National Aeronautics and Space Administration
Langley Research Center

Scientific and Technical Information Program Office

# Scientific and Technical Aerospace Reports

# STAR

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# NASA STI Program ... in Profile

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- NASA, NASA contractor, and NASA grantee reports
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- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

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# NASA STI Availability Information

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**Subject Term Index**

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# SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

*A Biweekly Publication of the National Aeronautics and Space Administration*

VOLUME 43, OCTOBER 7, 2005

## 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*.

**20050217136** Purdue Univ., West Lafayette, IN, USA

**Materials Issues Arising From Transient and Unsteady Loads in Combustion Devices**

Farris, T. N.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 31 pp.; In English; See also 20050217123; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Fretting fatigue is used as an example of failure arising from unsteady loads. Topics include: Successful prediction of fretting fatigue lives at room temperature; Elevated temperature experiments; Overview of experimental results; Fractography; Analysis of the experiments; and Conclusions and future work.

Derived from text

*Combustion; Transient Loads; Fretting; Fractography; Failure*

**20050217140** Purdue Univ., West Lafayette, IN, USA

**Subscale Test Methods for Combustion Devices**

Anderson, W. E.; Sisco, J. C.; Long, M. R.; Sung, I.-K.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 40 pp.; In English; See also 20050217123; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG8-1856; NAG8-1876; NAG8-1894; No Copyright; Avail.: CASI: A03, Hardcopy

Stated goals for long-life LRE s have been between 100 and 500 cycles: 1) Inherent technical difficulty of accurately defining the transient and steady state thermochemical environments and structural response (strain); 2) Limited statistical basis on failure mechanisms and effects of design and operational variability; and 3) Very high test costs and budget-driven need to protect test hardware (aversion to test-to-failure). Ambitious goals will require development of new databases: a) Advanced materials, e.g., tailored composites with virtually unlimited property variations; b) Innovative functional designs to exploit full capabilities of advanced materials; and c) Different cycles/operations. Subscale testing is one way to address technical and budget challenges: 1) Prototype subscale combustors exposed to controlled simulated conditions; 2) Complementary to conventional laboratory specimen database development; 3) Instrumented with sensors to measure thermostructural response; and 4) Coupled with analysis

Derived from text

*Combustion; Failure; Structural Strain; Thermochemistry; Data Bases; Prototypes*

## 02
## AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans, and other elements of turbomachinery. For related information see also *34 Fluid Mechanics and Thermodynamics*.

**20050215111** NASA Langley Research Center, Hampton, VA, USA

**Numerical Study of High-Temperature Jet Flow Using RANS/LES and PANS Formulations**

Abdol-Hamid, Khaled S.; Elmiligui, Alaa; [2005]; 17 pp.; In English; 23rd AIAA Applied Aerodynamics Conference, 6-9 Jun. 2005, Toronto, Ontario, Canada

Contract(s)/Grant(s): WBS 23-781-10-12

Report No.(s): AIAA Paper 2005-5092; Copyright; Avail.: CASI: A03, Hardcopy

Two multi-scale-type turbulence models are implemented in the PAB3D solver. The models are based on modifying the Reynolds Averaged Navier-Stokes (RANS) equations. The first scheme is a hybrid RANS/LES model utilizing the two-equation (k(epsilon)) model with a RANS/LES transition function dependent on grid spacing and the computed turbulence length scale. The second scheme is a modified version of the Partially Averaged Navier-Stokes (PANS) model, where the unresolved kinetic energy parameter (f(sub k)) is allowed to vary as a function of grid spacing and the turbulence length scale. This parameter is estimated based on a novel two-stage procedure to efficiently estimate the level of scale resolution possible for a given flow on a given grid for Partial Averaged Navier-Stokes (PANS). It has been found that the prescribed scale resolution can play a major role in obtaining accurate flow solutions. The parameter f(sub k) varies between zero and one and equal to one in the viscous sub layer, and when the RANS turbulent viscosity becomes smaller than the LES viscosity. The formulation, usage methodology, and validation examples are presented to demonstrate the enhancement of PAB3D's time-accurate and turbulence modeling capabilities. The accurate simulations of flow and turbulent quantities will provide valuable tool for accurate jet noise predictions. Solutions from these models are compared to RANS results and experimental data for high-temperature jet flows. The current results show promise for the capability of hybrid RANS/LES and PANS in simulating such flow phenomena.
Author
*Turbulence Models; Reynolds Averaging; Navier-Stokes Equation; Kinetic Energy; Gas Jets; High Temperature Gases*

**20050215169** NASA Glenn Research Center, Cleveland, OH, USA
**Single-Stage, 3.4:1-Pressure-Ratio Aspirated Fan Developed and Demonstrated**
Braunscheidel, Edward P.; Research and Technology 2003; May 2004; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Researchers are constantly pursuing technologies that will increase the performance of gas turbine engines. The aspirated compressor concept discussed here would allow the compression system to perform its task with about one-half of the compressor blades. To accomplish this, the researchers applied boundary layer control to the blades, casing, and hub. This method of boundary layer control consisted of removing small amounts of air from the main flow path at critical areas of the compressor. This bleed air could be used by other systems such as engine cooling or could be re-injected into lower pressure areas that require air for enhanced performance. This effort was initiated by the Massachusetts Institute of Technology (MIT) in response to a solicitation from the Defense Advanced Research Projects Agency (DARPA) who sought to advance research in flow control technology. The NASA Glenn Research Center partnered with MIT (principal investigator), Honeywell Aircraft Engines (cycle analysis, structural analysis, and mechanical design), and Pratt & Whitney (cycle analysis and aero-analysis) to conceptualize, design, analyze, build, and test the aspirated fan stage. The aero-design and aero-analysis of this fan stage were jointly executed by MIT and Glenn to minimize the amount of bleed flow needed and to maintain the highest efficiency possible (ref. 1). Mechanical design issues were complicated by the need to have a shrouded rotor with hollow blades, with rotor stress levels beyond the capabilities of titanium. The high stress issues were addressed by designing a shroud that was filament wound with a carbon fiber/epoxy matrix, resulting in an assembly that was strong enough to handle the high stresses. Both the rotor (preceding photographs) and stator (following photograph) were fabricated in two halves and then bolted together at the hub and tip, permitting the bleed passages to be machined into each half before assembly.
Author
*Gas Turbine Engines; Compressor Blades; Boundary Layer Control; Air Flow; Design Analysis; Pressure Ratio*

**20050215181** NASA Glenn Research Center, Cleveland, OH, USA
**Glow Discharge Plasma Demonstrated for Separation Control in the Low-Pressure Turbine**
Ashpis, David e.; Hultgren, Lennart S.; Research and Technology 2003; May 2004; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Flow separation in the low-pressure turbine (LPT) is a major barrier that limits further improvements of aerodynamic designs of turbine airfoils. The separation is responsible for performance degradation, and it prevents the design of highly loaded airfoils. The separation can be delayed, reduced, or eliminated completely if flow control techniques are used. Successful flow control technology will enable breakthrough improvements in gas turbine performance and design. The focus of this research project was the development and experimental demonstration of active separation control using glow discharge plasma (GDP) actuators in flow conditions simulating the LPT. The separation delay was shown to be successful, laying the foundation for further development of the technologies to practical application in the LPT. In a fluid mechanics context, the term 'flow control' means a technology by which a very small input results in a very large effect on the flow. In this project, the interest is to eliminate or delay flow separation on LPT airfoils by using an active flow control approach, in which disturbances are dynamically inserted into the flow, they interact with the flow, and they delay separation. The disturbances

can be inserted using a localized, externally powered, actuating device, examples are acoustic, pneumatic, or mechanical devices that generate vibrations, flow oscillations, or pulses. A variety of flow control devices have been demonstrated in recent years in the context of the external aerodynamics of aircraft wings and airframes, where the incoming flow is quiescent or of a very low turbulence level. However, the flow conditions in the LPT are significantly different because there are high levels of disturbances in the incoming flow that are characterized by high free-stream turbulence intensity. In addition, the Reynolds number, which characterizes the viscous forces in the flow and is related to the flow speed, is very low in the LPT passages.
Author
*Low Pressure; Gas Turbine Engines; Free Flow; Control Equipment; Active Control; Viscous Flow; Separated Flow; Magnetohydrodynamic Flow; Glow Discharges*

**20050215258** NASA Glenn Research Center, Cleveland, OH, USA
**Flutter Stability of the Efficient Low Noise Fan Calculated**
Bakhle, Milind A.; Srivastava, Rakesh; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The TURBO-AE aeroelastic code has been used to verify the flutter stability of the Efficient Low Noise Fan (ELNF), which is also referred to as the trailing-edge blowing fan. The ELNF is a unique technology demonstrator being designed and fabricated at the NASA Glenn Research Center for testing in Glenn's 9-by-15-Foot Low-Speed Wind Tunnel. In the ELNF, air can be blown out of slots near the trailing edges of the fan blades to fill in the wakes downstream of the rotating blades. This filling of the wakes leads to a reduction of the rotor-stator interaction (tone) noise that results from the interaction of wakes with the downstream stators. The ELNF will demonstrate a 1.6-EPNdB1 reduction in tone noise through wake filling, without increasing the broadband noise. Furthermore, the reduced blade row interaction will decrease the possibility of forced response and enable closer spacing of blade rows, thus reducing engine length and weight. During the design of the ELNF, the rotor blades were checked for flutter stability using the detailed aeroelastic analysis capability of the three-dimensional Navier-Stokes TURBOAE code. The aeroelastic calculations were preceded by steady calculations in which the blades were not allowed to vibrate. For each rotational speed, as the back-pressure was increased, the mass flow rate decreased, and the operating point moved along the constant speed characteristic (speed-line) from choke to stall as shown on the fan map. The TURBO-AE aeroelastic analyses were performed separately for the first two vibration modes (bending and torsion) and covered the complete range of interblade phase angles or nodal diameters at which flutter can occur. The results indicated that the ELNF blades would not encounter flutter at takeoff conditions. The calculations were then repeated for a part-speed condition (70-percent rotational speed), and the results again showed no flutter in the operating region. On the fan map (shown), the predicted flutter point at part speed condition was located beyond the stall line, which means that the ELNF will not encounter flutter since it will never operate beyond the stall line. All the calculations done so far have been for the nonblowing case, and selected calculations will be repeated with air blowing from the trailing edge of the fan.
Author
*Flutter; Stability; Low Noise; Fan Blades; Rotor Aerodynamics; Interactional Aerodynamics; Trailing Edges; Blowing; Aerodynamic Noise*

**20050216557** Army Research Lab., Aberdeen Proving Ground, MD USA
**Application of Computational Fluid Dynamics to a Monoplane Fixed-Wing Missile With Elliptic Cross Sections**
Heavey, Karen; Sahu, Jubaraj; Jul. 1, 2005; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437107; ARL-TR-3549; No Copyright; Avail.: CASI: A03, Hardcopy

This report describes a computational study undertaken to investigate the performance of the CFD++ flow solver for prediction of nonlinear aerodynamics of a complex finned missile using structured hexahedral and unstructured tetrahedral grids. A monoplane fixed-wing missile with elliptic cross sections provided a geometrically complex model. Numerical solutions were obtained for this configuration at supersonic speed for various roll orientations, angles of attack, and jaw angles. Steady-state solutions were obtained using a three-dimensional Reynolds-Averaged Navier-Stokes solver with a two-equation turbulence model. Numerical results show the qualitative features of the flow fields at various cross-sectional and streamwise positions along the computational model of the missile. Aerodynamic coefficients were extracted from the computed solutions and found to match well with the available experimental data for these configurations. These numerical results show the effectiveness of using computational fluid dynamics techniques to produce an accurate prediction of the aerodynamics of geometrically complete configurations.
DTIC
*Aerodynamic Characteristics; Computational Fluid Dynamics; Fixed Wings; Missiles; Monoplanes*

## 03
## AIR TRANSPORTATION AND SAFETY

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

**20050215035** NASA Langley Research Center, Hampton, VA, USA
**Fast-Time Evaluations of Airborne Merging and Spacing in Terminal Arrival Operations**
Krishnamurthy, Karthik; Barmore, Bryan; Bussink, Frank; Weitz, Lesley; Dahlene, Laura; [2005]; 11 pp.; In English; AIAA Guidance, Navigation, and Control Conference and Exhibit, 15-18 Aug. 2005, San Francisco, CA, USA
Contract(s)/Grant(s): 23-137-30-10; Copyright; Avail.: CASI: A03, Hardcopy

NASA researchers are developing new airborne technologies and procedures to increase runway throughput at capacity-constrained airports by improving the precision of inter-arrival spacing at the runway threshold. In this new operational concept, pilots of equipped aircraft are cleared to adjust aircraft speed to achieve a designated spacing interval at the runway threshold, relative to a designated lead aircraft. A new airborne toolset, prototypes of which are being developed at the NASA Langley Research Center, assists pilots in achieving this objective. The current prototype allows precision spacing operations to commence even when the aircraft and its lead are not yet in-trail, but are on merging arrival routes to the runway. A series of fast-time evaluations of the new toolset were conducted at the Langley Research Center during the summer of 2004. The study assessed toolset performance in a mixed fleet of aircraft on three merging arrival streams under a range of operating conditions. The results of the study indicate that the prototype possesses a high degree of robustness to moderate variations in operating conditions.
Author
*Robustness (Mathematics); Runways; Precision; Prototypes; Spacing*

**20050215114** NASA Langley Research Center, Hampton, VA, USA
**Conflict Resolution Performance in an Experimental Study of En Route Free Maneuvering Operations**
Doble, Nathan A.; Barhydt, Richard; Hitt, James M., II; [2005]; 9 pp.; In English; 6th USA/Europe Seminar on Air Traffic Management Research and Development, 27-30 Jun. 2005, Baltimore, MD, USA
Contract(s)/Grant(s): 23-137-10-10; Copyright; Avail.: CASI: A02, Hardcopy

NASA has developed a far-term air traffic management concept, termed Distributed Air/Ground Traffic Management (DAG-TM). One component of DAG-TM, En Route Free Maneuvering, allows properly trained flight crews of equipped autonomous aircraft to assume responsibility for separation from other autonomous aircraft and from Instrument Flight Rules (IFR) aircraft. Ground-based air traffic controllers continue to separate IFR traffic and issue flow management constraints to all aircraft. To examine En Route Free Maneuvering operations, a joint human-in-the-loop experiment was conducted in summer 2004 at the NASA Ames and Langley Research Centers. Test subject pilots used desktop flight simulators to resolve traffic conflicts and adhere to air traffic flow constraints issued by subject controllers. The experimental airspace integrated both autonomous and IFR aircraft at varying traffic densities. This paper presents a subset of the En Route Free Maneuvering experimental results, focusing on airborne and ground-based conflict resolution, and the effects of increased traffic levels on the ability of pilots and air traffic controllers to perform this task. The results show that, in general, increases in autonomous traffic do not significantly impact conflict resolution performance. In addition, pilot acceptability of autonomous operations remains high throughout the range of traffic densities studied. Together with previously reported findings, these results continue to support the feasibility of the En Route Free Maneuvering component of DAG-TM.
Author
*Maneuvers; Air Traffic Control; Controllers; Air Traffic*

**20050215139** Ohio Aerospace Inst., Brook Park, OH, USA
**Additional Results of Ice-Accretion Scaling at SLD Conditions**
Bond, Thomas H., Technical Monitor; Anderson, David N.; Tsao, Jen-Ching; August 2005; 18 pp.; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA
Contract(s)/Grant(s): NCC3-884; WBS 22-728-41-17
Report No.(s): NASA/CR-2005-213850; E-15220; AIAA Paper 2003-0390; No Copyright; Avail.: CASI: A03, Hardcopy

To determine scale velocity an additional similarity parameter is needed to supplement the Ruff scaling method. A Weber number based on water droplet MVD has been included in several studies because the effect of droplet splashing on ice

accretion was believed to be important, particularly for SLD conditions. In the present study, ice shapes recorded at Appendix-C conditions and recent results at SLD conditions are reviewed to show that droplet diameter cannot be important to main ice shape, and for low airspeeds splashing does not appear to affect SLD ice shapes. Evidence is presented to show that while a supplementary similarity parameter probably has the form of a Weber number, it must be based on a length proportional to model size rather than MVD. Scaling comparisons were made between SLD reference conditions and Appendix-C scale conditions using this Weber number. Scale-to-reference model size ratios were 1:1.7 and 1:3.4. The reference tests used a 91-cm-chord NACA 0012 model with a velocity of approximately 50 m/s and an MVD of 160 m. Freezing fractions of 0.3, 0.4, and 0.5 were included in the study.
Author
*Ice Formation; Freezing; Scale Models; Airspeed*

**20050215167** Ohio Aerospace Inst., Brook Park, OH, USA
**Overview of Icing Physics Relevant to Scaling**
Anderson, David N.; Tsao, Jen-Ching; August 2005; 23 pp.; In English; FAA In-Flight Icing/Ground De-Icing International Conference, 16-20 Jun. 2003, Chicago, IL, USA
Contract(s)/Grant(s): NCC3-884; WBS 22-728-41-17
Report No.(s): NASA/CR-2005-213851; Rept-2003-01-2130; E-15221; No Copyright; Avail.: CASI: A03, Hardcopy

An understanding of icing physics is required for the development of both scaling methods and ice-accretion prediction codes. This paper gives an overview of our present understanding of the important physical processes and the associated similarity parameters that determine the shape of Appendix C ice accretions. For many years it has been recognized that ice accretion processes depend on flow effects over the model, on droplet trajectories, on the rate of water collection and time of exposure, and, for glaze ice, on a heat balance. For scaling applications, equations describing these events have been based on analyses at the stagnation line of the model and have resulted in the identification of several non-dimensional similarity parameters. The parameters include the modified inertia parameter of the water drop, the accumulation parameter and the freezing fraction. Other parameters dealing with the leading edge heat balance have also been used for convenience. By equating scale expressions for these parameters to the values to be simulated a set of equations is produced which can be solved for the scale test conditions. Studies in the past few years have shown that at least one parameter in addition to those mentioned above is needed to describe surface-water effects, and some of the traditional parameters may not be as significant as once thought. Insight into the importance of each parameter, and the physical processes it represents, can be made by viewing whether ice shapes change, and the extent of the change, when each parameter is varied. Experimental evidence is presented to establish the importance of each of the traditionally used parameters and to identify the possible form of a new similarity parameter to be used for scaling.
Author
*Ice Formation; Leading Edges; Exposure; Analogies*

**20050215212** Ohio Aerospace Inst., Brook Park, OH, USA
**Evaluation and Validation of the Messinger Freezing Fraction**
Anderson, David N.; Tsao, Jen-Ching; August 2005; 18 pp.; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA
Contract(s)/Grant(s): NCC3-884; WBS 22-728-41-17
Report No.(s): NASA/CR-2005-213852; AIAA Paper 2003-1218; E-15222; No Copyright; Avail.: CASI: A03, Hardcopy

One of the most important non-dimensional parameters used in ice-accretion modeling and scaling studies is the freezing fraction defined by the heat-balance analysis of Messinger. For fifty years this parameter has been used to indicate how rapidly freezing takes place when super-cooled water strikes a solid body. The value ranges from 0 (no freezing) to 1 (water freezes immediately on impact), and the magnitude has been shown to play a major role in determining the physical appearance of the accreted ice. Because of its importance to ice shape, this parameter and the physics underlying the expressions used to calculate it have been questioned from time to time. Until now, there has been no strong evidence either validating or casting doubt on the current expressions. This paper presents experimental measurements of the leading-edge thickness of a number of ice shapes for a variety of test conditions with nominal freezing fractions from 0.3 to 1.0. From these thickness measurements, experimental freezing fractions were calculated and compared with values found from the Messinger analysis as applied by Ruff. Within the experimental uncertainty of measuring the leading-edge thickness, agreement of the experimental and analytical freezing fraction was very good. It is also shown that values of analytical freezing fraction were entirely consistent with observed ice shapes at and near rime conditions: At an analytical freezing fraction of unity,

experimental ice shapes displayed the classic rime shape, while for conditions producing analytical freezing fractions slightly lower than unity, glaze features started to appear.
Author
*Freezing; Heat Balance; Ice Formation*

**20050215215** Ohio Aerospace Inst., Brook Park, OH, USA
**Additional Study of Water Droplet Median Volume Diameter (MVD) Effects on Ice Shapes**
Tsao, Jen-Ching; Anderson, David N.; August 2005; 18 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA
Contract(s)/Grant(s): NCC3-938; WBS 22-728-41-17
Report No.(s): NASA/CR-2005-213853; AIAA Paper 2004-0413; E-15223; No Copyright; Avail.: CASI: A03, Hardcopy

This paper reports the result of an experimental study in the NASA Glenn Icing Research Tunnel (IRT) to evaluate how well the MVD-independent effect identified previously might apply to SLD conditions in rime icing situations. Models were NACA 0012 wing sections with chords of 53.3 and 91.4 cm. Tests were conducted with a nominal airspeed of 77 m/s (150 kt) and a number of MVD's ranging from 15 to 100 m with LWC of 0.5 to 1 g/cu m. In the present study, ice shapes recorded from past studies and recent results at SLD and Appendix-C conditions are reviewed to show that droplet diameter is not important to rime ice shape for MVD of 30 microns or larger, but for less than 30 m drop sizes a rime ice shape transition from convex to wedge to spearhead type ice shape is observed.
Author
*Ice Formation; Wings; Wedges; Drops (Liquids); Drop Size; Airspeed*

**20050215545** Nebraska Univ., Omaha, NE, USA
**Journal of Air Transportation, Volume 10, No. 2**
Bowen, Brent, Editor; Unal, Mehmet, Editor; Gudmundsson, Sveinn Vidar, Editor; Kabashkin, Igor, Editor; 2005; ISSN 1544-6980; In English; See also 20050215546 - 20050215553
Contract(s)/Grant(s): NCC5-572
Report No.(s): LC-HE9761.1.J68; Copyright; Avail.: CASI: C01, CD-ROM

Topics discussed include: Mitigation Alternatives for Carbon Dioxide Emissions by the Air Transport Industry in Brazil; Air Transport Regulation Under Transformation: The Case of Switzerland; An Estimation of Aircraft Emissions at Turkish Airports; Guide to the Implementation of Iso 14401 at Airports; The Impact of Constrained Future Scenarios on Aviation and Emissions; The Immediate Financial Impact of Transportation Deregulation on the Stockholders of the Airline Industry; Aviation Related Airport Marketing in an Overlapping Metropolitan Catchment Area: The Case of Milan's Three Airports; and Airport Pricing Systems and Airport Deregulation Effects on Welfare.
Derived from text
*Air Transportation; Airline Operations; Airports; Marketing; Carbon Dioxide*

**20050215546** Universidade Federal do Rio de Janeiro, Brazil
**Mitigation Alternatives for Carbon Dioxide Emissions by the Air Transport Industry in Brazil**
Simoes, Andre Felipe; Schaeffer, Roberto; EspiritoSanto, Respicio A., Jr.; Journal of Air Transportation, Volume 10, No. 2; 2005, pp. 4-19; In English; See also 20050215545; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Environmental issues are increasingly high priority when drawing up government policies for transportation in both industrialized and developing nations. Carbon dioxide (CO2) emissions generated by the sector has caused much concern, mainly due to the fast growing rate of these emissions, now accounting for approximately 13% of global warming. Since the early 1990s, some of the highest growth rates of transportation emissions have been recorded for air transportation, which currently accounts for around 3.5% of total anthropogenic carbon dioxide emissions. This increase is particular in the industrial-based developing countries, such as Brazil, where demand for air transportation has increased rapidly. In view of this, the main purpose of this paper is to discuss the contribution of Brazilian air transportation to global climate change and to present more environmentally friendly energy sources for mitigating CO2 emissions from this sector. The paper presents an inventory of CO2 emissions caused by the air transportation sector in Brazil, a set of trend forecasts through to the year 2023, indicating the progression of these emissions, with several possible improvement alternatives.
Author
*Air Pollution; Air Transportation; Climate Change; Carbon Dioxide; Policies; Global Warming; Climatology*

**20050215547** Porto Univ., Portugal

**Airport Pricing Systems and Airport Deregulation Effects on Welfare**

Barbot, Cristina; Journal of Air Transportation, Volume 10, No. 2; 2005, pp. 109-126; In English; See also 20050215545; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper analyses the effects of airport s pricing systems on welfare, comparing peak load with uniform pricing. It introduces a model with three firms - two airlines and one airport - in a two-stage game that solves the airlines duopoly problem in a Bertrand competition setting and the airport s profit maximization problem. Conclusions are different from others in previous research, which stress the importance of putting all firms together in the game. Mainly, results show that welfare does not always increase with peak load prices, and that the low quality airline and the airport increase their profits while the high quality airline loses profits. As an extension of the paper, airport deregulation is applied to the model and effects are found to be different from those of deregulating other utilities. In particular results point out that congested airports deregulation will have better results for welfare than uncongested airports.

Author

*Airline Operations; Commercial Aircraft; Civil Aviation; Airports*

**20050215548** Ecole Polytechnique Federale de Lausanne, Switzerland

**Air Transport Regulation Under Transformation: The Case of Switzerland**

Finger, Matthias; Piers, Michel; Journal of Air Transportation, Volume 10, No. 2; 2005, pp. 20-32; In English; See also 20050215545; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the past five years, the Swiss air transport sector has witnessed an unprecedented number of accidents and incidents, leading to an independent analysis ordered by the government. The resulting report of 2003 identified significant regulatory and institutional deficiencies with direct implications for safety. The challenges to Switzerland s institutional regulatory framework were further exacerbated because of the bankruptcy of the Swiss national flag carrier (Swissair in 2002) and the pressure on Zurich Unique airport resulting from of a new over flight regime in Germany in 2003. On the basis of this report, the government has ordered a profound transformation of the Swiss institutional regulatory framework, among which the transformation of the Swiss Federal Office of Civil Aviation (FOCA) into a regulator, whose predominant concern must be safety. This paper presents and critically analyzes the current transformation of the Swiss institutional regulatory regime against both regulation theory and safety performance criteria.

Author

*Air Transportation; Airports; Civil Aviation; Regulators; Safety*

**20050215549** Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne, Germany

**The Impact of Constrained Future Scenarios on Aviation and Emissions**

Berghof, Ralf; Journal of Air Transportation, Volume 10, No. 2; 2005, pp. 69-82; In English; See also 20050215545; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents results of research, whose main objective is the quantification of four scenarios for long-term development in aviation and related emissions. The research placed special emphasis on constraints relating to infrastructure, regulation and assumptions of technology development. Overall scenario results show that infrastructure enhancements and noise emissions could be successfully targeted with landing charges while a reduction of emissions via fuel tax or a quick introduction of hydrogen powered aircraft reduces strongly the profitability of the aviation industry.

Author

*Aircraft Industry; Air Pollution; Technology Utilization; Hydrogen; Exhaust Emission*

**20050215550** Yildiz Technical Univ., Istanbul, Turkey

**An Estimation of Aircraft Emissions at Turkish Airports**

Kesgin, Ugur; Journal of Air Transportation, Volume 10, No. 2; 2005, pp. 33-48; In English; See also 20050215545; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present the first estimates for aircraft landing and take-off (LTO) emissions at 40 Turkish airports in 2001, including the biggest airports: Ataturk International Airport in Istanbul (AIA), Antalya Airport in Antalya and Esenboga Airport in Ankara. The calculation model is based on flight data recorded by the State Airports Authority. The flight data include the type

and number of aircraft, number of passengers, and cargo volume by date and time. For the emission calculations, we used the International Civil Aviation Organization (ICAO) Engine Exhaust Emissions Data Bank, which includes minimum and maximum values for both fuel flow rates and emissions factors. Total LTO emissions at Turkish airports are estimated to be between 7614 and 8338 tons per year. These results are comparable with U.S. airports on the average. Approximately half of the LTO emissions are, however, produced at the AIA. To predict future emissions, we estimated that an increase of 25% in LTO cycles might cause a rise of between 31% and 33% in emissions. The estimations show that a decrease of 2 minutes in taxiing time results in a decrease of 6% in LTO emissions. The model developed in this study was shown to perform well for airport environmental planning and expansion in the Turkish case.
Author
*Exhaust Emission; Airports; Exhaust Gases; Takeoff; Airport Planning; Combustion Products; Environment Management; Estimates*

**20050215551** Anadolu Univ., Eskisehir, Turkey
**Guide to the Implementation of Iso 14401 at Airports**
Korul, Vildan; Journal of Air Transportation, Volume 10, No. 2; 2005, pp. 49-68; In English; See also 20050215545; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Today, many companies are subject to environmental regulations. A growing awareness of the impact of activities on the environment has created a greater need to take into account environmental factors in air transport. For that reason, an increasing number of corporations around the world are certifying their environmental management systems (EMS) by the ISO 14000 series standards. Improving the environmental performance of corporations is one way of limiting the environmental damage. EMS provide a framework for organizations that wish to effectively manage their environmental affairs. Implementing an EMS that conforms to the ISO 14001 standard may help businesses to integrate environmental values into their operations. This paper is intended to provide guidance to airports for the development and implementation of an EMS and assistance in meeting the requirements of ISO 14001. We show that improving the environmental performance of airports through ISO 14001 can reduce the negative environmental effects. To achieve a more environmentally friendly business practice, airports must develop internal management processes that integrate environmental objectives into day-to-day operations.
Author
*Air Transportation; Airports; Management Systems; Environment Effects; Environment Management; Certification*

**20050215552** Auburn Univ., AL, USA
**The Immediate Financial Impact of Transportation Deregulation on the Stockholders of the Airline Industry**
Hanna, Joe B.; Kunkel, Robert A.; Kuhlemeyer, Gregory A.; Johnson, Randy; Journal of Air Transportation, Volume 10, No. 2; 2005, pp. 83-95; In English; See also 20050215545; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper is an empirical study to analyze how a policy of deregulation aimed at one segment of the transportation industry (surface transportation) may indirectly impact the stockholders of another segment of the industry (airlines). The U.S. government eliminated the Interstate Commerce Commission (ICC) effective January 1, 1996. Previous research has shown termination of the ICC benefited surface transportation providers. However, what is unclear is whether or not the trend towards transportation deregulation impacts segments of the industry not directly targeted by the deregulation. The current study shows that, while airlines received a short-term, indirect positive financial impact from termination of the ICC, the impact was not statistically significant. Results show that transportation deregulation legislation must be specifically targeted to a particular segment of an industry and no carry over effect into other segments of the transportation industry appears to occur.
Author
*Airline Operations; Law (Jurisprudence); Civil Aviation; Commerce; Commercial Aircraft*

**20050215553** Luigi Bocconi Commercial Univ., Milan, Italy
**Aviation-Related Airport Marketing in an Overlapping Metropolitan Catchment Area: The Case of Milan's Three Airports**
Jarach, David; Journal of Air Transportation, Volume 10, No. 2; 2005, pp. 96-108; In English; See also 20050215545; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Milan is the third richest catchment area in Europe, just behind London and Paris, in terms of individual gross domestic product. Nevertheless, airport operations in Milan have not had the same degree of development that one would expect in such

a wealthy area. The main reason is due to the existence of three airports located within in the same metropolitan area, which creates a negative offer fragmentation and doesn t allow for airlines, and especially the hub carrier, to achieve significant returns on investment from improved outputs. Moreover, this situation, in the absence of a market-driven regulatory regime of flight activities able to split operations between the three sites in correlation with their technical, geographical and vocational characteristics, naturally tends to create overlapping and cross-cannibalization. Recent proposals to solve these problems have proved to be short-minded remedies. This paper aims to analyze the current situation of Milan s metropolitan area for airport operations and propose some innovative regulatory solutions that are needed to make Milan airports more marketable and, thus, create a platform for their distinctive strategic marketing positioning within the European airport scenario.
Author
*Airline Operations; Marketing; Commercial Aircraft; Civil Aviation; Maintenance; Airports*

**20050215572** NASA Langley Research Center, Hampton, VA, USA
**Joint NASA Ames/Langley Experimental Evaluation of Integrated Air/Ground Operations for En Route Free Maneuvering**
Barhydt, Richard; Kopardekar, Parimal; Battiste, Vernol; Doble, Nathan; Johnson, Walter; Lee, Paul; Prevot, Thomas; Smith, Nancy; [2005]; 13 pp.; In English; 6th USA/Europe Seminar on Air Traffic Management Research and Development, 27-30 Jun. 2005, Baltimore, MD, USA
Contract(s)/Grant(s): 23-137-10-10; No Copyright; Avail.: CASI: A03, Hardcopy

In order to meet the anticipated future demand for air travel, the National Aeronautics and Space Administration (NASA) is investigating a new concept of operations known as Distributed Air-Ground Traffic Management (DAG-TM). Under the En Route Free Maneuvering component of DAG-TM, appropriately equipped autonomous aircraft self separate from other autonomous aircraft and from managed aircraft that continue to fly under today s Instrument Flight Rules (IFR). Controllers provide separation services between IFR aircraft and assign traffic flow management constraints to all aircraft. To address concept feasibility issues pertaining to integrated air/ground operations at various traffic levels, NASA Ames and Langley Research Centers conducted a joint human-in-the-loop experiment. Professional airline pilots and air traffic controllers flew a total of 16 scenarios under four conditions: mixed autonomous/managed operations at three traffic levels and a baseline all-managed condition at the lowest traffic level. These scenarios included en route flights and descents to a terminal area meter fix in airspace modeled after the Dallas Ft. Worth area. Pilots of autonomous aircraft met controller assigned meter fix constraints with high success. Separation violations by subject pilots did not appear to vary with traffic level and were mainly attributable to software errors and procedural lapses. Controller workload was lower for mixed flight conditions, even at higher traffic levels. Pilot workload was deemed acceptable under all conditions. Controllers raised several safety concerns, most of which pertained to the occurrence of near-term conflicts between autonomous and managed aircraft. These issues are being addressed through better compatibility between air and ground systems and refinements to air and ground procedures.
Author
*Instrument Flight Rules; NASA Programs; Routes; Aircraft Maneuvers; Ground Based Control; Air Traffic Control*

**20050215574** NASA Langley Research Center, Hampton, VA, USA
**Extending a Flight Management Computer for Simulation and Flight Experiments**
Madden, Michael M.; Sugden, Paul C.; [2005]; 11 pp.; In English; AIAA Modeling and Simulation Technologies Conference and Exhibit, 15-18 Aug. 2005, San Francisco, CA, USA
Report No.(s): AIAA Paper 2005-6100; Copyright; Avail.: CASI: A03, Hardcopy

In modern transport aircraft, the flight management computer (FMC) has evolved from a flight planning aid to an important hub for pilot information and origin-to-destination optimization of flight performance. Current trends indicate increasing roles of the FMC in aviation safety, aviation security, increasing airport capacity, and improving environmental impact from aircraft. Related research conducted at the Langley Research Center (LaRC) often requires functional extension of a modern, full-featured FMC. Ideally, transport simulations would include an FMC simulation that could be tailored and extended for experiments. However, due to the complexity of a modern FMC, a large investment (millions of dollars over several years) and scarce domain knowledge are needed to create such a simulation for transport aircraft. As an intermediate alternative, the Flight Research Services Directorate (FRSD) at LaRC created a set of reusable software products to extend flight management functionality upstream of a Boeing-757 FMC, transparently simulating or sharing its operator interfaces. The paper details the design of these products and highlights their use on NASA projects.
Author
*Flight Characteristics; Flight SIMulation; Transport Aircraft; Aircraft Safety; Computer Programs; Flight Optimization*

**20050215585** Research and Technology Organization, Neuilly-sur-Seine, France

**Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation**

August 2005; 86 pp.; In English; Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation, 28-29 Oct. 2004, Madrid, Spain; See also 20050215586 - 20050215594

Report No.(s): RTO-EN-HFM-113; AC/323(HFM-113)TP/57; Copyright; Avail.: CASI: C01, CD-ROM: A05, Hardcopy

Associated Biodynamics in Aircraft Accident Investigation , to review the status and future directions related to effective crashworthiness design and design criteria of aircraft and how such new design interfaces with some critical aspects of the aircraft accident investigation preferably those related to forensic pathology, biodynamics of injury, injury mechanism, injury mitigation and their implications for flight safety in relation to any type air based platform. These Lecture Series (LS) will be focused on determining what injury and injury mechanism data are required from accident investigations and will make recommendations on effective techniques and methodologies to use in the conduct of an accident investigation. The purpose of this LS is to address the above mentioned critical aspects of the investigation and discuss specific issues such: 1) Determine service and country aircraft accident and ejection data requirements (injuries, equipment failure, etc...). Focus on determining what injury and injury mechanism data are required by service and by country and determine what data are not universally acquired, or not acquired at all, but deemed essential. 2) Acquire crash and survivability data on non aircraft accidents. Focus on general data, automobile crash data and correlation of measurements in anthropometric dummies to injury risk (predictive modelling of human tolerance levels), crashworthiness of vehicles and equipment and survivability of accidents, that may be useful in determination of injury mechanisms, survivability and development of crashworthiness design criteria. 3) Determine what appropriate injury criteria are available and how those criteria can be measured and analysed during testing of aircraft personnel. 4) Provide recommendations on effective accident investigation techniques and methodologies for obtaining accurate and sufficient injury data from aircraft crashes and ejection. Recommendations should enhance ability to determine injury mechanism from aircraft accidents and to prevent injuries. This LS, sponsored by the Human Factor and Medicine Panel has been implemented by the Consultant and Exchange Programme. Thanks for the collaboration and magnificent support given for the Spanish authorities in providing the necessary facilities in Madrid to conduct this Lecture Series, and LS speakers for providing the related academic technical and scientific information.

Author

*Accident Investigation; Biodynamics; Crashworthiness; Data Processing Equipment; Flight Safety*

**20050215588** Federal Aviation Administration, Oklahoma City, OK, USA

**Collection of Medical Information**

DeJohn, Charles; Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation; August 2005, pp. 8-1; In English; See also 20050215585; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Contents include the following: Incapacitation/Impairment. Report - fatal and non fatal events. Autopsy - fatal accidents. Medical information. Incapacitation database. Data input/output. Toxicology database link. Typical uses of injury databases. Derived from text

*Data Bases; Injuries; Toxicology; Accident Investigation; Flight*

**20050215589** Federal Aviation Administration, Oklahoma City, OK, USA

**Accident Investigation Techniques and Methodologies**

DeJohn, Charles; Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation; August 2005, pp. 2-1; In English; See also 20050215585; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Methodology: 1. A system of principles, practices and body of procedures (methods) applied to a specific branch of knowledge. An overall approach to a field such as accident investigation. Examples: Adversarial, Commission, Events Reconstruction, Modeling, Simulation. 2. Method: A technique or tool. A regular, disciplined, systematic set of procedures used according to an underlying, detailed, logically ordered plan. Examples: Multi-linear Events Sequencing (MES), Fault Tree Analysis (FTA), Management Oversight and Risk Tree (MORT).

Derived from text

*Accident Investigation; Procedures; Risk*

**20050215590** Spanish Armed Forces Technical Investigation Board, Madrid, Spain

**General Aspects in Aircraft Accident Investigation**

Tejada, Francisco Rios; Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation; August 2005, pp. 1-1 - 1-12; In English; See also 20050215585; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mishap description and investigational procedures play a key role in understanding what areas failed in the accident sequence of events and provides us the correct tools to address appropriate recommendations, in order to prevent future similar situations that leads to incidents or accidents. Wiegman and Shappel (26) described years ago a practical and comprehensive model of human factors which can be applied to every accident. The so named HFACS or Human factors Accident Classification System model followed the causative models described by previously by Reason (17) and later by AGARD WG-23 (19). Nowdays it constitutes a handy taxonomical tool to identify and determine causal facts related to active or latent conditions capable to lead to the accident. The investigation of and aircraft accident is always a difficult task, in where a great number of factors might be involved and where sometimes part of the clues are hidden or missing (5,6). It is like an enormous puzzle where we have to engage all the pieces according to the info provided by meteo, engines, cell, avionics, forensic, human factors etc..., but we have very often a big challenge, some of the pieces of the puzzle are missing, deteriorated, bleached, burned, or even artificially misplaced, and we have to figure out , what are they and where to fit them. From a biodynamic and impact point of view, the investigational accident process should target the preventive measures resulted from the detailed study of the crash forces involved and the type of injuries produced. The analysis of the patterns of injuries sustained by the aircrews are critical and any information concerning the type and nature of injuries involved in a fatal accident must be part of the investigation. Results of autopsies reveal most of the time that blunt trauma is the primary cause of death in more than 75% of the fatal cases, followed by bony injuries of the ribs, skull and facial bones. Very often all injuries appear and head injuries results as the leading cause of death (2,10,27). A recent paper pointed out the relevance of the investigation of injuries produced in the survivors, equally subjected to a mechanism of injury that can be easily study and theoretically reproduce in the survivor patient (11).

Author

*Accident Investigation; Autopsies; Crashes; Human Factors Engineering; Injuries*

**20050215592** Injury Analysis, LLC, Carlsbad, CA, USA

**Human Tolerance and Crash Survivability**

Shanahan, Dennis F.; Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation; August 2005, pp. 6-1 - 6-15; In English; See also 20050215585; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Aircraft and motor vehicle crashes will continue to occur in spite of all human efforts to prevent them. However, serious injury and death are not inevitable consequences of these crashes. It has been estimated that approximately 85 percent of all aircraft crashes are potentially survivable without serious injury for the occupants of these aircraft. Nevertheless, many deaths and serious injuries occur in crashes that are classified as 'survivable'. This is because the protective systems within the aircraft such as seats, restraint systems, and cabin strength were inadequate to protect the occupants in a crash that would have otherwise been non-injurious. In order to maximize survivability in a crash, one must have an understanding of the tolerance of humans to abrupt acceleration and then design an aircraft that is capable of maintaining its cabin/cockpit integrity up to the limits of human tolerance. This should be combined with judicious use of energy absorbing technologies that reduce accelerations experienced by the occupants and by restraint systems that provide appropriate support and prevent injurious contacts. This paper discusses basic principles of human tolerance to abrupt acceleration as well as basic concepts of crashworthiness design. Although these concepts are discussed in the context of helicopter crashes, the same principles apply to other vehicles.

Author

*Aircraft Accidents; Crashworthiness; Estimating; Human Tolerances; Injuries*

**20050215593** Injury Analysis, LLC, Carlsbad, CA, USA

**Basic Principles of Crashworthiness**

Shanahan, Dennis F.; Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation; August 2005, pp. 7-1 - 7-14; In English; See also 20050215585; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Crashworthiness can be defined as the ability of an aircraft and its internal systems to protect occupants from injury in the event of a crash. In general, injury in aircraft crashes can be considered to arise from three distinct sources: (1) excessive

acceleration forces; (2) direct trauma from contact with injurious surfaces, and; (3) exposure to environmental factors such as fire, smoke, water, and chemicals resulting in bums, drowning or asphyxiation. Consequently, effective crashworthiness designs must consider all possible sources of injury and eliminate or mitigate as many as practical for a given design impact limit. This involves considerations of (1) strength of the container (cockpit and cabin), (2) adequacy of seats and restraint systems, (3) adequacy of energy attenuation systems, (4) injurious objects in the local environment of occupants, and (5) post-crash factors, principally fire prevention and adequacy of escape routes. The U.S. Army UH-60 Black Hawk and AH-64 Apache helicopters were the first helicopters built to modem crashworthiness specifications. This paper uses investigations of crashes of these helicopters to illustrate basic crashworthiness principles and to demonstrate their effectiveness when systematically incorporated into helicopter designs.
Author
*Crashworthiness; Asphyxia; Crashes; Exposure; Injuries; Smoke*

**20050215594** Spanish Armed Forces Technical Investigation Board, Madrid, Spain
**Introduction**
Tejada, Francisco Rios; Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation; August 2005, pp. 1-1; In English; See also 20050215585; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Generally speaking accidents are defined in terms of damage or injury and aviation is not away of that simple concept. According to the International Civil Aviation Organization (ICAO) aircraft accident is an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which: a person is fatally or seriously injured as a result of being in the aircraft or direct in contact with any part of the aircraft, including parts which have become detached from the aircraft or direct exposure to the blast. The aircraft sustains damage or structural failure affecting the structural strength, performance or flight characteristics or require major repair or replacement of the affected component. Also it is considered an accident if the aircraft is missing or is completely inaccessible. This is the definition, but why does it happen might be our major concern and appropriate answer the biggest challenge. All aircraft accidents are different, but the accident investigation process it should be the same, including accumulating knowledge about the facts of the accident, analyzing the data and developing conclusions. This Lecture Series is devoted to the medical investigation related to the pathological findings associated to the biodynamics of the impact. From that perspective, the investigational accident procedure will be capable in procuring appropriate answers which necessarily will fit in the whole body of the investigation. That information is critical in producing clues about the nature of the injuries, and key for determining causal facts related to conditions capable to lead to the accident. This information will be focused on determining what injury and injury mechanism data are required from accident investigations in order to develop recommendations on effective methodologies to use in the conduct of an investigation. Finally this Lecture Series has long term objectives, such to promote knowledge in this specific field, also intend to facilitate networking and interchange information and create the appropriate atmosphere for future scientific and academic activities in Aircraft accident Investigation and possibly the most important one to step on future NATO common procedures which lead to interoperability.
Author
*Accident Investigation; Damage; Exposure; Structural Failure*

**20050215619** NASA Marshall Space Flight Center, Huntsville, AL, USA
**The Application of Electron Microscopy Techniques to the Space Shuttle Columbia Accident Investigation**
Shah, Sandeep; Jerman, Greg; [2005]; 8 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

The Space Shuttle Columbia was returning from a 16-day research mission, STS- 107, with nominal system performance prior to the beginning of the entry interface into earth's upper atmosphere. Approximately one minute and twenty four seconds into the peak heating region of the entry interface, an off-nominal temperature rise was observed in the left main landing gear brake line. Nearly seven minutes later, all contact was lost with Columbia. Debris was observed periodically exiting the Shuttle's flight path throughout the reentry profile over California, Nevada, and New Mexico, until its final breakup over Texas. During the subsequent investigation, electron microscopy techniques were crucial in revealing the location of the fatal damage that resulted in the loss of Columbia and her crew.
Author
*Electron Microscopy; Space Shuttles; Aircraft Accident Investigation; NASA Space Programs; Columbia (Orbiter)*

**20050215688** NASA Glenn Research Center, Cleveland, OH, USA

**Current Experimental Basis for Modeling Ice Accretions on Swept Wings**

Vargas, Mario; Septembwer 2005; 35 pp.; In English; Fourth Theoretical Fluid Mechanics Meeting, 6-9 Jun. 2005, Toronto, Ontario, Canada; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-077-41-17

Report No.(s): NASA/TM-2005-213836; E-15206; AIAA Paper 2005-5188; No Copyright; Avail.: CASI: A03, Hardcopy

This work presents a review of the experimental basis for modeling ice accretions on swept wings. Experimental work related to ice accretion physics on swept wings conducted between 1954 and 2004 is reviewed. Proposed models or explanations of scallop formations are singled out and discussed. Special emphasis is placed on reviewing the work done to determine the basic macroscopic mechanisms of scallop formation. The role of feather growth and its connection to scallop growth is discussed. Conceptual steps in modeling scallop formations are presented. Research elements needed for modeling are discussed.

Author

*Swept Wings; Ice Formation; Ice*

**20050217104** Georgia Inst. of Tech., Atlanta, GA, USA

**Intelligent Pilot Aids for Flight Re-Planning in Emergencies**

Pritchett, Amy R.; Ockerman, Jennifer; April 25, 2005; 69 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAG1-01055; No Copyright; Avail.: CASI: A04, Hardcopy

Effective and safe control of an aircraft may be difficult or nearly impossible for a pilot following an unexpected system failure. Without prior training, the pilot must ascertain on the fly those changes in both manual control technique and procedures that will lead to a safe landing of the aircraft. Sophisticated techniques for determining the required control techniques are now available. Likewise, a body of literature on pilot decision making provides formalisms for examining how pilots approach discrete decisions framed as the selection between options. However, other aspects of behavior, such as the task of route planning and guidance, are not as well studied. Not only is the pilot faced with possible performance changes to the aircraft dynamics, but he or she is also tasked to create a plan of actions that will effectively take the aircraft down to a safe landing. In this plan, the many actions that the pilot can perform are closely intertwined with the trajectory of the aircraft, making it difficult to accurately predict the final outcome. Coupled with the vast number of potential actions to be taken, this problem may seem intractable. This is reflected in the lack of a pre-specified procedure capable of giving pilots the ability to find a resolution for this task. This report summarizes a multi-year effort to examine methods to aid pilots in planning an approach and arrival to an airport following an aircraft systems failure. Ultimately, we hypothesize that automatic assistance to pilots can be provided in real-time in the form of improving pilot control of a damaged aircraft and providing pilots with procedural directives suitable for critical flight conditions; such systems may also benefit pilot training and procedure design. To achieve this result, a systematic, comprehensive research program was followed, building on prior research. This approach included a pencil-and-paper study with airline pilots examining methods of representing a flight route in an immediately understandable manner, and in a manner that would allow the pilot to modify an automatically-generated route and/or detect any inappropriate elements in an automatically-generated route. Likewise, a flight simulator study examined different cockpit systems for the relative merits of providing pilots with any of a variety of automated functions for emergency flight planning. The results provide specific guidance for the design of such systems.

Author

*Pilot Training; Emergencies; Airports; System Failures; Flight Plans; Landing Aids*

## 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*.

**20050215313** Alabama Univ., Huntsville, AL, USA

**Controls for Reusable Launch Vehicles During Terminal Area Energy Management**

Driessen, Brian J.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XIII-1 - XIII-5; In English; See also 20050215300; No Copyright; Avail.: CASI: A01, Hardcopy

During the terminal energy management phase of flight (last of three phases) for a reusable launch vehicle, it is common

for the controller to receive guidance commands specifying desired values for (i) the roll angle roll q(sub roll), (ii) the acceleration a(sub n) in the body negative z direction, -k(sub A)-bar, and (iii) omega(sub 3), the projection of onto the body-fixed axis k(sub A)-bar, is always indicated by guidance to be zero. The objective of the controller is to regulate the actual values of these three quantities, i.e make them close to the commanded values, while maintaining system stability.
Derived from text
*Reusable Launch Vehicles; Terminal Area Energy Management*

## 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*.

**20050214855** NASA Glenn Research Center, Cleveland, OH, USA
**New Tools Being Developed for Engine- Airframe Blade-Out Structural Simulations**
Lawrence, Charles; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

One of the primary concerns of aircraft structure designers is the accurate simulation of the blade-out event. This is required for the aircraft to pass Federal Aviation Administration (FAA) certification and to ensure that the aircraft is safe for operation. Typically, the most severe blade-out occurs when a first-stage fan blade in a high-bypass gas turbine engine is released. Structural loading results from both the impact of the blade onto the containment ring and the subsequent instantaneous unbalance of the rotating components. Reliable simulations of blade-out are required to ensure structural integrity during flight as well as to guarantee successful blade-out certification testing. The loads generated by these analyses are critical to the design teams for several components of the airplane structures including the engine, nacelle, strut, and wing, as well as the aircraft fuselage. Currently, a collection of simulation tools is used for aircraft structural design. Detailed high-fidelity simulation tools are used to capture the structural loads resulting from blade loss, and then these loads are used as input into an overall system model that includes complete structural models of both the engines and the airframe. The detailed simulation (shown in the figure) includes the time-dependent trajectory of the lost blade and its interactions with the containment structure, and the system simulation includes the lost blade loadings and the interactions between the rotating turbomachinery and the remaining aircraft structural components. General-purpose finite element structural analysis codes are typically used, and special provisions are made to include transient effects from the blade loss and rotational effects resulting from the engine s turbomachinery. To develop and validate these new tools with test data, the NASA Glenn Research Center has teamed with GE Aircraft Engines, Pratt & Whitney, Boeing Commercial Aircraft, Rolls-Royce, and MSC.Software.
Author
*Airframes; Fan Blades; Aircraft Structures; Computerized SIMulation; Finite Element Method; Rotation; Structural Analysis; Structural Design; Structural Failure*

**20050214860** NASA Glenn Research Center, Cleveland, OH, USA
**Fan Noise Source Diagnostic Test Completed and Documented**
Envia, Edmane; Research and Technology 2002; Martch 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The specially organized session offered an international forum to disseminate the results from a year long test that was conducted in 1999 in NASA Glenn Research Center s 9- by 15-Foot Low-Speed Wind Tunnel on a 22-in. scale-model turbofan bypass stage, which was designed to be representative of current aircraft engine technology. The test was a cooperative effort involving Glenn, the NASA Langley Research Center, GE Aircraft Engines, and the Boeing Company. The principal objective of the project was to study the source mechanisms of noise in a modern high-bypass-ratio turbofan engine through detailed aerodynamic and acoustic measurements.
Derived from text
*Acoustic Measurement; Aerodynamic Noise; Fan Blades; Turbofan Engines*

**20050214861** NASA Glenn Research Center, Cleveland, OH, USA, Ohio Aerospace Inst., OH, USA
**Neural Network and Regression Methods Demonstrated in the Design Optimization of a Subsonic Aircraft**
Hopkins, Dale A.; Lavelle, Thomas M.; Patnaik, Surya; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The neural network and regression methods of NASA Glenn Research Center s COMETBOARDS design optimization testbed were used to generate approximate analysis and design models for a subsonic aircraft operating at Mach 0.85 cruise speed. The analytical model is defined by nine design variables: wing aspect ratio, engine thrust, wing area, sweep angle, chord-thickness ratio, turbine temperature, pressure ratio, bypass ratio, fan pressure; and eight response parameters: weight, landing velocity, takeoff and landing field lengths, approach thrust, overall efficiency, and compressor pressure and temperature. The variables were adjusted to optimally balance the engines to the airframe. The solution strategy included a sensitivity model and the soft analysis model. Researchers generated the sensitivity model by training the approximators to predict an optimum design. The trained neural network predicted all response variables, within 5-percent error. This was reduced to 1 percent by the regression method. The soft analysis model was developed to replace aircraft analysis as the reanalyzer in design optimization. Soft models have been generated for a neural network method, a regression method, and a hybrid method obtained by combining the approximators. The performance of the models is graphed for aircraft weight versus thrust as well as for wing area and turbine temperature. The regression method followed the analytical solution with little error. The neural network exhibited 5-percent maximum error over all parameters. Performance of the hybrid method was intermediate in comparison to the individual approximators. Error in the response variable is smaller than that shown in the figure because of a distortion scale factor. The overall performance of the approximators was considered to be satisfactory because aircraft analysis with NASA Langley Research Center s FLOPS (Flight Optimization System) code is a synthesis of diverse disciplines: weight estimation, aerodynamic analysis, engine cycle analysis, propulsion data interpolation, mission performance, airfield length for landing and takeoff, noise footprint, and others.
Author
*Design Optimization; Design Analysis; Aircraft Models; Neural Nets; Mathematical Models*

**20050214865** NASA Glenn Research Center, Cleveland, OH, USA
**Oil-Free Turbomachinery Research Enhanced by Thrust Bearing Test Capability**
Bauman, Steven W.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

NASA Glenn Research Center s Oil-Free Turbomachinery research team is developing aircraft turbine engines that will not require an oil lubrication system. Oil systems are required today to lubricate rolling-element bearings used by the turbine and fan shafts. For the Oil-Free Turbomachinery concept, researchers combined the most advanced foil (air) bearings from industry with NASA-developed high-temperature solid lubricant technology. In 1999, the world s first Oil-Free turbocharger was demonstrated using these technologies. Now we are working with industry to demonstrate Oil-Free turbomachinery technology in a small business jet engine, the EJ-22 produced by Williams International and developed during Glenn s recently concluded General Aviation Propulsion (GAP) program. Eliminating the oil system in this engine will make it simpler, lighter (approximately 15 percent), more reliable, and less costly to purchase and maintain. Propulsion gas turbines will place high demands on foil air bearings, especially the thrust bearings. Up until now, the Oil-Free Turbomachinery research team only had the capability to test radial, journal bearings. This research has resulted in major improvements in the bearings performance, but journal bearings are cylindrical, and can only support radial shaft loads. To counteract axial thrust loads, thrust foil bearings, which are disk shaped, are required. Since relatively little research has been conducted on thrust foil air bearings, their performance lags behind that of journal bearings.
Derived from text
*Turbomachinery; Thrust Bearings; Turbine Engines; Lubrication Systems; Oils*

**20050215039** NASA Glenn Research Center, Cleveland, OH, USA
**Short Takeoff and Vertical Landing Capability Upgraded in NASA Glenn's 9- by 15-Foot Low-Speed Wind Tunnel**
Stark, David E.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center supports short takeoff and vertical landing (STOVL) tests in its 9- by 15-Foot Low Speed Wind Tunnel (9 x 15 LSWT). As part of a facility capability upgrade, a dynamic actuation system (DAS) was fabricated to enhance the STOVL testing capabilities. The DAS serves as the mechanical interface between the 9 x 15 LSWT test section structure and the STOVL model to be tested. It provides vertical and horizontal translation of the model in the test section and maintains the model attitude (pitch, yaw, and roll) during translation. It also integrates a piping system to supply the model with exhaust and hot air to simulate the inlet suction and nozzle exhausts, respectively. Hot gas ingestion studies have been performed with the facility ground plane installed. The DAS provides vertical (ascent and descent) translation speeds of up to 48 in./s and horizontal translation speeds of up to 12 in./s. Model pitch variations of +/- 7, roll variations of +/- 5, and yaw variations of 0 to 180 deg can be accommodated and are maintained within 0.25 deg throughout the translation profile. The hot air supply, generated by the facility heaters and regulated by control valves, provides three separate temperature zones to

the model for STOVL and hot gas ingestion testing. Channels along the supertube provide instrumentation paths from the model to the facility data system for data collection purposes. The DAS is supported by the 9 x 15 LSWT test section ceiling structure. A carriage that rides on two linear rails provides for horizontal translation of the system along the test section longitudinal axis. A vertical translation assembly, consisting of a cage and supertube, is secured to the carriage. The supertube traverses vertically through the cage on a set of linear rails. Both translation axes are hydraulically actuated and provide position and velocity profile control. The lower flange on the supertube serves as the model interface to the DAS. The supertube also serves as the exhaust path to the model and supports the hot air piping on its external surfaces. The DAS is currently being assembled at the 9 15 LSWT facility. Following assembly and installation, a series of checkouts will be performed to confirm the operation of the system.
Author
*Vertical Landing; Attitude (Inclination); Data Systems; Inlet Nozzles; Takeoff; V/STOL Aircraft*

**20050215259** NASA Glenn Research Center, Cleveland, OH, USA
**TURBO-AE Code Used to Redesign the Quiet High-Speed Fan**
Bakhle, Milind A.; Srivastava, Rakesh; Research and Technology 2003; May 2004; 1 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA/Honeywell Quiet High-Speed Fan (QHSF) was designed with aggressive goals for performance and noise reduction. During testing in NASA Glenn Research Center's 9- by 15-Foot Low-Speed Wind Tunnel, this forward-swept fan performed very well at design speed, and it also accomplished its goal of decreasing noise (6 dB measured) from the baseline fan used in current engines. However, an unexpected, severe flutter problem was encountered at part-speed conditions. Honeywell and Glenn used the flutter analysis capability of the TURBO-AE code to redesign the QHSF. The TURBO-AE code was included in Honeywell's design cycle. During the redesign effort, more than 30 airfoil geometries were analyzed in the design-of-experiments approach and more than 600 TURBO-AE flutter analyses were performed. The redesigned QHSF II, which is predicted to be flutter-free throughout its operating range, is being fabricated and will be tested in Glenn's 9- by 15-ft wind tunnel in the near future. Engine validation of the TURBO-AE flutter predictions for the QHSF II will be conducted on Honeywell's AS-907 advanced technology demonstrator engine in 2005. This work contributes directly to NASA's 10-year goal of reducing noise in future aircraft by 50 percent (10 dB) from current levels. It also enables aircraft engine blade rows to be checked for flutter stability during design with realistic physics modeling, thus eliminating added costs ($5 to $30 million) and delays (1 to 3 months) in engine development due to unexpected flutter vibrations. If a flutter analysis tool such as TURBO-AE had been available during the original QHSF design effort, the entire QHSF redesign may have been avoided, with an estimated saving of $2.4 million. The flutter calculations described here were performed under a contract by University of Toledo researchers in collaboration with Glenn and Honeywell researchers.
Derived from text
*Computer Programs; Noise Reduction; High Speed; Fans*

**20050215274** NASA Glenn Research Center, Cleveland, OH, USA
**Subsonic Aircraft With Regression and Neural-Network Approximators Designed**
Patnaik, Surya N.; Hopkins, Dale A.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

At the NASA Glenn Research Center, NASA Langley Research Center's Flight Optimization System (FLOPS) and the design optimization testbed COMETBOARDS with regression and neural-network-analysis approximators have been coupled to obtain a preliminary aircraft design methodology. For a subsonic aircraft, the optimal design, that is the airframe-engine combination, is obtained by the simulation. The aircraft is powered by two high-bypass-ratio engines with a nominal thrust of about 35,000 lbf. It is to carry 150 passengers at a cruise speed of Mach 0.8 over a range of 3000 n mi and to operate on a 6000-ft runway. The aircraft design utilized a neural network and a regression-approximations-based analysis tool, along with a multioptimizer cascade algorithm that uses sequential linear programming, sequential quadratic programming, the method of feasible directions, and then sequential quadratic programming again. Optimal aircraft weight versus the number of design iterations is shown. The central processing unit (CPU) time to solution is given. It is shown that the regression-method-based analyzer exhibited a smoother convergence pattern than the FLOPS code. The optimum weight obtained by the approximation technique and the FLOPS code differed by 1.3 percent. Prediction by the approximation technique exhibited no error for the aircraft wing area and turbine entry temperature, whereas it was within 2 percent for most other parameters. Cascade strategy was required by FLOPS as well as the approximators. The regression method had a tendency to hug the data points, whereas the neural network exhibited a propensity to follow a mean path. The performance of the neural network and regression methods was considered adequate. It was at about the same level for small, standard, and

large models with redundancy ratios (defined as the number of input-output pairs to the number of unknown coefficients) of 14, 28, and 57, respectively. In an SGI octane workstation (Silicon Graphics, Inc., Mountainview, CA), the regression training required a fraction of a CPU second, whereas neural network training was between 1 and 9 min, as given. For a single analysis cycle, the 3-sec CPU time required by the FLOPS code was reduced to milliseconds by the approximators. For design calculations, the time with the FLOPS code was 34 min. It was reduced to 2 sec with the regression method and to 4 min by the neural network technique. The performance of the regression and neural network methods was found to be satisfactory for the analysis and design optimization of the subsonic aircraft.
Author
*Approximation; Neural Nets; Subsonic Aircraft; Regression Analysis; Aircraft Design*

**20050215286** NASA Glenn Research Center, Cleveland, OH, USA
**Design of Ultra-High-Power-Density Machine Optimized for Future Aircraft**
Choi, Benjamin B.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center's Structural Mechanics and Dynamics Branch is developing a compact, nonpolluting, bearingless electric machine with electric power supplied by fuel cells for future 'more-electric' aircraft with specific power in the projected range of 50 hp/lb, whereas conventional electric machines generate usually 0.2 hp/lb. The use of such electric drives for propulsive fans or propellers depends on the successful development of ultra-high-power-density machines. One possible candidate for such ultra-high-power-density machines, a round-rotor synchronous machine with an engineering current density as high as 20,000 A/sq cm, was selected to investigate how much torque and power can be produced.
Derived from text
*Design Analysis; Mechanical Drives; Structural Analysis; Power Supplies*

**20050215418** NASA Glenn Research Center, Cleveland, OH, USA
**NASA Glenn's Engine Components Research Lab, Cell 2B, Reactivated to Support the U.S. Army Research Laboratory T700 Engine Test**
Beltran, Luis R.; Griffin, Thomas A.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The U.S. Army Vehicle Technology Directorate at the NASA Glenn Research Center has been directed by their parent command, the U.S. Army Research Laboratory (ARL), to demonstrate active stall technology in a turboshaft engine as the next step in transitioning this technology to the Army and aerospace industry. Therefore, the Vehicle Technology Directorate requested the reactivation of Glenn's Engine Components Research Lab, Cell 2B, (ECRL 2B). They wanted to test a T700 engine that had been used previously for turboshaft engine research as a partnership between the Army and NASA on small turbine engine research. ECRL 2B had been placed in standby mode in 1997. Glenn's Testing Division initiated reactivation in May 2002 to support the new research effort, and they completed reactivation and improvements in September 2003.
Derived from text
*Engine Design; Technology Transfer; Turboshafts*

**20050216398** NASA Glenn Research Center, Cleveland, OH, USA
**Application of a Constant Gain Extended Kalman Filter for In-Flight Estimation of Aircraft Engine Performance Parameters**
Kobayashi, Takahisa; Simon, Donald L.; Litt, Jonathan S.; September 2005; 19 pp.; In English; Turbo Expo 2005, 6-9 Jun. 2005, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-728-30-05; DA Proj. 1L1-61102-AF-20
Report No.(s): NASA/TM-2005-213865; E-15235; ARL-TR-3489; GT2005-68494; No Copyright; Avail.: CASI: A03, Hardcopy

An approach based on the Constant Gain Extended Kalman Filter (CGEKF) technique is investigated for the in-flight estimation of non-measurable performance parameters of aircraft engines. Performance parameters, such as thrust and stall margins, provide crucial information for operating an aircraft engine in a safe and efficient manner, but they cannot be directly measured during flight. A technique to accurately estimate these parameters is, therefore, essential for further enhancement of engine operation. In this paper, a CGEKF is developed by combining an on-board engine model and a single Kalman gain matrix. In order to make the on-board engine model adaptive to the real engine s performance variations due to degradation or anomalies, the CGEKF is designed with the ability to adjust its performance through the adjustment of artificial parameters

called tuning parameters. With this design approach, the CGEKF can maintain accurate estimation performance when it is applied to aircraft engines at offnominal conditions. The performance of the CGEKF is evaluated in a simulation environment using numerous component degradation and fault scenarios at multiple operating conditions.
Author
*Kalman Filters; Aircraft Engines; Gas Turbine Engines; Aircraft Performance; Amplification*

**20050216530** Army Command and General Staff Coll., Fort Leavenworth, KS USA
**Keeping the Dagger Sharp: A Comparison of MC-130H and MH-47E Selection and Training Methods**
Powell, Matthew A.; Jun. 17, 2005; 84 pp.; In English
Report No.(s): AD-A437057; No Copyright; Avail.: CASI: A05, Hardcopy

Since its inception in 1990, Air Force Special Operations Command (AFSOC) has struggled to balance its roles as both a Major Command in the US Air Force (USAF) and the air component of US Special Operations Command (USSOCOM). US code, Title 10, grants the authority to train US special operations forces to USSOCOM, however AFSOC is still required to observe USAF training rules and restrictions. This study compares the selection and training methodologies of AFSOC MC-130H aircrews and those of US Army MH-47E aircrews. It first analyzes the respective regulatory guidance and operational practices employed during assessment and selection, initial qualification training, and continuation training for each aircraft type. It then ascribes a quantitative valuing system to measure compliance with legal responsibilities. An analysis of the selection and training methodologies of baseline variants, the C-130 and CH-47, follows to highlight differences between conventional and unconventional forces. This study concludes that MC-130H selection and training has much more in common with conventional units than its unconventional counterpart, the MH-47E. In order to resolve the often conflicting responsibilities of air component of USSOCOM and USAF major command, this study then provides recommendations on how to modify MC-130H assessment and training methodologies.
DTIC
*Education; Helicopters; Selection; Transport Aircraft*

**20050217014** National War Coll., Washington, DC USA
**The F-14D: A Case Study in Decision-Making**
Van Cleef, Scott P.; Dec. 15, 1989; 14 pp.; In English
Report No.(s): AD-A436987; No Copyright; Avail.: CASI: A03, Hardcopy

In April 1989, the new Secretary of Defense, Richard Cheney, forwarded to Congress a revised defense budget proposal for fiscal year (FY) 1990. One of the primary objectives of the new budget proposal was to establish levels of defense spending that would keep the overall budget within the Gramm-Rudman-Hollings deficit reduction guidelines. Part of the proposed defense budget was a decision to eliminate 12 new production F-14D Tomcat fighters from the Navy budget and to terminate the program. As the year progressed and Congress undertook to thrash out the final federal budget, the Senate and House split on the decision to eliminate F-14D production. The Senate favored elimination while the House voted to support the original 12 proposed aircraft. The issue was decided in a House-Senate Conference Committee. In the end, Congress did not eliminate F-14D production. Nor did it vote to support the House's proposal to produce 12. Instead, Congress voted for the production of 18 F-14D aircraft in FY 90! Though the final outcome appears absurd and is the type of story that makes Congress look incompetent, it was much more involved than it appeared and illustrates much of what goes into the decision-making process of the U.S. Government. How this decision came about is the subject of this paper. The author examines the major participants in the decision-making process as it pertained to the F-14D and attempts to draw some conclusions as to why the process worked as it did.
DTIC
*Contractors; Decision Making; Defense Program; Fighter Aircraft; Jet Aircraft; Procurement*

**20050217015** National War Coll., Washington, DC USA
**The F-14 Decision and the Policy Making Process**
Meyers, Robert H.; Dec. 15, 1989; 12 pp.; In English
Report No.(s): AD-A436985; No Copyright; Avail.: CASI: A03, Hardcopy

Does America need more F-14 Navy fighter jets? After 5 months of debate in Congress, the question may finally be answered by a conference committee of the House and Senate members. But the future of the aircraft, assembled on Long Island by Grumman Corporation, is likely to be decided more by old-fashioned politics than by the loftier issue of national defense needs. The hottest issue in the just-concluded fiscal 1990 defense authorization conference was whether to cancel the

Navy's Long Island-produced F-14D, nicknamed 'Tomcat.' Conferees settled on a final buy of 18 jets for $1.6 billion, with the proviso that no more of the Grumman Corporation fighters would ever, ever, ever be built. 'In my roughly 20 years involved in this, I've never seen such forceful, if not ruthless, lobbying,' John W. Warner of Virginia, ranking Republican on the Senate Armed Services Committee, griped to reporters after the conference. 'We've nicknamed the termination clause the poison pill,' and hope it sticks.' How did the U.S. Navy arrive at a final buy of 18 new jets when the House Appropriations Committee favored 12 and the Senate favored canceling the program all together? Representative John M. Spratt (D-S.C.) stated, 'Well, you just don't understand how we do math around here!' The decision to purchase new F-14Ds offers an interesting and somewhat representative insight into the bureaucratic process. The author starts with the background of, and current issues surrounding, the procurement of the F-14D and then takes a look at the major players -- the Department of Defense, Grumman Corporation, and the Long Island Congressional Delegation -- and how each affected the outcome of the F-14D decision.
DTIC
*Contractors; Decision Making; Defense Program; F-14 Aircraft; Fighter Aircraft; Jet Aircraft; Policies; Procurement*

**20050217050** Army Command and General Staff Coll., Fort Leavenworth, KS USA
**SOF Tactical Repeater**
Magness, Matthew T.; Jun. 17, 2005; 110 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437046; No Copyright; Avail.: CASI: A06, Hardcopy

The future of Seabasing rests with the capability to rapidly re-supply and sustain forces from strategic distances. Sealift presents one way of accomplishing this sustainment; however, it is slow. The solution for rapid long-range sustainment of a Seabase must come in the form of aircraft capable of lifting massive weights over vast distances and delivering them directly to the structure. This thesis explores the primary research question: What are the long-range, heavy lift aircraft programs that could sustain Seabasing? The question is explored by using the Wisconsin 7-Step Problem-Solving Strategy: state the problem, determine the solution criteria, gather needed information, generate potential solutions, compare solutions and problem, select the solution, and prepare communications. Four concepts were identified (Lighter-than-Air, Wing-in-Ground, Advanced Theater Transport, and Seaplanes) as having the capabilities to support Seabasing. Due to the many factors associated with determining the best solution, a technique of performing a grid analysis with weighted criteria is used. The results indicate that the best types of aircraft suited to sustain a Seabase are ones that are large, joint in development and operation, can be utilized outside standard military applications, and are capable of carrying massive payloads great distances.
DTIC
*Seas; Military Technology; Seaplanes; Payloads*

## 06
## AVIONICS AND AIRCRAFT INSTRUMENTATION

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

**20050215620** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Serial Back-Plane Technologies in Advanced Avionics Architectures**
Varnavas, Kosta; [2005]; 25 pp.; In English; Digital Avionics Systems Conference, 30 Oct. - 3 Nov. 2005, Washington, DC, USA; No Copyright; Avail.: CASI: A03, Hardcopy

Current back plane technologies such as VME, and current personal computer back planes such as PCI, are shared bus systems that can exhibit nondeterministic latencies. This means a card can take control of the bus and use resources indefinitely affecting the ability of other cards in the back plane to acquire the bus. This provides a real hit on the reliability of the system. Additionally, these parallel busses only have bandwidths in the 100s of megahertz range and EMI and noise effects get worse the higher the bandwidth goes. To provide scalable, fault-tolerant, advanced computing systems, more applicable to today s connected computing environment and to better meet the needs of future requirements for advanced space instruments and vehicles, serial back-plane technologies should be implemented in advanced avionics architectures. Serial backplane technologies eliminate the problem of one card getting the bus and never relinquishing it, or one minor problem on the backplane bringing the whole system down. Being serial instead of parallel improves the reliability by reducing many of the

signal integrity issues associated with parallel back planes and thus significantly improves reliability. The increased speeds associated with a serial backplane are an added bonus.
Author
*Avionics; Systems Health Monitoring; Systems Engineering; Technologies*

## 07
## AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power; 28 Propellants and Fuels*; and *44 Energy Production and Conversion*.

**20050214846** NASA Glenn Research Center, Cleveland, OH, USA
**Glenn-HT Code Validated for Complex Turbine Blade Cooling Passage**
Rigby, David L.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

This work is motivated by the need to accurately predict heat transfer in turbomachinery. For efficient gas turbine operation, flow temperatures in the hot gas path exceed acceptable metal temperatures in many regions of the engine. So that the integrity of the parts can be maintained for an acceptable engine life, the parts must be cooled. Efficient cooling schemes require accurate heat transfer prediction to minimize regions that are overcooled and, even more importantly, to ensure adequate cooling in high-heat-flux regions.
Derived from text
*Turbine Blades; High Temperature Gases; Cooling; Heat Transfer*

**20050214849** NASA Glenn Research Center, Cleveland, OH, USA
**Low NOx, Lean Direct Wall Injection Combustor Concept Developed**
Tacina, Robert R.; Wey, Changlie; Choi, Kyung J.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The low-emissions combustor development at the NASA Glenn Research Center is directed toward advanced high-pressure aircraft gas turbine applications. The emphasis of this research is to reduce nitrogen oxides (NOx) at high-power conditions and to maintain carbon monoxide and unburned hydrocarbons at their current low levels at low-power conditions. Low-NOx combustors can be classified into rich burn and lean burn concepts. Lean burn combustors can be further classified into lean-premixed-prevaporized (LPP) and lean direct injection (LDI) combustors. In both concepts, all the combustor air, except for liner cooling flow, enters through the combustor dome so that the combustion occurs at the lowest possible flame temperature. The LPP concept has been shown to have the lowest NOx emissions, but for advanced high-pressure-ratio engines, the possibly of autoignition or flashback precludes its use. LDI differs from LPP in that the fuel is injected directly into the flame zone and, thus, does not have the potential for autoignition or flashback and should have greater stability. However, since it is not premixed and prevaporized, the key is good atomization and mixing of the fuel quickly and uniformly so that flame temperatures are low and NOx formation levels are comparable to those of LPP.
Derived from text
*Nitrogen Oxides; Emission; Combustion Chambers; Gas Turbines; Compressed Gas*

**20050214873** NASA Glenn Research Center, Cleveland, OH, USA, Toledo Univ., OH, USA
**Influence of Shock Wave on the Flutter Behavior of Fan Blades Investigated**
Srivastava, Rakesh; Bakhle, Milind A.; Stefko, George L.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Modern fan designs have blades with forward sweep; a lean, thin cross section; and a wide chord to improve performance and reduce noise. These geometric features coupled with the presence of a shock wave can lead to flutter instability. Flutter is a self-excited dynamic instability arising because of fluid-structure interaction, which causes the energy from the surrounding fluid to be extracted by the vibrating structure. An in-flight occurrence of flutter could be catastrophic and is a significant design issue for rotor blades in gas turbines. Understanding the flutter behavior and the influence of flow features on flutter will lead to a better and safer design. An aeroelastic analysis code, TURBO, has been developed and validated for flutter calculations at the NASA Glenn Research Center. The code has been used to understand the occurrence of flutter in a

forward-swept fan design. The forward-swept fan, which consists of 22 inserted blades, encountered flutter during wind tunnel tests at part speed conditions.
Derived from text
*Shock Waves; Flutter; Fan Blades*

**20050215120** NASA Glenn Research Center, Cleveland, OH, USA
**Parametric Investigation of Thrust Augmentation by Ejectors on a Pulsed Detonation Tube**
Wilson, Jack; Sgondea, Alexandru; Paxson, Daniel E.; Rosenthal, Bruce N.; August 2005; 16 pp.; In English; 41st Joint Propulsion Conference, 10-13 Jul. 2005, Tucson, AZ, USA
Contract(s)/Grant(s): NAS3-00145; WBS 22-708-03-05
Report No.(s): NASA/TM-2005-213823; AIAA Paper 2005-4208; E-15182; Copyright; Avail.: CASI: A03, Hardcopy

A parametric investigation has been made of thrust augmentation of a 1 inch diameter pulsed detonation tube by ejectors. A set of ejectors was used which permitted variation of the ejector length, diameter, and nose radius, according to a statistical design of experiment scheme. The maximum augmentations for each ejector were fitted using a polynomial response surface, from which the optimum ejector diameters, and nose radius, were found. Thrust augmentations above a factor of 2 were measured. In these tests, the pulsed detonation device was run on approximately stoichiometric air-hydrogen mixtures, at a frequency of 20 Hz. Later measurements at a frequency of 40 Hz gave lower values of thrust augmentation. Measurements of thrust augmentation as a function of ejector entrance to detonation tube exit distance showed two maxima, one with the ejector entrance upstream, and one downstream, of the detonation tube exit. A thrust augmentation of 2.5 was observed using a tapered ejector.
Author
*Ejectors; Thrust Augmentation; Pulse Detonation Engines; Experiment Design; Pipes (Tubes); Parameterization*

**20050215166** NASA Glenn Research Center, Cleveland, OH, USA
**Supersonic Rocket Thruster Flow Predicted by Numerical Simulation**
Davoudzadeh, Farhad; Research and Technology 2003; May 2004; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Despite efforts in the search for alternative means of energy, combustion still remains the key source. Most propulsion systems primarily use combustion for their needed thrust. Associated with these propulsion systems are the high-velocity hot exhaust gases produced as the byproducts of combustion. These exhaust products often apply uneven high temperature and pressure over the surfaces of the appended structures exposed to them. If the applied pressure and temperature exceed the design criteria of the surfaces of these structures, they will not be able to protect the underlying structures, resulting in the failure of the vehicle mission. An understanding of the flow field associated with hot exhaust jets and the interactions of these jets with the structures in their path is critical not only from the design point of view but for the validation of the materials and manufacturing processes involved in constructing the materials from which the structures in the path of these jets are made. The hot exhaust gases often flow at supersonic speeds, and as a result, various incident and reflected shock features are present. These shock structures induce abrupt changes in the pressure and temperature distribution that need to be considered. In addition, the jet flow creates a gaseous plume that can easily be traced from large distances. To study the flow field associated with the supersonic gases induced by a rocket engine, its interaction with the surrounding surfaces, and its effects on the strength and durability of the materials exposed to it, NASA Glenn Research Center s Combustion Branch teamed with the Ceramics Branch to provide testing and analytical support. The experimental work included the full range of heat flux environments that the rocket engine can produce over a flat specimen. Chamber pressures were varied from 130 to 500 psia and oxidizer-to-fuel ratios (o/f) were varied from 1.3 to 7.5.
Author
*Supersonic Speed; Thrust Chambers; Numerical Analysis; Combustion Products; Design Analysis*

**20050215216** NASA Glenn Research Center, Cleveland, OH, USA
**Impulsive Injection for Compressor Stator Separation Control**
Culley, Dennis E.; Braunscheidel, Edward P.; Bright, Michelle M.; August 2005; 17 pp.; In English; AIAA Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA
Contract(s)/Grant(s): WBS 22-714-70-52
Report No.(s): NASA/TM-2005-213859; AIAA Paper 2005-3633; E-15229; No Copyright; Avail.: CASI: A03, Hardcopy

Flow control using impulsive injection from the suction surface of a stator vane has been applied in a low speed axial

compressor. Impulsive injection is shown to significantly reduce separation relative to steady injection for vanes that were induced to separate by an increase in vane stagger angle of 4 degrees. Injected flow was applied to the airfoil suction surface using spanwise slots pitched in the streamwise direction. Injection was limited to the near-hub region, from 10 to 36 percent of span, to affect the dominant loss due to hub leakage flow. Actuation was provided externally using high-speed solenoid valves closely coupled to the vane tip. Variations in injected mass, frequency, and duty cycle are explored. The local corrected total pressure loss across the vane at the lower span region was reduced by over 20 percent. Additionally, low momentum fluid migrating from the hub region toward the tip was effectively suppressed resulting in an overall benefit which reduced corrected area averaged loss through the passage by 4 percent. The injection mass fraction used for impulsive actuation was typically less than 0.1 percent of the compressor through flow.
Author
*Compressors; Injection; Stators; Vanes; Suction; Airfoils*

**20050215242** NASA Glenn Research Center, Cleveland, OH, USA
**Probability Distribution Estimated From the Minimum, Maximum, and Most Likely Values: Applied to Turbine Inlet Temperature Uncertainty**
Holland, Frederic A., Jr.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Modern engineering design practices are tending more toward the treatment of design parameters as random variables as opposed to fixed, or deterministic, values. The probabilistic design approach attempts to account for the uncertainty in design parameters by representing them as a distribution of values rather than as a single value. The motivations for this effort include preventing excessive overdesign as well as assessing and assuring reliability, both of which are important for aerospace applications. However, the determination of the probability distribution is a fundamental problem in reliability analysis. A random variable is often defined by the parameters of the theoretical distribution function that gives the best fit to experimental data. In many cases the distribution must be assumed from very limited information or data. Often the types of information that are available or reasonably estimated are the minimum, maximum, and most likely values of the design parameter. For these situations the beta distribution model is very convenient because the parameters that define the distribution can be easily determined from these three pieces of information. Widely used in the field of operations research, the beta model is very flexible and is also useful for estimating the mean and standard deviation of a random variable given only the aforementioned three values. However, an assumption is required to determine the four parameters of the beta distribution from only these three pieces of information (some of the more common distributions, like the normal, lognormal, gamma, and Weibull distributions, have two or three parameters). The conventional method assumes that the standard deviation is a certain fraction of the range. The beta parameters are then determined by solving a set of equations simultaneously. A new method developed in-house at the NASA Glenn Research Center assumes a value for one of the beta shape parameters based on an analogy with the normal distribution (ref.1). This new approach allows for a very simple and direct algebraic solution without restricting the standard deviation. The beta parameters obtained by the new method are comparable to the conventional method (and identical when the distribution is symmetrical). However, the proposed method generally produces a less peaked distribution with a slightly larger standard deviation (up to 7 percent) than the conventional method in cases where the distribution is asymmetric or skewed. The beta distribution model has now been implemented into the Fast Probability Integration (FPI) module used in the NESSUS computer code for probabilistic analyses of structures (ref. 2).
Author
*Normal Density Functions; Probability Theory; Distribution Functions; Inlet Temperature; Turbines; Design Analysis; Standard Deviation; Reliability Analysis*

**20050215244** NASA Glenn Research Center, Cleveland, OH, USA
**Structural Benchmark Testing of Superalloy Lattice Block Subelements Completed**
Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Superalloy lattice block panels, which are produced directly by investment casting, are composed of thin ligaments arranged in three-dimensional triangulated trusslike structures (see the preceding figure). Optionally, solid panel face sheets can be formed integrally during casting. In either form, lattice block panels can easily be produced with weights less than 25 percent of the mass of a solid panel. Inconel 718 (IN 718) and MarM-247 superalloy lattice block panels have been developed under NASA's Ultra-Efficient Engine Technology Project and Higher Operating Temperature Propulsion Components Project to take advantage of the superalloys' high strength and elevated temperature capability with the inherent light weight and high stiffness of the lattice architecture (ref. 1). These characteristics are important in the future development of turbine engine components. Casting quality and structural efficiency were evaluated experimentally using small beam specimens machined

from the cast and heat treated 140- by 300- by 11-mm panels. The matrix of specimens included samples of each superalloy in both open-celled and single-face-sheet configurations, machined from longitudinal, transverse, and diagonal panel orientations. Thirty-five beam subelements were tested in Glenn's Life Prediction Branch's material test machine at room temperature and 650 C under both static (see the following photograph) and cyclic load conditions. Surprisingly, test results exceeded initial linear elastic analytical predictions. This was likely a result of the formation of plastic hinges and redundancies inherent in lattice block geometry, which was not considered in the finite element models. The value of a single face sheet was demonstrated by increased bending moment capacity, where the face sheet simultaneously increased the gross section modulus and braced the compression ligaments against early buckling as seen in open-cell specimens. Preexisting flaws in specimens were not a discriminator in flexural, shear, or stiffness measurements, again because of redundant load paths available in the lattice block structure. Early test results are available in references 2 and 3; more complete analyses are scheduled for publication in 2004.
Author
*Heat Resistant Alloys; High Temperature; Investment Casting; Gas Turbine Engines; Triangulation; Operating Temperature; Ligaments; High Strength*

**20050215262** NASA Glenn Research Center, Cleveland, OH, USA
**Cryogenic Electric Motor Tested**
Brown, Gerald V.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Technology for pollution-free 'electric flight' is being evaluated in a number of NASA Glenn Research Center programs. One approach is to drive propulsive fans or propellers with electric motors powered by fuel cells running on hydrogen. For large transport aircraft, conventional electric motors are far too heavy to be feasible. However, since hydrogen fuel would almost surely be carried as liquid, a propulsive electric motor could be cooled to near liquid hydrogen temperature (-423 F) by using the fuel for cooling before it goes to the fuel cells. Motor windings could be either superconducting or high purity normal copper or aluminum. The electrical resistance of pure metals can drop to 1/100th or less of their room-temperature resistance at liquid hydrogen temperature. In either case, super or normal, much higher current density is possible in motor windings. This leads to more compact motors that are projected to produce 20 hp/lb or more in large sizes, in comparison to on the order of 2 hp/lb for large conventional motors. High power density is the major goal. To support cryogenic motor development, we have designed and built in-house a small motor (7-in. outside diameter) for operation in liquid nitrogen.
Author
*Electric Motors; Cryogenics; Superconductivity; Cooling; Hydrogen Fuels; Electrical Resistance*

**20050215271** NASA Glenn Research Center, Cleveland, OH, USA
**Reduced-Order Blade Mistuning Analysis Techniques Developed for the Robust Design of Engine Rotors**
Min, James B.; Research and Technology 2003; May 2004; 4 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The primary objective of this research program is to develop vibration analysis tools, design tools, and design strategies to significantly improve the safety and robustness of turbine engine rotors. Bladed disks in turbine engines always feature small, random blade-to-blade differences, or mistuning. Mistuning can lead to a dramatic increase in blade forced-response amplitudes and stresses. Ultimately, this results in high-cycle fatigue, which is a major safety and cost concern. In this research program, the necessary steps will be taken to transform a state-of-the-art vibration analysis tool, the Turbo-Reduce forced-response prediction code, into an effective design tool by enhancing and extending the underlying modeling and analysis methods. Furthermore, novel techniques will be developed to assess the safety of a given design. In particular, a procedure will be established for using eigenfrequency curve veerings to identify 'danger zones' in the operating conditions--ranges of rotational speeds and engine orders in which there is a great risk that the rotor blades will suffer high stresses. This work also will aid statistical studies of the forced response by reducing the necessary number of simulations. Finally, new strategies for improving the design of rotors will be pursued. Several methods will be investigated, including the use of intentional mistuning patterns to mitigate the harmful effects of random mistuning, and the modification of disk stiffness to avoid reaching critical values of interblade coupling in the desired operating range. Recent research progress is summarized in the following paragraphs. First, significant progress was made in the development of the component mode mistuning (CMM) and static mode compensation (SMC) methods for reduced-order modeling of mistuned bladed disks (see the following figure). The CMM method has been formalized and extended to allow a general treatment of mistuning. In addition, CMM allows individual mode mistuning, which accounts for the realistic effects of local variations in blade properties that lead to different mistuning values for different mode types (e.g., mistuning of the first torsion mode versus the second flexural

mode). The accuracy and efficiency of the CMM method and the corresponding Turbo-Reduce code were validated for an example finite element model of a bladed disk.
Author
*Dynamic Structural Analysis; Turbine Engines; Rotors; Robustness (Mathematics); Finite Element Method; Mathematical Models*

**20050215281** NASA Glenn Research Center, Cleveland, OH, USA, Toledo Univ., OH, USA
**NASA Glenn's Seals Group Inaugurated a New State-of-the-Art High-Temperature Test Rig**
DeMange, Jeffrey J.; Dunlap, Patrick H., Jr.; Steinetz, Bruce M.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center is developing advanced control surface seals and propulsion system seals for future space and launch vehicles. To evaluate new seal designs, the Glenn Seals Team recently inaugurated a new state-of-the-art high temperature seal test facility. The Hot Compression/Hot Scrub Rig can perform either high-temperature seal-compression tests or scrub tests at temperatures of up to 3000 F by using different combinations of test fixtures made of monolithic silicon carbide (Hexoloy alpha-SiC), as shown in the following figures. For lower temperature tests (up to 1500 F), Inconel X-750 test fixturing can be used.
Derived from text
*Compression Tests; High Temperature Tests; Inconel (Trademark); Silicon Carbides*

**20050215285** NASA Glenn Research Center, Cleveland, OH, USA, Analex Corp., USA, ZIN Technologies, Inc., USA
**Testing of Composite Fan Vanes With Erosion-Resistant Coating Accelerated**
Bowman, Cheryl L.; Sutter, James K.; Otten, Kim D.; Samorezov, Sergey; Perusek, Gail P.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The high-cycle fatigue of composite stator vanes provided an accelerated life-state prior to insertion in a test stand engine. The accelerated testing was performed in the Structural Dynamics Laboratory at the NASA Glenn Research Center under the guidance of Structural Mechanics and Dynamics Branch personnel. Previous research on fixturing and test procedures developed at Glenn determined that engine vibratory conditions could be simulated for polymer matrix composite vanes by using the excitation of a combined slip table and electrodynamic shaker in Glenn's Structural Dynamics Laboratory. Bench-top testing gave researchers the confidence to test the coated vanes in a full-scale engine test.
Author
*Accelerated Life Tests; Coating; Dynamic Structural Analysis; Erosion; Polymer Matrix Composites*

**20050215287** NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA
**'Fan-Tip-Drive' High-Power-Density, Permanent Magnet Electric Motor and Test Rig Designed for a Nonpolluting Aircraft Propulsion Program**
Brown, Gerald V.; Kascak, Albert F.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

A scaled blade-tip-drive test rig was designed at the NASA Glenn Research Center. The rig is a scaled version of a direct-current brushless motor that would be located in the shroud of a thrust fan. This geometry is very attractive since the allowable speed of the armature is approximately the speed of the blade tips (Mach 1 or 1100 ft/s). The magnetic pressure generated in the motor acts over a large area and, thus, produces a large force or torque. This large force multiplied by the large velocity results in a high-power-density motor.
Derived from text
*Electric Motors; Transonic Speed; Scale Models; Blade Tips*

**20050215564** NASA Glenn Research Center, Cleveland, OH, USA
**Numerical Simulation of the RTA Combustion Rig**
Davoudzadeh, Farhad; Buehrle, Robert; Liu, Nan-Suey; Winslow, Ralph; August 2005; 22 pp.; In English; 40th Combustion, 28th Airbreathing Propulsion, 22nd Propulsion Systems Hazards, 4th Modeling and Simulations Joint Subcommittees Meetings, 13-17 Jun. 2005, Charleston, SC, USA
Contract(s)/Grant(s): WBS 22-714-02-20
Report No.(s): NASA/TM-2005-213899; E-15270; No Copyright; Avail.: CASI: A03, Hardcopy

The Revolutionary Turbine Accelerator (RTA)/Turbine Based Combined Cycle (TBCC) project is investigating

turbine-based propulsion systems for access to space. NASA Glenn Research Center and GE Aircraft Engines (GEAE) planned to develop a ground demonstrator engine for validation testing. The demonstrator (RTA-1) is a variable cycle, turbofan ramjet designed to transition from an augmented turbofan to a ramjet that produces the thrust required to accelerate the vehicle from Sea Level Static (SLS) to Mach 4. The RTA-1 is designed to accommodate a large variation in bypass ratios from sea level static to Mach 4 conditions. Key components of this engine are new, such as a nickel alloy fan, advanced trapped vortex combustor, a Variable Area Bypass Injector (VABI), radial flameholders, and multiple fueling zones. A means to mitigate risks to the RTA development program was the use of extensive component rig tests and computational fluid dynamics (CFD) analysis.

Author

*Trapped Vortices; Flame Holders; Computational Fluid Dynamics; Combustion; Turbines; Propulsion System Configurations; Injectors*

**20050215595** NASA Glenn Research Center, Cleveland, OH, USA

**Magnetically Levitated Ducted Fan Being Developed as a Propulsor Option for Electric Flight**

Emerson, Dawn C.; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center is developing a revolutionary engine concept called the Magnetically Levitated Ducted Fan. The objective of this work is to demonstrate the feasibility of a pollution-free electromagnetic propulsor for all-electric flight. This concept will help to reduce harmful emissions, to reduce the Nation's dependence on fossil fuels, and to mitigate many of the concerns and limitations encountered in conventional engine systems such as bearing wear, leaks, seal failure, and friction loss.

Author

*Engine Design; Ducted Fans; Magnetic Suspension; Friction*

**20050215597** NASA Glenn Research Center, Cleveland, OH, USA

**Advanced Manufacturing Techniques Demonstrated for Fabricating Developmental Hardware**

Redding, Chip; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

NASA Glenn Research Center's Engineering Development Division has been working in support of innovative gas turbine engine systems under development by Glenn's Combustion Branch. These one-of-a-kind components require operation under extreme conditions. High-temperature ceramics were chosen for fabrication was because of the hostile operating environment. During the designing process, it became apparent that traditional machining techniques would not be adequate to produce the small, intricate features for the conceptual design, which was to be produced by stacking over a dozen thin layers with many small features that would then be aligned and bonded together into a one-piece unit. Instead of using traditional machining, we produced computer models in Pro/ENGINEER (Parametric Technology Corporation (PTC), Needham, MA) to the specifications of the research engineer. The computer models were exported in stereolithography standard (STL) format and used to produce full-size rapid prototype polymer models. These semi-opaque plastic models were used for visualization and design verification. The computer models also were exported in International Graphics Exchange Specification (IGES) format and sent to Glenn's Thermal/Fluids Design & Analysis Branch and Applied Structural Mechanics Branch for profiling heat transfer and mechanical strength analysis.

Author

*Design Analysis; Gas Turbine Engines; Systems Engineering; Manufacturing; Product Development; High Temperature; Engine Design; Mechanics (Physics)*

**20050215640** NASA Glenn Research Center, Cleveland, OH, USA

**Photochemically Etched Construction Technology Developed for Digital Xenon Feed Systems**

Otsap, Ben; Cardin, Joseph; Verhey, Timothy R.; Rawlin, Vincent K.; Mueller, Juergen; Aadlund, Randall; Kay, Robert; Andrews, Michael; Research and Technology 2003; May 2004; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Electric propulsion systems are quickly emerging as attractive options for primary propulsion in low Earth orbit, in geosynchronous orbit, and on interplanetary spacecraft. The driving force behind the acceptance of these systems is the substantial reduction in the propellant mass that can be realized. Unfortunately, system designers are often forced to utilize components designed for chemical propellants in their electric systems. Although functionally acceptable, these relatively large, heavy components are designed for the higher pressures and mass flow rates required by chemical systems. To fully realize the benefits of electric propulsion, researchers must develop components that are optimized for the low flow rates,

critical leakage needs, low pressures, and limited budgets of these emerging systems.
Derived from text
*Technology Assessment; Photochemical Reactions; Xenon; Feed Systems; Propulsion System Performance; Electric Propulsion*

**20050215686** NASA Glenn Research Center, Cleveland, OH, USA
**Low-Speed Active Flow Control Laboratory Developed**
Culley, Dennis E.; Bright, Michelle M.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The future of aviation propulsion systems is increasingly focused on the application of control technologies to significantly enhance the performance of a new generation of air vehicles. Active flow control refers to a set of technologies that manipulate the flow of air and combustion gases deep within the confines of an engine to dynamically alter its performance during flight. By employing active flow control, designers can create engines that are significantly lighter, are more fuel efficient, and produce lower emissions. In addition, the operating range of an engine can be extended, yielding safer transportation systems. The realization of these future propulsion systems requires the collaborative development of many base technologies to achieve intelligent, embedded control at the engine locations where it will be most effective. NASA Glenn Research Center s Controls and Dynamics Technology Branch has developed a state-of-the-art low-speed Active Flow Control Laboratory in which emerging technologies can be integrated and explored in a flexible, low-cost environment. The facility allows the most promising developments to be prescreened and optimized before being tested on higher fidelity platforms, thereby reducing the cost of experimentation and improving research effectiveness.
Derived from text
*Propulsion System Configurations; Propulsion System Performance; Active Control; Air Flow; Low Speed*

**20050215690** NASA Glenn Research Center, Cleveland, OH, USA
**Investigation of Exoskeletal Engine Propulsion System Concept**
Roche, Joseph M.; Palac, Donald T.; Hunter, James E.; Myers, David E.; Snyder, Christopher A.; Kosareo, Daniel N.; McCurdy, David R.; Dougherty, Kevin T.; August 2005; 101 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-708-87-07
Report No.(s): NASA/TM-2005-213369; E-14837; No Copyright; Avail.: CASI: A06, Hardcopy

An innovative approach to gas turbine design involves mounting compressor and turbine blades to an outer rotating shell. Designated the exoskeletal engine, compression (preferable to tension for high-temperature ceramic materials, generally) becomes the dominant blade force. Exoskeletal engine feasibility lies in the structural and mechanical design (as opposed to cycle or aerothermodynamic design), so this study focused on the development and assessment of a structural-mechanical exoskeletal concept using the Rolls-Royce AE3007 regional airliner all-axial turbofan as a baseline. The effort was further limited to the definition of an exoskeletal high-pressure spool concept, where the major structural and thermal challenges are represented. The mass of the high-pressure spool was calculated and compared with the mass of AE3007 engine components. It was found that the exoskeletal engine rotating components can be significantly lighter than the rotating components of a conventional engine. However, bearing technology development is required, since the mass of existing bearing systems would exceed rotating machinery mass savings. It is recommended that once bearing technology is sufficiently advanced, a 'clean sheet' preliminary design of an exoskeletal system be accomplished to better quantify the potential for the exoskeletal concept to deliver benefits in mass, structural efficiency, and cycle design flexibility.
Author
*Propulsion System Configurations; Turbofans; Gas Turbine Engines; Turbine Blades; Compressor Blades; Aerothermodynamics*

**20050215691** NASA Glenn Research Center, Cleveland, OH, USA
**Intelligent Life-Extending Controls for Aircraft Engines Studied**
Guo, Ten-Huei; Research and Technology 2004; June 2005; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Current aircraft engine controllers are designed and operated to provide desired performance and stability margins. Except for the hard limits for extreme conditions, engine controllers do not usually take engine component life into consideration during the controller design and operation. The end result is that aircraft pilots regularly operate engines under unnecessarily harsh conditions to strive for optimum performance. The NASA Glenn Research Center and its industrial and academic

partners have been working together toward an intelligent control concept that will include engine life as part of the controller design criteria. This research includes the study of the relationship between control action and engine component life as well as the design of an intelligent control algorithm to provide proper tradeoffs between performance and engine life. This approach is expected to maintain operating safety while minimizing overall operating costs. In this study, the thermomechanical fatigue (TMF) of a critical component was selected to demonstrate how an intelligent engine control algorithm can significantly extend engine life with only a very small sacrifice in performance. An intelligent engine control scheme based on modifying the high-pressure spool speed (NH) was proposed to reduce TMF damage from ground idle to takeoff. The NH acceleration schedule was optimized to minimize the TMF damage for a given rise-time constraint, which represents the performance requirement. The intelligent engine control scheme was used to simulate a commercial short-haul aircraft engine.
Derived from text
*Algorithms; Controllers; Damage; Engine Control; Thermodynamics*

**20050215694** NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA
**Discrete Event Supervisory Control Applied to Propulsion Systems**
Litt, Jonathan S.; Shah, Neerav; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The theory of discrete event supervisory (DES) control was applied to the optimal control of a twin-engine aircraft propulsion system and demonstrated in a simulation. The supervisory control, which is implemented as a finite-state automaton, oversees the behavior of a system and manages it in such a way that it maximizes a performance criterion, similar to a traditional optimal control problem. DES controllers can be nested such that a high-level controller supervises multiple lower level controllers. This structure can be expanded to control huge, complex systems, providing optimal performance and increasing autonomy with each additional level. The DES control strategy for propulsion systems was validated using a distributed testbed consisting of multiple computers--each representing a module of the overall propulsion system--to simulate real-time hardware-in-the-loop testing. In the first experiment, DES control was applied to the operation of a nonlinear simulation of a turbofan engine (running in closed loop using its own feedback controller) to minimize engine structural damage caused by a combination of thermal and structural loads. This enables increased on-wing time for the engine through better management of the engine-component life usage. Thus, the engine-level DES acts as a life-extending controller through its interaction with and manipulation of the engine s operation.
Derived from text
*Complex Systems; Controllers; Engine Parts; Feedback Control; Propulsion System Performance; Turbofan Engines*

**20050216392** NASA Glenn Research Center, Cleveland, OH, USA
**Ejector Enhanced Pulsejet Based Pressure Gain Combustors: An Old Idea With a New Twist**
Paxson, Daniel E.; Dougherty, Kevin T.; August 2005; 22 pp.; In English; 41st Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-066-10-05
Report No.(s): NASA/TM-2005-213854; E-15224; AIAA Paper 2005-4216; No Copyright; Avail.: CASI: A03, Hardcopy

An experimental investigation of pressure-gain combustion for gas turbine application is described. The test article consists of an off-the-shelf valved pulsejet, and an optimized ejector, both housed within a shroud. The combination forms an effective can combustor across which there is a modest total pressure rise rather than the usual loss found in conventional combustors. Although the concept of using a pulsejet to affect semi-constant volume (i.e., pressure-gain) combustion is not new, that of combining it with a well designed ejector to efficiently mix the bypass flow is. The result is a device which to date has demonstrated an overall pressure rise of approximately 3.5 percent at an overall temperature ratio commensurate with modern gas turbines. This pressure ratio is substantially higher than what has been previously reported in pulsejet-based combustion experiments. Flow non-uniformities in the downstream portion of the device are also shown to be substantially reduced compared to those within the pulsejet itself. The standard deviation of total pressure fluctuations, measured just downstream of the ejector was only 5.0 percent of the mean. This smoothing aspect of the device is critical to turbomachinery applications since turbine performance is, in general, negatively affected by flow non-uniformities and unsteadiness. The experimental rig will be described and details of the performance measurements will be presented. Analyses showing the thermodynamic benefits from this level of pressure-gain performance in a gas turbine will also be assessed for several engine types. Issues regarding practical development of such a device are discussed, as are potential emissions reductions resulting

from the rich burning nature of the pulsejet and the rapid mixing (quenching) associated with unsteady ejectors.
Author
*Combustion Chambers; Ejectors; Pressure Oscillations; Pulsejet Engines; Pulse Detonation Engines*

**20050216394** NASA Glenn Research Center, Cleveland, OH, USA
**Control Algorithms and Simulated Environment Developed and Tested for Multiagent Robotics for Autonomous Inspection of Propulsion Systems**
Wong, Edmond; Research and Technology 2004; June 2005; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center and academic partners are developing advanced multiagent robotic control algorithms that will enable the autonomous inspection and repair of future propulsion systems. In this application, on-wing engine inspections will be performed autonomously by large groups of cooperative miniature robots that will traverse the surfaces of engine components to search for damage. The eventual goal is to replace manual engine inspections that require expensive and time-consuming full engine teardowns and allow the early detection of problems that would otherwise result in catastrophic component failures. As a preliminary step toward the long-term realization of a practical working system, researchers are developing the technology to implement a proof-of-concept testbed demonstration. In a multiagent system, the individual agents are generally programmed with relatively simple controllers that define a limited set of behaviors. However, these behaviors are designed in such a way that, through the localized interaction among individual agents and between the agents and the environment, they result in self-organized, emergent group behavior that can solve a given complex problem, such as cooperative inspection. One advantage to the multiagent approach is that it allows for robustness and fault tolerance through redundancy in task handling. In addition, the relatively simple agent controllers demand minimal computational capability, which in turn allows for greater miniaturization of the robotic agents.
Derived from text
*Algorithms; Computer Systems Performance; Autonomy; Controllers; Propulsion System Performance*

**20050216399** NASA Glenn Research Center, Cleveland, OH, USA
**Planar Inlet Design and Analysis Process (PINDAP)**
Slater, John W.; Gruber, Christopher R.; August 2005; 17 pp.; In English; 41st Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson,AZ, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-714-09-25
Report No.(s): NASA/TM-2005-213866; E-15236; AIAA Paper 2005-4203; No Copyright; Avail.: CASI: A03, Hardcopy

The Planar Inlet Design and Analysis Process (PINDAP) is a collection of software tools that allow the efficient aerodynamic design and analysis of planar (two-dimensional and axisymmetric) inlets. The aerodynamic analysis is performed using the Wind-US computational fluid dynamics (CFD) program. A major element in PINDAP is a Fortran 90 code named PINDAP that can establish the parametric design of the inlet and efficiently model the geometry and generate the grid for CFD analysis with design changes to those parameters. The use of PINDAP is demonstrated for subsonic, supersonic, and hypersonic inlets.
Author
*Computational Fluid Dynamics; Hypersonic Inlets; Supersonic Inlets; Planar Structures; Engine Design*

**20050217135** Japan Aerospace Exploration Agency, Japan
**Overview of Japanese Research and Development Program on Liquid Rocket Engine Combustor**
Hasegawa, K.; Kumakawa, A.; Onodera, T.; Shimizu, T.; Watanabe, Y.; Tomita, T.; Taniguchi, H.; Naruo,Y.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 39 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Contents include the following: (1) Laser Ablation Ignition. (2) Extendible Nozzle and Dual-Bell Nozzle. (3) LE-7A Nozzle Flow Separation Phenomenon. (4) Low Cycle Chamber Pressure Fluctuation. (5) LOX/LH2 Engine for Reusable Vehicle Test. (6) Study of Advanced Expander Bleed Cycle.
CASI
*Combustion Chambers; Engine Tests; Ignition; Hydrogen Oxygen Engines; Nozzle Flow*

## 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*.

**20050215401** Systems Technology, Inc., Hawthorne, CA, USA
**On-Line Loss of Control Detection Using Wavelets**
Brenner, Martin J., Technical Monitor; Thompson, Peter M.; Klyde, David H.; Bachelder, Edward N.; Rosenthal, Theodore J.; July 2005; 474 pp.; In English
Contract(s)/Grant(s): NAS4-01004
Report No.(s): NASA/CR-2005-212873; STI-TR-1341-1; STI-TR-1341-2; STI-TR-1341-3; No Copyright; Avail.: CASI: A20, Hardcopy

Wavelet transforms are used for on-line detection of aircraft loss of control. Wavelet transforms are compared with Fourier transform methods and shown to more rapidly detect changes in the vehicle dynamics. This faster response is due to a time window that decreases in length as the frequency increases. New wavelets are defined that further decrease the detection time by skewing the shape of the envelope. The wavelets are used for power spectrum and transfer function estimation. Smoothing is used to tradeoff the variance of the estimate with detection time. Wavelets are also used as front-end to the eigensystem reconstruction algorithm. Stability metrics are estimated from the frequency response and models, and it is these metrics that are used for loss of control detection. A Matlab toolbox was developed for post-processing simulation and flight data using the wavelet analysis methods. A subset of these methods was implemented in real time and named the Loss of Control Analysis Tool Set or LOCATS. A manual control experiment was conducted using a hardware-in-the-loop simulator for a large transport aircraft, in which the real time performance of LOCATS was demonstrated. The next step is to use these wavelet analysis tools for flight test support.
Author
*On-Line Systems; Wavelet Analysis; Detection; Aircraft Control; Algorithms*

**20050215587** Federal Aviation Administration, Oklahoma City, OK, USA
**Investigation of In-Flight Medical Incapacitations and Impairments**
DeJohn, Charles; Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation; August 2005, pp. 4-1; In English; See also 20050215585; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This flight experiment program is separated into several tasks: Approach/landing Visual meteorological conditions. 2 flight crew, 7 flight attendants, 240 passengers. No accident. No injuries or fatalities.Captain did not ask for landing gear. Approach flown at higher than normal airspeed. Reverse thrust used longer than normal. Captain applied full power on taxiway. FO reduced power to idle. Capitan again applied full throttle. Capitan incoherent. FO shut down engines and called for assistance.
Derived from text
*Flight Crews; Injuries; Landing Gear; Thrust Reversal*

**20050215692** QSS Group, Inc., USA, Army Research Lab., Cleveland, OH, USA
**Enhanced Bank of Kalman Filters Developed and Demonstrated for In-Flight Aircraft Engine Sensor Fault Diagnostics**
Kobayashi, Takahisa; Simon, Donald L.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

In-flight sensor fault detection and isolation (FDI) is critical to maintaining reliable engine operation during flight. The aircraft engine control system, which computes control commands on the basis of sensor measurements, operates the propulsion systems at the demanded conditions. Any undetected sensor faults, therefore, may cause the control system to drive the engine into an undesirable operating condition. It is critical to detect and isolate failed sensors as soon as possible so that such scenarios can be avoided. A challenging issue in developing reliable sensor FDI systems is to make them robust to changes in engine operating characteristics due to degradation with usage and other faults that can occur during flight. A sensor FDI system that cannot appropriately account for such scenarios may result in false alarms, missed detections, or misclassifications when such faults do occur. To address this issue, an enhanced bank of Kalman filters was developed, and its performance and robustness were demonstrated in a simulation environment. The bank of filters is composed of m + 1 Kalman filters, where m is the number of sensors being used by the control system and, thus, in need of monitoring. Each Kalman filter is designed on the basis of a unique fault hypothesis so that it will be able to maintain its performance if a

particular fault scenario, hypothesized by that particular filter, takes place.
Derived from text
*Engine Control; Fault Detection; Kalman Filters; Propulsion System Performance*

**20050215693** NASA Glenn Research Center, Cleveland, OH, USA
**Innovative Adaptive Control Method Demonstrated for Active Suppression of Instabilities in Engine Combustors**
Kopasakis, George; Research and Technology 2004; June 2005; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

This year, an improved adaptive-feedback control method was demonstrated that suppresses thermoacoustic instabilities in a liquid-fueled combustor of a type used in aircraft engines. Extensive research has been done to develop lean-burning (low fuel-to-air ratio) combustors that can reduce emissions throughout the mission cycle to reduce the environmental impact of aerospace propulsion systems. However, these lean-burning combustors are susceptible to thermoacoustic instabilities (high-frequency pressure waves), which can fatigue combustor components and even downstream turbine blades. This can significantly decrease the safe operating life of the combustor and turbine. Thus, suppressing the thermoacoustic combustor instabilities is an enabling technology for meeting the low-emission goals of the NASA Ultra-Efficient Engine Technology (UEET) Project.
Derived from text
*Adaptive Control; Combustion Chambers; Feedback Control; Fuel-Air Ratio; Propulsion System Performance*

**20050216527** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
**Head Tracking for 3D Audio Using a GPS-Aided MEMS IMU**
Joffrion, Jacque M.; Mar. 1, 2005; 130 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437051; AFIT/GE/ENG/05-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Audio systems have been developed which use stereo headphones to project sound in three dimensions. When using these 3D audio systems, audio cues sound like they are originating from a particular direction. There is a desire to apply 3D audio to general aviation applications, such as projecting control tower transmissions in the direction of the tower or providing an audio orientation cue for VFR pilots who find themselves in emergency zero-visibility conditions. 3D audio systems, however, require real-time knowledge of the pilot's head orientation in order to be effective. This research describes the development and testing of a low-cost head tracking system for 3D audio rendering applied in general aviation. The system uses a low-cost MEMS IMU combined with a low-cost, single frequency GPS receiver. Real-time data from both of these systems was sent to a laptop computer where a real-time Kalman filter was implemented in MATLAB to solve for position velocity, and attitude. The attitude information was then sent to a 3D audio system for sound direction rendering. The system was flight tested on board a Raytheon C-12C aircraft. The accuracy of the system was measured by comparing its output to truth data from a high-accuracy post-processed navigation-grade INS/DGPS solution. Results showed that roll and pitch error were accurate to within 1-2 degrees, but that heading error was dependent upon the flight trajectory. During straight-and-level flight, the heading error would drift up to 10-15 degrees because of heading unobservability. However, even with heading error, the ability of a pilot to determine the correct direction of a 3D audio cue was significantly improved when using the developed head tracking system over using the navigation-grade INS/GPS system fixed to the aircraft.
DTIC
*Flight Tests; Global Positioning System; Microelectromechanical Systems; Pilots; Radio Receivers*

## 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)*.

**20050214848** NASA Glenn Research Center, Cleveland, OH, USA
**High-Pressure Gaseous Burner (HPGB) Facility Became Operational**
Nguyen, Quang-Viet; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A gas-fueled high-pressure combustion facility with optical access, developed over the last 3 years, is now collecting research data in a production mode. The High-Pressure Gaseous Burner (HPGB) rig at the NASA Glenn Research Center can

operate at sustained pressures up to 60 atm with a variety of gaseous fuels and liquid jet fuel. The facility is unique because it is the only continuous-flow, hydrogen-capable 60-atm rig in the world with optical access. It will provide researchers with new insights into flame conditions that simulate the environment inside the ultra-high-pressure-ratio combustion chambers of tomorrow s advanced aircraft engines. The facility provides optical access to the flame zone through four fused-silica optical windows, enabling the calibration of nonintrusive optical diagnostics to measure chemical species and temperature. The data from the HPGB rig enable the validation of numerical codes that simulate gas turbine combustors.
Derived from text
*High Pressure; Burners; Gaseous Fuels; Data Acquisition; Combustion Chambers*

**20050215030** NASA Glenn Research Center, Cleveland, OH, USA
**Microsystems Fabrication Laboratory- New Class 100 Cleanroom Completed and Certified**
Borato, Frances M.; Research and Technology 2003; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A new Microsystems Fabrication Laboratory (MFL), a Class 100 cleanroom fabrication facility, was completed and certified in 2002 at the NASA Glenn Research Center. This facility, to be used by Glenn's Instrumentation and Controls Division, was designed and built as part of the NASA Construction of Facilities Program. The design, construction, and certification phases were managed by personnel from Glenn s Facilities and Test Engineering Division. Because of time constraints and the need for specialized cleanroom expertise, this 1000 ft2 laboratory was completed using a design-build procurement. Facility Planning & Resources (Pittsburgh, PA) was selected as the prime contractor and provided the architectural design and project management. A major subcontractor, AdvanceTEC, LLC (Richmond, VA), provided the mechanical and electrical design and performed the construction services. Throughout this fast-track project, Facilities and Test Engineering Division personnel provided overall project management and worked closely with the contractors to ensure that the customers needs were addressed and that the impact of the project implementation was minimized.
Derived from text
*Research Facilities; Construction; Certification*

**20050215485** NASA Glenn Research Center, Cleveland, OH, USA
**NASA Glenn's Single-Stage Axial Compressor Facility Upgraded**
Brokopp, Richard A.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

NASA Glenn Research Center's Single-Stage Axial Compressor Facility was upgraded in fiscal year 2003 to expand and improve its research capabilities for testing high-speed fans and compressors. The old 3000-hp drive motor and gearbox were removed and replaced with a refurbished 7000-hp drive motor and gearbox, with a maximum output speed of 21,240 rpm. The higher horsepower rating permits testing of fans and compressors with higher pressure ratio or higher flow. A new inline torquemeter was installed to provide an alternate measurement of fan and compressor efficiency, along with the standard pressure and temperature measurements. A refurbished compressor bearing housing was also installed with bidirectional rotation capability, so that a variety of existing hardware could be tested. Four new lubrication modules with backup capability were installed for the motor, gearbox, torquemeter, and compressor bearing housing, so that in case the primary pump fails, the backup will prevent damage to the rotating hardware. The combustion air supply line for the facility inlet air system was activated to provide dry air for repeatable inlet conditions. New flow conditioning hardware was installed in the facility inlet plenum tank, which greatly reduced the inlet turbulence. The new inlet can also be easily modified to accommodate 20- or 22-in.-diameter fans and compressors, so a variety of existing hardware from other facilities (such as Glenn's 9- by 15-Foot Low-Speed Wind Tunnel) can be tested in the Single-Stage Axial Compressor Facility. An exhaust line was also installed to provide bleed capability to remove the inlet boundary layer. To improve the operation and control of the facility, a new programmable logic controller (PLC) was installed to upgrade from hardwired relay logic to software logic. The PLC also enabled the usage of human-machine interface software to allow for easier operation of the facility and easier reconfiguration of the facility controls when necessary. Finally, a new health-monitoring system was installed to measure shaft speed, shaft movement, and machine vibration on all of the rotating equipment. The system also provides automatic alarms and shutdown of the equipment when required. An integrated systems test for checkout of the facility was completed on June 17, 2003. Research testing resumed on June 30 with data obtained in support of the Ultra-Efficient Engine Technology Project's Compressor Casing Treatment Project.
Author
*Research Facilities; Compressor Efficiency; Test Facilities; Temperature Measurement; High Speed; Fans; Pressure Measurement*

**20050215488** NASA Glenn Research Center, Cleveland, OH, USA

**Low-Pressure Capability of NASA Glenn's 10- by 10-Foot Supersonic Wind Tunnel Expanded**

Roeder, James W.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Extremely low dynamic pressure Q conditions are desired for space-related research including the testing of parachute designs and other decelerator concepts for future vehicles landing on Mars. Therefore, the low-pressure operating capability of the Abe Silverstein 10- by 10-foot Supersonic Wind Tunnel (10 10 SWT) at NASA Glenn Research Center was recently increased. Successful checkout tests performed in the fall of 2002 showed significantly reduced minimum operating pressures in the wind tunnel.

Derived from text

*Supersonic Wind Tunnels; Parachutes; Performance Tests*

**20050215495** NASA Marshall Space Flight Center, Huntsville, AL, USA

**MSFC Materials and Processes Core Capabilities Overview**

Vickers, John; Shah, Sandeep; [2005]; 18 pp.; In English; Alcan Workshop, 15-23 Jun. 2005, Issoire, France; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

World class facilities are: 1. National center for advanced manufacturing (NCAM). Composite development facility. Weld development laboratories. Rapid prototyping laboratory. Thermal spray facility. Thermal protection system development facility. Non-destructive evaluation laboratories. 2. SEM and failure analysis. 3. Hydrogen test facility. 4. Surface science diagnostic laboratory. 5. Space environmental effect facility. 6. Material combustion research facility.

Derived from text

*Combustion Chambers; Failure Analysis; Nondestructive Tests; Research Facilities*

**20050217033** QSS Group, Inc., Cleveland, OH, USA

**Improvements to the Total Temperature Calibration of the NASA Glenn Icing Research Tunnel**

Arrington, E. Allen; Gonsalez, Jose C.; August 2005; 24 pp.; In English; 41st Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS3-00145; WBS 22-077-41-14

Report No.(s): NASA/CR-2005-213875; E-15246; AIAA Paper 2005-4276; No Copyright; Avail.: CASI: A03, Hardcopy

The ability to accurately set repeatable total temperature conditions is critical for collecting quality icing condition data, particularly near freezing conditions. As part of efforts to continually improve data quality in the NASA Glenn Icing Research Tunnel (IRT), new facility instrumentation and new calibration hardware for total temperature measurement were installed and new operational techniques were developed and implemented. This paper focuses on the improvements made in the calibration of total temperature in the IRT.

Author

*Ice Formation; Research Facilities; Wind Tunnel Tests; Calibrating; Temperature Measurement*

## 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*.

**20050215334** Georgia Perimeter Coll., Clarkson, GA, USA

**NASA Integrated Vehicle Health Management (NIVHM) A New Simulation Architecture, Part I, An Investigation**

Sheppard, Gene; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXXIX-1 - XXXIX-9; In English; See also 20050215300; No Copyright; Avail.: CASI: A02, Hardcopy

The overall objective of this research is to explore the development of a new architecture for simulating a vehicle health monitoring system in support of NASA s on-going Integrated Vehicle Health Monitoring (IVHM) initiative. As discussed in NASA MSFC s IVHM workshop on June 29-July 1, 2004, a large number of sensors will be required for a robust IVHM system. The current simulation architecture is incapable of simulating the large number of sensors required for IVHM. Processing the data from the sensors into a format that a human operator can understand and assimilate in a timely manner will require a paradigm shift. Data from a single sensor is, at best, suspect and in order to overcome this deficiency, redundancy

will be required for tomorrow s sensors. The sensor technology of tomorrow will allow for the placement of thousands of sensors per square inch. The major obstacle to overcome will then be how we can mitigate the torrent of data from raw sensor data to useful information to computer assisted decisionmaking.
Derived from text
*Computer Techniques; Architecture (Computers); Monitors*

## 15
## LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

**20050214850** NASA Glenn Research Center, Cleveland, OH, USA
**Air-Breathing Launch Vehicle Technology Being Developed**
Trefny, Charles J.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Of the technical factors that would contribute to lowering the cost of space access, reusability has high potential. The primary objective of the GTX program is to determine whether or not air-breathing propulsion can enable reusable single-stage-to-orbit (SSTO) operations. The approach is based on maturation of a reference vehicle design with focus on the integration and flight-weight construction of its air-breathing rocket-based combined-cycle (RBCC) propulsion system.
Derived from text
*Technology Assessment; Single Stage to Orbit Vehicles; Launch Vehicles; Air Breathing Engines*

**20050214862** NASA Glenn Research Center, Cleveland, OH, USA
**Control Surface Seals Investigated for Re- Entry Vehicles**
Dunlap, Patrick H.; Steinetz, Bruce M.; Research and Technology 2002; March 2003; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Re-entry vehicles generally use control surfaces (e.g., rudders, body flaps, and elevons) to steer or guide them as they pass into and through the Earth s atmosphere. High temperature seals are required around control surfaces both along hinge lines and in areas where control surface edges seal against the vehicle body to limit hot gas ingestion and the transfer of heat to underlying low-temperature structures. Working with the NASA Johnson Space Center, the Seals Team at the NASA Glenn Research Center completed a series of tests on the baseline seal design for the rudder/fin control surface interfaces of the X-38 vehicle. This seal application was chosen as a case study to evaluate a currently available control surface seal design for applications in future re-entry vehicles. The structures of the rudder/fin assembly and its associated seals are shown in the following illustration.
Derived from text
*Control Surfaces; Flapping; Heat Transfer; High Temperature Gases; Hinges; Reentry Vehicles*

**20050215283** NASA Glenn Research Center, Cleveland, OH, USA
**Atlas V Launch Incorporated NASA Glenn Thermal Barrier**
Dunlap, Patrick H., Jr.; Steinetz, Bruce M.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

In the Spring of 2002, Aerojet experienced a major failure during a qualification test of the solid rocket motor that they were developing for the Atlas V Enhanced Expendable Launch Vehicle. In that test, hot combustion gas reached the O-rings in the nozzle-to-case joint and caused a structural failure that resulted in loss of the nozzle and aft dome sections of the motor. To improve the design of this joint, Aerojet decided to incorporate three braided carbon-fiber thermal barriers developed at the NASA Glenn Research Center. The thermal barriers were used to block the searing-hot 5500 F pressurized gases from reaching the temperature-sensitive O-rings that seal the joint. Glenn originally developed the thermal barriers for the nozzle joints of the space shuttle solid rocket motors, and Aerojet decided to use them on the basis of the results of several successful ground tests of the thermal barriers in the shuttle rockets. Aerojet undertook an aggressive schedule to redesign the rocket nozzle-to-case joint with the thermal barriers and to qualify it in time for a launch planned for the middle of 2003. They performed two successful qualification tests (Oct. and Dec. 2002) in which the Glenn thermal barriers effectively protected the O-rings. These qualification tests saved hundreds of thousands of dollars in development costs and put the Lockheed-Martin/Aerojet team back on schedule. On July 17, 2003, the first flight of an Atlas V boosted with solid rocket

motors successfully launched a commercial satellite into orbit from Cape Canaveral Air Force Station. Aero-jet's two 67-ft solid rocket boosters performed flawlessly, with each providing thrust in excess of 250,000 lbf. Both motors incorporated three Glenn-developed thermal barriers in their nozzle-to-case joints. The Cablevision satellite launched on this mission will be used to provide direct-to-home satellite television programming for the U.S. market starting in late 2003. The Atlas V is a product of the military's Enhanced Expendable Launch Vehicle program designed to provide assured military access to space. It can lift payloads up to 19,100 lb to geosynchronous transfer orbit and was designed to meet Department of Defense, commercial, and NASA needs. The Atlas V and Delta IV are two launch systems being considered by NASA to launch the Orbital Space Plane/Crew Exploration Vehicle. The launch and rocket costs of this mission are valued at $250 million. Successful application of the Glenn thermal barrier to the Atlas V program was an enormous breakthrough for the program's technical and schedule success.

Author

*Atlas Able 5 Launch Vehicle; Thermal Barriers (Plasma Control); Space Shuttle Boosters; NASA Space Programs*

**20050215335** Christian Brothers Univ., Memphis, TN, USA

**Integration of Launch Vehicle Simulation/Analysis Tools and Lunar Cargo Lander Design, Part 1/2**

Shiue, Yeu-Sheng Paul; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XL-1 - XL-6; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

Simulation and analysis of vehicle performance is essential for design of a new launch vehicle system. It is more and more demand to have an integrated, highly efficient, robust simulation tool with graphical user interface (GUI) for vehicle performance and simulations. The objectives of this project are to integrate and develop launch vehicle simulation and analysis tools in MATLAB/Simulink under PC Platform, to develop a vehicle capable of being launched on a Delta-IV Heavy Launch Vehicle which can land on the moon with the goal of pre-implanting cargo for a new lunar mission, also with the capability of selecting other launch vehicles that are capable of inserting a payload into Trans-Lunar Injection (TLI). The vehicle flight simulation software, MAVERIC-II (Marshall Aerospace VEhicle Representation In 'C'), developed by Marshall Space Flight Center was selected as a starting point for integration of simulation/analysis tools. The goals are to convert MAVERIC-II from UNIX to PC platform and build input/output GUI s in the MATLAB environment, and then integrate them under MATLAB/Simulink with other modules. Currently, MAVERIC-II has been successfully converted from UNIX to PC using Microsoft Services for UNIX subsystem on PC. Input/Output GUI's have been done for some key input/output files. Calling MAVERIC-II from Simulink has been tested. Details regarding Lunar Cargo Lander Design are described in Part 2/2 of the paper on page X-1.

Derived from text

*Cargo; Flight SIMulation; Aerospace Vehicles; Systems Integration; Computerized SIMulation; Delta 4 Launch Vehicle; Lunar Landing; Launch Vehicle Configurations*

**20050216389** NASA Glenn Research Center, Cleveland, OH, USA

**Intelligent Elements for the ISHM Testbed and Prototypes (ITP) Project**

Maul, William A.; Park, Han; Schwabacher, Mark; Watson, Michael; Mackey, Ryan; Fijany, Amir; Trevino, Luis; Weir, John; September 2005; 14 pp.; In English; Sensors for Industry Conference (SIcon/05), 8-10 Feb. 2005, Houston, TX, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-303-30-72

Report No.(s): NASA/TM-3005-213848; E-15219; No Copyright; Avail.: CASI: A03, Hardcopy

Deep-space manned missions will require advanced automated health assessment capabilities. Requirements such as in-space assembly, long dormant periods and limited accessibility during flight, present significant challenges that should be addressed through Integrated System Health Management (ISHM). The ISHM approach will provide safety and reliability coverage for a complete system over its entire life cycle by determining and integrating health status and performance information from the subsystem and component levels. This paper will focus on the potential advanced diagnostic elements that will provide intelligent assessment of the subsystem health and the planned implementation of these elements in the ISHM Testbed and Prototypes (ITP) Project under the NASA Exploration Systems Research and Technology program.

Author

*Systems Integration; Health; Fault Detection; Manned Space Flight; Deep Space*

**20050217094** NASA Langley Research Center, Hampton, VA, USA

**Thermal Structures Technology Development for Reusable Launch Vehicle Cryogenic Propellant Tanks**

Johnson, Theodore F.; Natividad, Roderick; Rivers, H. Kevin; Smith, Russell W.; September 2005; 28 pp.; In English

Contract(s)/Grant(s): 23-064-20-32

Report No.(s): NASA/TM-2005-213913; L-19165; No Copyright; Avail.: CASI: A03, Hardcopy

Analytical and experimental studies conducted at the NASA, Langley Research Center (LaRC) for investigating integrated cryogenic propellant tank systems for a reusable launch vehicle (RLV) are described. The cryogenic tanks are investigated as an integrated tank system. An integrated tank system includes the tank wall, cryogenic insulation, thermal protection system (TPS) attachment sub-structure, and TPS. Analysis codes are used to size the thicknesses of cryogenic insulation and TPS insulation for thermal loads, and to predict tank buckling strengths at various ring frame spacings. The unique test facilities developed for the testing of cryogenic tank components are described. Testing at cryogenic and high-temperatures verifies the integrity of materials, design concepts, manufacturing processes, and thermal/structural analyses. Test specimens ranging from the element level to the subcomponent level are subjected to projected vehicle operational mechanical loads and temperatures. The analytical and experimental studies described in this paper provide a portion of the basic information required for the development of light-weight reusable cryogenic propellant tanks.

Author

*Cryogenics; Propellant Tanks; Reusable Launch Vehicles; Structural Analysis; Thermal Protection; Test Facilities; Technology Utilization*

## 16
## SPACE TRANSPORTATION AND SAFETY

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

**20050214875** NASA Kennedy Space Center, Cocoa Beach, FL, USA

**STS-114: Discovery Mission Status Briefing**

July 29, 2005; In English; 34 min., 3 sec. playing time, in color, with sound; No Copyright; Avail.: CASI: V03, Videotape-VHS: B03, Videotape-Beta

Phil Engelauf, STS-114 Mission Operations Representative reports: the orbital rendezvous was successful, and today's activities includes initial preparations of the next day's extravehicular activities (EVA); he specifically mentioned tile repair, wiring on the outside of the vehicle to try to recover CMG2 (Control Moment Gyro), and preparation for the external stowage platform. John Shannon, Manager of the Space Shuttle Operations and Integration reports from Engineering standpoint that the composites of the underside of the tile surface seen from pictures taken during the pitch maneuver were extremely clean; the Engineering staff continues to look at the focus inspection data from the orbital boom sensor system (OBSS) and other data to assess the condition of the vehicle. Solid rocket boosters were retrieved and are towed back to the Air Force hangar in Cape Carneval. Six target inspection (nose gear doors, gap fillers, chine area, external tank doors, trailing edge, and ice), and arm operations, foam, conservation measures, shuttle air lock, aerodynamics assessment and re-entry were topics covered with the News media.

CASI

*Space Shuttle Missions; Space Shuttle Orbiters; Space Transportation System Flights; Extravehicular Activity*

**20050215014** NASA Glenn Research Center, Cleveland, OH, USA

**Fan Beam Emission Tomography Demonstrated Successfully in the Reduced-Gravity Environment of Drop Towers**

Feikema, Douglas A.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Fires onboard manned spacecraft and launch vehicles are a particularly feared hazard because one cannot jump ship while in orbit 240 nmi above the Earth at 17 000 mph! Understanding the physical properties of fires in free fall and on orbit is, therefore, a very important endeavor for NASA s Human Exploration and Development of Space (HEDS) enterprise. However, detailed information concerning the structure of microgravity fires remained elusive until recently since robustness, limited power, limited volume, and limited mass place severe constraints on diagnostic equipment for use in space and in NASA Glenn Research Center s reduced-gravity facilities. Under NASA Research Associate funding since 2001, En'Urga, Inc. (Dr. Sivathanu, principal investigator, and Dr. Lim, co-investigator) in collaboration with Glenn (Dr. Feikema,

coinvestigator) have successfully demonstrated a new technology for use in microgravity combustion. A midinfrared scanning spectrometer has been developed by En'Urga and tested at Glenn to measure 30 spectra per second at different spatial locations in a flame from 1.8 to 4.8 microns.
Derived from text
*Center of Gravity; Combustion; Flames*

**20050215025** NASA Glenn Research Center, Cleveland, OH, USA
**New Technologies Being Developed for the Thermophoretic Sampling of Smoke Particulates in Microgravity**
Sheredy, William A.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Characterization of Smoke Particulate for Spacecraft Fire Detection, or Smoke, microgravity experiment is planned to be performed in the Microgravity Science Glovebox Facility on the International Space Station (ISS). This investigation, which is being developed by the NASA Glenn Research Center, ZIN Technologies, and the National Institute of Standards and Technologies (NIST), is based on the results and experience gained from the successful Comparative Soot Diagnostics experiment, which was flown as part of the USMP-3 (USA Microgravity Payload 3) mission on space shuttle flight STS-75. The Smoke experiment is designed to determine the particle size distributions of the smokes generated from a variety of overheated spacecraft materials and from microgravity fires. The objective is to provide the data that spacecraft designers need to properly design and implement fire detection in spacecraft. This investigation will also evaluate the performance of the smoke detectors currently in use aboard the space shuttle and ISS for the test materials in a microgravity environment.
Derived from text
*Technology Assessment; Smoke Detectors; Size Distribution; Particulates; Gravitational Effects*

**20050215327** Tennessee Technological Univ., Cookeville, TN, USA
**The Effect of Infrastructure Sharing in Estimating Operations Cost of Future Space Transportation Systems**
Sundaram, Meenakshi; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XLIII-1 - XLIII-7; In English; See also 20050215300; No Copyright; Avail.: CASI: A02, Hardcopy

NASA and the aerospace industry are extremely serious about reducing the cost and improving the performance of launch vehicles both manned or unmanned. In the aerospace industry, sharing infrastructure for manufacturing more than one type spacecraft is becoming a trend to achieve economy of scale. An example is the Boeing Decatur facility where both Delta II and Delta IV launch vehicles are made. The author is not sure how Boeing estimates the costs of each spacecraft made in the same facility. Regardless of how a contractor estimates the cost, NASA in its popular cost estimating tool, NASA Air force Cost Modeling (NAFCOM) has to have a method built in to account for the effect of infrastructure sharing. Since there is no provision in the most recent version of NAFCOM2002 to take care of this, it has been found by the Engineering Cost Community at MSFC that the tool overestimates the manufacturing cost by as much as 30%. Therefore, the objective of this study is to develop a methodology to assess the impact of infrastructure sharing so that better operations cost estimates may be made.
Derived from text
*Space Transportation System; Operating Costs; Cost Estimates; Manufacturing; Mathematical Models*

**20050215397** NASA Kennedy Space Center, Cocoa Beach, FL, USA
**STS-114: Discovery Day 3 Mission Status Briefing**
July 28, 2005; In English; 36 min., 27 sec. playing time, in color, with sound; No Copyright; Avail.: CASI: V03, Videotape-VHS: B03, Videotape-Beta

Paul Hill, STS-114 Lead Shuttle Flight Director and John Shannon, Space Shuttle Flight Operations and Integration Manager are seen in this STS-114 flight day three Mission Status Briefing. Hill expresses that the Discovery Orbiter is performing beautifully and that STS-114 crew performed a picture perfect rendezvous. He also shows a video of the Rendezvous Pitch Maneuver (RPM) where Commander Eileen Collins slowly flips Discovery in a circle to give the Expedition 11 crew a view of Discovery's heat resistant tiles. He talks about the removal of the Multi-Purpose Logistics Module (MPLM) from Discovery's payload bay using the ISS Robotic Arm. Shannon discusses two objectives that his team is fulfilling on this mission. They include: 1) Understanding the health of Space Shuttle Discovery; and 2) Assessing the performance of the External Tank. Questions from the news media pertaining to the life expectancy of the Space Shuttle Discovery, battery

lifetime on the wing leading edge impact sensors, foam loss, PAL ramps, and the safety of the Space Shuttle Discovery are addressed.
CASI
*Discovery (Orbiter); Multi-Purpose Logistics Modules; Robot Arms; Space Transportation System Flights; International Space Station*

**20050215575** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Microwave and Millimeter Wave Testing for the Inspection of the Space Shuttle Spray on Foam Insulations (SOFI) and the Acreage Heat Tiles**
Zoughi, R.; Kharkovsky, S.; Hepburn, F. L.; [2005]; 8 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNM04AA15A; Copyright; Avail.: CASI: A02, Hardcopy

The utility of microwave and millimeter wave nondestructive testing and evaluation (NDT&E) methods, for testing the Space Shuttle's external he1 tank spray on foam insulation (SOFI) and the acreage heat tiles has been investigated during the past two years. Millimeter wave NDE techniques are capable of producing internal images of SOFI. This paper presents the results of testing several diverse panels with embedded voids and debonds at millimeter wave frequencies. Additionally, the results of testing a set of heat tiles are also presented. Finally, the attributes of these methods as well as the advantageous features associated with these systems are also provided.
Author
*Foams; Microwaves; Millimeter Waves; Space Shuttles; Sprayers; Tiles; Nondestructive Tests; Thermal Insulation*

**20050215579** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Microwave and Millimeter Wave Imaging of the Space Shuttle External Fuel Tank Spray on Foam Insulation (SOFI) using Synthetic Aperture Focusing Techniques (SAFT}**
Case, J. T.; Robbins, J.; Kharkivskiy, S.; Hepburn, F.; Zoughi, R.; [2005]; 16 pp.; In English; Quantitative Nondestructive Evaluaiton Conference, 31 Jul. - 5 Aug. 2005, Brunswick, ME, USA
Contract(s)/Grant(s): NNM04AA15A; No Copyright; Avail.: CASI: A03, Hardcopy

The Space Shuttle Columbia s catastrophic failure is thought to have been caused by a dislodged piece of external tank spray on foam insulation (SOFI) striking the left wing of the orbiter causing significant damage to some of the reinforced carbodcarbon leading edge wing panels. Microwave and millimeter wave nondestructive evaluation methods have shown great potential for inspecting SOFI for the purpose of detecting anomalies such as small air voids that may cause separation of the SOFI from the external tank during a launch. These methods are capable of producing relatively high-resolution images of the interior of SOFI particularly when advanced imaging algorithms are incorporated into the overall system. To this end, synthetic aperture focusing techniques (SAFT) are being developed. This paper presents some of the preliminary results of this investigation using SAFT-based methods and microwave holography at relatively low frequencies illustrating their potential capabilities for operation at millimeter wave frequencies.
Author
*External Tanks; Foams; Insulation; Space Shuttles; Synthetic Apertures; Millimeter Waves; Microwave Holography; Imaging Techniques*

**20050217100** NASA Langley Research Center, Hampton, VA, USA
**Technical Consultation of the Hubble Space Telescope (HST) System Health Assessment: Analysis of HST Health**
Gentz, Steven J.; Heard, Brent N.; Hodson, Robert F.; Pettit, Duane H.; Pandolf, John E.; Azzolini, John D.; Dennehy, Cornelius J.; Farley, Rodger E.; Kirchman, Frank J.; Spidaliere, Peter D.; September 2005; 39 pp.; In English
Contract(s)/Grant(s): 104-08-33
Report No.(s): NASA/TM-2005-213917; NESC-RP-04-12/04-060-E; L-19173; No Copyright; Avail.: CASI: A03, Hardcopy

The NESC conducted an abridged independent examination of available information and personnel interviews to evaluate the current and anticipated state of the spacecraft subsystems and the parameters that describe the HST's health. These examinations included the projected timeliness of a robotic SM and whether the GSFC baseline concept is likely to provide the capability to extend the useful scientific life of the HST by an additional 5 years. The NESC team collected a broad spectrum of pertinent HST Program analyses, reports, briefings, and the results of the IPAO and the Aerospace Corporation AOA assessments as they relate to the degradation of the HST s health. This review included the state of the HST subsystems

having the potential to impact the viability of the HST, but will not be serviced under the baseline robotic SM.
Author
*Hubble Space Telescope; Systems Health Monitoring; Aerospace Safety; Robotics; Systems Engineering*

**20050217163** NASA Glenn Research Center, Cleveland, OH, USA
**Flexible Metallic Overwrap Concept Developed for On-Orbit Repair of Space Shuttle Orbiter Leading Edges**
Ritzert, Frank J.; Nesbitt, James A.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Columbia accident has focused attention on the critical need for on-orbit repair concepts for leading edges in the event that damage is incurred during space shuttle orbiter flight. Damage that is considered as potentially catastrophic for orbiter leading edges ranges from simple cracks to holes as large as 16 in. in diameter. NASA is particularly interested in examining potential solutions for areas of larger damage since such a problem was identified as the cause for the Columbia disaster. One possible idea for the on-orbit repair of the reinforced carbon/carbon (RCC) leading edges is an overwrap concept that would use a metallic sheet flexible enough to conform to the contours of the orbiter and robust enough to protect any problem area from catastrophic failure during reentry. The simplified view of the application of a refractory metal sheet over a mockup of shuttle orbiter panel 9, which experiences the highest temperatures on the shuttle during reentry is shown. The metallic overwrap concept is attractive because of its versatility as well as the ease with which it can be included in an onboard repair kit. Reentry of the orbiter into Earth's atmosphere imposes extreme requirements on repair materials. Temperatures can exceed 1650 C for up to 15 min in the presence of an extremely oxidizing plasma environment. Several other factors are critical, including catalysity, emissivity, and vibrational and aerodynamic loads. Materials chosen for this application will need to be evaluated with respect to high-temperature capability, resistance to oxidation, strength, coefficient of thermal expansion, and thermal conductivity. The temperature profile across panel 9 during reentry as well as a schematic of the overwrap concept itself is shown.
Derived from text
*Composite Wrapping; Space Shuttle Orbiters; Leading Edges; Metal Sheets; Spacecraft Maintenance*

## 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*.

**20050215015** NASA Glenn Research Center, Cleveland, OH, USA
**Radiative Enhancement Effects on Flame Spread (REEFS) Project Studied 'Green House' Effects on Fire Spread**
Gokoglu, Suleyman A.; Ronney, Paul; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Radiative Enhancement Effects on Flame Spread (REEFS) project, slated for flight aboard the International Space Station, reached a major milestone by holding its Science Concept Review this year. REEFS is led by principal investigator Paul Ronney from the University of Southern California in conjunction with a project team from the NASA Glenn Research Center. The study is focusing on flame spread over flat solid fuel beds to improve our understanding of more complex fires, such as those found in manned spacecraft and terrestrial buildings. The investigation has direct implications for fire safety, both for space and Earth applications, and extends previous work with emphasis on the atmospheres and flow environments likely to be present in fires that might occur in microgravity. These atmospheres will contain radiatively active gases such as carbon dioxide (CO2) from combustion products, and likely gaseous fuels such as carbon monoxide (CO) from incomplete combustion of solid fuel, as well as flows induced by ventilation currents. During tests in the 2.2-Second Drop Tower and KC-135 aircraft at Glenn, the principal investigator introduced the use of foam fuels for flame spread experiments over thermally thick fuels to obtain large spread rates in comparison to those of dense fuels such as PMMA. This enables meaningful results to be obtained even in the 2.2 s available in drop tower experiments.
Author
*Augmentation; Carbon Dioxide; Combustion Products; Flame Propagation; Ventilation*

**20050215622** NASA Marshall Space Flight Center, Huntsville, AL, USA

**The Integrated Safety-Critical Advanced Avionics Communication and Control (ISAACC) System Concept: Infrastructure for ISHM**

Gwaltney, David A.; Briscoe, Jeri M.; [2005]; 1 pp.; In English; 2005 Integrated Systems Health Management Conference, 8-11 Aug. 2005, Cincinnati, OH, USA; No Copyright; Avail.: Other Sources; Abstract Only

Integrated System Health Management (ISHM) architectures for spacecraft will include hard real-time, critical subsystems and soft real-time monitoring subsystems. Interaction between these subsystems will be necessary and an architecture supporting multiple criticality levels will be required. Demonstration hardware for the Integrated Safety-Critical Advanced Avionics Communication & Control (ISAACC) system has been developed at NASA Marshall Space Flight Center. It is a modular system using a commercially available time-triggered protocol, ?Tp/C, that supports hard real-time distributed control systems independent of the data transmission medium. The protocol is implemented in hardware and provides guaranteed low-latency messaging with inherent fault-tolerance and fault-containment. Interoperability between modules and systems of modules using the TTP/C is guaranteed through definition of messages and the precise message schedule implemented by the master-less Time Division Multiple Access (TDMA) communications protocol. 'Plug-and-play' capability for sensors and actuators provides automatically configurable modules supporting sensor recalibration and control algorithm re-tuning without software modification. Modular components of controlled physical system(s) critical to control algorithm tuning, such as pumps or valve components in an engine, can be replaced or upgraded as 'plug and play' components without modification to the ISAACC module hardware or software. ISAACC modules can communicate with other vehicle subsystems through time-triggered protocols or other communications protocols implemented over Ethernet, MIL-STD- 1553 and RS-485/422. Other communication bus physical layers and protocols can be included as required. In this way, the ISAACC modules can be part of a system-of-systems in a vehicle with multi-tier subsystems of varying criticality. The goal of the ISAACC architecture development is control and monitoring of safety critical systems of a manned spacecraft. These systems include spacecraft navigation and attitude control, propulsion, automated docking, vehicle health management and life support. ISAACC can integrate local critical subsystem health management with subsystems performing long term health monitoring. The ISAACC system and its relationship to ISHM will be presented.

Author

*Active Control; Avionics; Communication Networks; Space Navigation; Life Support Systems; Health; Systems Integration*

**20050215644** NASA Dryden Flight Research Center, Edwards, CA, USA

**Ku- and Ka-Band Phased Array Antenna for the Space-Based Telemetry and Range Safety Project**

Whiteman, Donald E.; Valencia, Lisa M.; Birr, Richard B.; [2005]; 10 pp.; In English; 23rd AIAA International Communications Satellite Systems Conference, 25-28 Sep. 2005, Rome, Italy; No Copyright; Avail.: CASI: A02, Hardcopy

The National Aeronautics and Space Administration Space-Based Telemetry and Range Safety study is a multiphase project to increase data rates and flexibility and decrease costs by using space-based communications assets for telemetry during launches and landings. Phase 1 used standard S-band antennas with the Tracking and Data Relay Satellite System to obtain a baseline performance. The selection process and available resources for Phase 2 resulted in a Ku-band phased array antenna system. Several development efforts are under way for a Ka-band phased array antenna system for Phase 3. Each phase includes test flights to demonstrate performance and capabilities. Successful completion of this project will result in a set of communications requirements for the next generation of launch vehicles.

Author

*Antenna Arrays; Phased Arrays; Rates (Per Time); Ultrahigh Frequencies; Superhigh Frequencies*

## 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*.

**20050215027** NASA Glenn Research Center, Cleveland, OH, USA

**Multifunctional Inflatable Structure Being Developed for the PowerSphere Concept**

Peterson, Todd T.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The continuing development of microsatellites and nanosatellites for low Earth orbits requires the collection of sufficient power for instruments onboard a low-weight, low-volume spacecraft. Because the overall surface area of a microsatellite or nanosatellite is small, body-mounted solar cells cannot provide enough power. The deployment of traditional, rigid, solar arrays necessitates larger satellite volumes and weights, and also requires extra apparatus for pointing. One solution to this power choke problem is the deployment of a spherical, inflatable power system. This power system, termed the 'PowerSphere,' has several advantages, including a high collection area, low weight and stowage volume, and the elimination of solar array pointing mechanisms.
Derived from text
*Inflatable Structures; Microsatellites; Nanosatellites; Weight (Mass)*

**20050215040** NASA Langley Research Center, Hampton, VA, USA
**Flight Data Analysis of HyShot 2**
Hass, Neal E.; Smart, Michael K.; Paull, Alan; [2005]; 17 pp.; In English; 13th AIAA/CIRA International Space Planes and Hypersonic Systems Technologies Conference, 16-20 May 2005, Capua, Italy
Contract(s)/Grant(s): 23-745-30-30
Report No.(s): AIAA Paper 2005-3354; Copyright; Avail.: CASI: A03, Hardcopy

The development of scramjet propulsion for alternative launch and payload delivery capabilities has comprised largely of ground experiments for the last 40 years. With the goal of validating the use of short duration ground test facilities, the University of Queensland, supported by a large international contingency, devised a ballistic re-entry vehicle experiment called HyShot to achieve supersonic combustion in flight above Mach 7.5. It consisted of a double wedge intake and two back-to-back constant area combustors; one supplied with hydrogen fuel at an equivalence ratio of 0.33 and the other un-fueled. Following a first launch failure on October 30th 2001, the University of Queensland conducted a successful second launch on July 30th, 2002. Post-flight data analysis of the second launch confirmed the presence of supersonic combustion during the approximately 3 second test window at altitudes between 35 and 29 km. Reasonable correlation between flight and some pre-flight shock tunnel tests was observed.
Author
*Supersonic Combustion Ramjet Engines; Launching; Payloads; Reentry Vehicles; Supersonic Combustion; Flight Tests*

**20050215061** NASA Goddard Space Flight Center, Greenbelt, MD, USA
**The Swift Mission and the REM Telescope**
Gehrels, N.; Chincarini, G.; Giommi, P.; Mason, K. O.; Nousek, J. A.; Wells, A. A.; White, N. E.; Barthelemy, S. D.; Burrow, D. N.; Hurley, K. C., et al.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Following a description of the science drive which originated the Swift Mission, this is US NASA MIDEX Mission with the collaboration of Italy and the UK, we will describe the status of the hardware and the observing strategy. The telemetry is carried out via the TDRSS satellite for those communications that need immediate response. The data transfer and the scheduled uploading of routine commands will be done through the ASI Malindi station in Kenia. Both in the US and in Europe a large effort will be done to follow the bursts with the maximum of efficiency and as soon as possible after the alert. We will describe how the ESO VLT telescopes are able to respond to the alert. To address the problematic of the dark bursts and to immediately follow up all of the bursts also in the Near Infrared we designed and built a 60 cm NIR Robotic telescope, REM, to be located on the ESO ground at Cerro La Silla. The instrumentation includes also a low dispersion spectrograph with the capability of multi wavelength optical photometry.
Author
*X Ray Telescopes; Space Missions; Spacecraft Design; TDR Satellites; Robotics*

**20050215093** NASA Langley Research Center, Hampton, VA, USA
**A Design Comparison of Atmospheric Flight Vehicles for the Exploration of Titan**
Gasbarre, Joseph F.; Wright, Henry S.; Lewis, Mark J.; [2005]; 18 pp.; In English; AIAA Atmospheric Flight Mechanics Conference and Exhibit, 15-18 Aug. 2005, San Francisco, CA, USA
Contract(s)/Grant(s): 23-752-50-20
Report No.(s): AIAA Paper 2005-6235; Copyright; Avail.: CASI: A03, Hardcopy

Titan, the largest moon of Saturn, is one of the most scientifically interesting locations in the Solar System. With a very cold atmosphere that is five times as dense as Earth s, and one and a half times the surface pressure, it also provides one of the most aeronautically fascinating environments known to humankind. While this may seem the ideal place to attempt atmospheric flight, many challenges await any vehicle attempting to navigate through it. In addition to these physical challenges, any scientific exploration mission to Titan will most likely have several operational constraints. One difficult constraint is the desire for a global survey of the planet and thus, a long duration flight within the atmosphere. Since many of the scientific measurements that would be unique to a vehicle flying through the atmosphere (as opposed to an orbiting spacecraft) desire near-surface positioning of their associated instruments, the vehicle must also be able to fly within the first scale height of the atmosphere. Another difficult constraint is that interaction with the surface, whether by landing or dropped probe, is also highly desirable from a scientific perspective. Two common atmospheric flight platforms that might be used for this mission are the airplane and airship. Under the assumption of a mission architecture that would involve an orbiting relay spacecraft delivered via aerocapture and an atmospheric flight vehicle delivered via direct entry, designs were developed for both platforms that are unique to Titan. Consequently, after a viable design was achieved for each platform, their advantages and disadvantages were compared. This comparison included such factors as deployment risk, surface interaction capability, mass, and design heritage. When considering all factors, the preferred candidate platform for a global survey of Titan is an airship.
Author
*Titan; Aerospace Vehicles; Deployment; Surface Reactions*

**20050215102** NASA Marshall Space Flight Center, Huntsville, AL, USA
**MIT-NASA Workshop: Transformational Technologies**
Mankins, J. C., Editor; Christensen, C. B.; Gresham, E. C.; Simmons, A.; Mullins, C. A.; March 2005; 48 pp.; In English; MIT-NASA Workshop: Transformational Technologies, 11-12 Dec. 2003, Cambridge, MA, USA
Report No.(s): NASA/CP-2005-213741; M-1134; No Copyright; Avail.: CASI: A03, Hardcopy

As a space faring nation, we are at a critical juncture in the evolution of space exploration. NASA has announced its Vision for Space Exploration, a vision of returning humans to the Moon, sending robots and eventually humans to Mars, and exploring the outer solar system via automated spacecraft. However, mission concepts have become increasingly complex, with the potential to yield a wealth of scientific knowledge. Meanwhile, there are significant resource challenges to be met. Launch costs remain a barrier to routine space flight; the ever-changing fiscal and political environments can wreak havoc on mission planning; and technologies are constantly improving, and systems that were state of the art when a program began can quickly become outmoded before a mission is even launched. This Conference Publication describes the workshop and featured presentations by world-class experts presenting leading-edge technologies and applications in the areas of power and propulsion; communications; automation, robotics, computing, and intelligent systems; and transformational techniques for space activities. Workshops such as this one provide an excellent medium for capturing the broadest possible array of insights and expertise, learning from researchers in universities, national laboratories, NASA field Centers, and industry to help better our future in space.
Author
*Robotics; Propulsion; Automatic Control; Computers; Space Exploration; Spacecraft Design*

**20050215115** NASA Langley Research Center, Hampton, VA, USA
**Radiation Protection for Lunar Mission Scenarios**
Clowdsley, Martha S.; Nealy, John E.; Wilson, John W.; Anderson, Brooke M.; Anderson, Mark S.; Krizan, Shawn A.; [2005]; 11 pp.; In English; AIAA SPACE 2005 Conference and Exposition, 30 Aug. - 1 Sep. 2005, Long Beach, CA, USA
Contract(s)/Grant(s): 23-612-10-81-A1; Copyright; Avail.: CASI: A03, Hardcopy

Preliminary analyses of shielding requirements to protect astronauts from the harmful effects of radiation on both short-term and long-term lunar missions have been performed. Shielding needs for both solar particle events (SPEs) and galactic cosmic ray (GCR) exposure are discussed for transit vehicles and surface habitats. This work was performed under the aegis of two NASA initiatives. The first study was an architecture trade study led by Langley Research Center (LaRC) in which a broad range of vehicle types and mission scenarios were compared. The radiation analysis for this study primarily focused on the additional shielding mass required to protect astronauts from the rare occurrence of a large SPE. The second study, led by Johnson Space Center (JSC), involved the design of lunar habitats. Researchers at LaRC were asked to evaluate the changes to mission architecture that would be needed if the surface stay were lengthened from a shorter mission duration of 30 to 90 days to a longer stay of 500 days. Here, the primary radiation concern was GCR exposure. The methods used for these studies as well as the resulting shielding recommendations are discussed. Recommendations are also made for more

detailed analyses to minimize shielding mass, once preliminary vehicle and habitat designs have been completed. Here, methodologies are mapped out and available radiation analysis tools are described. Since, as yet, no dosimetric limits have been adopted for missions beyond low earth orbit (LEO), radiation exposures are compared to LEO limits. Uncertainties associated with the LEO career effective dose limits and the effects of lowering these limits on shielding mass are also discussed.
Author
*Radiation Protection; Astronauts; Exposure; Radiation Dosage; Radiation Effects; Shielding*

**20050215301** Christian Brothers Univ., Memphis, TN, USA
**Integration Of Launch Vehicle Simulation/Analysis Tools And Lunar Cargo Lander Design, Part 2/2**
DeJean, George Brian; Shiue, Yeu-Sheng Paul; King, Jeffrey; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. X-1 - X-8; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

Part 2, which will be discussed in this report, will discuss the development of a Lunar Cargo Lander (unmanned launch vehicle) that will transport usable payload from Trans- Lunar Injection to the moon. The Delta IV-Heavy was originally used to transport the Lunar Cargo Lander to TLI, but other launch vehicles have been studied. In order to uncover how much payload is possible to land on the moon, research was needed in order to design the sub-systems of the spacecraft. The report will discuss and compare the use of a hypergolic and cryogenic system for its main propulsion system. The guidance, navigation, control, telecommunications, thermal, propulsion, structure, mechanisms, landing gear, command, data handling, and electrical power sub-systems were designed by scaling off other flown orbiters and moon landers. Once all data was collected, an excel spreadsheet was created to accurately calculate the usable payload that will land on the moon along with detailed mass and volume estimating relations. As designed, The Lunar Cargo Lander can plant 5,400 lbm of usable payload on the moon using a hypergolic system and 7,400 lbm of usable payload on the moon using a cryogenic system.
Author
*Computerized SIMulation; Control Systems Design; Launch Vehicles; Navigation; Payloads; Telecommunication*

**20050215310** Middle Tennessee State Univ., Murfreesboro, TN, USA
**Reliability Assessment Of Conceptual Launch Vehicles**
Bloomer, Lisa A.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. V-1 - V-5; In English; See also 20050215300; No Copyright; Avail.: CASI: A01, Hardcopy

Planning is underway for new NASA missions to the moon and to MARS. These missions carry a great deal of risk, as the Challenger and Columbia accidents demonstrate. In order to minimize the risks to the crew and the mission, risk reduction must be done at every stage, not only in quality manufacturing, but also in design. It is necessary, therefore, to be able to compare the risks posed in different launch vehicle designs. Further, these designs have not yet been implemented, so it is necessary to compare these risks without being able to test the vehicles themselves. This paper will discuss some of the issues involved in this type of comparison. It will start with a general discussion of reliability estimation. It will continue with a short look at some software designed to make this estimation easier and faster. It will conclude with a few recommendations for future tools.
Derived from text
*Manufacturing; NASA Programs; Reliability; Test Vehicles*

**20050215317** Tennessee State Univ., Nashville, TN, USA
**Study of a 30-M Boom For Solar Sail-Craft: Model Extendibility and Control Strategy**
Keel, Leehyun; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXIII-1 - XXIII-5; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Space travel propelled by solar sails is motivated by the fact that the momentum exchange that occurs when photons are reflected and/or absorbed by a large solar sail generates a small but constant acceleration. This acceleration can induce a constant thrust in very large sails that is sufficient to maintain a polar observing satellite in a constant position relative to the Sun or Earth. For long distance propulsion, square sails (with side length greater than 150 meters) can reach Jupiter in two years and Pluto in less than ten years. Converting such design concepts to real-world systems will require accurate analytical models and model parameters. This requires extensive structural dynamics tests. However, the low mass and high flexibility of large and light weight structures such as solar sails makes them unsuitable for ground testing. As a result, validating analytical models is an extremely difficult problem. On the other hand, a fundamental question can be asked. That is whether

an analytical model that represents a small-scale version of a solar-sail boom can be extended to much larger versions of the same boom. To answer this question, we considered a long deployable boom that will be used to support the solar sails of the sail-craft. The length of fully deployed booms of the actual solar sail-craft will exceed 100 meters. However, the test-bed we used in our study is a 30 meter retractable boom at MSFC. We first develop analytical models based on Lagrange s equations and the standard Euler-Bernoulli beam. Then the response of the models will be compared with test data of the 30 meter boom at various deployed lengths. For this stage of study, our analysis was limited to experimental data obtained at 12ft and 18ft deployment lengths. The comparison results are positive but speculative. To observe properly validate the analytic model, experiments at longer deployment lengths, up to the full 30 meter, have been requested. We expect the study to answer the extendibility question of the analytical models. In operation, rapid temperature changes can be induced in solar sails as they transition from day to night and vice versa. This generates time dependent thermally induced forces, which may in turn create oscillation in structural members such as booms. Such oscillations have an adverse effect on system operations, precise pointing of instruments and antennas and can lead to self excited vibrations of increasing amplitude. The latter phenomenon is known as thermal flutter and can lead to the catastrophic failure of structural systems. To remedy this problem, an active vibration suppression system has been developed. It was shown that piezoelectric actuators used in conjunction with a Proportional Feedback Control (PFC) law (or Velocity Feedback Control (VFC) law) can induce moments that can suppress structural vibrations and prevent flutter instability in spacecraft booms. In this study, we will investigate control strategies using piezoelectric transducers in active, passive, and/or hybrid control configurations. Advantages and disadvantages of each configuration will be studied and experiments to determine their capabilities and limitations will be planned. In particular, special attention will be given to the hybrid control, also known as energy recycling, configuration due to its unique characteristics.
Derived from text
*Feedback Control; Mathematical Models; Solar Sails; Booms (Equipment); Retractable Equipment*

**20050215330** University of Northern Arizona, Flagstaff, AZ, USA
**Rack Distribution Effects on MPLM Center of Mass**
Tester, John T.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XLIV-1 - XLIV-5; In English; See also 20050215300; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

This research was in support of exploring the need for more flexible ‘center of gravity (CG) specifications than those currently established by NASA for the Multi-Purpose Logistics Module (MPLM). The MPLM is the cargo carrier for International Space Station (ISS) missions. The MPLM provides locations for 16 standard racks, as shown in Figure 1; not all positions need to be filled in any given flight. The MPLM coordinate system (X(sub M), Y(sub M), Z(sub M)) is illustrated as well. For this project, the primary missions of interest were those which supply the ISS and remove excess materials on the return flights. These flights use a predominate number of ‘Resupply Stowage Racks’ (RSR) and ‘Resupply Stowage Platforms’ (RSP). In these two types of racks, various smaller items are stowed. Hence, these racks will exhibit a considerable range of mass values as well as a range as to where their individual CG are located.
Derived from text
*Center of Mass; Multi-Purpose Logistics Modules; Gravitation*

**20050215337** Clark-Atlanta Univ., GA, USA
**Development of a Modeling Framework to Support Control Investigations of Sailcraft Missions A First Cut: ABLE Sailcraft Dynamics Model**
Sarathy, Sriprakash; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXXVII-1 - XXXVII-6; In English; See also 20050215300; No Copyright; Avail.: CASI: A02, Hardcopy

Solar Sailcraft, the stuff of dreams of the H.G. Wells generation, is now a rapidly maturing reality. The promise of unlimited propulsive power by harnessing stellar radiation is close to realization. Currently, efforts are underway to build, prototype and test two configurations. These sails are designed to meet a 20m sail requirement, under guidance of the In-Space Propulsion (ISP) technology program office at MSFC. While these sails will not fly , they are the first steps in improving our understanding of the processes and phenomena at work. As part of the New Millennium Program (NMP) the ST9 technology validation mission hopes to launch and fly a solar sail by 2010 or sooner. Though the Solar Sail community has been studying and validating various concepts over two decades, it was not until recent breakthroughs in structural and material technology, has made possible to build sails that could be launched. With real sails that can be tested (albeit under earth conditions), the real task of engineering a viable spacecraft has finally commenced. Since it is not possible to accurately or practically recreate the actual operating conditions of the sailcraft (zero-G, vacuum and extremely low temperatures), much of the work has

focused on developing accurate models that can be used to predict behavior in space, and for sails that are 6-10 times the size of currently existing sails. Since these models can be validated only with real test data under 'earth' conditions, the process of modeling and the identification of uncertainty due to model assumptions and scope need to be closely considered. Sailcraft models that exist currently, are primarily focused on detailed physical representations at the component level, these are intended to support prototyping efforts. System level models that cut across different sail configurations and control concepts while maintaining a consistent approach are non-existent. Much effort has been focused on the areas of thrust performance, solar radiation prediction, and sail membrane behavior vis-a-vis their reflective geometry, such as wrinkling/folding/furling as it pertains to thrust prediction. A parallel effort has been conducted on developing usable models for developing attitude control systems (ACS), for different sail configurations in different regimes. There has been very little by way of a system wide exploration of the impact of the various control schemes, thrust prediction models for different sail configurations being considered.

Author

*Solar Sails; Stellar Radiation; Attitude Control; Performance Prediction; Propulsion; Thrust*

**20050215340** Mississippi State Univ., MS, USA

**On Structural Design of a Mobile Lunar Habitat with Multi-Layered Environmental Shielding**

Rais-Rohani, Masoud; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXXIV-1 - XXXIV-5; In English; See also 20050215300; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The future human lunar missions are expected to undertake far more ambitious activities than those of the Apollo program with the possibility of some missions lasting up to several months. Such extended missions require the use of large-size lunar outposts to accommodate living quarters for the astronauts as well as indoor laboratory facilities. The greatest obstacle to the prolonged human presence on the Moon is the threat posed by the harsh lunar environment that is plagued with multi-source high-energy radiation exposure as well as frequent barrage of meteoroids. Hence, for such extended missions to succeed, it is vital that the future lunar outposts be designed to provide a safe habitat for the astronauts. Over the past few years, a variety of ideas and concepts for future lunar outposts and bases have been proposed. With shielding as the primary concern, some have suggested the use of natural structures such as lava tubes while others have taken a more industrial approach and suggested the construction of fixed structures in the form of inflatable, inflatable with rigid elements, and tent-style membrane. For evaluation of these structural design concepts, Drake and Richter1 have proposed a rating system based on such factors as effectiveness, importance, and timing. While all of these designs, in general, benefit from in-situ resource utilization (i.e., lunar regolith) for shielding, they share a common disadvantage of being fixed to one particular location that would limit exploration to the region in close proximity of the outpost.

Derived from text

*Structural Design; Space Capsules; Lunar Exploration; Radiation Dosage*

**20050215414** NASA Glenn Research Center, Cleveland, OH, USA

**Multifunctional Inflatable Structure Being Developed for the PowerSphere Concept**

Peterson, Todd T.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

NASA has funded a collaborative team of The Aerospace Corporation, ILC Dover, Lockheed Martin, and NASA Glenn Research Center to develop the Multifunctional Inflatable Structure (MIS) for a 'PowerSphere' concept through a NASA Research Announcement. This power system concept has several advantages, including a high collection area, low weight and stowage volume, and the elimination of all solar array pointing mechanisms. The current 3-year effort will culminate with the fabrication and testing of a fully functional engineering development unit. The baseline design of the Power-Sphere consists of two opposing semispherical domes connected to a central spacecraft. Each semispherical dome consists of hexagonal and pentagonal solar cell panels that together form a geodetic sphere. Inflatable ultraviolet (UV) rigidizable tubular hinges between the solar cell panels and UV rigidizable isogrid center columns with imbedded flex circuitry form the MIS. The reference configuration for the PowerSphere is a 0.6-m-diameter (fully deployed) spacecraft with a total mass budget of 4 kg (1 kg for PowerSphere, 3 kg for spacecraft) capable of producing 29 W of electricity with 10-percent-efficient thin-film solar cells. In a stowed configuration, the solar cell panels will be folded sequentially to the outside of the instrument decks. The center column will be z-folded between the instrument decks and the spacecraft housing for packaging. The instrument panel will secure the z-folded stack with launch ties. After launch, once the release tie is triggered, the center column and hinge tubes will inflate and be rigidized in their final configurations by ultraviolet radiation. The overall PowerSphere deployment sequence is shown pictorially in the following illustration.

Author

*Inflatable Structures; Ultraviolet Radiation; Solar Arrays; Product Development; Fabrication*

**20050215461** Missouri Univ., Rolla, MO, USA

**Overview of Microwave and Millimeter Wave Testing Activities for the Inspection of the Space Shuttle SOH and Heat Tiles**

Zoughi, R.; [2005]; 1 pp.; In English; 32nd Annual Review of Progress in Quantitative Nondestructive Evaluation (WNDE) Conference, 31 Jul. - 5 Aug. 2005, Brunswick, ME, USA

Contract(s)/Grant(s): NNM04AA15A; No Copyright; Avail.: Other Sources; Abstract Only

Microwave and millimeter wave nondestructive testing and evaluation methods, have shown great potential for inspecting the Space Shuttle s external tank spray on foam insulation (SOFI) and acreage heat tiles. These methods are capable of producing high-resolution images of et interior of these structures. To this end, several different microwave and millimeter wave nondestructive testing methods have been investigated for this purpose. These methods have included near-field as well as focused approaches ranging in frequency from 10 GHz to beyond 100 GHz. Additionally, synthetic aperture focusing methods have also been developed in this regime for obtaining high-resolution images of the interior of these critical structures. These methods possess the potential for producing 3D images of these structures in a relatively short amount of time. This paper presents a summary of these activities in addition to providing examples of images produced using these diverse methods.

Author

*Millimeter Waves; Microwaves; Nondestructive Tests; External Tanks; Insulation; Foams*

**20050215563** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Low Earth Orbit Environmental Effects on Space Tether Materials**

Finckernor, Miria M.; Gitlemeier, Keith A.; Hawk, Clark W.; Watts, Ed; [2005]; 23 pp.; In English

Contract(s)/Grant(s): 159-89-10; Copyright; Avail.: CASI: A03, Hardcopy

Atomic oxygen (AO) and ultraviolet (UV) radiation erode and embrittle most polymeric materials. This research was designed to test several different materials and coatings under consideration for their application to space tethers, for resistance to these effects. The samples were vacuum dehydrated, weighed and then exposed to various levels of AO or UV radiation at the NASA Marshall Space Flight Center. They were then re-weighed to determine mass loss due to atomic oxygen erosion, inspected for damage and tensile tested to determine strength loss. The experiments determined that the Photosil coating process, while affording some protection, damaged the tether materials worse than the AO exposure. TOR-LM also failed to fully protect the materials, especially from UV radiation. The POSS and nickel coatings did provide some protection to the tethers, which survived the entire test regime. M5 was tested, uncoated, and survived AO exposure, though its brittleness prevented any tensile testing.

Author

*Ultraviolet Radiation; Environment Effects; Low Earth Orbits; Spacecraft Construction Materials; Nickel Coatings; Oxygen Atoms*

**20050215570** Georgia Inst. of Tech., Atlanta, GA, USA

**Command Generation and Control of Momentum Exchange Electrodynamic Reboost Tethered Satellite**

Robertson, Michael J.; 2005; 17 pp.; In English

Contract(s)/Grant(s): NGT8-52943; No Copyright; Avail.: CASI: A03, Hardcopy

The research completed for this NASA Graduate Student Research Program Fellowship sought to enhance the current state-of-the-art dynamic models and control laws for Momentum Exchange Electrodynamic Reboost satellite systems by utilizing command generation, specifically Input Shaping. The precise control of tethered spacecraft with flexible appendages is extremely difficult. The complexity is magnified many times when the satellite must interact with other satellites as in a momentum exchange via a tether. The Momentum Exchange Electronic Reboost Tether (MXER) concept encapsulates all of these challenging tasks [l]. Input Shaping is a command generation technique that allows flexible spacecraft to move without inducing residual vibration [2], limit transient deflection [3] and utilize fuel-efficient actuation [4]. Input shaping is implemented by convolving a sequence of impulses, known as the input shaper, with a desired system command to produce a shaped input that is then used to drive the system. This process is demonstrated in Figure 1. The shaped command is then use to drive the system without residual vibration while meeting many other performance specifications. The completed work developed tether control algorithms for retrieval. A simple model of the tether response has been developed and command shaping was implemented to minimize unwanted dynamics. A model of a flexible electrodynamic tether has been developed to investigate the tether s response during reboost. Command shaping techniques have been developed to eliminate the tether oscillations and reduce the tether s deflection to pre-specified levels during reboost. Additionally, a model for the spin-up of

a tethered system was developed. This model was used in determining the parameters for optimization the resulting angular velocity.
Author
*Command and Control; Control Theory; Tethered Satellites; Spacecraft Control; Functional Design Specifications; Flexible Spacecraft*

**20050215584** NASA Kennedy Space Center, Cocoa Beach, FL, USA
**STS-114: Discovery Day 5 Post MMT Briefing**
July 30, 2005; 3 pp.; In English; 38 min. playing time, in color, with sound; No Copyright; Avail.: CASI: V03, Videotape-VHS: B03, Videotape-Beta

Wayne Hill, Space Shuttle Deputy Program Manager, and Chair of the Mission Management Team, reports the following: the testing of the thermal protection system in space, on orbit was successful; the MMT meeting formally approved the mission extension for one day; image analysis from the launch phase has been completed; tile and blankets had been formally cleared by the Engineering team; additional inspection of the reinforced carbon-carbon (RCC); gap filler, heat shield and small black spot phenomenon are carefully inspected and evaluated to prepare the safe return of the Discovery. Bill Gerstenmaier, ISS Program Manager reports on the extra vehicular activities (EVA): replaced the GPS antenna; prepared the airlock to attach the ESP2; re-powered CMG2; transfer of CWCs; and the MISSE packages were wrapped around thru at the end of the air lock. He mentioned the high currents problem seen on CMG3, which they will have to take off line to check and understand the problem. Consumables, engineering performance of the three sensors (LCS, LDRI, ITVC), CMG removal and replacement, EVA2 and EVA3, gap fillers, RCC, hydrogen tank pre-press cycles, thermal protection system, inspection, ISS supply maintenance, and projection of next flight are topics covered with the News Media.
CASI
*Space Transportation System; Space Shuttles; Launching*

**20050215604** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Solar Sail Roadmap Mission GN and C Challenges**
Heaton, Andrew F.; [2005]; 10 pp.; In English; AIAA GN&C Conference, 15-19 Aug. 2005, San Francisco, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

The NASA In-Space Propulsion program is funding development work for solar sails to enhance future scientific opportunities. Key to this effort are scientific solar sail roadmap missions identified by peer review. The two near-term missions of interest are L1 Diamond and Solar Polar Imager. Additionally, the New Millennium Program is sponsoring the Space Technology 9 (ST9) demonstration mission. Solar sails are one of five technologies competing for the ST9 flight demonstration. Two candidate solar sail missions have been identified for a potential ST9 flight. All the roadmap missions and candidate flight demonstration missions face various GN&C challenges. A variety of efforts are underway to address these challenges. These include control actuator design and testing, low thrust optimization studies, attitude control system design and modeling, control-structure interaction studies, trajectory control design, and solar radiation pressure model development. Here we survey the various efforts underway and identify a few of specific recent interest and focus.
Author
*Aerospace Engineering; Solar Sails; Trajectory Control; Design Optimization; Flight Tests; Actuators; Attitude Control*

**20050215611** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Applications of the Electrodynamic Tether to Interstellar Travel**
Matloff, Gregory L.; Johnson, Les; June 21, 2005; 11 pp.; In English
Contract(s)/Grant(s): SAIC-440055739; Copyright; Avail.: CASI: A03, Hardcopy

After considering relevant properties of the local interstellar medium and defining a sample interstellar mission, this paper considers possible interstellar applications of the electrodynamic tether, or EDT. These include use of the EDT to provide on-board power and affect trajectory modifications and direct application of the EDT to starship acceleration. It is demonstrated that comparatively modest EDTs can provide substantial quantities of on-board power, if combined with a large-area electron-collection device such as the Cassenti toroidal-field ramscoop. More substantial tethers can be used to accomplish large-radius thrustless turns. Direct application of the EDT to starship acceleration is apparently infeasible.
Author
*Interstellar Travel; Tethering; Electrodynamics*

## 19
## SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

**20050215410** NASA Glenn Research Center, Cleveland, OH, USA

**International Space Station Solar Array Wing On-Orbit Electrical Performance Degradation Measured**

Gustafson, Eric D.; Kerslake, Thomas W.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The port-side photovoltaic power module (P6) was activated on the International Space Station in December 2000. P6 provides electrical power to channels 2B and 4B to operate ISS power loads. A P6 is shown in the preceding photograph. This article highlights the work done at the NASA Glenn Research Center to calculate the on-orbit degradation of the P6 solar array wings (SAWs) using on-orbit data from December 2000 to February 2003. During early ISS operations, the 82 strings of photovoltaic cells that make up a SAW can provide much more power than is necessary to meet the demand. To deal with excess power, a sequential shunt unit successively shunts the current from the strings. This shunt current was the parameter chosen for the SAW performance degradation study for the following reasons: (1) it is based on a direct shunt current measurement in the sequential shunt unit, (2) the shunt current has a low temperature dependence that reduces the data correction error from using a computationally derived array temperature, and (3) the SSU shunt current is essentially the same as the SAW short-circuit current on a per-string basis.

Derived from text

*International Space Station; Solar Arrays; Performance Tests; Photovoltaic Cells*

**20050215415** NASA Glenn Research Center, Cleveland, OH, USA

**Space Station Power Generation Investigated in Support of the Beta Gimbal Anomaly Resolution**

Delleur, Ann M.; Propp, Timothy; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The International Space Station (ISS) is the largest and most complex spacecraft ever assembled and operated in orbit. The first U.S. photovoltaic module, containing two solar arrays, was launched, installed, and activated in early December 2000. After the first week of continuously rotating the U.S. solar arrays, engineering personnel in the ISS Mission Evaluation Room observed higher than expected electrical currents on the drive motor in one of the Beta Gimbal Assemblies (BGA), the mechanism used to maneuver a U.S. solar array (see the on-orbit photograph). The magnitude of the motor currents continued to increase over time on both BGAs, creating concerns about the ability of the gimbals to continue pointing the solar arrays towards the Sun, a function critical for continued assembly of the ISS. The BGA provides two critical capabilities to the ISS: (1) transfer of electrical power across a rotating joint and (2) positioning of the solar arrays. A number of engineering disciplines convened in May 2001 to address this on-orbit hardware anomaly. Over the course of a year, many scenarios were developed and used. Only two are discussed here: parked arrays and dual-angle mode.

Derived from text

*Photovoltages; Solar Arrays; Currents*

## 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*.

**20050214857** NASA Glenn Research Center, Cleveland, OH, USA

**Explicit Finite Element Techniques Used to Characterize Splashdown of the Space Shuttle Solid Rocket Booster Aft Skirt**

Melis, Matthew E.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

NASA Glenn Research Center s Structural Mechanics Branch has years of expertise in using explicit finite element methods to predict the outcome of ballistic impact events. Shuttle engineers from the NASA Marshall Space Flight Center and

NASA Kennedy Space Flight Center required assistance in assessing the structural loads that a newly proposed thrust vector control system for the space shuttle solid rocket booster (SRB) aft skirt would expect to see during its recovery splashdown.
Derived from text
*Finite Element Method; Space Shuttle Boosters; Structural Analysis*

**20050215029** NASA Glenn Research Center, Cleveland, OH, USA
**International Space Station Power System Telemetry Compared With Analytically Derived Data for Shadowed Cases**
Fincannon, H. James; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

This article highlights fiscal year 2002 work performed by NASA Glenn Research Center personnel to validate algorithms and data developed in-house to predict shadowing effects on the International Space Station (ISS) solar arrays power generation. The validation effort utilized video footage and on-orbit telemetry for cases spanning a 1-yr period. Validation was required because of the uncertainty of various aspects involved in shadowing analysis. Results show that a good comparison exists between actual and predicted shadowed power system performance for solar array front and backside shadowing.
Derived from text
*International Space Station; Power Supplies; Telemetry*

**20050215032** NASA Glenn Research Center, Cleveland, OH, USA
**6-ft High-Power Electric Propulsion Test Port, EPL Tank 5 Installed**
Grisnik, Stanley P.; Theman, Elmer R.; Swiatek, Michael W.; Speicer, Henry J.; Jankovsky, Robert S.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

High-power electric propulsion is a critical component of NASA s proposed missions to the outer planets. Mission studies have shown that high-power, high-specific-impulse propulsion systems can deliver 2000 kg of scientific payload to Pluto with trip times on the order of 10 years. Of greater significance is the ability of these propulsion systems to place this science payload in orbit around the planet, rather than making the fast fly-bys associated with traditional chemical propulsion systems. Significant ground test programs are required to develop the new technologies needed for thrusters operating at power levels exceeding 20 kW, an order of magnitude above the state of the art.
Derived from text
*Electric Propulsion; Ground Tests; Propulsion System Configurations; Propulsion System Performance*

**20050215033** NASA Glenn Research Center, Cleveland, OH, USA
**Research Combustion Lab Facility Capabilities and Throughput Enhanced by New Test Stands**
Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The original test stand location has a small copper rocket engine mounted on the stand. The new stand, located about 4 feet to the left, has a long pulse detonation combustion engine mounted on it. To the rear of the two stands can be seen a bulkhead with feed line outlets that can be switched at common valves behind the bulkhead to supply either stand. A gauge panel is visible through a doorway in the bulkhead at which various purge pressures are set. A connection panel for instrumentation wiring can be seen above the stands.
Derived from text
*Research Facilities; Combustion Chambers; Engine Design; Measuring Instruments; Pulse Detonation Engines; Test Stands*

**20050215041** NASA Glenn Research Center, Cleveland, OH, USA
**Liquid Propellant Manipulated Acoustically**
Oeftering, Richard C.; Chato, David J.; Mann, Adin, III; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Fluids are difficult to manage in the space environment. Without gravity, the liquid and gas do not always remain separated as they do in the 1g environment of Earth. Instead the liquid and gas volumes mix and migrate under the influence of surface tension, thermodynamic forces, and external disturbances. As a result, liquid propellants may not be in a useable location or may even form a chaotic mix of liquid and gas bubbles. In the past, mechanical pumps, baffles, and a variety of specialized passive devices have been used to control the liquid and gas volumes. These methods need to be carefully tuned to a specific configuration to be effective. With increasing emphasis on long-term human activity in space there is a trend toward liquid systems that are more flexible and provide greater control. We are exploring new methods of manipulating liquids by using

the nonlinear acoustic effects achieved by using beams of highly directed high-intensity acoustic waves.
Derived from text
*Liquid Rocket Propellants; Sound Waves; Interfacial Tension; Gravitation*

**20050215095** NASA Glenn Research Center, Cleveland, OH, USA
**Integrated Propulsion/Vehicle System Structurally Optimized**
Hunter, James E.; McCurdy, David R.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Ongoing research and testing are essential in the development of air-breathing hypersonic propulsion technology, and this year some positive advancement was made at the NASA Glenn Research Center. Recent work performed for GTX, a rocket-based combined-cycle, single-stage-to-orbit concept, included structural assessments of both the engine and flight vehicle. In the development of air-breathing engine technology, it is impractical to design and optimize components apart from the fully integrated system because tradeoffs must be made between performance and structural capability. Efforts were made to control the flight trajectory, for example, to minimize the aerodynamic heating effects. Structural optimization was applied to evaluate concept feasibility and was instrumental in the determination of the gross liftoff weight of the integrated system. Achieving low Earth orbit with even a small payload requires an aggressive approach to weight minimization through the use of lightweight, oxidation-resistant composite materials. Assessing the integrated system involved investigating the flight trajectory to determine where the critical load events occur in flight and then generating the corresponding environment at each of these events. Structural evaluation requires the mapping of the critical flight loads to finite element models, including the combined effects of aerodynamic, inertial, combustion, and other loads. NASA s APAS code was used to generate aerodynamic pressure and temperature profiles at each critical event. The radiation equilibrium surface temperatures from APAS were used to predict temperatures through the thickness. Heat transfer solutions using NASA's MINIVER code and the SINDA code (Cullimore & Ring Technologies, Littleton, CO) were calculated at selective points external to the integrated vehicle system and then extrapolated over the entire exposed surface. FORTRAN codes were written to expedite the finite element mapping of the aerodynamic heating effects for the internal structure.
Author
*Air Breathing Engines; Hypersonic Flight; Propulsion; Rocket-Based Combined-Cycle Engines; Systems Integration*

**20050215161** NASA Glenn Research Center, Cleveland, OH, USA
**Cryogenic Nitrogen Thermosyphon Developed and Characterized**
Plachta, David W.; Christie, Robert; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A two-phase nitrogen thermosyphon was developed at the NASA Glenn Research Center to efficiently integrate a cryocooler into an insulated liquid-nitrogen-filled tank as part of an advanced development zero-boiloff (ZBO) ground test. NASA Marshall Space Flight Center's (MSFC) Advanced Space Transportation Program supported this test to improve the performance of in-space propulsion system concepts. Recent studies (ref. 1) have shown significant mass reductions and other advantages when incorporating active cooling in a ZBO configuration, enabling consideration of high-performing cryogenic propellants for long-duration applications in space. Active cooling was integrated via a thermosyphon, made of copper, 42 in. (1070 mm) long with an inner diameter of 0.436 in. (11 mm). It was charged with nitrogen to 225 psia at 300 K, which provided a fill ratio of 15 percent. The temperatures and heat flows through the thermosyphon were monitored during the startup phase of the ZBO test, and steady-state tests were conducted over a range of increasing and decreasing heat flows. The results also were compared with the initial design calculations and with results for a similar thermosyphon. They show that the thermal resistance of the thermosyphon was one-half of that expected--0.2 K/W at a heat flow of 8.0 W. The design calculations also showed that this resistance can be made relatively constant over a wider range of heat flows by making the ratio of evaporator area to condenser area 3:1. The better-than-expected results will translate into reduced integration loss for the ZBO concept.
Author
*Cryogenic Cooling; Liquid Nitrogen; Thermosiphons; Ground Tests; Propulsion System Configurations; Cryogenic Rocket Propellants*

**20050215170** NASA Glenn Research Center, Cleveland, OH, USA
**Pulsed Ejector Thrust Amplification Tested and Modeled**
Wilson, Jack; Research and Technology 2003; May 2004; 3 pp.; In English; See Document ID 20050019494; No Copyright; Avail.: CASI: A01, Hardcopy

There is currently much interest in pulsed detonation engines for aeronautical propulsion. This, in turn, has sparked renewed interest in pulsed ejectors to increase the thrust of such engines, since previous, though limited, research had indicated that pulsed ejectors could double the thrust in a short device. An experiment has been run at the NASA Glenn Research Center, using a shrouded Hartmann-Sprenger tube as a source of pulsed flow, to measure the thrust augmentation of a statistically designed set of ejectors. A Hartmann- Sprenger tube directs the flow from a supersonic nozzle (Mach 2 in the present experiment) into a closed tube. Under appropriate conditions, an oscillation is set up in which the jet flow alternately fills the tube and then spills around flow emerging from the tube. The tube length determines the frequency of oscillation. By shrouding the tube, the flow was directed out of the shroud as an axial stream. The set of ejectors comprised three different ejector lengths, three ejector diameters, and three nose radii. The thrust of the jet alone, and then of the jet plus ejector, was measured using a thrust plate. The arrangement is shown in this photograph. Thrust augmentation is defined as the thrust of the jet with an ejector divided by the thrust of the jet alone. The experiments exhibited an optimum ejector diameter and length for maximizing the thrust augmentation, but little dependence on nose radius. Different frequencies were produced by changing the length of the Hartmann-Sprenger tube, and the experiment was run at a total of four frequencies. Additional measurements showed that the major feature of the pulsed jet was a starting vortex ring. The size of the vortex ring depended on the frequency, as did the optimum ejector diameter.
Author
*Pulse Detonation Engines; Ejectors; Thrust Augmentation; Hartmann-Sprenger Tubes; Jet Flow; Supersonic Nozzles*

**20050215304** Florida Inst. of Tech., Melbourne, FL, USA
**Modeling and Testing of Non-Nuclear, Highpower Simulated Nuclear Thermal Rocket Reactor Elements**
Kirk, Daniel R.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXIV-1 - XXIV-7; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

When the President offered his new vision for space exploration in January of 2004, he said, 'Our third goal is to return to the moon by 2020, as the launching point for missions beyond,' and, 'With the experience and knowledge gained on the moon, we will then be ready to take the next steps of space exploration: human missions to Mars and to worlds beyond.' A human mission to Mars implies the need to move large payloads as rapidly as possible, in an efficient and cost-effective manner. Furthermore, with the scientific advancements possible with Project Prometheus and its Jupiter Icy Moons Orbiter (JIMO), (these use electric propulsion), there is a renewed interest in deep space exploration propulsion systems. According to many mission analyses, nuclear thermal propulsion (NTP), with its relatively high thrust and high specific impulse, is a serious candidate for such missions. Nuclear rockets utilize fission energy to heat a reactor core to very high temperatures. Hydrogen gas flowing through the core then becomes superheated and exits the engine at very high exhaust velocities. The combination of temperature and low molecular weight results in an engine with specific impulses above 900 seconds. This is almost twice the performance of the LOX/LH2 space shuttle engines, and the impact of this performance would be to reduce the trip time of a manned Mars mission from the 2.5 years, possible with chemical engines, to about 12-14 months.
Derived from text
*Electric Propulsion; Exhaust Velocity; Hydrogen Oxygen Engines; Nuclear Reactors; Propulsion System Performance; Rocket Thrust; Thermal Reactors*

**20050215311** State Univ. of New York, NY, USA
**The Technology and Art of Aerocapture**
Bangs, Mary C.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. II-1 - II-5; In English; See also 20050215300; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Aerocapture is a type of aero-assist technology in which an interplanetary spacecraft is equipped with a device shaped to optimize atmospheric drag during a pass through a planet s upper atmosphere. An aerocapture maneuver alters the spacecraft s trajectory so that it is captured as a satellite of that planet. Aerocapture is related to aerobraking. In aerobraking, a spacecraft lowers its orbit around a planet by repeated passes through that planet s upper atmosphere. As part of the public outreach effort of the NASA MSFC In-Space Propulsion research effort, a poster is being constructed relating to the new technology of aerocapture. Entitled 'The Technology & Art of Aerocapture,' this poster will speak to three groups of people. The first and broadest audience is the general public who may or may not be familiar with aerocapture as a concept. The second group is the scientifically educated and informed public that is familiar with the concept of aerocapture but may or may not know the finer points about it. Finally, the third audience consists of the group that has worked with and is familiar with aerocapture. The poster is designed to educate and inspire all these audiences.
Author
*Aerocapture; Interplanetary Spacecraft; Aerobraking; Aeroassist; Drag*

**20050215314** Rose-Hulman Inst. of Tech., Terre Haute, IN, USA

**Enhancement and Analysis of Real-Time Radiography Images**

Doering, Edward R.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XII-1 - XII-5; In English; See also 20050215300; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Shuttle Redesigned Solid Rocket Motor (RSRM) nozzle interiors fabricated from carbon phenolic composite exhibit 'ply lift' when hot fired. The composite surface is smooth when fabricated, but the individual plies separate and lift away from the surface when exposed to high temperature and high-pressure exhaust gas. It shows a cross section of a post-fired composite in which ply lift is evident as dark fissures. Surface charring is also visible as a darker band about 0.2 inches thick. Charring is normal, but ply lift is not desirable since the fissures could possibly initiate an abnormal exhaust path from the RSRM. The underlying mechanisms of ply lift are under investigation as part of the Shuttle Return-To-Flight Program.

Derived from text

*Solid Propellant Rocket Engines; Fabrication; Carbon-Phenolic Composites; Nozzle Design*

**20050215320** Alabama Univ., Huntsville, AL, USA

**Control of Combustion-Instabilities Through Various Passive Devices**

Frendi, Kader; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XV-1 - XV-24; In English; See also 20050215300; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

It is well known that under some operating conditions, rocket engines (using solid or liquid fuels) exhibit unstable modes of operation that can lead to engine malfunction and shutdown. The sources of these instabilities are diverse and are dependent on fuel, chamber geometry and various upstream sources such as pumps, valves and injection mechanism. It is believed that combustion-acoustic instabilities occur when the acoustic energy increase due to the unsteady heat release of the flame is greater than the losses of acoustic energy from the system [1, 2]. Giammar and Putnam [3] performed a comprehensive study of noise generated by gasfired industrial burners and made several key observations; flow noise was sometimes more intense than combustion roar, which tended to have a characteristic frequency spectrum. Turbulence was amplified by the flame. The noise power varied directly with combustion intensity and also with the product of pressure drop and heat release rate. Karchmer [4] correlated the noise emitted from a turbofan jet engine with that in the combustion chamber. This is important, since it quantified how much of the noise from an engine originates in the combustor. A physical interpretation of the interchange of energy between sound waves and unsteady heat release rates was given by Rayleigh [5] for inviscid, linear perturbations. Bloxidge et al [6] extended Rayleigh s criterion to describe the interaction of unsteady combustion with one-dimensional acoustic waves in a duct. Solutions to the mass, momentum and energy conservation equations in the pre- and post-flame zones were matched by making several assumptions about the combustion process. They concluded that changes in boundary conditions affect the energy balance of acoustic waves in the combustor. Abouseif et al [7] also solved the one-dimensional flow equations, but they used a onestep reaction to evaluate the unsteady heat release rate by relating it to temperature and velocity perturbations. Their analysis showed that oscillations arise from coupling between entropy waves produced at the flame and pressure waves originating from the nozzle. Yang and Culick [8] assumed a thin flame sheet, which is distorted by velocity and pressure oscillations. Conservation equations were expressed in integral form and solutions for the acoustic wave equations and complex frequencies were obtained. The imaginary part of the frequency indicated stability regions of the flame. Activation energy asymptotics together with a one-step reaction were used by McIntosh [9] to study the effects of acoustic forcing and feedback on unsteady, one-dimensional flames. He found that the flame stability was altered by the upstream acoustic feedback. Shyy et al [10] used a high-accuracy TVD scheme to simulate unsteady, one-dimensional longitudinal, combustion instabilities. However, numerical diffusion was not completely eliminated. Recently, Prasad [11] investigated numerically the interactions of pressure perturbations with premixed flames. He used complex chemistry to study responses of pressure perturbations in one-dimensional combustors. His results indicated that reflected and transmitted waves differed significantly from incident waves.

Author

*Rocket Engines; Combustion; Heat Transfer; Pressure Oscillations; Frequency Stability; Acoustic Instability; Flame Stability; Malfunctions*

**20050215406** NASA Glenn Research Center, Cleveland, OH, USA

**Physics of Colloids in Space--Plus (PCS+) Experiment Completed Flight Acceptance Testing**

Doherty, Michael P.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Physics of Colloids in Space--Plus (PCS+) experiment successfully completed system-level flight acceptance testing

in the fall of 2003. This testing included electromagnetic interference (EMI) testing, vibration testing, and thermal testing. PCS+, an Expedite the Process of Experiments to Space Station (EXPRESS) Rack payload will deploy a second set of colloid samples within the PCS flight hardware system that flew on the International Space Station (ISS) from April 2001 to June 2002. PCS+ is slated to return to the ISS in late 2004 or early 2005.
Derived from text
*Colloids; Electromagnetic Interference; Vibration; Thermal Analysis*

**20050215408** NASA Glenn Research Center, Cleveland, OH, USA
**Solid Fuel Delivery System Developed for Combustion Testing on the International Space Station**
Frate, David T.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

NASA initiated Bioastronautics and Human Research Initiatives in 2001 and 2003, respectively, to enhance the safety and performance of humans in space. The Flow Enclosure Accommodating Novel Investigations in Combustion of Solids (FEANICS) is a multiuser facility being built at the NASA Glenn Research Center to advance these initiatives by studying fire safety and the combustion of solid fuels in the microgravity environment of the International Space Station (ISS). One of the challenges for the FEANICS team was to build a system that allowed for several consecutive combustion tests to be performed with minimal astronaut crew interaction. FEANICS developed a fuel carousel that contains a various number of fuel samples, depending on the fuel width, and introduces them one at a time into a flow tunnel in which the combustion testing takes place. This approach will allow the science team to run the experiments from the ground, while only requiring the crew to change out carousels after several tests have been completed.
Derived from text
*Fuel Systems; Solid Propellants; Combustion; Performance Tests*

**20050215409** NASA Glenn Research Center, Cleveland, OH, USA
**Combustion Module-2 Achieved Scientific Success on Shuttle Mission STS-107**
Over, Ann P.; Research and Technology 2003; May 2004; 5 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The familiar teardrop shape of a candle is caused by hot, spent air rising and cool fresh air flowing behind it. This type of airflow obscures many of the fundamental processes of combustion and is an impediment to our understanding and modeling of key combustion controls used for manufacturing, transportation, fire safety, and pollution. Conducting experiments in the microgravity environment onboard the space shuttles eliminates these impediments. NASA Glenn Research Center's Combustion Module-2 (CM-2) and its three experiments successfully flew on STS-107/Columbia in the SPACEHAB module and provided the answers for many research questions. However, this research also opened up new questions. The CM-2 facility was the largest and most complex pressurized system ever flown by NASA and was a precursor to the Glenn Fluids and Combustion Facility planned to fly on the International Space Station. CM-2 operated three combustion experiments: Laminar Soot Processes (LSP), Structure of Flame Balls at Low Lewis-Number (SOFBALL), and Water Mist Fire Suppression Experiment (Mist). Although Columbia's mission ended in tragedy with the loss of her crew and much data, most of the CM-2 results were sent to the ground team during the mission.
Author
*Combustion Chambers; Combustion Chemistry; Fire Prevention; Spacecraft Modules*

**20050215568** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Preliminary Assessment of Thrust Augmentation of NEP Based Missions**
Chew, Gilbert; Pelaccio, Dennis G.; Chiroux, Robert; Pervan, Sherry; Rauwolf, Gerald A.; White, Charles; [2005]; 2 pp.; In English; AIAA 2005 Space Conference, 30 Aug. - 1 Sep. 2005, Long Beach, CA, USA; Copyright; Avail.: CASI: A01, Hardcopy

Science Applications International Corporation (SAIC), with support from NASA Marshall Space Flight Center, has conducted a preliminary study to compare options for augmenting the thrust of a conventional nuclear electric propulsion (NEP) system. These options include a novel nuclear propulsion system concept known as Hybrid Indirect Nuclear Propulsion (HINP) and conventional chemical propulsion. The utility and technical feasibility of the HINP concept are assessed, and features and potential of this new in-space propulsion system concept are identified. As part of the study, SAIC developed top-level design tools to model the size and performance of an HINP system, as well as for several chemical propulsion options, including liquid and gelled propellants. A mission trade study was performed to compare a representative HINP system with chemical propulsion options for thrust augmentation of NEP systems for a mission to Saturn's moon Titan. Details pertaining to the approach, features, initial demonstration results for HINP model development, and the mission trade study

are presented. Key technology and design issues associated with the HINP concept and future work recommendations are also identified.
Derived from text
*Nuclear Electric Propulsion; Thrust Augmentation; Space Missions; NASA Space Programs; Technology Assessment*

**20050215598** NASA Glenn Research Center, Cleveland, OH, USA
**Bimodal Nuclear Thermal Rocket Propulsion Investigated for Power-Rich, Artificial-Gravity Human Exploration Missions to Mars**
Borowski, Stanley K.; McGuire Melissa L.; Dudzinski, Leonard A.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center is involved in systems and mission analysis studies for Prometheus and the President s Vision for Space Exploration. In support of this effort, engineers at Glenn have been studying the application of nuclear thermal rocket (NTR) engines to human missions to Mars. The NTR is one of the leading propulsion options for future NASA human exploration missions because of its high specific impulse capability (I(sub sp) approx. 875 to 950 sec) and attractive engine thrust-to-weight ratio (\g3). Because only a relatively small amount of enriched uranium-235 fuel is consumed in an NTR during the primary propulsion maneuvers of a typical Mars mission, engines configured for both propulsive thrust and modest power generation (referred to as bimodal operation) provide the basis for a robust, power-rich stage with efficient propulsive capture capability. A family of modular bimodal NTR (BNTR) space-transfer-vehicle concepts has been developed that utilize a common core stage powered by three approx.15-klb(sub f) engines that produce 50 kWe of total electrical power for crew life support, high-data-rate communications with Earth, and an active refrigeration system for long-term, zero-boiloff liquid hydrogen (LH2) storage. Candidate nuclear fuels for BNTR engines include uranium carbide (UC2) particles with a chemical-vapor-deposited coating in graphite and uranium-carbide zirconium carbide (UC-ZrC) in graphite, which were developed during the Nuclear Engine for Rocket Vehicle Application (NERVA) program, as well as uranium oxide (UO2) in tungsten (W) metal cermet. These fuels, which are listed in order of increasing temperature capability, can produce hot hydrogen exhaust ranging from approx. 2550 to 2900 K. Each engine has its own closed-cycle Brayton rotating unit, capable of generating up to 25 kWe, that provides an engine-out capability. Under nominal conditions, each Brayton rotating unit would operate at two-thirds of the rated power (approx. 17 kWe).
Author
*Artificial Gravity; Systems Analysis; Nuclear Rocket Engines; Nuclear Propulsion; Uranium Carbides; Uranium Oxides; Nuclear Fuels*

**20050215635** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Microinstabilities in the Gasdynamic Mirror Propulsion System**
Emrich, William; [2005]; 1 pp.; In English; 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA; No Copyright; Avail.: Other Sources; Abstract Only

The gasdynamic mirror has been proposed as a concept which could form the basis of a highly efficient fusion rocket engine. Gasdynamic mirrors differ from most other mirror type plasma confinement schemes in that they have much larger aspect ratios and operate at somewhat higher plasma densities. There are several types of instabilities which are known to plague mirror type confinement schemes. These instabilities fall into two general classes. One class of instability is the Magnetohdrodynamic or MHD instability which induces gross distortions in the plasma geometry. The other class of instability is the ‘loss cone’ microinstability which leads to general plasma turbulence. The ‘loss cone’ microinstability is caused by velocity space asymmetries resulting from the loss of plasma having constituent particle velocities within the angle of the magnetic mirror ‘loss cone.’ These instabilities generally manifest themselves in high temperature, moderately dense plasmas. The present study indicates that a GDM configured as a rocket engine might operate in a plasma regine where microinstabilities could potentially be significant.
Author
*Magnetohydrodynamic Stability; Gas Dynamics; Magnetic Mirrors; Propulsion System Configurations; Rocket Engines*

**20050215641** NASA Glenn Research Center, Cleveland, OH, USA
**Options Studied for Managing Space Station Solar Array Electrical Hazards for Sequential Shunt Unit Replacement**
Delleur, Ann M.; Kerslake, Thomas W.; Levy, Robert K.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The U.S. solar array strings on the International Space Station are connected to a sequential shunt unit (SSU). The job

of the SSU is to shunt, or short, the excess current from the solar array, such that just enough current is provided downstream to maintain the 160-V bus voltage while meeting the power load demand and recharging the batteries. Should an SSU fail on-orbit, it would be removed and replaced with the on-orbit spare during an astronaut space walk or extravehicular activity (EVA) (see the photograph). However, removing an SSU during an orbit Sun period with input solar array power connectors fully energized could result in substantial hardware damage and/or safety risk to the EVA astronaut. The open-circuit voltage of cold solar-array strings can exceed 320 V, and warm solar-array strings could feed a short circuit with a total current level exceeding 240 A.
Derived from text
*Solar Arrays; Space Stations; Electric Batteries; Hazards; Failure; Management*

**20050215642**
**Probabilistic Analysis Techniques Applied to Complex Spacecraft Power System Modeling**
Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Electric power system performance predictions are critical to spacecraft, such as the International Space Station (ISS), to ensure that sufficient power is available to support all the spacecraft s power needs. In the case of the ISS power system, analyses to date have been deterministic, meaning that each analysis produces a single-valued result for power capability because of the complexity and large size of the model. As a result, the deterministic ISS analyses did not account for the sensitivity of the power capability to uncertainties in model input variables. Over the last 10 years, the NASA Glenn Research Center has developed advanced, computationally fast, probabilistic analysis techniques and successfully applied them to large (thousands of nodes) complex structural analysis models. These same techniques were recently applied to large, complex ISS power system models. This new application enables probabilistic power analyses that account for input uncertainties and produce results that include variations caused by these uncertainties. Specifically, N&R Engineering, under contract to NASA, integrated these advanced probabilistic techniques with Glenn s internationally recognized ISS power system model, System Power Analysis for Capability Evaluation (SPACE).
Derived from text
*Complex Systems; Performance Prediction; Spacecraft Power Supplies; Structural Analysis*

**20050216518** Air Force Research Lab., Edwards AFB, CA USA
**Development of a Thrust Stand Micro-Balance to Assess Micropropulsion Performance**
Pancotti, Anthony P.; Lilly, Taylor; Ketsdever, Andrew D.; Aguero, Victor; Schwoebel, Paul R.; Jun. 1, 2005; 6 pp.; In English
Contract(s)/Grant(s): Proj-5026
Report No.(s): AD-A437017; No Copyright; Avail.: CASI: A02, Hardcopy

As proposed spacecraft and their associated thrusters have become smaller, technology has been developed to meet the demand for performance measurements for the extremely low force levels produced. For such thrusters, it is also desirable to measure the mass changes resulting from the utilization of propellant associated with either the steady state thrust or transient impulses. A thrust stand and novel data analysis method is presented to make both thrust (or impulse) and mass change measurements concurrently. It is shown that very accurate and repeatable measurements of mass can be made using an existing thrust stand system. Furthermore, it is shown that impulse and mass measurements can be resolved at the same time from a single thrust stand trace.
DTIC
*Balance; Low Thrust Propulsion; Mass; Mass Distribution; Measurement; Microbalances; Microthrust; Spacecraft Propulsion*

**20050217095** NASA Glenn Research Center, Cleveland, OH, USA
**Forward Technology Solar Cell Experiment (FTSCE) for MISSE-5 Verified and Readied for Flight on STS-114**
Jenkins, Phillip P.; Krasowski, Michael J.; Greer, Lawrence C.; Flatico, Joseph M.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Forward Technology Solar Cell Experiment (FTSCE) is a space solar cell experiment built as part of the Fifth Materials on the International Space Station Experiment (MISSE-5): Data Acquisition and Control Hardware and Software. It represents a collaborative effort between the NASA Glenn Research Center, the Naval Research Laboratory, and the U.S. Naval Academy. The purpose of this experiment is to place current and future solar cell technologies on orbit where they will be characterized and validated. This is in response to recent on-orbit and ground test results that raised concerns about the in-space survivability of new solar cell technologies and about current ground test methodology. The various components of

the FTSCE are assembled into a passive experiment container--a 2- by 2- by 4-in. folding metal container that will be attached by an astronaut to the outer structure of the International Space Station. Data collected by the FTSCE will be relayed to the ground through a transmitter assembled by the U.S. Naval Academy. Data-acquisition electronics and software were designed to be tolerant of the thermal and radiation effects expected on orbit. The experiment has been verified and readied for flight on STS-114.
Derived from text
*Solar Cells; Thermal Radiation; Computer Programs; Data Acquisition*

**20050217110** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Beamed Energy and Other Concepts for Aerospace Propulsion Applications**
Cole, John W.; [2005]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Propulsion for aerospace applications is limited by two basic parameters: specific energy (MJ/kg) and specific power (KW/kg). Specific energy can perhaps be improved by increasing the energy content of propellants, increasing energy storage of other on-board devices, and by the use of intense off-board energy sources such as beamed energy. Several beamed energy concepts for space access have been investigated using Lasers and Microwave beams. Several preliminary concepts have been examined for high altitude platforms for commercial or military applications. Some of these results are described. Additionally, two concepts are briefly described for potentially improving on-board specific energy: Metallic Hydrogen and Magnetic Energy Storage.
Author
*Aerospace Engineering; Spacecraft Propulsion; Laser Power Beaming; Microwave Transmission*

**20050217123** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Fifth International Symposium on Liquid Space Propulsion**
Garcia, R., Compiler; January 2005; 1167 pp.; In English; Fifth International Symposium on Liquid Space Propulsion, 27-30 Oct. 2003, Chattanooga, TN, USA; See also 20050217124 - 20050217152
Report No.(s): NASA/CP-2005-213607; M-1129; No Copyright; Avail.: CASI: A99, Hardcopy

Contents include the fiollowing: Theme: Life-life Combustion Devices Technology. Technical Sessions: International Perspectives. System Level Effects. Component Level Processes. Material Considerations. Design Environments -- Predictions. Injector Design Technology. Design Environments -- Measurements. Panel Discussion: Views on future research and development needs and Symposium observations. Aquarium Welcome and Southern Belle Riverboat Recognition Banquet evening events.
Derived from text
*Liquid Propellant Rocket Engines; Combustion; Life (Durability); Propulsion*

**20050217124** Boeing Co., USA
**History of Rocket Propulsion at Rocketdyne**
Fisher, Steve; Fifth International Symposium on Liquid Space Propulsion; January 2005; 40 pp.; In English; See also 20050217123; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

From 0.01 LB thrust space engines to 1.8 million LB thrust F-1A booster. Nearly all propellant combinations: from exotic storables, tri-dyne, LOX/kerosene, LOX/hydrogen, peroxide/hydrocarbons, to LOX/alcohols and everything in between. Nearly all engine cycles: from pressure fed, gas generator, fuel rich staged, 'oxidizer rich' staged, various expanders, self pressurizing, hot gas tap-off, to full flow (combined fuel and oxidizer rich) staged. Nearly all thrust chamber configurations: from conventional, dual bell, Aerospike, linear Aerospike, concentric booster/sustainer, to expansion-deflection.
Derived from text
*Liquid Propellant Rocket Engines; Thrust Chambers; Aerospike Engines; Propulsion; Gas Generators*

**20050217125** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Experimental Results for an Annular Aerospike with Differential Throttling**
Ruf, Joseph H.; McDaniels, David M.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 20 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

A) MSFC funded an internal study on Altitude Compensating Nozzles: 1) Develop an ACN design and performance prediction tool. 2) Design, build and test cold flow ACN nozzles. 3) An annular aerospike nozzle was designed and tested. 4) Incorporated differential throttling to assess Thrust Vector Control. B) Objective of the test hardware: 1) Provide design tool

verification. 2) Provide benchmark data for CFD calculations. 3) Experimentally measure side force, or TVC, for a differentially throttled annular aerospike.
Derived from text
*Thrust Vector Control; Performance Prediction; Computational Fluid Dynamics; Annular Nozzles*

**20050217127** Centre National de la Recherche Scientifique, Paris, France
**Investigation of Subcritical and Transcritical Cryogenic Combustion Using Imaging and Laser Techniques**
Candel, S.; Juniper, M.; Scouflair, P.; Rolon, C.; Clauss, W.; Klimenko, D.; Oschwald, M.; Grisch, F.; Bouchardy, P.; Vingert, L.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 26 pp.; In English; See also 20050217123; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The detailed understanding of liquid propellant combustion is necessary to the development of improved and more reliable propulsion systems. This article describes experimental investigations aimed at providing a fundamental basis for design and engineering of combustion components. It reports recent applications of imaging techniques and laser diagnostics to cryogenic combustion at high pressure. The flame structure is investigated in the trascritical range where the pressure exceeds the critical pressure of oxygen but the temperature of the injected liquid oxygen is below its critical value. Data are obtained from imaging of OH* radicals emission, backlighting and Coherent Anti-Stokes Raman Scattering of H2O molecules. Results from these different diagnostics provide a detailed view of the flame structure and some quantitative temperature profile measurements at various pressure. The data may be used to guide numerical modeling of transcritical flames and the theoretical and numerical analysis of the stabilization process. Results obtained may also be employed to devise engineering methodologies for component development aimed at service life extension.
Author
*Combustion; Cryogenics; Liquid Rocket Propellants; Propulsion System Performance; Propellant Combustion; Imaging Techniques; Mathematical Models*

**20050217128** Air Force Research Lab., USA
**Understanding Injection Into High Pressure Supercritical Environments**
Chehroudi, B.; Talley, D.; Mayer, W.; Branam, R.; Smith, J. J.; Schik, A.; Oschwald, M.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 27 pp.; In English; See also 20050217123; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The objectives of this paper are: Consolidate and compare the findings of two independent laboratories related to the injection of cryogenic liquids into high pressure supercritical environments.
Derived from text
*Cryogenics; Cold Flow Tests; Fracture Strength; Sound Waves*

**20050217130** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Operational Issues in the Development of a Cost-Effective Reusable LOX/LH2 Engine**
Ballard, Richard O.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 20 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Contents include the following: SLI initiated under NASA Research Announcement (NRA) 8-30. Strategic Objectives. Make spaceflight safer (1 in 10000 mission LOV). Make spaceflight cheaper ($1000/lb payload). Two prototype LOX/LH2 engine systems funded under Cycle-1 of NRA8-30. COBRA (Pratt & Whitney / Aerojet). RS-83 (Rocketdyne).
Derived from text
*Reusable Launch Vehicles; Cost Effectiveness; Space Flight; Propulsion System Performance*

**20050217131** Japan Aerospace Exploration Agency, Japan
**Research Achievement on Long-Life Thrust Chambers at NAL/KPL**
Kumakawa, A.; Moriya, S.; Sato, M.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 51 pp.; In English; See also 20050217123; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy

Since its establishment of in 1965, NAL ( National Aerospace Laboratory) / KPL ( Kakuda Space Propulsion Laboratory) has contributed to the R&D of Japanese launch vehicles, especially with respect to propulsion. It has been involved in the R&D of rocket engines such as the LE-5 engine and the LE-7 engine. These engines have been respectively used for the H-1

and H-2 launch vehicles. NAL/KPL has been merged and renamed as Space Propulsion Research Center of JAXA ( Japan Aerospace Exploration Agency) this October.
Derived from text
*Thrust Chambers; Rocket Engines; Propulsion*

**20050217132** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Combustion Device Failures During Space Shuttle Main Engine Development**
Goetz, Otto K.; Monk, Jan C.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 59 pp.; In English; See also 20050217123; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy

Major Causes: Limited Initial Materials Properties. Limited Structural Models - especially fatigue. Limited Thermal Models. Limited Aerodynamic Models. Human Errors. Limited Component Test. High Pressure. Complicated Control.
Derived from text
*Combustion; Engine Design; Failure; Aerodynamic Characteristics*

**20050217133** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Transient Mathematical Modeling for Liquid Rocket Engine Systems: Methods, Capabilities, and Experience**
Seymour, David C.; Martin, Michael A.; Nguyen, Huy H.; Greene, William D.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 36 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The subject of mathematical modeling of the transient operation of liquid rocket engines is presented in overview form from the perspective of engineers working at the NASA Marshall Space Flight Center. The necessity of creating and utilizing accurate mathematical models as part of liquid rocket engine development process has become well established and is likely to increase in importance in the future. The issues of design considerations for transient operation, development testing, and failure scenario simulation are discussed. An overview of the derivation of the basic governing equations is presented along with a discussion of computational and numerical issues associated with the implementation of these equations in computer codes. Also, work in the field of generating usable fluid property tables is presented along with an overview of efforts to be undertaken in the future to improve the tools use for the mathematical modeling process.
Author
*Mathematical Models; Liquid Propellant Rocket Engines; Computer Programs*

**20050217134** Office National d'Etudes et de Recherches Aerospatiales, Paris, France
**CFD Code Validation for Space Propulsion Applications**
Vuillot, F.; Scherrer, D.; Habiballah, M.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 55 pp.; In English; See also 20050217123; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy

The presentation covers: 1) SPACE PROPULSION (launcher applications): a. Present: Liquid and solid rocket propulsion, b. Future: Hypersonic airbreathing propulsion. 2) COMPETITIVE MARKET: a. Costs and delays b. Usefulness of numerical simulations: c. Selecting appropriate designs, d. Validating specific solutions. Helping design test benches and instrumentation/measurement plans f. Analyzing static firings, hot testings and flight data. 3) IMPORTANCE of CODE VALIDATION: a. Accuracy b. Reliability
Derived from text
*Computational Fluid Dynamics; Reliability; Launchers; Propulsion; Air Breathing Engines*

**20050217137** Army Research Lab., Cleveland, OH, USA
**Damage Assessment of Combustion Devices**
Bonacuse, Peter J.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 26 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Complex interactions among damage mechanisms are possible depending on material, temperature range, loading conditions, and environment. Extrapolations from limited data can lead to unconservative and inaccurate life prediction of the combustor devices. Conditions representative of the service environment in the durability testing of materials and components are highly desirable. The accuracy of all life prediction models is highly dependent on the accuracy of the model inputs (temperatures, stresses/strains, material properties). It is important to identify the mechanisms causing damage in the combustor device and utilize the appropriate models to estimate the durability of the component in a reliable manner. There

is always a distribution in the number of cycles or time to failure in materials subjected to repeated loading. Multiple experiments are necessary to quantify this variability, especially at longer expected lives (typically result in higher variability in life). To minimize damage in combustion devices: reduce thermal gradients, lower peak temperatures, reduce the effect of environment, and reduce the severity and number of thermal excursions.
Author
*Combustion Chambers; Damage Assessment; Temperature Gradients; Prediction Analysis Techniques; Performance Tests; Life (Durability); Accuracy; Degradation; Failure*

**20050217139** Seoul National Univ., Korea, Republic of
**Subscale Testing and Design Issues of Injectors**
Yoon, Youngbin; Jeung, In-Seuck; Fifth International Symposium on Liquid Space Propulsion; January 2005; 11 pp.; In English; See also 20050217123; Original contains color illustrations
Contract(s)/Grant(s): M1-0104-00-0058; No Copyright; Avail.: CASI: A03, Hardcopy

The breakup characteristics of liquid sheets formed by like-doublet injector were investigated in the cold-flow and atmospheric ambient pressure condition. The sheet breakup wavelength, which induces the sheet to be broken into ligaments, as well as the sheet breakup length, which is important for the flame location, was measured using a stroboscopic light. Since these spray characteristics are affected by the flow characteristics of two liquid jets before they impinge on each other, we focused on the effects of orifice internal flow such as the cavitation phenomenon that occurs inside the sharp-edged orifice. From the experimental results, we found that the liquid jet turbulence delays the sheet breakup and makes shorter wavelengths of sheet. Since the turbulent strength of sharp-edged orifice is stronger than that of round-edged orifice, the shape of orifice entrance results in large differences in the spray characteristics. Using these results, we proposed empirical models on the spray characteristics of the like-doublet injector, and these models are believed to provide some useful and actual data for designing liquid rocket combustors.
Author
*Flow Characteristics; Fluid Jets; Injectors; Internal Flow; Orifice Flow; Spray Characteristics; Cavitation Flow; Combustion Chambers*

**20050217141** Korea Aerospace Research Inst., Daejeon, Korea, Republic of
**Development of a Liquid Propellant Rocket, Korea Sounding Rocket (KSR)-III**
Chae,Yeon Seok; Lee, Soo Yong; Seo, Seonghyeon; Fifth International Symposium on Liquid Space Propulsion; January 2005; 35 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Korea Sounding Rocket-III has established itself as the first-ever bi-propellant liquid rocket designed and manufactured in Korea, which is fueled by pressure-fed, liquid oxygen and environment-friendly kerosene. The project on KSR-III took its development period of five years to achieve its successful launch campaign on November 28, 2002. The main objectives of the development of KSR-III were to acquire prerequisite experiences in the development of satellite launchers and to further strengthen capability of domestic industries related to space technology. The program has been accomplished by going through many development stages such as subscale model and full-scale engine combustion tests, propellant feeding system tests, integrated power plant tests, and eventually a flight test. Each development stage underwent various technical difficulties and challenges that had to be resolved and verified with reliable processes to minimize trials and errors. The subscale model combustion test provided useful data about the combustion efficiency of a split-triplet (F-OO-F) injector and suggested the best injector arrangement. Two types of subscale thrust chambers allowed us to determine the design of an injector and a faceplate for the full scale thrust chamber. The on-ground combustion tests of a full-scale thrust chamber had verified its performance and the endurance of hardware including ablative material. The thrust and chamber pressure of the engine are 13tonf @ sea level and 13.6 atm, respectively, which lasts for 59 seconds. A composite baffle successfully suppressed troublesome high frequency combustion instability at the beginning of the development. Throughout the program, three different versions of full-scale chambers had been designed and manufactured for the optimization of performance and weight. The propellant feeding system was tested and verified through water flow tests and each component showed acceptable performance for flight use. Eventually, the thrust chamber assembly and the propellant feeding system were vertically integrated to check the functionality of subsystems and verify the performance of the whole propulsion system and thus, a stage qualification test had been conducted before a final flight test. At long last, the series of all these tests resulted in the successful flight test of KSR-III.
Author
*Liquid Rocket Propellants; Combustion Efficiency; Combustion Stability; Engine Tests; Performance Tests; Propellant Tests*

**20050217142** Northrop Grumman Space Technology, ReUnited States

**Lifetime Issues for In-Space Propulsion Systems**

Dressler, Gordon; Fifth International Symposium on Liquid Space Propulsion; January 2005; 30 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The Orbital Express program will be a key flight demonstration that spacecraft can attain many additional years of operational life by in-space refueling of propellants. A major improvement in the mission life capability of current radiation-cooled ACS/RCS thrusters can be obtained by elimination of sensitive anti-oxidation coatings through use of: regeneratively-cooled combustion chambers, or noble refractory metal combustion chambers.

Derived from text

*Combustion Chambers; Propellants; Propulsion System Performance; Regenerative Cooling; Service Life*

**20050217143** Purdue Univ., USA

**Injectors for Long Life Combustion Devices**

Bazarov, Vladimir; Fifth International Symposium on Liquid Space Propulsion; January 2005; 34 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Life-limiting factors in LRE combustion devices: 1) High local heat fluxes, caused by high pressure, gas density and high velocity of combustion products; 2) Concentration non-uniformity and local zones of oxidizer-rich gases; 3) High level and wide spectrum of mechanical vibrations; 4) Combustion instability; 5) Combustion unsteadiness, accompanied by high amplitude and wide frequency range of gas pressure, velocity and vorticity pulsation; and 6) Most of them depend on injector design and operation.

Derived from text

*Injectors; Heat Flux; Gas Pressure; Combustion Stability; Combustion Products; Compressed Gas*

**20050217144** Air Force Research Lab., USA

**Gas-Centered Swirl Coaxial Liquid Injector Evaluations**

Cohn, A. K.; Strakey, P. A.; Talley, D. G.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 39 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Development of Liquid Rocket Engines is expensive. Extensive testing at large scales usually required. In order to verify engine lifetime, large number of tests required. Limited Resources available for development. Sub-scale cold-flow and hot-fire testing is extremely cost effective. Could be a necessary (but not sufficient) condition for long engine lifetime. Reduces overall costs and risk of large scale testing. Goal: Determine knowledge that can be gained from sub-scale cold-flow and hot-fire evaluations of LRE injectors. Determine relationships between cold-flow and hot-fire data.

Derived from text

*Liquid Propellant Rocket Engines; Performance Tests; Life (Durability)*

**20050217145** European Aeronautic Defence and Space Co., Munich, Germany

**Injector Issues With Different Propellant Combinations**

Haeseler, D.; Maedig, C.; Rubinski, V.; Kosmatcheva, V.; Berezhnoy, V.; Bratukhin, N.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 51 pp.; In English; See also 20050217123; Original contains color illustrations

Contract(s)/Grant(s): DLR Proj. 50JR9911; No Copyright; Avail.: CASI: A04, Hardcopy

Contents include the folowing: Experimental characterization of operation, efficiency, heat flux of: Injection element concepts for wide throttling range. Injection element concepts for large flowrate. Injection element concepts for hydrocarbon fuels (LOX-Methane and LOX-Kerosene). Activities in cooperation with KBKhA/Russia since 1993

Derived from text

*Injectors; Propellants; Throttling; Flow Velocity*

**20050217146** Nauchno-Proizvodstvennoe Obedinenie Energomash, USSR

**LOX Kerosene Oxygen-Rich Staged Combustion Rocket Engine Design and Life Issues**

Chelkis, Feliks; Fifth International Symposium on Liquid Space Propulsion; January 2005; 33 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The principal decisions with respect to the design of RD-170 (RD-171) were based on the experience in development of engines with oxygen rich staged combustion (ORSC). Development of engines of such type was initiated in the early sixties of the last century. For the past period of time newly developed engines have been made mainly with ORSC cycle. This period

of time was the most important phase of the history of rocket engineering development in the Soviet Union. A major part of the production and test infrastructure that provided capabilities to develop engines with a high level of combustion chamber pressure was established then. In the same period of time, based on experience in engine development and operations, the modern scientific-engineering methods and standard documentation base now in use were generated. As of today, some ORSC engines have a very high performance both in Russia and in the whole world.
Derived from text
*Combustion Chambers; Engine Design; Liquid Oxygen; Rocket Engine Design*

**20050217147** Institut Superieur des Materiaux et de la Construction Mecanique, France
**Material Requirements and Limitations for Liquid Rocket Engines**
Inglebert, G.; Gras, R.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 44 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

An outline includes: 1) Spatial systems work in severe environment Vacuum, cryogenic fluids, hot gases; 2) Key parameters for design: mechanical links, guiding, power transmission systems, sealing; 3) Engines for launchers: Turbopumps to compress LH2 and LO(x) \g 100 bars Combustion chamber and nozzle yields specific thrust; 4) Deep knowledge of materials Physical properties in the loading range (thermal and mechanical); 5) Accurate enough behavior models.
Derived from text
*Liquid Propellant Rocket Engines; Cryogenic Fluids; Combustion Chambers; Specific Impulse*

**20050217149** Pratt and Whitney Space Propulsion, West Palm Beach, FL, USA
**Cooling and Life Issues for Long Life Combustion Chambers**
Popp, Mike; Fifth International Symposium on Liquid Space Propulsion; January 2005; 26 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Conclusions: 1) Long Combustion Chamber Life is enabled by reducing Chamber Liner Temperatures and Chemical Attack; 2) Injector-originated Film Cooling is widely used; 3) Chamber Wall-originated Film Cooling and Thermal Barrier Coatings are used successfully in RD-170/180 Flight Engines; 4) Transpiration Cooling has been successfully demonstrated; further testing and manufacturing process development needed 5) Thermal Barrier Coatings must demonstrate Fail/Safe Behavior; 6) Combination of Thermal Barrier Coating, Film Cooling, Transpiration Cooling (TBD) enables Long Life Chamber Construction. PERFORMANCE must be traded for LIFE: Long Life Design results in reduced Isp and increased mass, however, penalties are relatively small.
Derived from text
*Combustion Chambers; Cooling; Film Cooling; Injectors; Sweat Cooling; Thermal Control Coatings; Failure*

**20050217150** Office National d'Etudes et de Recherches Aerospatiales, Paris, France, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Lampoldshausen, Germany
**Experimental Investigation and Modeling of the Ignition Transient of a Coaxial H2/O2-Injector**
Oschwald, M.; Schmidt, V.; Klimenko, D.; Haidn, O.; Nicole, A.; Ordonneau, G.; Habiballah, M.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 56 pp.; In English; See also 20050217123; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy

A test case have been defined to investigate experimentally and by numerical simulation the transient ignition phenomenology when igniting coaxial injected O2 and H2 by a laser. Using high-speed photography the temporal evolution of the flame and its anchoring at the injector could be visualized. From the analysis of the flame front movement flame velocities and convection velocities have been determined at specific phases during the ignition transient.
Author
*Experimentation; Models; Ignition; Oxygen; Hydrogen; Injectors; Numerical Analysis*

**20050217151** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Future Directions for Space Transportation and Propulsion at NASA**
Sackheim, Robert L.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 52 pp.; In English; See also 20050217123; Original contains black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy

Contents include the following: Oxygen Compatible Materials. Manufacturing Technology Demonstrations. Turbopump Inducer Waterflow Test. Turbine Damping 'Whirligig' Test. Single Element Preburner and Main Injector Test. 40K Multi-Element Preburner and MI. Full-Scale Battleship Preburner. Prototype Preburner Test Article. Full-Scale Prototype

TCA. Turbopump Hot-Fire Test Article. Prototype Engine. Validated Analytical Models.
Derived from text
*Propulsion System Configurations; Technology Assessment; Preburners; Prototypes; Turbine Pumps*

**20050217196** NASA Glenn Research Center, Cleveland, OH, USA
**Cooled Ceramic Matrix Composite Propulsion Structures Demonstrated**
Jaskowiak, Martha H.; Dickens, Kevin W.; Research and Technology 2004; June 1, 2005; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

NASA's Next Generation Launch Technology (NGLT) Program has successfully demonstrated cooled ceramic matrix composite (CMC) technology in a scramjet engine test. This demonstration represented the world s largest cooled nonmetallic matrix composite panel fabricated for a scramjet engine and the first cooled nonmetallic composite to be tested in a scramjet facility. Lightweight, high-temperature, actively cooled structures have been identified as a key technology for enabling reliable and low-cost space access. Tradeoff studies have shown this to be the case for a variety of launch platforms, including rockets and hypersonic cruise vehicles. Actively cooled carbon and CMC structures may meet high-performance goals at significantly lower weight, while improving safety by operating with a higher margin between the design temperature and material upper-use temperature. Studies have shown that using actively cooled CMCs can reduce the weight of the cooled flow-path component from 4.5 to 1.6 lb/sq ft and the weight of the propulsion system s cooled surface area by more than 50 percent. This weight savings enables advanced concepts, increased payload, and increased range. The ability of the cooled CMC flow-path components to operate over 1000 F hotter than the state-of-the-art metallic concept adds system design flexibility to space-access vehicle concepts. Other potential system-level benefits include smaller fuel pumps, lower part count, lower cost, and increased operating margin.
Derived from text
*Cooling Systems; Ceramic Matrix Composites; Propulsion; Composite Structures*

**20050217201** ZIN Technologies, Inc., Brook Park, OH, USA
**Advanced Controller Developed for the Free-Piston Stirling Convertor**
Gerber, Scott S.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A free-piston Stirling power convertor is being considered as an advanced power-conversion technology for future NASA deep-space missions requiring long-life radioisotope power systems. The NASA Glenn Research Center has identified key areas where advanced technologies can enhance the capability of Stirling energy-conversion systems. One of these is power electronic controls. Current power-conversion technology for Glenn-tested Stirling systems consists of an engine-driven linear alternator generating an alternating-current voltage controlled by a tuning-capacitor-based alternating-current peak voltage load controller. The tuning capacitor keeps the internal alternator electromotive force (EMF) in phase with its respective current (i.e., passive power factor correction). The alternator EMF is related to the piston velocity, which must be kept in phase with the alternator current in order to achieve stable operation. This tuning capacitor, which adds volume and mass to the overall Stirling convertor, can be eliminated if the controller can actively drive the magnitude and phase of the alternator current.
Derived from text
*Converters; Piston Engines; Stirling Cycle; Electromotive Forces; Energy Conversion*

## 23
## CHEMISTRY AND MATERIALS (GENERAL)

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

**20050215126** SpaceWorks, Inc., Carefree, AZ, USA
**Surface Sampling System for Low-Gravity Missions**
Preble, Jeffrey C.; Schoenoff, Michael S.; DiPalma, John A.; September 08, 2005; 45 pp.; In English
Contract(s)/Grant(s): NAG5-13150; No Copyright; Avail.: CASI: A03, Hardcopy

SpaceWorks has identified several sampling missions that could benefit from the technology developed under this project. Requirements were established for the surface sampling system. SpaceWorks teamed with Virginia Tech to identify and select a baseline adhesive suitable for the surface sampling system. SpaceWorks identified Solimide foam as the baseline substrate

material. SpaceWorks conducted extensive testing to characterize the performance of the substrate/adhesive combination. A prototype version of the sampler head was designed and built by SpaceWorks.
Derived from text
*Microgravity; Prototypes; Sampling*

**20050215307** Louisiana Tech Univ., Ruston, LA, USA
**Incorporation of a Chemical Equilibrium Equation of State into LOCI-Chem**
Cox, Carey F.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. VIII-1 - VIII-5; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Renewed interest in development of advanced high-speed transport, reentry vehicles and propulsion systems has led to a resurgence of research into high speed aerodynamics. As this flow regime is typically dominated by hot reacting gaseous flow, efficient models for the characteristic chemical activity are necessary for accurate and cost effective analysis and design of aerodynamic vehicles that transit this regime. The LOCI-Chem code recently developed by Ed Luke at Mississippi State University for NASA/MSFC and used by NASA/MSFC and SSC represents an important step in providing an accurate, efficient computational tool for the simulation of reacting flows through the use of finite-rate kinetics [3]. Finite rate chemistry however, requires the solution of an additional N-1 species mass conservation equations with source terms involving reaction kinetics that are not fully understood. In the equilibrium limit, where the reaction rates approach infinity, these equations become very stiff. Through the use of the assumption of local chemical equilibrium the set of governing equations is reduced back to the usual gas dynamic equations, and thus requires less computation, while still allowing for the inclusion of reacting flow phenomenology. The incorporation of a chemical equilibrium equation of state module into the LOCI-Chem code was the primary objective of the current research. The major goals of the project were: (1) the development of a chemical equilibrium composition solver, and (2) the incorporation of chemical equilibrium solver into LOCI-Chem. Due to time and resource constraints, code optimization was not considered unless it was important to the proper functioning of the code.
Author
*Chemical Equilibrium; Chemical Reactions; Aerodynamics; High Speed; Equations of State; Equilibrium Equations; Reaction Kinetics; Reacting Flow*

**20050215394** National Center for Microgravity Research on Fluids and Combustion, Cleveland, OH, USA
**Edge Diffusion Flame Propagation and Stabilization Studied**
Takahashi, Fumiaki; Katta, Viswanath R.; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

In most practical combustion systems or fires, fuel and air are initially unmixed, thus forming diffusion flames. As a result of flame-surface interactions, the diffusion flame often forms an edge, which may attach to burner walls, spread over condensed fuel surfaces, jump to another location through the fuel-air mixture formed, or extinguish by destabilization (blowoff). Flame holding in combustors is necessary to achieve design performance and safe operation of the system. Fires aboard spacecraft behave differently from those on Earth because of the absence of buoyancy in microgravity. This ongoing in-house flame-stability research at the NASA Glenn Research Center is important in spacecraft fire safety and Earth-bound combustion systems.
Derived from text
*Flame Propagation; Flame Stability; Combustion Chambers; Destabilization*

**20050215679** NASA Glenn Research Center, Cleveland, OH, USA
**Inorganic Photovoltaics Materials and Devices: Past, Present, and Future**
Hepp, Aloysius F.; Bailey, Sheila G.; Rafaelle, Ryne P.; Organic Photovoltaics: Machanisms, Materials and Devices; August 2005; 24 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-319-20-A1; WBS 22-319-20-C1
Report No.(s): NASA/TM-2005-213341; E-14809; No Copyright; Avail.: CASI: A03, Hardcopy

This report describes recent aspects of advanced inorganic materials for photovoltaics or solar cell applications. Specific materials examined will be high-efficiency silicon, gallium arsenide and related materials, and thin-film materials, particularly amorphous silicon and (polycrystalline) copper indium selenide. Some of the advanced concepts discussed include multi-junction III-V (and thin-film) devices, utilization of nanotechnology, specifically quantum dots, low-temperature chemical processing, polymer substrates for lightweight and low-cost solar arrays, concentrator cells, and integrated power devices. While many of these technologies will eventually be used for utility and consumer applications, their genesis can be

traced back to challenging problems related to power generation for aerospace and defense. Because this overview of inorganic materials is included in a monogram focused on organic photovoltaics, fundamental issues and metrics common to all solar cell devices (and arrays) will be addressed.
Author
*Copper Indium Selenides; Polycrystals; Gallium Arsenides; Solar Cells; Photovoltaic Conversion; Quantum Dots; Amorphous Silicon*

**20050215681** NASA Glenn Research Center, Cleveland, OH, USA
**A Study of Cavitation-Ignition Bubble Combustion**
Nguyen, Quang-Viet; Jacqmin, David A.; August 2005; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DE-A105-02OR-22929; WBS 22R-722-96; SAA-3-547
Report No.(s): NASA/TM-2005-213599; E-15066; No Copyright; Avail.: CASI: A03, Hardcopy

We present the results of an experimental and computational study of the physics and chemistry of cavitation-ignition bubble combustion (CIBC), a process that occurs when combustible gaseous mixtures are ignited by the high temperatures found inside a rapidly collapsing bubble. The CIBC process was modeled using a time-dependent compressible fluid-dynamics code that includes finite-rate chemistry. The model predicts that gas-phase reactions within the bubble produce CO and other gaseous by-products of combustion. In addition, heat and mechanical energy release through a bubble volume-expansion phase are also predicted by the model. We experimentally demonstrate the CIBC process using an ultrasonically excited cavitation flow reactor with various hydrocarbon-air mixtures in liquid water. Low concentrations (\h 160 ppm) of carbon monoxide (CO) emissions from the ultrasonic reactor were measured, and found to be proportional to the acoustic excitation power. The results of the model were consistent with the measured experimental results. Based on the experimental findings, the computational model, and previous reports of the 'micro-diesel effect' in industrial hydraulic systems, we conclude that CIBC is indeed possible and exists in ultrasonically- and hydrodynamically-induced cavitation. Finally, estimates of the utility of CIBC process as a means of powering an idealized heat engine are also presented.
Author
*Cavitation Flow; Combustion; Bubbles; Heat Transfer; Fluid Dynamics; Carbon Monoxide; Reaction Kinetics*

**20050216396** NASA Glenn Research Center, Cleveland, OH, USA
**Combustion Synthesis of Sm0.5Sr0.5CoO3-x and La0.6Sr0.4CoO3-x Nanopowders for Solid Oxide Fuel Cell Cathodes**
Bansal, Narottam P.; Zhong, zhimin; August 2005; 17 pp.; In English; Sixth Pacific Rim Conference on Ceramic and Glass Technology, 11-16 Sep. 2005, Maui, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-066-20-06
Report No.(s): NASA/TM-2005-213897; E-15268; No Copyright; Avail.: CASI: A03, Hardcopy

Nanopowders of Sm0.5Sr0.5CoO(3-x) (SSC) and La0.6Sr0.4CoO(3-x) (LSC) compositions, which are being investigated as cathode materials for intermediate temperature solid oxide fuel cells, were synthesized by a solution-combustion method using metal nitrates and glycine as fuel. Development of crystalline phases in the as-synthesized powders after heat treatments at various temperatures was monitored by x-ray diffraction. Perovskite phase in LSC formed more readily than in SSC. Single phase perovskites were obtained after heat treatment of the combustion synthesized LSC and SSC powders at 1000 and 1200 C, respectively. The as-synthesized powders had an average particle size of ~12 nm as determined from x-ray line broadening analysis using the Scherrer equation. Average grain size of the powders increased with increase in calcination temperature. Morphological analysis of the powders calcined at various temperatures was done by scanning electron microscopy.
Author
*Powder (Particles); Solid Oxide Fuel Cells; Cathodes; Combustion Synthesis; Nanotechnology; Lanthanum; Strontium; Cobalt Oxides; Samarium*

**20050217112** NASA Langley Research Center, Hampton, VA, USA
**Technical Consultation of the International Space Station (ISS) Internal Active Thermal Control System (IATCS) Cooling Water Chemistry**
Gentz, Steven J.; Rotter, Hank A.; Easton, Myriam; Lince, Jeffrey; Park, Woonsup; Stewart, Thomas; Speckman, Donna; Dexter, Stephen; Kelly, Robert; September 2005; 323 pp.; In English
Contract(s)/Grant(s): 104-08-43
Report No.(s): NASA/TM-2005-213918; NESC-RP-05-71/04-018-E; L-19174; No Copyright; Avail.: CASI: A14, Hardcopy

The Internal Active Thermal Control System (IATCS) coolant exhibited unexpected chemical changes during the first year

of on-orbit operation following the launch and activation in February 2001. The coolant pH dropped from 9.3 to below the minimum specification limit of 9.0, and re-equilibrated between 8.3 and 8.5. This drop in coolant pH was shown to be the result of permeation of CO2 from the cabin into the coolant via Teflon flexible hoses which created carbonic acid in the fluid. This unexpected diffusion was the result of having a cabin CO2 partial pressure higher than the ground partial pressure (average 4.0 mmHg vs. less than 0.2 mmHg). This drop in pH was followed by a concurrent increasing coolant nickel concentration. No other metal ions were observed in the coolant and based on previous tests, the source of nickel ion was thought to be the boron nickel (BNi) braze intermetallics used in the construction of HXs and cold plates. Specifically, BNi2 braze alloy was used for the IATCS IFHX and BNi3 braze alloy was used for the IATCS Airlock Servicing and Performance Checkout Unit (SPCU) HX and cold plates. Given the failure criticality of the HXs, a Corrosion Team was established by the IATCS CWG to determine the impact of the nickel corrosion on hardware performance life.
Author
*Cooling; International Space Station; Temperature Control; Chemistry; Airlock Modules; Water*

## 24
## COMPOSITE MATERIALS

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

**20050214851** NASA Glenn Research Center, Cleveland, OH, USA
**Delaminations Investigated With Ultrasonic Spectroscopy**
Cosgriff, Laura M.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A previous study suggested that the ultrasonic spectroscopy technique identified possible disbonds or delaminations in polymer matrix composite (PMC) rings sectioned from flywheel rotors (ref. 1). These results went unsubstantiated by other nondestructive evaluation (NDE) methods. To explain the results, PMC rings were further investigated with ultrasonic spectroscopy (ref. 2). The ultrasonic spectroscopy system utilizes a continuous-swept sine waveform as the input. After the swept sine wave traverses the material, the captured waveform is subjected to two fast Fourier transforms. The second fast Fourier transform along with equalization of the frequency spectrum, allows for evaluation of the fundamental resonant frequency. The full-thickness resonance, the resonance corresponding to the location of the intentional disbond, and the frequency spectrum were examined in an effort to characterize the sensitivity of the NDE method to various delamination conditions.
Author
*Fourier Transformation; Fast Fourier Transformations; Ultrasonic Spectroscopy; Polymer Matrix Composites; Debonding (Materials); Nondestructive Tests; Frequency Distribution*

**20050214856** NASA Glenn Research Center, Cleveland, OH, USA
**Hydrostatic Stress Effects Incorporated Into the Analysis of the High-Strain-Rate Deformation of Polymer Matrix Composites**
Goldberg, Robert K.; Roberts, Gary D.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Procedures for modeling the effect of high strain rate on composite materials are needed for designing reliable composite engine cases that are lighter than the metal cases in current use. The types of polymer matrix composites that are likely to be used in such an application have a deformation response that is nonlinear and that varies with strain rate. The nonlinearity and strain rate dependence of the composite response is primarily due to the matrix constituent. Therefore, in developing material models to be used in the design of impact-resistant composite engine cases, the deformation of the polymer matrix must be correctly analyzed. However, unlike in metals, the nonlinear response of polymers depends on the hydrostatic stresses, which must be accounted for within an analytical model. An experimental program has been carried out through a university grant with the Ohio State University to obtain tensile and shear deformation data for a representative polymer for strain rates ranging from quasi-static to high rates of several hundred per second. This information has been used at the NASA Glenn Research Center to develop, characterize, and correlate a material model in which the strain rate dependence and nonlinearity (including hydrostatic stress effects) of the polymer are correctly analyzed. To obtain the material data, Glenn s researchers designed and fabricated test specimens of a representative toughened epoxy resin. Quasi-static tests at low strain rates and split Hopkinson bar tests at high strain rates were then conducted at the Ohio State University. The experimental data confirmed the strong effects of strain rate on both the tensile and shear deformation of the polymer. For the analytical model, Glenn researchers

modified state variable constitutive equations previously used for the viscoplastic analysis of metals to allow for the analysis of the nonlinear, strain-rate-dependent polymer deformation. Specifically, we accounted for the effects of hydrostatic stresses. An important discovery in the course of this work was that the hydrostatic stress effects varied during the loading process, which needed to be accounted for within the constitutive equations. The model is characterized primarily by shear data, with tensile data used to characterize the hydrostatic stress effects.
Author
*Polymer Matrix Composites; Hydrostatics; Strain Rate; Tensile Deformation*

**20050214858** NASA Glenn Research Center, Cleveland, OH, USA
**High-Performance Acousto-Ultrasonic Scan System Being Developed**
Roth, Don J.; Martin, Richard E.; Cosgriff, Laura M.; Gyekenyesi, Andrew L.; Kautz, Harold E.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Acousto-ultrasonic (AU) interrogation is a single-sided nondestructive evaluation (NDE) technique employing separated sending and receiving transducers. It is used for assessing the microstructural condition and distributed damage state of the material between the transducers. AU is complementary to more traditional NDE methods, such as ultrasonic cscan, x-ray radiography, and thermographic inspection, which tend to be used primarily for discrete flaw detection. Throughout its history, AU has been used to inspect polymer matrix composites, metal matrix composites, ceramic matrix composites, and even monolithic metallic materials. The development of a high-performance automated AU scan system for characterizing within-sample microstructural and property homogeneity is currently in a prototype stage at NASA. This year, essential AU technology was reviewed. In addition, the basic hardware and software configuration for the scanner was developed, and preliminary results with the system were described. Mechanical and environmental loads applied to composite materials can cause distributed damage (as well as discrete defects) that plays a significant role in the degradation of physical properties. Such damage includes fiber/matrix debonding (interface failure), matrix microcracking, and fiber fracture and buckling. Investigations at the NASA Glenn Research Center have shown that traditional NDE scan inspection methods such as ultrasonic c-scan, x-ray imaging, and thermographic imaging tend to be more suited to discrete defect detection rather than the characterization of accumulated distributed micro-damage in composites. Since AU is focused on assessing the distributed micro-damage state of the material in between the sending and receiving transducers, it has proven to be quite suitable for assessing the relative composite material state. One major success story at Glenn with AU measurements has been the correlation between the ultrasonic decay rate obtained during AU inspection and the mechanical modulus (stiffness) seen during fatigue experiments with silicon carbide/silicon carbide (SiC/SiC) ceramic matrix composite samples. As shown in the figure, ultrasonic decay increased as the modulus decreased for the ceramic matrix composite tensile fatigue samples. The likely microstructural reason for the decrease in modulus (and increase in ultrasonic decay) is the matrix microcracking that commonly occurs during fatigue testing of these materials. Ultrasonic decay has shown the capability to track the pattern of transverse cracking and fiber breakage in these composites.
Author
*Interrogation; Nondestructive Tests; Transducers; Microstructure; Microcracks; Damage; Radiography; Metal Matrix Composites; Composite Materials*

**20050215036** NASA Langley Research Center, Hampton, VA, USA
**Preparation and Characterization of PETI-330/Multiwalled Carbon Nanotube**
Ghose, Sayata; Watson, Kent A.; Working, Dennis C.; Criss, Jim M.; Siochi, Emilie J.; Connell, John W.; [2005]; 17 pp.; In English; Nanocomposites 2005, 22-24 Aug. 2005, San Francisco, CA, USA; Copyright; Avail.: CASI: A03, Hardcopy

As part of an ongoing effort to incorporate multifunctionality into advanced composites, blends of PETI-330 and multi-walled carbon nanotubes (MWCNTs) were prepared, characterized and fabricated into moldings. The PETI-330/MWCNT mixtures were prepared at concentrations ranging from 3 to 25 weight percent by dry mixing the components in a ball mill. The resulting powders were characterized for degree of mixing, thermal and rheological properties. Based on the characterization results, PETI-330/MWCNT samples were scaled up to ~300 g and used to fabricate moldings 10.2 cm x 15.2 cm x 0.32 cm thick. The moldings were made by injecting the mixtures at 260-280 C into an Invar tool followed by curing for 1 h at 371 C. The tool was designed to impart shear during the injection process in an attempt to achieve some alignment of the MWCNTs in the flow direction. Good quality moldings were obtained that were subsequently characterized for thermal, mechanical and electrical properties. The degree of dispersion and alignment of the MWCNTs were investigated using high-resolution scanning electron microscopy. The preparation and preliminary characterization of PETI-330/MWCNT

composites will be discussed. Keywords: phenylethynyl terminated imides, high temperature polymers, nanocomposites, moldings
Author
*Carbon Nanotubes; Composite Materials; Mixtures; Powder (Particles); High Temperature; Nanocomposites*

**20050215097** NASA Glenn Research Center, Cleveland, OH, USA
**Analytical Failure Prediction Method Developed for Woven and Braided Composites**
Min, James B.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Historically, advances in aerospace engine performance and durability have been linked to improvements in materials. Recent developments in ceramic matrix composites (CMCs) have led to increased interest in CMCs to achieve revolutionary gains in engine performance. The use of CMCs promises many advantages for advanced turbomachinery engine development and may be especially beneficial for aerospace engines. The most beneficial aspects of CMC material may be its ability to maintain its strength to over 2500 F, its internal material damping, and its relatively low density. Ceramic matrix composites reinforced with two-dimensional woven and braided fabric preforms are being considered for NASA s next-generation reusable rocket turbomachinery applications (for example, see the preceding figure). However, the architecture of a textile composite is complex, and therefore, the parameters controlling its strength properties are numerous. This necessitates the development of engineering approaches that combine analytical methods with limited testing to provide effective, validated design analyses for the textile composite structures development.
Derived from text
*Braided Composites; Ceramic Matrix Composites; Design Analysis; Fabrics; Failure Analysis; Woven Composites*

**20050215165** NASA Glenn Research Center, Cleveland, OH, USA
**Associative Flow Rule Used to Include Hydrostatic Stress Effects in Analysis of Strain-Rate-Dependent Deformation of Polymer Matrix Composites**
Goldberg, Robert K.; Roberts, Gary D.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

designing reliable composite engine cases that are lighter than the metal cases in current use. The types of polymer matrix composites that are likely to be used in such an application have a deformation response that is nonlinear and that varies with strain rate. The nonlinearity and the strain-rate dependence of the composite response are due primarily to the matrix constituent. Therefore, in developing material models to be used in the design of impact-resistant composite engine cases, the deformation of the polymer matrix must be correctly analyzed. However, unlike in metals, the nonlinear response of polymers depends on the hydrostatic stresses, which must be accounted for within an analytical model. By applying micromechanics techniques along with given fiber properties, one can also determine the effects of the hydrostatic stresses in the polymer on the overall composite deformation response. First efforts to account for the hydrostatic stress effects in the composite deformation applied purely empirical methods that relied on composite-level data. In later efforts, to allow polymer properties to be characterized solely on the basis of polymer data, researchers at the NASA Glenn Research Center developed equations to model the polymers that were based on a non-associative flow rule, and efforts to use these equations to simulate the deformation of representative polymer materials were reasonably successful. However, these equations were found to have difficulty in correctly analyzing the multiaxial stress states found in the polymer matrix constituent of a composite material. To correct these difficulties, and to allow for the accurate simulation of the nonlinear strain-rate-dependent deformation analysis of polymer matrix composites, in the efforts reported here Glenn researchers reformulated the polymer constitutive equations from basic principles using the concept of an associative flow rule. These revised equations were characterized and validated in an experimental program carried out through a university grant with the Ohio State University, wherein tensile and shear deformation data were obtained for a representative polymer for strain rates ranging from quasi-static to high rates of several hundred per second. Tensile deformation data also were obtained over a variety of strain rates and fiber orientation angles for a representative polymer matrix composite composed using the polymer.
Derived from text
*Hydrostatics; Stress Analysis; Numerical Analysis; Polymer Matrix Composites; Strain Rate*

**20050215248** NASA Glenn Research Center, Cleveland, OH, USA
**Scatter in Carbon/Silicon Carbide (C/SiC) Composites Quantified**
Murthy, Pappu L. N.; Gyekenyesi, John P.; Mital, Subodh K.; Research and Technology 2003; May 2004; 5 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Carbon-fiber-reinforced silicon carbide matrix (C/SiC) composites processed by chemical vapor infiltration are candidate materials for aerospace thermal structures. Carbon fibers can retain properties at very high temperatures, but they are known to have poor oxidation resistance in adverse, high-temperature environments. Nevertheless, the combination of CVI-SiC matrix with higher stiffness and oxidation resistance, the interfacial coating, and additional surface-seal coating provides the necessary protection to the carbon fibers, and makes the material viable for high-temperature space applications operating under harsh environments. Furthermore, C/SiC composites, like other ceramic matrix composites (CMCs), exhibit graceful non-catastrophic failure because of various inherent energy dissipating mechanisms. The material exhibits nonlinearity in deformation even at very low stress levels. This is the result of the severe matrix microcracking present in the as processed composite because of large differences between the coefficients of thermal expansion of the fiber and the matrix. Utilization of these advanced composites in next generation space vehicles will require innovative structural configurations, updated materials, and refined analyses. Structural safety issues for these vehicles are in direct competition with performance and cost. One would have to quantify the uncertainties associated with the design using formal probabilistic methods. Specifically four fundamental aspects on which analyses are based-- (1) loading conditions, (2) material behavior, (3) geometrical configurations, and (4) structural connections between the composite components and baseline structure--are stochastic in nature. A direct way to formally account for uncertainties is to develop probabilistic structural analysis methods where all participating variables are described by appropriate probability density functions. The present work, however, focuses on analyzing the stochastic material behavior of these advanced composites using formal probabilistic analysis methods. Often, some of the desirable property characteristics that allow composites to offer advantages over conventional structural materials (like tailoring of composite properties) and the complexity are in fact responsible for their greater statistical variability and the requirements for more characterization tests. Composite properties are anisotropic as well, having different properties in different directions. This means that characterization of a property such as stiffness--which will vary greatly depending on the orientation of the fiber relative to the direction of the testing--must be repeated for several different directions and loading conditions. The fabrication process for composites also introduces statistical variations in properties and geometry. A composite part is produced in a number of steps, each of which introduces statistical variability. The matrix is usually produced from a combination of raw materials; and the fiber, which has its own set of properties, is often coated or surface treated, introducing yet another source of variability.

Author

*Carbon Fibers; Silicon Carbides; Structural Analysis; Composite Structures; High Temperature Environments; Ceramic Matrix Composites; Composite Materials*

**20050215252** NASA Glenn Research Center, Cleveland, OH, USA

**Particulate Titanium Matrix Composites Tested--Show Promise for Space Propulsion Applications**

Lerch, Bradley A.; Ellis, J. Rodney; Arnold. Steven M.; Research and Technology 2003; May 2004; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Uniformly distributed particle-strengthened titanium matrix composites (TMCs) can be manufactured at lower cost than many types of continuous-fiber composites. The innovative manufacturing technology combines cold and hot isostatic pressing procedures to produce near-final-shape components. Material stiffness is increased up to 26-percent greater than that of components made with conventional titanium materials at no significant increase in the weight. The improved mechanical performance and low-cost manufacturing capability motivated an independent review to assess the improved properties of ceramic titanium carbide (TiC) particulate-reinforced titanium at elevated temperature. Researchers at the NASA Glenn Research Center creatively designed and executed deformation and durability tests to reveal operating regimes where these materials could lower the cost and weight of space propulsion systems. The program compares the elevated-temperature performance of titanium alloy Ti-6Al-4V matrix material to an alloy containing 10 wt% of TiC particles. Initial experiments showed that at these relatively low particle concentrations the material stiffness of the TMC was improved 20 percent over that of the plain Ti-6Al-4V alloy when tested at 427 C. The proportional limit and ultimate strength of the composite in tension are 21- and 14-percent greater than those of the plain alloy. Compression tests showed that the proportional limit is about 30 percent greater for TMC than for the plain alloy. The enhanced deformation resistance of the TMC was also evident in a series of tensile and compressive stress relaxation tests that were made. Specimens were subjected to tensile or compressive strain amplitudes of 0.75 percent for 24 hr followed by a return to zero strain imposed for 24 hr. The stress relaxation data were normalized with respect to the maximum stress for each case and plotted as a function of time in the following graph. Tensile stresses relaxed 19 percent for the TMC and 25 percent for the plain Ti-6Al-4V alloy. Compressive stresses relaxed 25 percent for the TMC and 39 percent for the plain Ti-6Al-4V alloy. The superior deformation resistance of the TMC extends to a creep

rate that is 28-percent slower for the TMC when it is loaded to stress levels that are 26-percent higher than for the plain Ti-6Al-4V alloy.
Author
*Titanium Alloys; Metal Matrix Composites; Propulsion System Configurations; Fiber Composites; Ceramics; Titanium Carbides; Matrix Materials; Propulsion System Performance*

**20050215255** NASA Glenn Research Center, Cleveland, OH, USA
**Probabilistic Residual Strength Model Developed for Life Prediction of Ceramic Matrix Composites**
Thomas, David J.; Verrilli, Michael J.; Calomino, Anthony M.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

For the next generation of reusable launch vehicles, NASA is investigating introducing ceramic matrix composites (CMCs) in place of current superalloys for structural propulsion applications (e.g., nozzles, vanes, combustors, and heat exchangers). The higher use temperatures of CMCs will reduce vehicle weight by eliminating and/or reducing cooling system requirements. The increased strength-to-weight ratio of CMCs relative to superalloys further enhances their weight savings potential. However, in order to provide safe designs for components made of these new materials, a comprehensive life prediction methodology for CMC structures needs to be developed. A robust methodology for lifing composite structures has yet to be adopted by the engineering community. Current industry design practice continues to utilize deterministic empirically based models borrowed from metals design for predicting material life capabilities. The deterministic nature of these models inadequately addresses the stochastic character of brittle composites, and their empirical reliance makes predictions beyond the experimental test conditions a risky extrapolation. A team of engineers at the NASA Glenn Research Center has been developing a new life prediction engineering model. The Probabilistic Residual Strength (PRS) model uses the residual strength of the composite as its damage metric. Expected life and material strength are both considered probabilistically to account for the observed stochastic material response. Extensive experimental testing has been carried out on C/SiC (a candidate aerospace CMC material system) in a controlled 1000 ppm O2/argon environment at elevated temperatures of 800 and 1200 C. The test matrix was established to allow observation of the material behavior, characterization of the model, and validation of the model's predictive capabilities. Sample results of the validation study are illustrated in the graphs.
Author
*Ceramic Matrix Composites; Composite Structures; Prediction Analysis Techniques; Residual Strength; Life (Durability); Heat Resistant Alloys; High Temperature*

**20050215295** Army Research Lab., Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
**PS300 Tribomaterials Evaluated at 6500C by Bushing Test Rig**
Striebing, Donald R.; DellaCorte, Christopher; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

A new facility has been developed to test the tribological behavior (friction and wear) of PS300 solid lubricant bushings at high temperatures. PS300 is a commercially available solid lubricant invented at the NASA Glenn Research Center. It can be prepared as a plasma spray coating or as a free-standing powder metallurgy component, designated PM300. PS300 and PM300 composites are designed to lubricate sliding components at temperatures above the capability of today's best oils, greases, and solid lubricants. One of the primary applications being pursued for PM300 is the development of bushings for use in high-temperature machinery. Examples include inlet guide vane bushings for gas turbines and conveyors, and bearings for industrial furnaces and ovens. Encouraging preliminary field trials indicate that PS300 and PM300 lubricant materials have been commercialized successfully in several industrial applications. However, the lack of laboratory performance data has hindered further commercialization especially for new applications that differ significantly from the established experience base. The purpose of the newly developed bushing test rig will be to determine the performance characteristics of PM300, and other materials, under conditions closely matching intended applications. The data will be used to determine engineering friction and wear rates and to estimate the life expectancy of bushings for new applications. In the new rig, the bushing is loaded against a rotating shaft inside a furnace enclosure (see the preceding photograph). Loads can vary from 5 to 200 N, speeds from 1 to 400 rpm, and temperatures from 25 to 800 C. Furnace temperature, bushing temperature, shaft speed, and torque are monitored during the test, and wear of both the bushing and the shaft is measured after testing is completed. Initially, PM300 bushings will be evaluated and compared with lower temperature, traditional bushing materials like graphite and porous bronze. The baseline PM304 composition is 60 wt% NiCr (a binder), 20 wt% Cr2O3 (a hardener), 10 wt% BaF2/CaF2 (a high-temperature lubricant), and 10 wt% Ag (a low-temperature lubricant). Future research efforts will include determining the effects of load, sliding speed, and temperature on tribological performance and, possibly, tailoring composition for specific

applications. We expect that the availability of measured performance data will enhance the market penetration of PM300 technology.
Author
*Bushings; High Temperature Lubricants; Solid Lubricants; Test Facilities; Tribology; Composite Materials*

**20050215306** Auburn Univ., AL, USA
**Fiber Reinforced Composites for Insulation and Structures**
Broughton, Roy M., Jr.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. VI-1 - VI-6; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

The work involves two areas: Composites, optimum fiber placement with initial construction of a pressure vessel, and the general subject of insulation, a continual concern in harsh thermal environments. Insulation
Author
*Fiber Composites; Insulation; Thermal Environments; Pressure Vessels*

**20050215454** NASA Glenn Research Center, Cleveland, OH, USA
**Thermal Conductivity and Water Vapor Stability of Ceramic HfO2-Based Coating Materials**
Zhu, Dong-Ming; Fox, Dennis S.; Bansal, Narottam P.; Miller, Robert A.; [2004]; 16 pp.; In English; Symposium on Advanced Ceramic Coatings for Structural, Environmental and Functional Application, 25-30 Jan. 2004, Cocoa Beach, FL, USA
Contract(s)/Grant(s): WBS 22-714-04-30; No Copyright; Avail.: CASI: A03, Hardcopy

HfO2-Y2O3 and La2Zr2O7 are candidate thermal/environmental barrier coating materials for gas turbine ceramic matrix composite (CMC) combustor liner applications because of their relatively low thermal conductivity and high temperature capability. In this paper, thermal conductivity and high temperature phase stability of plasma-sprayed coatings and/or hot-pressed HfO2-5mol%Y2O3, HfO2-15mol%Y2O3 and La2Zr2O7 were evaluated at temperatures up to 1700 C using a steady-state laser heat-flux technique. Sintering behavior of the plasma-sprayed coatings was determined by monitoring the thermal conductivity increases during a 20-hour test period at various temperatures. Durability and failure mechanisms of the HfO2-Y2O3 and La2Zr2O7 coatings on mullite/SiC Hexoloy or CMC substrates were investigated at 1650 C under thermal gradient cyclic conditions. Coating design and testing issues for the 1650 C thermal/environmental barrier coating applications will also be discussed.
Author
*Ceramic Matrix Composites; Stability; Thermal Conductivity; Water Vapor; Hafnium Oxides; Yttrium Oxides; Lanthanum Oxides; Zirconium Oxides*

**20050215457** NASA Langley Research Center, Hampton, VA, USA, Army Research Lab., Hampton, VA, USA
**Compression-Loaded Composite Panels With Elastic Edge Restraints and Initial Prestress**
Hilburger, Mark W.; Nemeth, Michael P.; Riddick, Jaret C.; Thornburgh, Robert P.; August 2005; 35 pp.; In English
Contract(s)/Grant(s): 23-376-10-30-02
Report No.(s): NASA/TP-2005-213906; ARL-TR-3572; L-19162; No Copyright; Avail.: CASI: A03, Hardcopy

A parametric study of the effects of test-fixture-induced initial prestress and elastic edge restraints on the prebuckling and buckling responses of a compression-loaded, quasi-isotropic curved panel is presented. The numerical results were obtained by using a geometrically nonlinear finite element analysis code with high-fidelity models. The results presented show that a wide range of prebuckling and buckling behavior can be obtained by varying parameters that represent circumferential loaded-edge restraint and rotational unloaded-edge restraint provided by a test fixture and that represent the mismatch in specimen and test-fixture radii of curvature. For a certain range of parameters, the panels exhibit substantial nonlinear prebuckling deformations that yield buckling loads nearly twice the corresponding buckling load predicted by a traditional linear bifurcation buckling analysis for shallow curved panels. In contrast, the results show another range of parameters exist for which the nonlinear prebuckling deformations either do not exist or are relatively benign, and the panels exhibit buckling loads that are nearly equal to the corresponding linear bifurcation buckling load. Overall, the results should be of particular interest to scientists, engineers, and designers involved in simulating flight-hardware boundary conditions in structural verification and certification tests, involved in validating structural analysis tools, and interested in tailoring buckling performance.
Author
*Composite Structures; Prestressing; Compression Loads; Parameterization; Curved Panels; Constraints; Elastic Properties; Aerospace Vehicles*

**20050215603** NASA Marshall Space Flight Center, Huntsville, AL, USA

**New Fiber Reinforced Waterless Concrete for Extraterrestrial Structural Applications**

Toutanji, H.; Tucker, D.; Ethridge, E.; [2005]; 1 pp.; In English; Twelfth International Conference on Composites/Nano Engineering, 1-6 Aug. 2005, Tenerife, Canary Islands, Spain; Copyright; Avail.: Other Sources; Abstract Only

Commercial use of sulfur concrete on Earth is well established, particularly in corrosive, e.g., acid and salt, environments. Having found troilite (FeS) on the Moon raises the question of using extracted sulfur as a lunar construction mate: iii an attractive alternative to conventional concrete as it does not require water For the purpose of this paper it is assumed that lunar ore is mined, refined, and the raw sulfur processed with appropriate lunar regolith to form, for example, brick and beam elements. Glass fibers produced from regolith were used as a reinforcement to improve the mechanical properties of the sulfur concrete. Glass fibers and glass rebar were produced by melting the lunar regolith simulant. Lunar regolith stimulant was melted in a 25 cc Pt-Rh crucible in a Sybron Thermoline 46100 high temperature MoSi2 furnace at melting temperatures of 1450 to 1600G. The glass melt wets the ceramic rod and long continuous glass fibers were easily hand drawn. The glass fibers were immediately coated with a protective polymer to maintain the mechanical strength. The viability of sulfur concrete as a construction material for extraterrestrial application is presented. The mechanical properties of the glass fiber reinforced sulfur concrete were investigated.

Author

*Concretes; Fiber Composites; Extraterrestrial Environments; Structural Design*

**20050215605** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Optical Sensing using Fiber Bragg Gratings for Monitoring Structural Damage in Composite Over-Wrapped Vessels**

Grant, Joseph; [2005]; 1 pp.; In English; SPIE Optics and Photonics Conference, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Composite Over-Wrap Vessels are widely used in the aerospace community. They are made of thin-walled bottles that are over wrapped with high strength fibers embedded in a matrix material. There is a strong drive to reduce the weight of space borne vehicles and thus pushes designers to adopt COPVs that are over wrapped with graphite fibers embedded in its epoxy matrix. Unfortunately, this same fiber-matrix configuration is more susceptible to impact damage than others and to make matters worse; there is a regime where impacts that damage the over wrap leave no visible scar on the COPV surface. In this paper FBG sensors are presented as a means of monitoring and detecting these types of damage. The FBG sensors are surface mounted to the COPVs and optically interrogated to explore the structural properties of these composite pressure vessels. These gratings optically inscribed into the core of a single mode fiber are used as a tool to monitor the stress strain relation in the composite matrix. The response of these fiber-optic sensors is investigated by pressurizing the cylinder up to its burst pressure of around 4500 psi. A Fiber Optic Demodulation System built by Blue Road Research, is used for interrogation of the Bragg gratings.

Author

*Optical Fibers; Fiber Optics; Epoxy Matrix Composites; Matrix Materials; Stress-Strain Relationships*

**20050215687** NASA Glenn Research Center, Cleveland, OH, USA

**Crack Driving Forces in a Multilayered Coating System for Ceramic Matrix Composite Substrates**

Ghosn, Louis J.; Zhu, Dongming; Miller, Robert A.; September 2005; 15 pp.; In English; 29th International Conference on Advanced Ceramics and Composites, 23-28 Jan. 2005, Cocoa Beach, FL, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 22-714-30-26

Report No.(s): NASA/TM-2005-213835; E-15205; No Copyright; Avail.: CASI: A03, Hardcopy

The effects of the top coating thickness, modulus and shrinkage strains on the crack driving forces for a baseline multilayer Yttria-Stabilized-Zirconia/Mullite/Si thermal and environment barrier coating (TEBC) system for SiC/SiC ceramic matrix composite substrates are determined for gas turbine applications. The crack driving forces increase with increasing modulus, and a low modulus thermal barrier coating material (below 10 GPa) will have no cracking issues under the thermal gradient condition analyzed. Since top coating sintering increases the crack driving forces with time, highly sintering resistant coatings are desirable to maintain a low tensile modulus and maintain a low crack driving force with time. Finite element results demonstrated that an advanced TEBC system, such as ZrO2/HfO2, which possesses improved sintering resistance and high temperature stability, exhibited excellent durability. A multi-vertical cracked structure with fine columnar spacing is an ideal strain tolerant coating capable of reducing the crack driving forces to an acceptable level even with a high modulus of 50 GPa.

Author

*Ceramic Matrix Composites; Coating; Finite Element Method; Sintering; Protective Coatings; Thermal Stability; Thermal Control Coatings*

**20050216391** NASA Marshall Space Flight Center, Huntsville, AL, USA, Cornerstone Research Group, Inc., Dayton, OH, USA

**Synlam(TM) Composite Mirror for Cyrogenic Applications**

Hermiller, Jason; Stahl, H. Philip; August 2005; 24 pp.; In English; Mirror Technology Days 2005, 16-18 Aug. 2005, Huntsville, AL, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NNM05AA39C; Copyright; Avail.: CASI: A03, Hardcopy

This presentation summarizes results of Small Business Innovation Research (SBIR) Phase I contract funded by NASA Marshall Space Flight Center and managed by Dr. H. Philip Stahl.

Derived from text

*Mirrors; Composite Materials; Cryogenics*

**20050216393** NASA Glenn Research Center, Cleveland, OH, USA

**Low Conductivity Thermal Barrier Coatings**

Zhu, Dong-Ming; September 2005; 29 pp.; In English; School of Materials Engineering Seminar, 28 Feb. 2005, West Lafayette, IN, USA; Original contains poor quality, truncated or crooked pages

Contract(s)/Grant(s): WBS 22-714-20-09

Report No.(s): NASA/TM-2005-213857; E-15227; No Copyright; Avail.: CASI: A03, Hardcopy

Thermal barrier coatings will be more aggressively designed to protect gas turbine engine hot-section components in order to meet future engine higher fuel efficiency and lower emission goals. In this presentation, thermal barrier coating development considerations and requirements will be discussed. An experimental approach is established to monitor in real time the thermal conductivity of the coating systems subjected to high-heat-flux, steady-state and cyclic temperature gradients. Advanced low conductivity thermal barrier coatings have also been developed using a multi-component defect clustering approach, and shown to have improved thermal stability. The durability and erosion resistance of low conductivity thermal barrier coatings have been improved utilizing advanced coating architecture design, composition optimization, in conjunction with more sophisticated modeling and design tools.

Author

*Thermal Control Coatings; Thermal Conductivity; Corrosion Resistance; Design Optimization; Thermal Stability*

**20050216397** NASA Glenn Research Center, Cleveland, OH, USA

**Approximate Micromechanics Treatise of Composite Impact**

Chamis, Christos C.; Handler, Louis M.; September 2005; 32 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 22-104-08-01

Report No.(s): NASA/TM-2005-210756; E-12680-1; No Copyright; Avail.: CASI: A03, Hardcopy

A formalism is described for micromechanic impact of composites. The formalism consists of numerous equations which describe all aspects of impact from impactor and composite conditions to impact contact, damage progression, and penetration or containment. The formalism is based on through-the-thickness displacement increments simulation which makes it convenient to track local damage in terms of microfailure modes and their respective characteristics. A flow chart is provided to cast the formalism (numerous equations) into a computer code for embedment in composite mechanic codes and/or finite element composite structural analysis.

Author

*Micromechanics; Composite Materials; Formalism; Impact Damage*

**20050217101** NASA Glenn Research Center, Cleveland, OH, USA

**As-Fabricated Reinforced Carbon/Carbon Characterized**

Jacobson, Nathan S.; Calomino, Anthony M.; Webster, Neal; Research and Technology 2004; June 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Reinforced carbon/carbon (RCC) is a critical material for the space shuttle orbiter. It is used on the wing leading edge and the nose cap, where maximum temperatures are reached on reentry. The existing leading-edge system is a single-plate RCC composite construction with a wall thickness of approximately 1/4 in., making it a prime reliant protection scheme for vehicle operation.

Derived from text

*Carbon-Carbon Composites; Fabrication; Thickness*

**20050217105** QSS Group, Inc., USA

**Glenn Refractory Adhesive for Bonding and Exterior Repair (GRABER) Developed for Repairing Shuttle Damage**

Singh, Mrityunjay; Shpargel, Tarah P.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Advanced in-space repair technologies for reinforced carbon/carbon composite (RCC) thermal protection system (TPS) structures are critically needed for the space shuttle Return To Flight (RTF) efforts. These technologies are also critical for the repair and refurbishment of thermal protection system structures of future Crew Exploration Vehicles of space exploration programs. The Glenn Refractory Adhesive for Bonding and Exterior Repair (GRABER) material developed at the NASA Glenn Research Center has demonstrated capabilities for repair of small cracks and damage in RCC leading-edge material. The concept consists of preparing an adhesive paste of desired ceramic in a polymer/phenolic resin matrix with appropriate additives, such as surfactants, and then applying the paste into the damaged or cracked area of the RCC composite components with caulking guns. The adhesive paste cures at 100 to 120 C and transforms into a high-temperature ceramic during simulated vehicle reentry testing conditions.

Derived from text

*Adhesive Bonding; Carbon-Carbon Composites; Composite Materials; Thermal Protection*

**20050217113** NASA Glenn Research Center, Cleveland, OH, USA, Sandia National Labs., USA

**Followup to Columbia Investigation: Reinforced Carbon/Carbon From the Breach Location in the Wing Leading Edge Studied**

Jacobson, Nathan S.; Opila, Elizabeth J.; Tallant, David; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Initial estimates on the temperature and conditions of the breach in the Space Shuttle Columbia's wing focused on analyses of the slag deposits. These deposits are complex mixtures of the reinforced carbon/carbon (RCC) constituents, insulation material, and wing structural materials. Identification of melted/solidified Cerachrome insulation (Thermal Ceramics, Inc., Augusta, GA) indicated that the temperatures at the breach had exceeded 1760 C.

Derived from text

*Carbon-Carbon Composites; Insulation; Leading Edges*

**20050217169** NASA Glenn Research Center, Cleveland, OH, USA

**High-Temperature Piezoelectric Ceramic Developed**

Sayir, Ali; Farmer, Serene C.; Dynys, Frederick W.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Active combustion control of spatial and temporal variations in the local fuel-to-air ratio is of considerable interest for suppressing combustion instabilities in lean gas turbine combustors and, thereby, achieving lower NOx levels. The actuator for fuel modulation in gas turbine combustors must meet several requirements: (1) bandwidth capability of 1000 Hz, (2) operating temperature compatible with the fuel temperature, which is in the vicinity of 400 F, (3) stroke of approximately 4 mils (100 m), and (4) force of 300 lb-force. Piezoelectric actuators offer the fastest response time (microsecond time constants) and can generate forces in excess of 2000 lb-force. The state-of-the-art piezoceramic material in industry today is Pb(Zr,Ti)O3, called PZT. This class of piezoelectric ceramic is currently used in diesel fuel injectors and in the development of high-response fuel modulation valves. PZT materials are generally limited to operating temperatures of 250 F, which is 150 F lower than the desired operating temperature for gas turbine combustor fuel-modulation injection valves. Thus, there is a clear need to increase the operating temperature range of piezoceramic devices for active combustion control in gas turbine engines.

Derived from text

*Piezoelectric Ceramics; Piezoelectric Actuators; Fabrication; Refractory Materials*

**20050217173** NASA Glenn Research Center, Cleveland, OH, USA

**Structures Self-Assembled Through Directional Solidification**

Dynys, Frederick W.; Sayir, Ali; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Nanotechnology has created a demand for new fabrication methods with an emphasis on simple, low-cost techniques. Directional solidification of eutectics (DSE) is an unconventional approach in comparison to low-temperature biomimetic approaches. A technical challenge for DSE is producing microstructural architectures on the nanometer scale. In both

processes, the driving force is the minimization of Gibb's free energy. Selfassembly by biomimetic approaches depends on weak interaction forces between organic molecules to define the architectural structure. The architectural structure for solidification depends on strong chemical bonding between atoms. Constituents partition into atomic-level arrangements at the liquid-solid interface to form polyphase structures, and this atomic-level arrangement at the liquid-solid interface is controlled by atomic diffusion and total undercooling due to composition (diffusion), kinetics, and curvature of the boundary phases. Judicious selection of the materials system and control of the total undercooling are the keys to producing structures on the nanometer scale. The silicon-titanium silicide (Si-TiSi2) eutectic forms a rod structure under isothermal cooling conditions. At the NASA Glenn Research Center, directional solidification was employed along with a thermal gradient to promote uniform rods oriented with the thermal gradient. The preceding photomicrograph shows the typical transverse microstructure of a solidified Si-TiSi2 eutectic composition. The dark and light gray regions are Si and TiSi2, respectively. Preferred rod orientation along the thermal gradient was poor. The ordered TiSi2 rods have a narrow distribution in diameter of 2 to 3 m, as shown. The rod diameter showed a weak dependence on process conditions. Anisotropic etch behavior between different phases provides the opportunity to fabricate structures with high aspect ratios. The photomicrographs show the resulting microstructure after a wet chemical etch and a dry plasma etch. The wet chemical etches the silicon away, exposing the TiSi2 rods, whereas plasma etching preferentially etches the Si-TiSi2 interface to form a crater. The porous architectures are applicable to fabricating microdevices or creating templates for part fabrication. The porous rod structure can serve as a platform for fabricating microplasma devices for propulsion or microheat exchangers and for fabricating microfilters for miniatured chemical reactors. Although more work is required, self-assembly from DSE can have a role in microdevice fabrication.
Derived from text
*Directional Solidification (Crystals); Nanotechnology; Self Assembly; Fabrication*

**20050217198** NASA Glenn Research Center, Cleveland, OH, USA
**SiC/SiC Ceramic Matrix Composites Developed for High-Temperature Space Transportation Applications**
Kiser, J. Douglas; Bhatt, Ramakrishna, T.; Morscher, Gregory N.; Yun, Hee Mann; DiCarlo, James A.; Petko, Jeanne F.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Researchers at the NASA Glenn Research Center have been developing durable, high-temperature ceramic matrix composites (CMCs) with silicon carbide (SiC) matrices and SiC or carbon fibers for use in advanced reusable launch vehicle propulsion and airframe applications in the Next Generation Launch Technology (NGLT) Program. These CMCs weigh less and are more durable than competing metallic alloys, and they are tougher than silicon-based monolithic ceramics. Because of their high specific strength and durability at high temperatures, CMCs such as C/SiC (carbon- fiber-reinforced silicon carbide) and SiC/SiC (silicon-carbide-fiber-reinforced silicon carbide) may increase vehicle performance and safety significantly and reduce the cost of transporting payloads to orbit.
Derived from text
*Silicon Carbides; Ceramic Matrix Composites; High Temperature; Fiber Composites; Durability; Carbon Fibers*

## 25
## INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

**20050216524** Air Force Research Lab., Edwards AFB, CA USA
**Laser-Induced Fluorescence of Neutral Xenon in the Near Field of a 200 W hall Thruster**
Hargus, William A., Jr; Jul. 1, 2005; 11 pp.; In English
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A437037; No Copyright; Avail.: CASI: A03, Hardcopy

This work presents measurements of neutral xenon velocity in the plume of the Busek Company BHT-200-X3 200 W Hall thruster at a single 250 V anode potential operating condition. The xenon velocities were measured using laser induced fluorescence of the 6s'1/20/1 -6p'3/22 excited state transition at 834. 68 nm. Velocities were interrogated near the exit plane of the anode discharge and in the vicinity of the cathode. Both axial and radial velocities were measured simultaneously using phase sensitive detection. The exit plane axial velocity varies from 350-50 m/s near the outer acceleration channel radius to approximately 150 m/s at the inner radius. The radial velocity at the outer insulator is approximately zero, but increases to

approximately 100 m/s directed away from the protruding central magnetic pole at the inner insulator. This is consistent with the creation of neutrals at the inner radius by ions neutralized following a wall collision with the protruding central magnetic pole. Neutral velocities downstream of the exit plane also show a radial velocity away from the central magnetic pole. However, this behavior may be due to the influence of the cathode plume. Velocity measurements in the cathode plume show that xenon velocities reach in excess of 610 m/s. Since the cathode flow represents a substantial portion of the thruster flow and is only weakly ionized, the cathode plume may influence the neutral velocities nearer the anode. Evidence of interaction between the two flows takes the form of widened fluorescence line profiles which may indicate the collisional mixing disparate neutral streams or possibly several gas dynamic shocks.
DTIC
*Exhaust Gases; Hall Thrusters; Laser Induced Fluorescence; Near Fields; Plumes; Xenon*

**20050216538** Army Engineer Research and Development Center, Vicksburg, MS USA
**Phosphorous Saturation Characteristics in Relation to Land-Use Practice for Soils in the Upper Eau Galle River Watershed, Wisconsin**
James, William F.; Barko, John W.; Soballe, David M.; Aug. 1, 2005; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437081; ERDC-WQTN-PD-17; No Copyright; Avail.: CASI: A02, Hardcopy

The purpose of this demonstration was to determine relationships between phosphorus saturation characteristics and extractable phosphorus forms in soils from differing land-use practices in an agriculturally dominated watershed that drains into a U.S. Army Corps of Engineers impoundment. This information will be important for watershed modeling applications that use an index of soils to predict phosphorus loss during runoff. Table 1 Category Program.
DTIC
*Land Use; Phosphorus; Rivers; Soils; Watersheds*

**20050216539** Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
**HAPSITE(Trademark) Gas Chromatograph/Mass Spectrometer Variability Assessment**
Skinner, Michael A.; Jul. 27, 2005; 56 pp.; In English
Report No.(s): AD-A437085; CI04-1149; No Copyright; Avail.: CASI: A04, Hardcopy

GC-MS is a powerful technology and considered the 'gold standard' for identifying unknown chemicals because it can separate and identify chemicals individually. The GC-MS combination allows a user to identify and quantify volatile or some semi-volatile chemicals in a mixture. The Inficon(Tradename) portable GC-MS called HAPSITE(Tradename) uses the same theoretical principles as any other GC-MS. The HAPSITE(Tradename) is a unique version of a GC-MS because it is small and lightweight. Its dimensions are 18' x 17' x 7' and it weighs 35 lbs. It is designed to be worn as a backpack, making this GC-MS system the first 'man-portable' system. The carrier gas, which is traditionally a large compressed gas cylinder, is compressed nitrogen in a container about the size of a typical 12 oz. aerosol can. Advances in technology have reduced the size of the GC-MS components enabling the HAPSITE(Tradename) system to be taken directly to an incident involving unknown chemicals for near-real-time analysis. The HAPSITE(Tradename) draws samples directly from the air, which is different from laboratory GC-MS systems that typically rely on liquid injection. Direct air sampling avoids wet chemistry manipulations that are too difficult and time consuming to perform in a response situation. Results of this study give the operators in the field an understanding of the response variability between HAPSITE(Tradename) instruments against known chemical concentrations. Knowing instrument variability allows greater confidence in the chemical concentration estimates and more trustworthy risk assessments, enabling responders to make informed decisions during an incident. The goal of this research is to provide information on the variability that exists between HAPSITE(Tradename) instruments.
DTIC
*Gas Chromatography; Mass Spectrometers; Portable Equipment; Variability*

**20050217025** California Univ., Los Angeles, CA USA
**Aerogel and Porous Silicon MEMS for on-Chip Vacuum Packaging**
Wu, Ming C.; Dunn, Bruce; Kim, Chang-Jin; Aug. 31, 2004; 17 pp.; In English
Contract(s)/Grant(s): DAAH01-99-C-R220
Report No.(s): AD-A437105; No Copyright; Avail.: CASI: A03, Hardcopy

The goal of this project is to develop a versatile on-chip vacuum-package technology for surface-micromachined devices. The resulting on-chip encapsulation technology is expected to provide a low-cost, high performance packaging solution for a wide variety of surface micromachined devices, especially micro- and nano-resonators. Our approach is to cover the MEMS

structures with a nano-porous membrane before releasing. Release etching is performed by liquid- or gas-phase etching through the permeable membrane. Sealing is achieved by depositing a metal or dielectric film directly on the nano-porous shell in vacuum. Two types of nano-porous materials are developed: thin-film aerogels and porous polysilicon (PPS).
DTIC
*Aerogels; High Acceleration; Microelectromechanical Systems; Packaging; Porosity; Porous Materials; Porous Silicon; Silicon Polymers; Vacuum*

**20050217158** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Vapor Transport of ZnO in Closed Ampoules**
Palosz, Witold; [2005]; 1 pp.; In English
Contract(s)/Grant(s): NAS8-02096; No Copyright; Avail.: Other Sources; Abstract Only

Vapor transport of ZnO by PVT and CVT using carbon, carbon monoxide, and hydrogen as the transport agents was studied. Theoretical calculations of the mass flux were based on equilibrium thermodynamics and 1-D diffusional mass transport. Experimental results were found to be consistent with theoretical predictions. NO apparent kinetic limitations to sublimation were observed. Slow reaction of carbon with ZnO source was found.
Author
*Ampoules; Zinc Oxides; Vapors; Transport Theory*

## 26
## METALS AND METALLIC MATERIALS

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

**20050214867** NASA Glenn Research Center, Cleveland, OH, USA
**Alloy Interface Interdiffusion Modeled**
Bozzolo, Guillermo H.; Garces, Jorge E.; Abel, Phillip B.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

With renewed interest in developing nuclear-powered deep space probes, attention will return to improving the metallurgical processing of potential nuclear fuels so that they remain dimensionally stable over the years required for a successful mission. Previous work on fuel alloys at the NASA Glenn Research Center was primarily empirical, with virtually no continuing research. Even when empirical studies are exacting, they often fail to provide enough insight to guide future research efforts. In addition, from a fundamental theoretical standpoint, the actinide metals (which include materials used for nuclear fuels) pose a severe challenge to modern electronic-structure theory. Recent advances in quantum approximate atomistic modeling, coupled with first-principles derivation of needed input parameters, can help researchers develop new alloys for nuclear propulsion.
Derived from text
*Failure; Nuclear Fuels; Nuclear Propulsion; Space Probes; Alloys*

**20050214870** NASA Glenn Research Center, Cleveland, OH, USA
**Transition of PS300 Solid Lubricant Coating Technology to Field Aided by Demonstration on Key Substrate Alloys**
DellaCorte, Christopher; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

PS300 is a high-temperature solid lubricant coating originally developed to lubricate nickel-based superalloy shafts operating against foil air bearings in Oil-Free turbomachinery applications. PS300 is a plasma-spray-deposited coating developed at the NASA Glenn Research Center. It is available for non-exclusive licensing and has found applications in aerospace and industry. PS300 reduces friction and wear from below room temperature to over 650 C in both oxidizing and reducing environments. Early development centered on coating nickel-based shafts for use in turbomachinery. Potential industrial and aerospace customers, however, expressed interest in using the coating on a wide variety of substrates including steels, stainless steels, and nonferrous alloys like aluminum and titanium. To support this interest, a research program was carried out at Glenn in which nine different substrate candidate materials were evaluated for suitability with the PS300 coating. The materials were first coated with PS300 and then tested for coating strength and adhesion both before and after exposure to high-temperature air.
Derived from text
*Solid Lubricants; Coating; Technology Assessment; Substrates; Alloys; High Temperature Lubricants*

**20050215173** NASA Glenn Research Center, Cleveland, OH, USA

**Distribution of Inclusion-Initiated Fatigue Cracking in Powder Metallurgy Udimet 720 Characterized**

Bonacuse, Peter J.; Kantzos, Pete T.; Barrie, Robert; Telesman, Jack; Ghosn, Louis J.; Gabb, Timothy P.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

In the absence of extrinsic surface damage, the fatigue life of metals is often dictated by the distribution of intrinsic defects. In powder metallurgy (PM) alloys, relatively large defects occur rarely enough that a typical characterization with a limited number of small volume fatigue test specimens will not adequately sample inclusion-initiated damage. Counterintuitively, inclusion-initiated failure has a greater impact on the distribution in PM alloy fatigue lives because they tend to have fewer defects than their cast and wrought counterparts. Although the relative paucity of defects in PM alloys leads to higher mean fatigue lives, the distribution in observed lives tends to be broader. In order to study this important failure initiation mechanism without expending an inordinate number of specimens, a study was undertaken at the NASA Glenn Research Center where known populations of artificial inclusions (seeds) were introduced to production powder. Fatigue specimens were machined from forgings produced from the seeded powder. Considerable effort has been expended in characterizing the crack growth rate from inclusion-initiated cracks in seeded PM alloys. A rotating and translating positioning system, with associated software, was devised to map the surface inclusions in low-cycle fatigue (LCF) test bars and to monitor the crack growth from these inclusions. The preceding graph illustrates the measured extension in fatigue cracks from inclusions on a seeded LCF test bar subjected to cyclic loading at a strain range of 0.8 percent and a strain ratio (max/min) of zero. Notice that the observed inclusions fall into three categories: some do not propagate at all (arrest), some propagate with a decreasing crack growth rate, and a few propagate at increasing rates that can be modeled by fracture mechanics. The following graph shows the measured inclusion-initiated crack growth rates from 10 interrupted LCF tests plotted against stress intensities calculated for semi-elliptical cracks with the observed surface lengths. The expected scatter in the crack growth rates for stress intensity ranges near threshold is observed. These data will be used to help determine the distribution in growth rates of cracks emanating from inclusions as well as the proportion of cracks that arrest under various loading conditions. Author

*Powder Metallurgy; Crack Propagation; Cyclic Loads; Fatigue Tests; Fracture Mechanics; Metal Fatigue; Powder (Particles)*

**20050215288** Army Research Lab., Cleveland, OH, USA

**Gear Performance Improved by Coating**

Krantz, Timothy L.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Gears, bearings, and other mechanical elements transmit loads through contacting surfaces. Even if properly designed, manufactured, installed, and maintained, gears and bearings will eventually fail because of the fatigue of the working surfaces. Economical means for extending the fatigue lives of gears and bearings are highly desired, and coatings offer the opportunity to engineer surfaces to extend the fatigue lives of mechanical components. A tungsten-containing diamondlike-carbon coating exhibiting high hardness, low friction, and good toughness was evaluated for application to spur gears. Fatigue testing was done at the NASA Glenn Research Center on both uncoated and coated spur gears. The results showed that the coating extended the surface fatigue lives of the gears by a factor of about 5 relative to the uncoated gears. For the experiments, a lot of spur test gears made from AISI 9310 gear steel were case-carburized and ground to aerospace specifications. The geometries of the 28-tooth, 8-pitch gears were verified as meeting American Gear Manufacturing Association (AGMA) quality class 12. One-half of the gears were randomly selected for coating. The method of coating was selected to achieve desired adherence, toughness, hardness, and low-friction characteristics. First the gears to be coated were prepared by blasting (vapor honing) with Al2O3 particles and cleaning. Then, the gears were provided with a thin adhesion layer of elemental chromium followed by magnetron sputtering of the outer coating consisting of carbon (70 at.%), hydrogen (15 at.%), tungsten (12 at.%), and nickel (3 at.%) (atomic percent at the surface). In total, the coating thickness was about 2.5 to 3 microns. As compared with the steel substrate, the coated surface was harder by a factor of about 2 and had a smaller elastic modulus. All gears were tested using a 5-centistoke synthetic oil, a 10,000-rpm rotation speed, and a hertzian contact stress of at least 1.7 GPa (250 ksi). Tests were run until either surface fatigue occurred or 300 million stress cycles were completed. Tests were run using either a pair of uncoated gears or a pair of coated gears (coated gears mated with uncoated gears were not evaluated). The fatigue test results, shown on Weibull coordinates in the graph, demonstrate that the coating provided substantially longer fatigue lives even though some of the coated gears endured larger stresses. The increase in fatigue life was a factor of about 5 and the statistical confidence for the improvement is high (greater than 99 percent). Examination of the tested gears revealed substantial reductions of total wear for coated gears in comparison to uncoated gears. The coated gear surface topography changed with running, with localized areas of the tooth surface becoming smoother with running. Theories explaining how coatings can

extend gear fatigue lives are research topics for coating, tribology, and fatigue specialists. This work was done as a partnership between NASA, the U.S. Army Research Laboratory, United Technologies Research Corporation, and Sikorsky Aircraft.
Author
*Gears; Coatings; Fatigue Life; Aluminum Oxides; Carburizing; Carbon Isotopes; Hardness; Magnetron Sputtering*

**20050215293** NASA Langley Research Center, Hampton, VA, USA
**7075-T6 and 2024-T351 Aluminum Alloy Fatigue Crack Growth Rate Data**
Forth, Scott C.; Wright, Christopher W.; Johnston, William M., Jr.; August 2005; 24 pp.; In English
Contract(s)/Grant(s): WU 23-064-30-24
Report No.(s): NASA/TM-2005-213907; L-19163; No Copyright; Avail.: CASI: A03, Hardcopy

Experimental test procedures for the development of fatigue crack growth rate data has been standardized by the American Society for Testing and Materials. Over the past 30 years several gradual changes have been made to the standard without rigorous assessment of the affect these changes have on the precision or variability of the data generated. Therefore, the ASTM committee on fatigue crack growth has initiated an international round robin test program to assess the precision and variability of test results generated using the standard E647-00. Crack growth rate data presented in this report, in support of the ASTM roundrobin, shows excellent precision and repeatability.
Author
*Aluminum Alloys; Crack Propagation; Fatigue (Materials); Metal Fatigue*

**20050216512** Aerospace Corp., El Segundo, CA USA
**Image Analysis Study of the Porosity Characteristics of Nickel Sinter**
Zimmerman, Albert H.; To, G. A.; Apr. 15, 2005; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8802-04-C-0001
Report No.(s): AD-A436994; TR-2005(8555)-3; SMC-TR-05-16; No Copyright; Avail.: CASI: A03, Hardcopy

A new image-analysis technique is described for measuring the distributions of irregularly shaped pores through the structure of porous electrodes. This technique has been used to measure the porosity characteristics of sintered nickel plaque made by a range of manufacturing processes for use in the nickel electrodes in nickel-hydrogen cells. These characteristics include variations in porosity and pore size through the thickness of the sinter, as well as the uniformity of the sinter. Sinter made using an aqueous slurry process is found to provide the uniformity typically found in dry-powder sinter processes, with the smaller pore sizes typically associated with the alcohol-based slurry sinter process.
DTIC
*Image Analysis; Nickel; Porosity; Sintering*

**20050217023** NASA Glenn Research Center, Cleveland, OH, USA
**New Deep Reactive Ion Etching Process Developed for the Microfabrication of Silicon Carbide**
Evans, Laura J.; Beheim, Glenn M.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Silicon carbide (SiC) is a promising material for harsh environment sensors and electronics because it can enable such devices to withstand high temperatures and corrosive environments. Microfabrication techniques have been studied extensively in an effort to obtain the same flexibility of machining SiC that is possible for the fabrication of silicon devices. Bulk micromachining using deep reactive ion etching (DRIE) is attractive because it allows the fabrication of microstructures with high aspect ratios (etch depth divided by lateral feature size) in single-crystal or polycrystalline wafers. Previously, the Sensors and Electronics Branch of the NASA Glenn Research Center developed a DRIE process for SiC using the etchant gases sulfur hexafluoride (SF6) and argon (Ar). This process provides an adequate etch rate of 0.2 m/min and yields a smooth surface at the etch bottom. However, the etch sidewalls are rougher than desired, as shown in the preceding photomicrograph. Furthermore, the resulting structures have sides that slope inwards, rather than being precisely vertical. A new DRIE process for SiC was developed at Glenn that produces smooth, vertical sidewalls, while maintaining an adequately high etch rate.
Derived from text
*Silicon Carbides; Ions; Etching; Photomicrographs; High Aspect Ratio; Flexibility*

**20050217067** Maryland Univ., College Park, MD USA
**SOF Tactical Repeater**
Anderson, Michael L.; Perlis, Donald R.; Jan. 1, 2004; 21 pp.; In English
Report No.(s): AD-A437019; No Copyright; Avail.: CASI: A03, Hardcopy

This essay describes a general approach to building perturbation-tolerant autonomous systems, based on the conviction that artificial agents should be able to notice when something is amiss, assess the anomaly, and guide a solution into place. This basic strategy of self-guided learning is termed the metacognitive loop; it involves the system monitoring, reasoning about, and, when necessary, altering its own decision-making components. This paper (a) argues that equipping agents with a metacognitive loop can help to overcome the brittleness problem, (b) details the metacognitive loop and its relation to our ongoing work on time-sensitive commonsense reasoning, (c) describes specific, implemented systems whose perturbation tolerance was improved by adding a metacognitive loop, and (d) outlines both short-term and long-term research agendas. DTIC

*Brittleness; Perturbation; Anomalies*

**20050217171** NASA Glenn Research Center, Cleveland, OH, USA

**Effects of High-Temperature Exposures on the Fatigue Life of Disk Superalloys Examined**

Gabb, Timothy P.; Telesman, Jack; Kantzos, Pete T.; Smith, James W.; Research and Technology 2004; June 2005; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Tests used to characterize the low-cycle-fatigue resistance of disk superalloys are usually performed at cyclic frequencies of 0.33 Hz or faster. However, service conditions for disks in some aerospace and land-based gas turbine engines can produce major cycle periods extending from minutes to hours and days. Over a service life, this can produce total service times near the maximum temperature that exceed 100 hr for aerospace applications and 100,000 hr for land-based applications. Such time-dependent effects of realistic mission cycles on fatigue resistance can be significant in superalloy disks, and need to be considered for accurate disk life prediction. The purpose of this study at the NASA Glenn Research Center was to examine the effects of extended exposures and extended cycle periods on the fatigue resistance of two disk superalloys. Current alloy Udimet 720 (Special Metals Corporation, Huntington, WV) disk material was provided by Solar Turbines/Caterpillar Co., and advanced alloy ME3 was provided by the NASA Ultra-Efficient Engine Technologies (UEET) Project, in powder-metallurgy-processed, supersolvus heat-treated form. Fatigue specimens were fully machined and exposed in air at temperatures of 650 to 704 C for extended times. Then, they were tested using conventional fatigue tests with a total strain range of 0.70 percent and a minimum-to-maximum strain ratio of zero to determine the effects of prior exposure on fatigue resistance. Subsequent tests with extended dwells at minimum strain in each fatigue cycle were performed to determine cyclic exposure effects. Author

*Exposure; High Temperature; Fatigue Tests; Udimet Alloys; Service Life; Fatigue Life*

**20050217175** NASA Glenn Research Center, Cleveland, OH, USA

**Potential High-Temperature Shape-Memory-Alloy Actuator Material Identified**

Noebe, Ronald D.; Gaydosh, Darrell J.; Biles, Tiffany A.; Garg, Anita; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Shape-memory alloys are unique ‘smart materials’ that can be used in a wide variety of adaptive or ‘intelligent’ components. Because of a martensitic solid-state phase transformation in these materials, they can display rather unusual mechanical properties including shape-memory behavior. This phenomenon occurs when the material is deformed at low temperatures (below the martensite finish temperature, Mf) and then heated through the martensite-to-austenite phase transformation. As the material is heated to the austenite finish temperature Af, it is able to recover its predeformed shape. If a bias is applied to the material as it tries to recover its original shape, work can be extracted from the shape-memory alloy as it transforms. Therefore, shape-memory alloys are being considered for compact solid-state actuation devices to replace hydraulic, pneumatic, or motor-driven systems.

Derived from text

*Actuators; Deformation; Heat Resistant Alloys; Shape Memory Alloys*

**20050217179** NASA Glenn Research Center, Cleveland, OH, USA, Rhenium Alloys, Inc., USA

**Processing of Ni30Pt20Ti50 High-Temperature Shape-Memory Alloy Into Thin Rod Demonstrated**

Noebe, Ronald D.; Draper, Susan L.; Biles, Tiffany A.; Leonhardt, Todd; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

High-temperature shape-memory alloys (HTSMAs) based on nickel-titanium (NiTi) with significant ternary additions of palladium (Pd), platinum (Pt), gold (Au), or hafnium (Hf) have been identified as potential high-temperature actuator materials for use up to 500 C. These materials provide an enabling technology for the development of ‘smart structures’ used to control the noise, emissions, or efficiency of gas turbine engines. The demand for these high-temperature versions of conventional

shape-memory alloys also has been growing in the automotive, process control, and energy industries. However these materials, including the NiPtTi alloys being developed at the NASA Glenn Research Center, will never find widespread acceptance unless they can be readily processed into useable forms.
Derived from text
*Shape Memory Alloys; Titanium Alloys; Nickel Alloys; Platinum*

**20050217182** NASA Glenn Research Center, Cleveland, OH, USA
**Candidate Materials Evaluated for a High-Temperature Stirling Convertor Heater Head**
Bowman, Randy R.; Ritzert, Frank J.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Department of Energy and NASA have identified Stirling Radioisotope Generators (SRGs) as a candidate power system for use on long-duration, deep-space science missions and Mars rovers. One of the developments planned for an upgraded version of the current SRG design is to achieve higher efficiency by increasing the overall operating temperature of the system. Currently, the SRG operates with a heater head temperature of 650 C and is fabricated from the nickel-base superalloy 718. The current operating temperature is at the limit of alloy 718 s capability, and any planned increase in temperature will be contingent on identifying a more capable material from which to fabricate the heater head. To this end, personnel at the NASA Glenn Research Center are evaluating advanced materials for a high-temperature heater head to allow a higher convertor temperature ratio and, thus, increase the system efficiency. A generic list of properties that were used to screen the candidate materials follows: (1) creep, (2) fabricability, (3) helium gas containment, (4) long-term stability and compatibility, (5) ability to form a hermetical closeout seal, and (6) ductility and toughness.
Derived from text
*Creep Properties; Heat Resistant Alloys; High Temperature; Stirling Cycle; Nickel Alloys; Nickel*

**20050217183** NASA Glenn Research Center, Cleveland, OH, USA
**Full-Scale GRCop-84 Combustion Chamber Liner Preform Fabricated Successfully**
Ellis, David L.; Russell, Carolyn K.; Goudy, Rick; Research and Technology 2004; June 2005; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

GRCop-84 (Cu-8 at.% Cr-4 at.% Nb) has been under development at the NASA Glenn Research Center for several years. The alloy possesses a unique combination of good thermal conductivity, high elevated temperature strength, long creep life, and long low-cycle- fatigue. The alloy is also more oxidation resistant than pure copper and most competitive alloys. The combination of properties has attracted attention from major rocket engine manufacturers who are interested in the alloy for the combustion chamber liner in their next generation of regeneratively cooled engines. Before GRCop-84 can be used in a main combustion chamber application, it must be demonstrated that the alloy can be made successfully to the large sizes and proper shape needed and that it retain useful properties. Recent efforts have successfully demonstrated the ability to fabricate a liner preform via metal spinning that retains the alloy s strength even in the welded sections.
Derived from text
*Combustion Chambers; Copper; Creep Properties; Life (Durability); Metal Spinning; Thermal Conductivity*

**20050217185** NASA Glenn Research Center, Cleveland, OH, USA
**Quick Access Rocket Exhaust Rig Testing of Coated GRCop-84 Sheets Used to Aid Coating Selection for Reusable Launch Vehicles**
Raj, Sai V.; Robinson, Raymond C.; Ghosn, Louis J.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The design of the next generation of reusable launch vehicles calls for using GRCop-84 copper alloy liners based on a composition1 invented at the NASA Glenn Research Center: Cu-8(at.%)Cr-4%Nb. Many of the properties of this alloy have been shown to be far superior to those of other conventional copper alloys, such as NARloy-Z. Despite this considerable advantage, it is expected that GRCop-84 will suffer from some type of environmental degradation depending on the type of rocket fuel utilized. In a liquid hydrogen (LH2), liquid oxygen (LO2) booster engine, copper alloys undergo repeated cycles of oxidation of the copper matrix and subsequent reduction of the copper oxide, a process termed ‘blanching’. Blanching results in increased surface roughness and poor heat-transfer capabilities, local hot spots, decreased engine performance, and premature failure of the liner material. This environmental degradation coupled with the effects of thermomechanical stresses,

creep, and high thermal gradients can distort the cooling channel severely, ultimately leading to its failure.
Derived from text
*Rocket Exhaust; Performance Tests; Coating; Copper Alloys*

**20050217192** NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA
**Very Tough, Erosion-Resistant Turbine Airfoil Thermal Barrier Coatings Developed**
Zhu, Dong-Ming; Miller, Robert A.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Ceramic thermal barrier coatings (TBCs) are receiving increased attention for advanced gas turbine engine applications. These coatings are considered to be technologically important because of their ability to further increase engine operating temperatures and reduce cooling requirements, thus achieving higher engine efficiency, lower emissions, and increased performance goals. To take full advantage of the capabilities of these coatings, researchers need to use an aggressive design approach whenever possible--one that allows greater temperature reductions through the coating systems and less cooling air to the components. Advanced TBCs that have significantly lower thermal conductivity and better thermal stability than current coatings have been developed for future ultra-efficient, low-emission engine systems. Multicomponent-doped, defect-clustered TBCs have been shown to offer the low conductivity and high stability required for future high-temperature engine applications.
Derived from text
*Erosion; Resistance; Turbines; Airfoils; Thermal Control Coatings; Ceramic Coatings*

**20050217193** NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA
**Low-Thermal-Conductivity Pyrochlore Oxide Materials Developed for Advanced Thermal Barrier Coatings**
Bansal, Narottam P.; Zhu, Dong-Ming; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

When turbine engines operate at higher temperatures, they consume less fuel, have higher efficiencies, and have lower emissions. The upper-use temperatures of the base materials (superalloys, silicon-based ceramics, etc.) used for the hot-section components of turbine engines are limited by the physical, mechanical, and corrosion characteristics of these materials. Thermal barrier coatings (TBCs) are applied as thin layers on the surfaces of these materials to further increase the operating temperatures. The current state-of-the-art TBC material in commercial use is partially yttria-stabilized zirconia (YSZ), which is applied on engine components by plasma spraying or by electron-beam physical vapor deposition. At temperatures higher than 1000 C, YSZ layers are prone to sintering, which increases thermal conductivity and makes them less effective. The sintered and densified coatings can also reduce thermal stress and strain tolerance, which can reduce the coating s durability significantly. Alternate TBC materials with lower thermal conductivity and better sintering resistance are needed to further increase the operating temperature of turbine engines.
Derived from text
*Low Conductivity; Thermal Conductivity; Oxides; Yttria-Stabilized Zirconia; Thermal Control Coatings; Stress-Strain Relationships; Heat Resistant Alloys*

**20050217197** NASA Glenn Research Center, Cleveland, OH, USA, QSS Group, Inc., USA
**Permeability of Candidate Stirling Heater Head Materials Measured**
Freedman, Marc R.; Singh, Mrityunjay; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Researchers at the NASA Glenn Research Center are evaluating high-temperature materials for Stirling heater heads for second- and third-generation Stirling radioisotope power systems that would help to increase the system efficiency to 30 to 35 percent and the system specific power to 8 to 10+ W/kg. Ceramic materials could make it possible for the convertor hot-end temperature to be increased to 1050 to 1200 C, in comparison to the current 650 C with an Inconel 718 heater head. A hermetically sealed Stirling heater head must retain a constant internal pressure of nearly 400-psi helium (He) throughout its useful life (120,000 hr) at the design operating temperature. Therefore, He permeability was measured for eight potential materials and compared with the permeability of the current heater head material, Inconel 718. The eight materials included silicon nitride (Si3N4), silicon dioxide (SiO2), both sintered and chemical vapor deposited (CVD) silicon carbide (SiC), alumina (Al2O3), two types of melt-infiltrated (MI) SiC/SiC composites, and a carbon/SiC composite (C/SiC). Glenn submitted samples of each material to Porous Materials, Inc., Ithaca, New York, for permeability analysis. At room temperature and 30-psi He, four materials--Si3N4, Al2O3, SiO2, and sintered SiC--demonstrated lower permeability than

Inconel 718. The CVD SiC and all the composite materials were significantly more permeable to He than the baseline material. Derived from text

*Stirling Cycle; Heaters; Ceramics; Porous Materials; Silicon Nitrides; Silicon Dioxide*

## 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*.

**20050214868** NASA Glenn Research Center, Cleveland, OH, USA

**Industry Needs Fulfilled by Patented NASA PS300 Solid Lubricant Technology**

DellaCorte, Christopher; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

In 1999, the NASA Glenn Research Center was awarded a patent (#5866518) for a new high-temperature solid lubricant coating material, PS300. A combination of wear-resistant metals and ceramics with solid lubricant additives, PS300 reduces friction and wear in sliding contacts from below ambient to over 650 C. This lubricant is an outgrowth of over three decades of high-temperature tribological research and was specifically developed as a shaft lubricant to protect foil air bearings used in Oil-Free turbomachinery, like gas turbines. Foil bearings are lubricated by air at high speeds but experience sliding and wear during initial startup and shut down when a lubricating film of air has not yet developed. PS300 shaft coatings have successfully lubricated foil bearings for over 100 000 cycles without wearing out.

Derived from text

*Solid Lubricants; Wear Resistance; High Temperature Lubricants*

**20050215011** NASA Glenn Research Center, Cleveland, OH, USA

**Commercialization of NASA PS304 Solid Lubricant Coating Enhanced by Fundamental Powder Flow Research**

Stanford, Malcolm K.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center has developed a patented high-temperature solid lubricant coating, designated PS304, for reducing friction and wear in bearing systems. The material used to produce the coating is initially a blend of metallic and ceramic powders that are deposited on the bearing surface by the plasma spray process. PS304 was developed to lubricate foil air bearings in Oil-Free turbomachinery, where the moving surfaces are coated with a hydrodynamic air film except at the beginning and end of an operation cycle when the air film is not present. The coating has been successful in several applications including turbochargers, land-based turbines, and industrial drying furnace conveyor components, with current development activities directed at implementation in Oil-Free aeropropulsion engines.

Derived from text

*Aircraft Engines; Coating; Friction Reduction; Gas Bearings; High Temperature Lubricants*

**20050215013** NASA Glenn Research Center, Cleveland, OH, USA

**NASA PS304 Lubricant Tested in World's First Commercial Oil-Free Gas Turbine**

Weaver, Harold F.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

In a marriage of research and commercial technology, a 30-kW Oil-Free Capstone microturbine electrical generator unit has been installed and is serving as a test bed for long-term life-cycle testing of NASA-developed PS304 shaft coatings. The coatings are used to reduce friction and wear of the turbine engine s foil air bearings during startup and shut down when sliding occurs, prior to the formation of a lubricating air film. This testing supports NASA Glenn Research Center s effort to develop Oil-Free gas turbine aircraft propulsion systems, which will employ advanced foil air bearings and NASA s PS304 high temperature solid lubricant to replace the ball bearings and lubricating oil found in conventional engines. Glenn s Oil-Free Turbomachinery team s current project is the demonstration of an Oil-Free business jet engine. In anticipation of future flight certification of Oil-Free aircraft engines, long-term endurance and durability tests are being conducted in a relevant gas turbine environment using the Capstone microturbine engine. By operating the engine now, valuable performance data for PS304 shaft coatings and for industry s foil air bearings are being accumulated.

Derived from text

*Foil Bearings; Friction Reduction; High Temperature Lubricants; Lubricating Oils; Solid Lubricants; Test Stands*

**20050215125** NASA Glenn Research Center, Cleveland, OH, USA

**Polynomial Expressions for Estimating Elastic Constants From the Resonance of Circular Plates**

Salem, Jonathan A.; Singh, Abhishek; August 2005; 22 pp.; In English

Contract(s)/Grant(s): WBS 22-066-30-03

Report No.(s): NASA/TM-2005-213843; E-15217; No Copyright; Avail.: CASI: A03, Hardcopy

Two approaches were taken to make convenient spread sheet calculations of elastic constants from resonance data and the tables in ASTM C1259 and E1876: polynomials were fit to the tables; and an automated spread sheet interpolation routine was generated. To compare the approaches, the resonant frequencies of circular plates made of glass, hardened maraging steel, alpha silicon carbide, silicon nitride, tungsten carbide, tape cast NiO-YSZ, and zinc selenide were measured. The elastic constants, as calculated via the polynomials and linear interpolation of the tabular data in ASTM C1259 and E1876, were found comparable for engineering purposes, with the differences typically being less than 0.5 percent. Calculation of additional v values at t/R between 0 and 0.2 would allow better curve fits. This is not necessary for common engineering purposes, however, it might benefit the testing of emerging thin structures such as fuel cell electrolytes, gas conversion membranes, and coatings when Poisson s ratio is less than 0.15 and high precision is needed.

Author

*Elastic Properties; Modulus of Elasticity; Resonant Frequencies; Poisson Ratio; Yttria-Stabilized Zirconia; Zinc Selenides; Tungsten Carbides; Circular Plates*

**20050215250** NASA Glenn Research Center, Cleveland, OH, USA

**Integrity of Ceramic Parts Predicted When Loads and Temperatures Fluctuate Over Time**

Nemeth, Noel N.; Research and Technology 2003; May 2004; 5 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Brittle materials are being used, and being considered for use, for a wide variety of high performance applications that operate in harsh environments, including static and rotating turbine parts for unmanned aerial vehicles, auxiliary power units, and distributed power generation. Other applications include thermal protection systems, dental prosthetics, fuel cells, oxygen transport membranes, radomes, and microelectromechanical systems (MEMS). In order for these high-technology ceramics to be used successfully for structural applications that push the envelope of materials capabilities, design engineers must consider that brittle materials are designed and analyzed differently than metallic materials. Unlike ductile metals, brittle materials display a stochastic strength response because of the combination of low fracture toughness and the random nature of the size, orientation, and distribution of inherent microscopic flaws. This plus the fact that the strength of a component under load may degrade over time because of slow crack growth means that a probabilistic-based life-prediction methodology must be used when the tradeoffs of failure probability, performance, and useful life are being optimized. The CARES/Life code (which was developed at the NASA Glenn Research Center) predicts the probability of ceramic components failing from spontaneous catastrophic rupture when these components are subjected to multiaxial loading and slow crack growth conditions. Enhancements to CARES/Life now allow for the component survival probability to be calculated when loading and temperature vary over time.

Derived from text

*Ceramics; Thermal Protection; Brittle Materials; Crack Propagation; Mechanical Properties*

**20050215336** Auburn Univ., AL, USA

**Fiber Reinforced Composite Materials Used for Tankage**

Cunningham, Christy; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. IX-1 - IX-6; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

The Nonmetallic Materials and Processes Group is presently working on several projects to optimize cost while providing effect materials for the space program. One factor that must be considered is that these materials must meet certain weight requirements. Composites contribute greatly to this effort. Through the use of composites the cost of launching payloads into orbit will be reduced to one-tenth of the current cost. This research project involved composites used for aluminum pressure vessels. These tanks are used to store cryogenic liquids during flight. The tanks need some type of reinforcement. Steel was considered, but added too much weight. As a result, fiber was chosen. Presently, only carbon fibers with epoxy resin are wrapped around the vessels as a primary source of reinforcement. Carbon fibers are lightweight, yet high strength. The carbon fibers are wet wound onto the pressure vessels. This was done using the ENTEC Filament Winding Machine. It was thought that an additional layer of fiber would aid in reinforcement as well as containment and impact reduction. Kevlar was selected because it is light weight, but five times stronger that steel. This is the same fiber that is used to make bullet-proof vests trampolines, and tennis rackets.

Derived from text

*Composite Materials; Cryogenics; Fiber Composites; High Strength; Tanks (Containers)*

**20050215491** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Microwave and Millimeter Wave Imaging of the Space Shuttle External Fuel Tank Spray on Foam Insulation (SOFI) Using Synthetic Aperture Focusing Techniques (SAFT)**

Case, J. T.; Robbins, J.; Kharkovshy, S.; Hepburn, F. L.; Zoughi, R.; [2005]; 1 pp.; In English; 32nd Annual Review in Quantiative Nondestructive Evaluation (QNDE) Conference, 31 Jul. - 5 Aug. 2005, Brunswick, ME, USA

Contract(s)/Grant(s): NNM04AA15A; Copyright; Avail.: Other Sources; Abstract Only

The Space Shuttle Columbia's catastrophic failure is thought to have been caused by a dislodged piece of external tank SOFI (Spray On Foam Insulation) striking the left wing of the orbiter causing significant damage to some of the reinforced carbodcarbon leading edge wing panels. Microwave and millimeter wave nondestructive evaluation methods, have shown great potential for inspecting the SOFI for the purpose of detecting anomalies such as small voids that may cause separation of the foam from the external tank during the launch. These methods are capable of producing relatively high-resolution images of the interior of SOH particularly when advanced imaging algorithms are incorporated into the overall system. To this end, synthetic aperture focusing techniques are being deveioped for this purpose. These iechniqiies pradiice high-resolution images that are independent of the distance of the imaging probe to the SOFI with spatial resolution in the order of the half size of imaging probe aperture. At microwave and millimeter wave frequencies these apertures are inherently small resulting in high-resolution images. This paper provides the results of this investigation using 2D and 3D SAF based methods and holography. The attributes of these methods and a full discussion of the results will also be provided.

Author

*External Tanks; Foams; Microwave Imagery; Millimeter Waves; Space Shuttles; Sprayers; Synthetic Apertures; Thermal Insulation*

**20050217029** NASA Glenn Research Center, Cleveland, OH, USA

**Ultrasonic Guided-Wave-Scan System Used to Characterize C-Enhanced Silicon Carbide Composite During Creep-Rupture Tests**

Roth, Don J.; Cosgriff, Laura M.; Martin, Richard E.; Verrilli, Michael J.; Research and Technology; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Ceramic matrix composites (CMCs) are being developed for advanced aerospace propulsion applications in order to save weight, improve reuse capability, and increase performance. However, mechanical and environmental loads applied to CMCs can cause degradation in the form of discrete flaws and distributed microdamage that can play a significant role in reducing desirable physical properties. Categories of microdamage include fiber/matrix debonding (interface failure), matrix microcracking, fiber fracture and buckling, oxidation, and second-phase formation. Distributed microdamage in CMCs has proven difficult to characterize nondestructively because of the complex microstructure and macrostructure of these materials, and a recent study regarding the durability of a ceramic matrix composite discussed the requirement for improved nondestructive evaluation (NDE) methods for monitoring degradation in these materials.

Derived from text

*Nondestructive Tests; Microstructure; Microcracks; Ceramic Matrix Composites; Silicon Carbides; Defects; Creep Tests*

**20050217160** NASA Glenn Research Center, Cleveland, OH, USA, Michigan State Univ., MI, USA

**Properties of PMR Polyimides Improved by Preparation of Polyhedral Oligomeric Silsesquioxane (POSS) Nanocomposites**

Campbell, Sandi G.; Lee, Andre; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The field of hybrid organic-inorganic materials has grown drastically over the last several years. This interest stems from our ever-increasing ability to custom-build and control molecular structure at several length scales. This ability to control both the composition and structure of hybrid materials is sometimes broadly referred to as nanocomposite systems. One class of hybrid (organic-inorganic) nanostructured material is polyhedral oligomeric silsesquioxane (POSS), shown in the preceding diagram. The hybrid composition gives POSS materials dramatically enhanced properties relative to traditional hydrocarbons and inorganics. An important benefit of this technology is that it makes possible the formulations of nanostructured chemicals with excellent thermal and oxidative stability. This is largely due to the inorganic component.

Derived from text

*Composition (Property); Hydrocarbons; Molecular Structure; Nanocomposites*

**20050217165** NASA Glenn Research Center, Cleveland, OH, USA

**Mechanical and Electrical Properties of a Polyimide Film Significantly Enhanced by the Addition of Single-Wall Carbon Nanotubes**

Meador, Michael A.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Single-wall carbon nanotubes have been shown to possess a combination of outstanding mechanical, electrical, and thermal properties. The use of carbon nanotubes as an additive to improve the mechanical properties of polymers and/or enhance their thermal and electrical conductivity has been a topic of intense interest. Nanotube-modified polymeric materials could find a variety of applications in NASA missions including large-area antennas, solar arrays, and solar sails; radiation shielding materials for vehicles, habitats, and extravehicular activity suits; and multifunctional materials for vehicle structures and habitats. Use of these revolutionary materials could reduce vehicle weight significantly and improve vehicle performance and capabilities.

Derived from text

*Electrical Properties; Mechanical Properties; Polyimides; Thermal Conductivity; Thermodynamic Properties*

**20050217167** NASA Glenn Research Center, Cleveland, OH, USA

**High-Temperature Polymer Composites Tested for Hypersonic Rocket Combustor Backup Structure**

Sutter, James K.; Shin, E. Eugene; Thesken, John C.; Fink, Jeffrey E.; Research and Technology 2004; June 2005; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Significant component weight reductions are required to achieve the aggressive thrust-toweight goals for the Rocket Based Combined Cycle (RBCC) third-generation, reusable liquid propellant rocket engine, which is one possible engine for a future single-stage-toorbit vehicle. A collaboration between the NASA Glenn Research Center and Boeing Rocketdyne was formed under the Higher Operating Temperature Propulsion Components (HOTPC) program and, currently, the Ultra-Efficient Engine Technology (UEET) Project to develop carbon-fiber-reinforced high-temperature polymer matrix composites (HTPMCs). This program focused primarily on the combustor backup structure to replace all metallic support components with a much lighter polymer-matrixcomposite- (PMC-) titanium honeycomb sandwich structure.

Derived from text

*High Temperature; Polymer Matrix Composites; Spacecraft Propulsion; Fiber Composites*

**20050217168** NASA Glenn Research Center, Cleveland, OH, USA

**Mechanically Strong, Lightweight Porous Materials Developed (X-Aerogels)**

Leventis, Nicholas; Research and Technology 2004; June 2005; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Aerogels are attractive materials for a variety of NASA missions because they are ultralightweight, have low thermal conductivity and low-dielectric constants, and can be readily doped with other materials. Potential NASA applications for these materials include lightweight insulation for spacecraft, habitats, and extravehicular activity (EVA) suits; catalyst supports for fuel cell and in situ resource utilization; and sensors for air- and water-quality monitoring for vehicles, habitats, and EVA suits. Conventional aerogels are extremely fragile and require processing via supercritical fluid extraction, which adds cost to the production of an aerogel and limits the sizes and geometries of samples that can be produced from these materials. These issues have severely hampered the application of aerogels in NASA missions.

Derived from text

*Aerogels; Low Conductivity; Porous Materials; Thermal Conductivity*

**20050217194** NASA Glenn Research Center, Cleveland, OH, USA

**Strong, Tough Glass Composites Developed for Solid Oxide Fuel Cell Seals**

Bansal, Narottam P.; Choi, Sung R.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A fuel cell is an electrochemical device that continuously converts the chemical energy of a fuel directly into electrical energy. It consists of an electrolyte, an anode, and a cathode. Various types of fuel cells are available, such as direct methanol fuel cells, alkaline fuel cells, proton-exchange-membrane fuel cells, phosphoric acid fuel cells, molten carbonate fuel cells, and solid oxide fuel cells (SOFCs). The salient features of an SOFC are all solid construction and high-temperature electrochemical-reaction-based operation, resulting in clean, efficient power generation from a variety of fuels. SOFCs are

being developed for a broad range of applications, such as portable electronic devices, automobiles, power generation, and aeronautics.
Derived from text
*Glass; Chemical Energy; Electrolytes; Composite Materials*

## 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*.

**20050215012** NASA Glenn Research Center, Cleveland, OH, USA
**Field Effects of Buoyancy on a Premixed Turbulent Flame Studied by Particle Image Velocimetry**
Cheng, Robert K.; Research and Technology 2002; March 2003; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Typical laboratory flames for the scientific investigation of flame/turbulence interactions are prone to buoyancy effects. Buoyancy acts on these open flame systems and provides upstream feedbacks that control the global flame properties as well as local turbulence/flame interactions. Consequently the flame structures, stabilization limits, and turbulent reaction rates are directly or indirectly coupled with buoyancy. The objective of this study is to characterize the differences between premixed turbulent flames pointing upwards (1g), pointing downwards (-1g), and in microgravity (mg). The configuration is an inverted conical flame stabilized by a small cone-shaped bluff body that we call CLEAN Flames (Cone-Stabilized Lean Flames). We use two laser diagnostics to capture the velocity and scalar fields. Particle image velocimetry (PIV) measures the mean and root mean square velocities and planar imaging by the flame fronts method outlines the flame wrinkle topology. The results were obtained under typical conditions of small domestic heating systems such as water heaters, ovens, and furnaces. Significant differences between the 1g and -1g flames point to the need for including buoyancy contributions in theoretical and numerical calculations. In Earth gravity, there is a complex coupling of buoyancy with the turbulent flow and heat release in the flame. An investigation of buoyancy-free flames in microgravity will provide the key to discern gravity contributions. Data obtained in microgravity flames will provide the benchmark for interpreting and analyzing 1g and -1g flame results.
Derived from text
*Buoyancy; Chemical Reactions; Flame Propagation; Heat Transfer; Premixed Flames; Turbulent Flames*

**20050215016** National Center for Microgravity Research on Fluids and Combustion, Cleveland, OH, USA
**Interaction Between Flames and Electric Fields Studied**
Yuan, Zeng-Guang; Hegde, Uday; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The interaction between flames and electric fields has long been an interesting research subject that has theoretical importance as well as practical significance. Many of the reactions in a flame follow an ionic pathway: that is, positive and negative ions are formed during the intermediate steps of the reaction. When an external electric field is applied, the ions move according to the electric force (the Coulomb force) exerted on them. The motion of the ions modifies the chemistry because the reacting species are altered, it changes the velocity field of the flame, and it alters the electric field distribution. As a result, the flame will change its shape and location to meet all thermal, chemical, and electrical constraints. In normal gravity, the strong buoyant effect often makes the flame multidimensional and, thus, hinders the detailed study of the problem.
Derived from text
*Buoyancy; Electric Fields; Flames; Gravitation*

**20050215104** NASA Glenn Research Center, Cleveland, OH, USA
**Hydrogen Fuel Capability Added to Combustor Flametube Rig**
Frankenfield, Bruce J.; Research and Technology 2002; March 2003; 1 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Facility capabilities have been expanded at Test Cell 23, Research Combustor Lab (RCL23) at the NASA Glenn Research Center, with a new gaseous hydrogen fuel system. The purpose of this facility is to test a variety of fuel nozzle and flameholder hardware configurations for use in aircraft combustors. Previously, this facility only had jet fuel available to perform these various combustor flametube tests. The new hydrogen fuel system will support the testing and development of aircraft

combustors with zero carbon dioxide (CO2) emissions. Research information generated from this test rig includes combustor emissions and performance data via gas sampling probes and emissions measuring equipment. The new gaseous hydrogen system is being supplied from a 70 000-standard-ft3 tube trailer at flow rates up to 0.05 lb/s (maximum). The hydrogen supply pressure is regulated, and the flow is controlled with a -in. remotely operated globe valve. Both a calibrated subsonic venturi and a coriolis mass flowmeter are used to measure flow. Safety concerns required the placement of all hydrogen connections within purge boxes, each of which contains a small nitrogen flow that is vented past a hydrogen detector. If any hydrogen leaks occur, the hydrogen detectors alert the operators and automatically safe the facility. Facility upgrades and modifications were also performed on other fluids systems, including the nitrogen gas, cooling water, and air systems. RCL23 can provide nonvitiated heated air to the research combustor, up to 350 psig at 1200 F and 3.0 lb/s. Significant modernization of the facility control systems and the data acquisition systems was completed. A flexible control architecture was installed that allows quick changes of research configurations. The labor-intensive hardware interface has been removed and changed to a software-based system. In addition, the operation of this facility has been greatly enhanced with new software programming and graphic operator interface stations. Glenn s RCL23 facility systems were successfully checked out in the spring of 2002, and hydrogen combustor research testing began in the summer of 2002.
Author
*Hydrogen Fuels; Combustion Chambers; Flame Holders; Pipes (Tubes); Research Facilities*

**20050215554** NASA Marshall Space Flight Center, Huntsville, AL, USA
**'Powdered Magnesium: Carbon Dioxide Combustion for Mars Propulsion'**
Foote, John P.; Litchford, Ron J.; [2005]; 1 pp.; In English; 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA; Copyright; Avail.: Other Sources; Abstract Only

Powdered magnesium - carbon dioxide combustion is examined as a potential in-situ propellant combination for Mars propulsion. Although this particular combination has relatively low performance in comparison to traditional bi-propellants, it remains attractive as a potential basis for future Martian mobility systems since it could be partially or wholly manufactured from indigenous planetary resources. As a means of achieving high mobility during long-duration Mars exploration missions, the poorer performing in-situ combination can, in fact, become a superior alternative to conventional storable propellants, which would need to be entirely transported from earth. Thus, the engineering aspects of powdered metal combustion devices are discussed including transport/injection of compacted powder, ignition, combustion efficiency, combustion stability, dilution effects, lean burn limits, and slag formation issues. It is suggested that these technological issues could be effectively addressed through a multi-phase research and development effort beginning with basic feasibility tests using an existing dump configured atmospheric pressure burner. Follow-on phases would involve the development and testing of a pressurized research combustor and technology demonstration tests of a prototypical rocket configuration.
Author
*Magnesium; Carbon Dioxide; Combustion Efficiency; Propulsion; Mars Exploration; Metal Powder; Metal Combustion; Combustion Stability*

**20050217016** National War Coll., Washington, DC USA
**The Next Energy Crisis: US National Security Vulnerability in the 1990s**
Craig, Derek K.; Mar. 15, 1990; 34 pp.; In English
Report No.(s): AD-A436973; No Copyright; Avail.: CASI: A03, Hardcopy

Although oil prices today are relatively low and supplies are plentiful, the fact remains that the USA is now over 50% dependent on foreign sources for a resource that is vital to the U.S. economy and national security. The availability of cheap foreign oil has undermined the goal of energy independence and seriously eroded the margin of energy security. Despite growing U.S. dependence on foreign oil, there is no consensus in the nation that energy security is a critical problem. Many analysts argue the situation has changed radically from the 1970s because U.S. imports are more diversified, there are greater supplies available outside of OPEC and the Middle East, and there is considerable excess supply capacity. These analysts believe this situation will continue into the foreseeable future with no supply problems. Other analysts predict that by the mid-1990s, conditions will be ripe for another oil crisis because world supply and demand will be in near equilibrium and a crisis in the Persian Gulf could seriously upset the supply side and send prices soaring again. Optimistic views tend to focus primarily on the supply aspects while pessimistic views focus more on the price aspects. Both supply and price are important. Energy security is not just adequate and uninterrupted supplies but also supplies at reasonable prices. Regardless of whether one accepts the optimistic or the pessimistic view, the availability of oil is still a vital U. S. national security interest. Given the long lead times required to develop and implement alternate fuel technologies, the USA must be prepared to meet all possible contingencies that could affect the supply of oil at reasonable prices. A critical analysis of the issue requires an

examination of the oil market, the potential threats to supply, the foreign policy instruments required to deal with any threat, and the international and domestic actions needed to provide an adequate margin of energy security.
DTIC
*Oils; Policies; Security; Supplying; United States; Vulnerability*

**20050217073** Seacoast Science, Inc., Carlsbad, CA USA
**SOF Tactical Repeater**
Todd, Minsa; Aug. 30, 2005; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W9113M-05-C-0100
Report No.(s): AD-A437028; No Copyright; Avail.: CASI: A03, Hardcopy

Report developed under SBIR contract' for topic 'MDA04-146' This report was developed under SBIR contract for topic MDA04-146. Seacoast Science Inc. has provided proof-of-concept technical results and proposed prototype design for the detection of hypergolic fuels and oxidizers for use in the MDA Kinetic Energy Interceptor (KEI) program. The proposed sensor system consists of three different sensor cases all containing a MEMS chemicapacitor sensor array. Seacoast's sensor technology utilizes an array of micromachined capacitors coated with chemoselective materials selected for their sensitivity to the hypergolic fuels and oxidizers. We have successfully accomplished the primary objective of this Phase I program by establishing the viability of Seacoast Science's capacitive sensors to detect hypergolic chemicals (monomethyl hydrazine) at a concentration well below its LEL level and within 2 orders of magnitude of its PEL with first generation selective materials. First generation sensors have also demonstrated detection of oxidizer off-gas (NO2) two orders of magnitude below its PEL. In addition the following project tasks were completed: 1) New chemosensitive materials were synthesized and characterized. 2) Motherboard was redesigned to decrease power consumption and size. 3) Pattern recognition program was initiated for incorporation into a Phase II product. 4) Completed design of prototype sensor suite for fuel detection in the KEI program.
DTIC
*Fuels; Microelectromechanical Systems; Energy Consumption; Methylhydrazine; Oxidizers*

## 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*.

**20050215022** NASA Glenn Research Center, Cleveland, OH, USA
**Physics of Colloids in Space (PCS): Microgravity Experiment Completed Operations on the International Space Station**
Doherty, Michael P.; Sankaran, Subramanian; Research and Technology 2002; March 2003; 5 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Immediately after mixing, the two-phase-like colloid-polymer critical point sample begins to phase separate, or de-mix, into two phases-one that resembles a gas and one that resembles a liquid, except that the particles are colloids and not atoms. The colloid-poor black regions (colloidal gas) grow bigger, and the colloid-rich white regions (colloidal liquid) become whiter as the domains further coarsen. Finally, complete phase separation is achieved, that is, just one region of each colloid-rich (white) and colloid-poor (black) phase. This process was studied over four decades of length scale, from 1 micrometer to 1 centimeter.
Derived from text
*Colloids; Gravitational Effects; Spaceborne Experiments*

**20050215023** NASA Glenn Research Center, Cleveland, OH, USA
**Coarsening Experiment Prepared for Flight**
Hickman, J. Mark; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Coarsening in Solid-Liquid Mixtures-2 (CSLM-2) experiment is a materials science spaceflight experiment whose purpose is to investigate the kinetics of competitive particle growth within a liquid matrix. During coarsening, small particles shrink by losing atoms to larger particles, causing the larger particles to grow. In this experiment, solid particles of tin will grow (coarsen) within a liquid lead-tin eutectic matrix. The following figures show the coarsening of tin particles in a lead-tin

(Pb-Sn) eutectic as a function of time. By conducting this experiment in a microgravity environment, we can study a greater range of solid volume fractions, and the effects of sedimentation present in terrestrial experiments will be negligible. The CSLM-2 experiment flew November 2002 on space shuttle flight STS-113 for operation on the International Space Station, but it could not be run because of problems with the Microgravity Science Glovebox in the U.S. Laboratory module. Additional samples will be sent to ISS on subsequent shuttle flights.
Derived from text
*Microgravity; Liquid-Solid Interfaces; Spaceborne Experiments; Sediments*

**20050215024** NASA Glenn Research Center, Cleveland, OH, USA, ZIN Technologies, Inc., USA
**Advanced Microgravity Acceleration Measurement Systems (AMAMS) Being Developed**
Sicker, Ronald J.; Kacpura, Thomas J.; Research and Technology 2002; March 2003; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Advanced Microgravity Acceleration Measurement Systems (AMAMS) project is part of NASA s Instrument Technology Development program to develop advanced sensor systems. The primary focus of the AMAMS project is to develop microelectromechanical systems (MEMS) for acceleration sensor systems to replace existing electromechanical sensor systems presently used to assess relative gravity levels aboard spacecraft. These systems are used to characterize both vehicle and payload responses to low-gravity vibroacoustic environments. The collection of microgravity acceleration data is useful to the microgravity life sciences, microgravity physical sciences, and structural dynamics communities. The inherent advantages of semiconductor-based systems are reduced size, mass, and power consumption, with enhanced long-term calibration stability.
Derived from text
*Acceleration Measurement; Sensors; Vibrational Stress; Microelectromechanical Systems; Dynamic Structural Analysis*

**20050215103** NASA Glenn Research Center, Cleveland, OH, USA
**Modular Avionics Concept Developed for Microgravity Space Experiments: FEANICS**
Hausmann, Clifford R.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Flow Enclosure Accommodating Novel Investigations in Combustion of Solids (FEANICS) is a facility being developed at the NASA Glenn Research Center that will be integrated into the Combustion Integrated Rack onboard the International Space Station. FEANICS will support various experimental studies of solid combustion in a microgravity environment. The experiments will vary, and the FEANICS facility hardware combined with the Combustion Integrated Rack hardware is designed to meet the science requirements of the individual experiments.
Derived from text
*Gravitational Effects; Spaceborne Experiments; Combustion; Solids*

**20050215164** NASA Glenn Research Center, Cleveland, OH, USA
**Contact Angle Influence on Geysering Jets in Microgravity Investigated**
Chato, David J.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Microgravity poses many challenges to the designer of spacecraft tanks. Chief among these are the lack of phase separation and the need to supply vapor-free liquid or liquid-free vapor to the spacecraft processes that require fluid. One of the principal problems of phase separation is the creation of liquid jets. A jet can be created by liquid filling, settling of the fluid to one end of the tank, or even closing a valve to stop the liquid flow. Anyone who has seen a fountain knows that jets occur in normal gravity also. However, in normal gravity, the gravity controls and restricts the jet flow. In microgravity, with gravity largely absent, surface tension forces must be used to contain jets. To model this phenomenon, a numerical method that tracks the fluid motion and the surface tension forces is required. Jacqmin has developed a phase model that converts the discrete surface tension force into a barrier function that peaks at the free surface and decays rapidly away. Previous attempts at this formulation were criticized for smearing the interface. This can be overcome by sharpening the phase function, double gridding the fluid function, and using a higher-order solution for the fluid function. The solution of this equation can be rewritten as two coupled Poisson equations that also include the velocity.
Author
*Fluid Jets; Liquid Flow; Microgravity; Vapors*

**20050215648** NASA Glenn Research Center, Cleveland, OH, USA

**Fundamental Research Applied To Enable Hardware Performance in Microgravity**

Sheredy, William A.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

NASA sponsors microgravity research to generate knowledge in physical sciences. In some cases, that knowledge must be applied to enable future research. This article describes one such example. The Dust and Aerosol measurement Feasibility Test (DAFT) is a risk-mitigation experiment developed at the NASA Glenn Research Center by NASA and ZIN Technologies, Inc., in support of the Smoke Aerosol Measurement Experiment (SAME). SAME is an investigation that is being designed for operation in the Microgravity Science Glovebox aboard the International Space Station (ISS). The purpose of DAFT is to evaluate the performance of P-Trak (TSI Incorporated, Shoreview, MN)--a commercially available condensation nuclei counter and a key SAME diagnostic- -in long-duration microgravity because of concerns about its ability to operate properly in that environment. If its microgravity performance is proven, this device will advance the state of the art in particle measurement capabilities for space vehicles and facilities, such as aboard the ISS. The P-Trak, a hand-held instrument, can count individual particles as small as 20 nm in diameter in an aerosol stream. Particles are drawn into the device by a built-in suction pump. Upon entering the instrument, these particles pass through a saturator tube where they mix with an alcohol vapor (see the following figure). This mixture then flows through a cooled condenser tube where some of the alcohol condenses onto the sample particles, and the droplets grow in a controlled fashion until they are large enough to be counted. These larger droplets pass through an internal nozzle and past a focused laser beam, producing flashes of light that are sensed by a photodetector and then counted to determine particle number concentration. The operation of the instrument depends on the proper internal flow and recycling of isopropyl alcohol in both the vapor and liquid phases.

Author

*Microgravity; Hardware; Aerosols; Dust; Vapor Phases; Physical Sciences; Photometers*

**20050215653** NASA Glenn Research Center, Cleveland, OH, USA

**Capillary Flow Experiments Began on the International Space Station**

J. Mark Hickman; Green, Robert D.; Research and Technology 2004; June 2005; 5 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Capillary Flow Experiments (CFEs) are a suite of fluid physics flight experiments designed to investigate capillary flows and phenomena in low gravity. Data obtained from the CFEs will be crucial to NASA s Space Exploration Initiative, particularly pertaining to fluids management systems such as fuels and cryogen storage systems, thermal control systems (e.g., water recycling), and materials processing in the liquid state. NASA s current plans for exploration missions assume the use of larger liquid propellant masses than have ever flown on interplanetary missions. Under low-gravity conditions, capillary forces can be exploited to control fluid orientation so that such large mission-critical systems perform predictably. The first of the CFE experiments has been conducted on the International Space Station, and the data are being analyzed. The experiment suite is described briefly.

Derived from text

*Capillary Flow; Cryogenics; Fluid Dynamics; Microgravity*

**20050215680** NASA Glenn Research Center, Cleveland, OH, USA

**Glenn's Telescience Support Center Provided Around-the-Clock Operations Support for Space Experiments on the International Space Station**

Malarik, Diane C.; Research and Technology 2004; June 2005; 5 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

NASA Glenn Research Center s Telescience Support Center (TSC) allows researchers on Earth to operate experiments onboard the International Space Station (ISS) and the space shuttles. NASA s continuing investment in the required software, systems, and networks provides distributed ISS ground operations that enable payload developers and scientists to monitor and control their experiments from the Glenn TSC. The quality of scientific and engineering data is enhanced while the long-term operational costs of experiments are reduced because principal investigators and engineering teams can operate their payloads from their home institutions.

Derived from text

*Communication Networks; Software Engineering; Spaceborne Experiments*

## 31
## ENGINEERING (GENERAL)

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

**20050215131** National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China
**Journal of the Chinese Institute of Engineers, Volume 28, No. 4**
Chen, Shi-Shuenn, Editor; Tsai, Hsien-Lung, Editor; Shiou, Fang-Jung, Editor; Lee, Liang-Sun, Editor; Young, Der-Liang, Editor; Pan, Ching-Tsai, Editor; Chen, Jean-Lien, Editor; Chung, Chung-Ping; Chao, Ching-Kong, et al.; July 2005; ISSN 0253-3839; 181 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Contents include the following: Unsteady Unidirectional MHD Flows of a Non-Newtonian Fluid Saturated in a Porous Medium. Development of Solar Cooling Load Factors for Fenestration in Thailand. Stable Fuzzy Control with Adaptive Rotor Imbalance Compensation for Nonlinear Magnetic Bearing Systems. Flow Induced Vibrations of a Triangular Tube Array in Various Arrangements of Orientation and Natural Frequency. Establishing the Relationship between Damage Measure, Seismic Hazard, Structural Ductility and Period for PBSD. Finding the Weighting Value and Ranking of the Damage Evaluation for Existing Reinforced Concrete Bridges Using Comparison Matrix Method. A DRBEM Model for Harbor Oscillation with the Effect of Energy Dissipation. A Two-Layer Cryptographic Scheme for a Service Framework Based on Mobile Agents. An Efficient Solid Angle Sampling Technique Using Bounding Volume Approach. A Novel Normal Walk Model for PCS Networks with Mesh Cell Configuration. Design of an Adjustable-Way Cache for Energy Reduction. A Pinwheel Packet Scheduling Scheme for Broadband Wireless Networks.
CASI
*Magnetohydrodynamic Flow; Solar Cooling; Resonant Frequencies; Damage Assessment; Energy Dissipation; Rotors*

**20050215405** NASA Glenn Research Center, Cleveland, OH, USA
**General-Purpose Stereo Imaging Velocimetry Technique Developed for Space and Industrial Applications**
McDowell, Mark; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A new three-dimensional, full-field analysis technique has been developed for industrial and space applications. Stereo Imaging Velocimetry (SIV) will provide full-field analysis for three-dimensional flow data from any optically transparent fluid that can be seeded with tracer particles. The goal of SIV is to provide a means to measure three-dimensional fluid velocities quantitatively and qualitatively at many points. SIV is applicable to any optically transparent fluid experiment. Except for the tracer particles, this measurement technique is nonintrusive. Velocity accuracies are on the order of 95 to 99 percent of fullfield. The system components of SIV include camera calibration, centroid determination, overlap decomposition, particle tracking, stereo matching, and three-dimensional velocity analysis. SIV has been used successfully for space shuttle experiments as well as for fluid flow applications for business and industry.
Author
*Velocity Measurement; Imaging Techniques; Fluid Flow*

**20050216452** Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
**Characteristics and Sampling Efficiencies of Biobadge Aerosol Samplers**
Kesavan, Jana S.; Hottell, Karen A.; May 1, 2005; 19 pp.; In English
Report No.(s): AD-A436882; ECBC-TN-024; No Copyright; Avail.: CASI: A03, Hardcopy

The aerosol sampling efficiencies of four BioBadge(R) samplers manufactured by MesoSystem Technology, Incorporated (Richland, WA) were determined at the U. S. Army Edgewood Chemical Biological Center. BioBadge(R) samplers are battery operated personal samplers that use the rotating impactor/impellor technology to collect particles. Collected particles are removed from the impellor using either the lab or the field method. These methods require that the impellor be put into a zip lock bag with liquid for the particle removal procedure. The lab method sonicates the zip lock bag to remove the collected particles, and the field method claps the zip lock bag using a hand. Sampling efficiency tests were conducted with 1 - and 2.26-um fluorescent PSL beads, 3- and 8-um fluorescent oleic acid particles, and approximately 1-um BO Bacillus subtilis var. niger (Bacillus globigii) aerosol particles. The results show that the sampling efficiency is highest for 8-um particles using both recovery methods. The lab method shows a sampling efficiency of 74.3% +/- 3.0, and the field method shows a sampling efficiency of 65.5% +/- 5.4 for the 8-um particles. For 1-um particles, the sampling efficiency drops to 4.0% +/- 0.9 and 9.3% +/- 1.1 for the lab and field methods, respectively. BG results were similar to the 1-um PSL results.
DTIC
*Aerosols; Efficiency; Samplers; Sampling*

## 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*.

**20050214853** NASA Glenn Research Center, Cleveland, OH, USA

**Effects of a Scanning Reflectarray Antenna on Modulated Data Modeled**

Romanofsky, Robert R.; Xiong, Fu-Qin; Research and Technology 2002; March 2003; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The ferroelectric reflectarray is a new type of scanning antenna under development for space and ground communications and radar applications at the NASA Glenn Research Center. The reflectarray offers tremendous cost, gain, and efficiency advantages in comparison to the state-of-the-art phased arrays, but there is an inherent intersymbol interference (ISI) problem with digital communication data streams processed through the array because of the way the reflectarray is operated. This interference stems from the fact that the antenna beam is formed by the superposition of reflected waves from the array elements. The delays from the elements to the observation point of each wave differ. Ferroelectric phase shifters are designed to compensate for the modulo-2p phase differences so that the waves will constructively interfere at the sinusoidal carrier level; however, the delays of the integer-number multiple of the carrier period are not compensated for. This lack of compensation causes ISI in digital modulated signals. ISI has not been a problem with analog modulations and low-rate digital modulations since the distortion (or ISI) introduced is negligible. The problem becomes acute when the data rate gets higher, and the electrical size of the array gets bigger. Moreover, there are intrinsic transient effects associated with the phase shifters and the controller that executes the algorithm to direct the beam. That is, phase shifter updates to redirect the beam may be initiated simultaneously, but nonlinearity will cause different settling times. The ISI problem and other effects ultimately limit the size (gain) and data rate of the reflectarray. An ISI analysis was required to prove or disprove the suitability of the reflectarray antenna for high-rate digitally modulated signals and to give guidance for determining antenna parameters. In this research, the nature of the ISI of the reflectarray has been mathematically modeled.

Derived from text

*Antenna Arrays; Mathematical Models; Reflector Antennas; Ferroelectricity; Scanners; Modulation; Data Processing*

**20050214877** Universidad Nacional Autonoma de Mexico, Mexico City, Mexico

**A Video Based Laboratory on the Internet, and the Experiences Obtained with High-school Teachers**

Gamboa-Rodriguez, F.; Perez-Silva, J. L.; Lara-Rosano, F.; Miranda-Vitela, A.; Cabiedes-Contreras; Castaneda-Martinez, R.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A Video Based Laboratory is a software that shows physical phenomena on a digital video (sometimes they also use photographs or stroboscopic photographs). The measurements on the video are possible, because the physical measurements of the recorded objects are known, as well as the size in pixels of the window where the video is shown. With these data, it is possible to calculate a function that maps, for each pixel of the window, the physical corresponding distance. Thus, users can obtain 'virtual' experimental data; very similar to the data they would have obtained in the actual laboratory. In this article we present an on line video based laboratory, and how it is used by high school teachers.

Author

*Digital Television; Video Communication; Internets*

**20050214892** University of Science of Malaysia, Malaysia, Royal Malaysian Army, Malaysia

**Advanced Mobile Multipoint Real-Time Military Conferencing System (AMMCS)**

International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 12 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The soldiers of the future will far surpass those of today. The need for realtime multipoint communication becomes even more critical as the soldiers in the field must be able to communicate, both audio and visually to the command center in order for the command center to fully understand the magnitude of the situation. Now there is the capability to develop an Advanced Mobile Military Conferencing System which will enhance the capability of each individual soldier to function as an entire system. Using the MCS Military engine, Mlabs is able to redevelop and reengineer the system into a mobile wireless and

satellite communication unit for the infantry soldiers and other units on the field and front to communicate with central command. MCS is an advanced distributed multimedia conferencing system based on the RSW Control Criteria and the distributed network entities architecture.
Author
*Communication Equipment; Real Time Operation; Wireless Communication*

**20050214953** Ericsson Ltd., Dublin, Ireland
**Overview of the role of ATM/AAL2 Aggregator in UMTS Access Network**
Petrovic, Aleksandar D.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 3 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The second generation of mobile telecommunication systems provided digital transmission, with high quality voice being the primary functionality. Data services and limited data handling in these systems however proved to be a huge success. To enhance these services the 3rd generation of mobile telecommunications was conceived in order to provide higher data rates. These increased data rates will enable services such as web access, high quality images and video to be transmitted and received in a manner that will enhance the end customer communications experience. However these enhanced services will impose considerable demands on the access network infrastructure, both from the radio transmission point of view and transmission network, carrying the traffic from the base stations to the core network. One part of that network is ATM Aggregator. In this paper reader can see that ATM Aggregator fulfils requirements for UMTS Terrestrial Radio Access Network (UTRAN).
Author
*Asynchronous Transfer Mode; Radio Transmission; Telecommunication; Topology; Communication Networks*

**20050214974** Fern Univ., Hagen, Germany
**Communication Behavior and Collaboration in Virtual Seminars: Experiences**
Feldmann, Birgit; Schlageter, Gunter; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Collaborative Learning through computer mediated communication gains more and more interest in the e-learning community. For an online-learning environment, collaborative facilities are essential. This is especially true for virtual seminars, which are highly interactive group-oriented activities. This paper describes the experiences made during five virtual seminars concerning the communication and collaboration aspect. The seminars were part of the computer science distance study of the Virtual University (VU) Hagen. Our experiences show how different virtual seminars can be, depending on topics, students and communication tools. But the following applies to all: Virtual seminars are a great possibility to improve motivation and quality for students in a distance study environment. Index Terms communication behavior, collaboration, collaborative work
Author
*Interprocessor Communication; Learning*

**20050215056** University of Western Illinois, Macomb, IL, USA
**Designing IT Infrastructure for e-Governments: The Case of Digital Repositories**
Amaravadi, Chandra S.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 15 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Due to the internet, there is a growing pressure for governments across the world to provide e-government services to the public. For instance, villagers in the state of Madhya Pradesh, India are informed via web technology, of the schedules of water tankers which bring fresh water to the villages. It is expected that digital libraries or more appropriately digital repositories (DR) will be a key technology here. The DR will be expected to respond to requests, often initiated by machine agents, such as the maximum hours an employee can work. Based on DOLCE, an ontology developed by the Italian Institute of Cognitive

Sciences and Technology, we have developed a scheme called DAST for classifying information in DRs, to aid in the retrieval process. The ontology is elaborated and illustrated with examples.
Author
*Dast Program; International Space Year; Internets; Libraries*

**20050215157** NASA Glenn Research Center, Cleveland, OH, USA
**Ka-Band Multibeam Aperture Phased Array Being Developed**
Reinhart, Richard C.; Kacpura, Thomas J.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Phased-array antenna systems offer many advantages to low-Earth-orbiting satellite systems. Their large scan angles and multibeam capabilities allow for vibration-free, rapid beam scanning and graceful degradation operation for high rate downlink of data to users on the ground. Technology advancements continue to reduce the power, weight, and cost of these systems to make phased arrays a competitive alternative in comparison to the gimbled reflector system commonly used in science missions. One effort to reduce the cost of phased arrays is the development of a Ka-band multibeam aperture (MBA) phased array by Boeing Corporation under a contract jointly by the NASA Glenn Research Center and the Office of Naval Research. The objective is to develop and demonstrate a space-qualifiable dual-beam Ka-band (26.5-GHz) phased-array antenna. The goals are to advance the state of the art in Ka-band active phased-array antennas and to develop and demonstrate multibeam transmission technology compatible with spacecraft in low Earth orbit to reduce the cost of future missions by retiring certain development risks. The frequency chosen is suitable for space-to-space and space-to-ground communication links. The phased-array antenna has a radiation pattern designed by combining a set of individual radiating elements, optimized with the type of radiating elements used, their positions in space, and the amplitude and phase of the currents feeding the elements. This arrangement produces a directional radiation pattern that is proportional to the number of individual radiating elements. The arrays of interest here can scan the main beam electronically with a computerized algorithm. The antenna is constructed using electronic components with no mechanical parts, and the steering is performed electronically, without any resulting vibration. The speed of the scanning is limited primarily by the control electronics. The radiation performance degrades gracefully if a portion of the elements fail. The arrays can be constructed to conform to a mounting surface, and multibeam capability is integral to the design. However, there are challenges for mission designers using monolithic-microwave-integrated-circuit- (MMIC-) based arrays because of reduced power efficiency, higher costs, and certain system effects that result in link degradations. The multibeam aperture phased-array antenna development is attempting to address some of these issues, particularly manufacturing, costs, and system performance.
Author
*Phased Arrays; Microwave Antennas; Antenna Arrays; Antenna Design; Communication Networks; Extremely High Frequencies; Antenna Radiation Patterns*

**20050215177** NASA Glenn Research Center, Cleveland, OH, USA
**Reconfigurable Transceiver and Software-Defined Radio Architecture and Technology Evaluated for NASA Space Communications**
Reinhart, Richard C.; Kacpura, Thomas J.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center is investigating the development and suitability of a software-based open-architecture for space-based reconfigurable transceivers (RTs) and software-defined radios (SDRs). The main objectives of this project are to enable advanced operations and reduce mission costs. SDRs are becoming more common because of the capabilities of reconfigurable digital signal processing technologies such as field programmable gate arrays and digital signal processors, which place radio functions in firmware and software that were traditionally performed with analog hardware components. Features of interest of this communications architecture include nonproprietary open standards and application programming interfaces to enable software reuse and portability, independent hardware and software development, and hardware and software functional separation. The goals for RT and SDR technologies for NASA space missions include prelaunch and on-orbit frequency and waveform reconfigurability and programmability, high data rate capability, and overall communications and processing flexibility. These operational advances over current state-of-art transceivers will be provided to reduce the power, mass, and cost of RTs and SDRs for space communications. The open architecture for NASA communications will support existing (legacy) communications needs and capabilities while providing a path to more capable, advanced waveform development and mission concepts (e.g., ad hoc constellations with self-healing networks and high-rate science data return). A study was completed to assess the state of the art in RT architectures, implementations, and technologies. In-house researchers conducted literature searches and analysis, interviewed Government and industry contacts,

and solicited information and white papers from industry on space-qualifiable RTs and SDRs and their associated technologies for space-based NASA applications. The white papers were evaluated, compiled, and used to assess RT and SDR system architectures and core technology elements to determine an appropriate investment strategy to advance these technologies to meet future mission needs. The use of these radios in the space environment represents a challenge because of the space radiation suitability of the components, which drastically reduces the processing capability. The radios available for space are considered to be RTs (as opposed to SDRs), which are digitally programmable radios with selectable changes from an architecture combining analog and digital components. The limited flexibility of this design contrasts against the desire to have a power-efficient solution and open architecture.
Author
*Space Communication; Software Engineering; Signal Processing; Field-Programmable Gate Arrays; Signal Analyzers; Software Reuse; Applications Programs (Computers)*

**20050215294** NASA Glenn Research Center, Cleveland, OH, USA
**Secure, Mobile, Wireless Network Technology Designed, Developed, and Demonstrated**
Ivancic, William D.; Paulsen, Phillip E.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The inability to seamlessly disseminate data securely over a high-integrity, wireless broadband network has been identified as a primary technical barrier to providing an order-of-magnitude increase in aviation capacity and safety. Secure, autonomous communications to and from aircraft will enable advanced, automated, data-intensive air traffic management concepts, increase National Air Space (NAS) capacity, and potentially reduce the overall cost of air travel operations. For the first time ever, secure, mobile, network technology was designed, developed, and demonstrated with state-ofthe- art protocols and applications by a diverse, cooperative Government-industry team led by the NASA Glenn Research Center. This revolutionary technology solution will make fundamentally new airplane system capabilities possible by enabling secure, seamless network connections from platforms in motion (e.g., cars, ships, aircraft, and satellites) to existing terrestrial systems without the need for manual reconfiguration. Called Mobile Router, the new technology autonomously connects and configures networks as they traverse from one operating theater to another. The Mobile Router demonstration aboard the Neah Bay, a U.S. Coast Guard vessel stationed in Cleveland, Ohio, accomplished secure, seamless interoperability of mobile network systems across multiple domains without manual system reconfiguration. The Neah Bay was chosen because of its low cost and communications mission similarity to low-Earth-orbiting satellite platforms. This technology was successfully advanced from technology readiness level (TRL) 2 (concept and/or application formation) to TRL 6 (system model or prototype demonstration in a relevant environment). The secure, seamless interoperability offered by the Mobile Router and encryption device will enable several new, vehicle-specific and systemwide technologies to perform such things as remote, autonomous aircraft performance monitoring and early detection and mitigation of potential equipment malfunctions. As an additional benefit, team advancements were incorporated into open standards, ensuring technology transfer. Low-cost, commercial products incorporating the new technology are already available. Furthermore, these products are fully interoperable with legacy network technology equipment currently being used throughout the world.
Author
*Mobile Communication Systems; National Airspace System; Communication Networks; Technology Assessment; Wireless Communication*

**20050215319** Motlow State Community Coll., Tullahoma, TN, USA
**Learning Effectiveness of the NASA Digital Learning Network**
Hix, Billy; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXI-1 - XXI-6; In English; See also 20050215300; No Copyright; Avail.: CASI: A02, Hardcopy

Student participation in actual investigations which develop inquiry and intellectual skills has long been regarded as an essential component of science instructions (Schwab, 1962; White, 1999). Such investigations give students an opportunity to appreciate the spirit of science and promote an understanding of the nature of science. However, classroom research conducted over the past 20 years describes science teaching as primarily teacher centered. Typical instruction consists of whole class, noninteractive activities in which individual seatwork has constituted the bulk of classroom interactions (Tobin and Gallagher, 1997). Students typically learn science from textbooks and lectures. Their main motivation is to do reasonably well on tests and examinations (Layman, 1999). During the past five years, infrastructure constraints have reduced to the point that many schools systems can now afford low cost, high quality video conferencing equipment (International Society for Technology in Education, 2003). This study investigates the use of interactive video conferencing vs. face to face interaction with hands-on, inquiry based activities. Some basic questions to be addressed are: How does the delivery method impact the

students understanding of the goals of the experiment? Are students explanation of the strategies of experimentation different based on the method of instruction that was provided. Do students engaged in a workshop with the instructor in the room vs. an instructor over video conferencing have different perception of the understanding of the subject materials?
Derived from text
*Learning; Pulse Communication; NASA Programs; Video Conferencing; Communication Networks*

**20050215338** Alabama Univ., Huntsville, AL, USA
**Coupled Electromagnetic Resonators for Enhanced Communications and Telemetry**
Dimmock, John O.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XI-1 - XI-14; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Future NASA missions will require the collection of an increasing quantity and quality of data which, in turn, will place increasing demands on advanced sensors and advanced high bandwidth telemetry and communications systems. The capabilities of communication and telemetry systems depend, among other factors, on the stability, controllability and spectral purity of the carrier wave. These, in turn, depend on the quality of the oscillator, or resonator, or the Q of the system. Recent work on high Q optical resonators has indicated that the Q, or quality factor, of optical microsphere resonators can be substantially enhanced by coupling several such resonators together.1-3 In addition to the possibility of enhanced Q and increased energy storage capacity, the coupled optical resonators indicate that a wide variety of interesting and potentially useful phenomena such as induced transparency and interactive mode splitting can be observed depending critically on the morphology and configuration of the microresonators. The purpose of this SFFP has been to examine several different coupled electromagnetic oscillator configurations in order to evaluate their potential for enhanced electromagnetic communications.
Author
*Electromagnetic Coupling; Optical Resonators; Controllability; Telemetry; Telecommunication*

**20050215348** Chinese Culture Univ., Taipei, Taiwan, Province of China
**The Non-specific Intelligent Guided-View System Based On RFID Technology**
Chao, Hung-Pin; IPSI 2005 Hawaii Proceedings; [2005]; 6 pp.; In English; See also 20050215347; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The purposes of this research are to design a 'Non-specific Purpose Intelligent system with context-aware capability' as a kernal system and then to design an 'Intelligent Wireless Guided-View System' evolved from it. That kernel System includes the Radio Frequency Identification (RFID) technique and take advantage of the Artificial Intelligent technique, for instance 'Expert System', 'Intelligent Agent' and 'Neuro Network', etc., to reach the expected functions of automatic getting information from environment and respond an Adaptive-Feedback to its user. This 'Intelligent Wireless Guided-View System' will use an RFID System as a fundamental environment and the Expert System (ES) and the Intelligent Agent (IA) of Artificial Intelligent (AI) as added-value application functions. Additionally, the Finite State Machine (FSM) will be used to express the input-output, components and functions of this system.
Author
*Artificial Intelligence; Wireless Communication; Kernel Functions*

**20050216388** NASA Glenn Research Center, Cleveland, OH, USA
**Packet-Based Protocol Efficiency for Aeronautical and Satellite Communications**
Carek, David A.; August 2005; 21 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-337-41-06-C1
Report No.(s): NASA/TM-2005-213363; E-14831; No Copyright; Avail.: CASI: A03, Hardcopy

This paper examines the relation between bit error ratios and the effective link efficiency when transporting data with a packet-based protocol. Relations are developed to quantify the impact of a protocol s packet size and header size relative to the bit error ratio of the underlying link. These relations are examined in the context of radio transmissions that exhibit variable error conditions, such as those used in satellite, aeronautical, and other wireless networks. A comparison of two packet sizing methodologies is presented. From these relations, the true ability of a link to deliver user data, or information, is determined. Relations are developed to calculate the optimal protocol packet size forgiven link error characteristics. These relations could be useful in future research for developing an adaptive protocol layer. They can also be used for sizing protocols in the design of static links, where bit error ratios have small variability.
Author
*Satellite Communication; Aeronautical Satellites; Radio Transmission*

**20050216426** Electronics and Telecommunications Research Inst., Daejon, Korea, Republic of

**A Study on the Encryption Techniques for Digital Right Management of MPEG-4 Video**

Kim, Jun-il; Yoon, Ki-Song; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 10 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents encryption techniques for digital right management solutions of MPEG-4 streams. MPEG-4 is a format for multimedia streaming and stored in the MPEG-4 file format. We designed three kinds of encryption methods, which encrypt macro blocks (MBs) or motion vectors (MVs) of I-, P-VOPs (Video Object Planes), extracted from the MPEG-4 file format. We used DES to encrypt MPEG-4 data. Based on theses three methods, we designed and implemented a DRM solution for an Internet broadcasting service, which enabled a MPEG-4 data streaming, and then compared the results to get an optimal encryption method.

Author

*Cryptography; Multimedia; Video Communication; Pulse Communication*

**20050216444** NASA Glenn Research Center, Cleveland, OH, USA

**Quantum Sensing and Communications Being Developed for Nanotechnology**

Lekki, John D.; Nguyen, Quang-Viet; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

An interdisciplinary quantum communications and sensing research effort for application in microdevices has been underway at the NASA Glenn Research Center since 2000. Researchers in Glenn's Instrumentation and Controls, Communications Technology, and Propulsion and Turbomachinery Divisions have been working together to study and develop techniques that utilize quantum effects for sensing and communications. The emerging technology provides an innovative way to communicate faster and farther using less power and to sense, measure, and image environmental properties in ways that are not possible with existing technology.

Derived from text

*Quantum Efficiency; Communication; Nanotechnology*

**20050216519** Army Command and General Staff Coll., Fort Leavenworth, KS USA

**The Impact of Technology on the Command, Control, and Organizational Structure of Insurgent Groups**

Leahy, Kevin C.; Jun. 17, 2005; 76 pp.; In English; Original contains color illustrations

Report No.(s): AD-A437024; No Copyright; Avail.: CASI: A05, Hardcopy

Recent world events in Iraq have highlighted the power of insurgent groups in battling a more powerful opponent like the USA. Some reports have characterized the insurgency in Iraq as a technology-empowered, network-centric organization without a defined command and control structure, while others have painted the insurgency as an undefined hierarchical organization. This thesis attempts to answer the following questions: Has technology changed the way the Iraq insurgency operates?; How are insurgent groups employing information technology for command and control?; and What commonalities existed among the command and control structures of past insurgencies? Three historical examples, the Front for National Liberation in Algeria, the Irish Republican Army in Ireland, and the Vietcong in South Vietnam, illustrate how insurgent groups have used technology for command and control. These historical examples are compared with reported trends in insurgent organization and insurgent activity in Iraq. The author concludes that, although Iraqi insurgents attempt to utilize technology for command and control, they must revert to the same methods used by past insurgent groups because the USA and coalition forces enjoy superiority in the area of information technology. This work also endeavors to provide an overview of U.S. unconventional warfare doctrine, which is modeled after past insurgencies. U.S. counterinsurgency doctrine was developed almost 40 years ago to counter communist insurgencies, and there have been very few changes to this doctrine in the years following the Vietnam War.

DTIC

*Command and Control; Communication Networks; Control Systems Design; Controllers; Data Processing; Information Systems; Organizations*

**20050216526** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Performance of a Spectrally Encoded Multi-Carrier Phase Shift Keying Communications System in a Frequency-Selective, Slowly-Fading Multipath Channel**

Gaona, Charles M.; Mar. 1, 2005; 148 pp.; In English; Original contains color illustrations

Report No.(s): AD-A437050; AFIT/GE/ENG/05-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research examines the performance of a spectrally encoded, multi-carrier, phase shift keying communications system in a frequency-selective, slowly-fading multipath channel. The specific communications system modeled is the transform domain communication system (TDCS) originally researched as an interference avoidance technique. Previous TDCS research assumed an additive white gaussian noise channel, which is not representative of a realistic environment. This thesis presents overviews of previous TDCS research, the multipath fading channel, and the RAKE receiver. Analysis and Matlab simulations compare the performance of spectrally encoded and un-encoded signals through a multipath fading channel using an L-diversity TDCS RAKE receiver. Encoded signals take on the spectral shape of the multipath fading channel transfer function. Un-encoded signals have a flat magnitude spectrum. The research also evaluates the interference rejection capability of spectrally encoded signals in a multipath channel. Research results indicate for diversities ranging between 2 and 50, spectrally encoded signals need 1.0 to 2.75dB less transmitted normalized bit energy to noise power spectral density ratios to achieve the same probability of bit error as un-encoded signals. Results also demonstrate that spectrally encoded TDCS signals retain the interference rejection capability.
DTIC
*Coding; Frequencies; Multipath Transmission; Phase Shift Keying; Selective Fading; Telecommunication*

**20050216540** State Univ. of New York, Binghamton, NY USA
**Cooperative Communications for Wireless Information Assurance**
Li, Xiaohua E.; Jul. 1, 2005; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-04-1-0213; Proj-558B
Report No.(s): AD-A437086; AFRL-IF-RS-TR-2005-279; No Copyright; Avail.: CASI: A03, Hardcopy
This report describes research in the 2004 Summer Visiting Faculty Research Program from May 04 Aug 04. Three of our research topics within the field of wireless communication networks are included: theory of physical-layer security, realizing physical-layer security for 802.11b wireless LAN, and cooperative communications in distributed sensor networks.
DTIC
*Wide Area Networks; Wireless Communication*

**20050216548** Bolt, Beranek, and Newman, Inc., Cambridge, MA USA
**Next Generation (XG) Architecture and Protocol Development (XAP)**
Ramanathan, Ram; Partridge, Criag; Aug. 1, 2005; 248 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-03-C-0139; Proj-P858
Report No.(s): AD-A437096; AFRL-IF-RS-TR-2005-281; No Copyright; Avail.: CASI: A11, Hardcopy
The DARPA XG program seeks to develop and demonstrate adaptive spectrum utilization techniques which can be used to access unused spectrum without interference to incumbent users. This report describes the progress which was made to develop an XG architecture which is capable of accommodating a wide range of adaptive protocols operating within the bounds of spectral policy. Additionally this development included the definition of a machine readable policy language and a policy conformance reasoner to validate if candidate transmissions are compliant to spectrum policy.
DTIC
*Cognition; Policies; Protocol (Computers); Radio Communication*

**20050216551** Massachusetts Univ., Amherst, MA USA
**Fluid Methods for Modeling Large, Heterogeneous Networks**
Towsley, Don; Gong, Weibo; Hollot, Kris; Liu, Yong; Misra, Vishal; Aug. 1, 2005; 104 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0554; Proj-K148
Report No.(s): AD-A437100; AFRL-IF-RS-TR-2005-282; No Copyright; Avail.: CASI: A06, Hardcopy
Researchers from the University of Massachusetts developed fluid-based methodologies for characterizing the behavior of large IP networks handling large numbers of TCP and UDP flows. These methodologies provide for rapid and efficient rates of individual and aggregate flows. These fluid models were also applied to the problems of characterizing the spread of worms and viruses and to the cascade of failures within the BGP routing infrastructure. The resulting fluid models were used to develop novel active queue management mechanisms resulting in more stable TCP performance and novel rate controllers for the purpose of providing minimum rate guarantees to TCP flow aggregates. Last, methodologies and tools were developed to integrate fluid network simulation with packet-level simulation.
DTIC
*Computational Fluid Dynamics; Heterogeneity; Mathematical Models; Models; Network Analysis; Networks*

## 33
## ELECTRONICS AND ELECTRICAL ENGINEERING

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

**20050214896** George Washington Univ., Washington, DC, USA
**Fusion of Multiple Images with Robust Random Field Models**
Eom, Kie B.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A fusion of multiple sensors with different resolution and noise characteristics is considered in this paper. The fusion of two sensors is formulated as a robust estimation problem, then the two-sensor fusion algorithm is generalized to the fusion of multiple sensors. In the two-sensor fusion problem, two sensors are assumed having complimentary characteristics, one with poor resolution and the other with poor noise characteristics. It is assumed that the unobservable original image is composed of de- terministic and stochastic components, and deterministic component is estimated by the scale change of low-resolution sensor output. The stochastic component is estimated by the combination of robust modeling and data cleaning. A robust estimation algorithm for the estimation of model parameters is also presented. The fusion of multiple sensors is done by applying the weighted sum of images obtained by pairwise fusion. The multi- sensor fusion algorithm is tested with simulated images and real synthetic aperture radar images. In the experiment, the fusion algorithm yielded images where both resolution and signal-to-noise ratio are substantially improved compared to images before applying the fusion.
Author
*Noise Measurement; Multisensor Fusion; Signal to Noise Ratios; Principal Components Analysis*

**20050215031** NASA Glenn Research Center, Cleveland, OH, USA
**Static Frequency Converter System Installed and Tested**
Brown, Donald P.; Sadhukhan, Debashis; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A new Static Frequency Converter (SFC) system has been installed and tested at the NASA Glenn Research Center s Central Air Equipment Building to provide consistent, reduced motor start times and improved reliability for the building s 14 large exhausters and compressors. The operational start times have been consistent around 2 min, 20 s per machine. This is at least a 3-min improvement (per machine) over the old variable-frequency motor generator sets. The SFC was designed and built by Asea Brown Boveri (ABB) and installed by Encompass Design Group (EDG) as part of a Construction of Facilities project managed by Glenn (Robert Scheidegger, project manager). The authors designed the Central Process Distributed Control Systems interface and control between the programmable logic controller, solid-state exciter, and switchgear, which was constructed by Gilcrest Electric.
Derived from text
*Frequency Converters; Performance Tests; Distributed Parameter Systems; Control Systems Design*

**20050215034** NASA Glenn Research Center, Cleveland, OH, USA
**Hybrid Power Management (HPM) Program Resulted in Several New Applications**
Eichenberg, Dennis J.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Hybrid Power Management (HPM) is the innovative integration of diverse, state-of-the-art power devices in an optimal configuration for space and terrestrial applications. The appropriate application and control of the various power devices significantly improves overall system performance and efficiency. The advanced power devices include ultracapacitors, fuel cells, and photovoltaics. HPM has extremely wide potential with applications from nanowatts to megawatts. Applications include power generation, transportation systems, biotechnology systems, and space power systems. HPM has the potential to significantly alleviate global energy concerns, improve the environment, and stimulate the economy.
Derived from text
*Biotechnology; Power Supplies; Technology Assessment*

**20050215145** NASA Glenn Research Center, Cleveland, OH, USA, Face Electronics, LLC, Norfolk, VA, USA

**Novel High-Voltage, High-Power Piezoelectric Transformer Developed and Demonstrated for Space Communications Applications**

Carazo, Alfredo V.; Wintucky, Edwin G.; Research and Technology 2003; May 2004; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Improvements in individual piezoelectric transformer (PT) performance and the combination of these PTs in a unique modular topology under a Phase I contract with the NASA Glenn Research Center have enabled for the first time the simultaneous achievement of both high voltage and high power at much higher levels than previously obtained with any PT. Feasibility was demonstrated by a prototype transformer (called a Tap-Soner), which is shown in the preceding photograph as part of a direct-current to direct-current (dc-dc) converter having two outputs rated at 1.5 kV/5 W and 4.5 kV/20 W. The power density of 3.5 W/cm3 is significantly lower than for magnetic transformers with the same voltage and power output. This development, which is being done under a Small Business Innovation Research (SBIR) contract by Face Electronics, LC (Norfolk, VA), is based on improvements in the materials and design of Face's basic patented Transoner-T3 PT, shown in the left in the following figure. The T3 PT is most simply described as a resonant multilayer transducer where electrical energy at the input section is efficiently mechanically coupled to the output section, which then vibrates in a fundamental longitudinal mode to generate a high gain in voltage. The piezoelectric material used is a modified lead-zirconium-titanate-based ceramic. One of the significant improvements in PT design was the incorporation of a symmetrical double input layer, shown on the right in the following figure, which eliminated the lossy bending vibration modes characteristic of a single input layer. The performance of the improved PT was optimized to 1.5 kV/5 W. The next step was devising a way to combine the individual PTs in a modular circuit topology needed to achieve the desired high voltage and power output. Since the optimum performance of the individual PT occurs at resonance, the most efficient operation of the modular transformer was achieved by using a separate drive circuit for each PT. The output section consists of a separate output rectifier for each PT connected in series.

Author

*Space Communication; Transformers; Piezoelectricity; High Voltages; Electric Potential*

**20050215149** NASA Glenn Research Center, Cleveland, OH, USA, Analex Corp., USA

**Field Effect Transistor Behavior in Electrospun Polyaniline/Polyethylene Oxide Demonstrated**

Mueller, Carl H.; Theofylaktos, Onoufrios; Robinson, Daryl C.; Miranda, Felix A.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Novel transistors and logic devices based on nanotechnology concepts are under intense development. The potential for ultra-low-power circuitry makes nanotechnology attractive for applications such as digital electronics and sensors. For NASA applications, nanotechnology offers tremendous opportunities for increased onboard data processing, and thus autonomous decisionmaking ability, and novel sensors that detect and respond to environmental stimuli with little oversight requirements. Polyaniline/polyethylene oxide (PANi/PEO) nanofibers are of interest because they have electrical conductivities that can be changed from insulating to metallic by varying the doping levels and conformations of the polymer chain. At the NASA Glenn Research Center, we have observed field effect transistor (FET) behavior in electrospun PANi/PEO nanofibers doped with camphorsulfonic acid. The nanofibers were deposited onto Au electrodes, which had been prepatterned onto oxidized silicon substrates. The preceding scanning electron image shows the device used in the transistor measurements. Saturation channel currents are observed at surprisingly low source/drain voltages (see the following graph). The hole mobility in the depletion regime is 1.4x10(exp -4)sq cm/V sec, whereas the one-dimensional charge density (at zero gate bias) is calculated to be approximately 1 hole per 50 two-ring repeat units of polyaniline, consistent with the rather high channel conductivity (approx.10(exp -3) S/cm). Reducing or eliminating the PEO content in the fiber is expected to enhance device parameters. Electrospinning is thus proposed as a simple method of fabricating one-dimensional polymer FET's.

Author

*Polyethylenes; Field Effect Transistors; Transistors; Nanotechnology; Digital Electronics; Doped Crystals; Electric Potential; Decision Making*

**20050215325** North Carolina Univ., Charlotte, NC, USA

**Analysis of Piezoelectric Structural Sensors with Emergent Computing Techniques**

Ramers, Douglas L.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXXV-1 - XXXV-17; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this project was to try to interpret the results of some tests that were performed earlier this year and to

demonstrate a possible use of emergence in computing to solve IVHM problems. The test data used was collected with piezoelectric sensors to detect mechanical changes in structures. This project team was included of Dr. Doug Ramers and Dr. Abdul Jallob of the Summer Faculty Fellowship Program, Arnaldo Colon-Lopez - a student intern from the University of Puerto Rico of Turabo, and John Lassister and Bob Engberg of the Structural and Dynamics Test Group. The tests were performed by Bob Engberg to compare the performance two types of piezoelectric (piezo) sensors, Pb(Zr(sub 1-1)Ti(sub x))O3, which we will label PZT, and Pb(Zn(sub 1/3)Nb(sub 2/3))O3-PbTiO, which we will label SCP. The tests were conducted under varying temperature and pressure conditions. One set of tests was done by varying water pressure inside an aluminum liner covered with carbon-fiber composite layers (a cylindrical 'bottle' with domed ends) and the other by varying temperatures down to cryogenic levels on some specially prepared composite panels. This report discusses the data from the pressure study. The study of the temperature results was not completed in time for this report. The particular sensing done with these piezo sensors is accomplished by the sensor generating an controlled vibration that is transmitted into the structure to which the sensor is attached, and the same sensor then responding to the induced vibration of the structure. There is a relationship between the mechanical impedance of the structure and the resulting electrical impedance produced in the in the piezo sensor. The impedance is also a function of the excitation frequency. Changes in the real part of impendance signature relative to an original reference signature indicate a change in the coupled structure that could be the results of damage or strain. The water pressure tests were conducted by pressurizing the bottle on a test stand, and running sweeps of excitations frequencies for each of the piezo sensors and recording the resulting impedance. The sweeps were limited to 401 points by the available analyzer, and it was decided to perform individual sweeps at five different excitation frequency ranges. The frequency ranges used for the PZTs were different in two of the five ranges from the ranges used for the SCP. The bottles were pressurized to empty (no water), 0psig, 77 psig, 155 psig, 227 psig in nearly uniform increments of about 77psi. One of each of the two types of piezo sensors was fastened on to the bottle surface at two locations: about midway between the ends on cylindrical portion of the bottle and at the very edge of one of the end domes. The data was collected in files by sensor type (2 cases), by location (2 cases), by frequency range (5 cases), and pressure (5cases) to produce 100 data sets of 401 impedances. After familiarization with the piezo sensing technology and obtaining the data, the team developed a set of questions to try to answer regarding the data and made assignments of responsibilities. The next section lists the questions, and the remainder of the report describes the data analysis work performed by Dr. Ramers. This includes a discussion of the data, the approach to answering the question using statistical techniques, the use of an emergent system to investigate the data where statistical techniques were not usable, conclusions regarding the data, and recommendations.
Author
*Piezoelectricity; Dynamic Structural Analysis; Electrical Impedance; Computation; Composite Structures; Statistical Analysis*

**20050215412** NASA Glenn Research Center, Cleveland, OH, USA
**International Space Station Nickel-Hydrogen Batteries Approached 3-Year On-Orbit Mark**
Dalton, Penni J.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The International Space Station's (ISS) electric power system (EPS) employs nickel-hydrogen (Ni-H2) batteries as part of its power system to store electrical energy. The batteries are charged during insolation and discharged, providing station power, during eclipse. The batteries are designed to operate at a maximum 35-percent depth of discharge during normal operation. Thirty-eight individual pressure vessel Ni-H2 battery cells are series-connected and packaged in an orbital replacement unit (ORU), and two ORUs are series-connected, using a total of 76 cells, to form one battery. When the ISS is in its assembly-complete form, the electrical power system will have a total of 24 batteries (48 ORUs) on-orbit. The ISS is the first application for low-Earth-orbit cycling of this quantity of series-connected cells.
Derived from text
*Nickel Hydrogen Batteries; Electric Batteries; Pressure Vessels*

**20050215426** New Mexico State Univ., Las Cruces, NM, USA
**A Proposed Method to Estimate Signal to Noise Plus Interference Levels in Order to Improve the Performance of Mobile Ad Hoc Network Routing Protocols**
Mullen, John P.; IPSI 2005 Amalfi Proceedings; [2005]; 6 pp.; In English; See also 20050215422; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Because random variations in signal-to-noise plus interference ratio (SNIR) profoundly affect mobile ad hoc network performance, good estimates of mean SNIR are essential for reliable routing. This paper proposes that signal levels be estimated independently from noise plus interference (N+I) levels because 1) N+I levels can be estimated when the signal is absent, 2) signal estimates must allow for missing values when the transmitter cannot be identified, 3) signal and N+I levels

vary for different reasons and 4) separate estimates are less variable than direct estimates of SNIR. It also demonstrates the effectiveness of these methods via simulation.
Author
*Signal to Noise Ratios; Estimating; Noise Intensity; Protocol (Computers); Transmitters; Stochastic Processes*

**20050215445** Shri Guru Gobind Singhji Inst. of Engineering and Technology, India
**Highly Density Charge Packets of Electrons: An Inevitable Solution for Resistance Free Circuitry**
Shrigovind, Tiwari; Zaheer, Gilani; Karuneshwar, Mishra; IPSI 2005 Amalfi Proceedings; [2005]; 6 pp.; In English; See also 20050215422; Original contains black and white illustrations
Contract(s)/Grant(s): DR456; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Electromagnetic Zero point vacuum fluctuations manifest themselves in the form of Casimir effect. This effect can take place even between electrons which ultimately are carriers of electric charge immersed in the sea of electromagnetic vacuum fluctuations. The Casimir effect at shortening distances can overpower the coulomb s force of repulsion thereby resulting in the electrons finally being attracted towards each other forming stable packets of electrons. These packets of electrons are free to move in any direction and can be used instead of conductors to transfer charge between different potentials using even non conducting material like plastic tubes. This technology would reduce the resistance dramatically and help in designing very high speed circuits even at room temperatures. In this paper we would be considering the viability of systems based on the concept of formation of highly densely charged packets of electrons formed under the balanced interaction of coulomb s force of repulsion and Casimir force. Index Terms Casimir effect, highly densely charged packets of electrons, quantum vacuum fluctuations,
Author
*Electric Charge; Electrons; Conductors; Vacuum; Circuits*

**20050215613** Utah State Univ., Logan, UT, USA
**Measurements of Electrical and Electron Emission Properties of Highly Insulating Materials**
Dennison, J. R.; Brunson, Jerilyn; Hoffman, Ryan; Abbott, Jonathon; Thomson, Clint; Sim, Alec; 1 July 2005; 1 pp.; In English; Workshop on Multifunctional Materials (Keystone III Workshop III), 21-26 Aug. 2005, Keystone, CO, USA
Contract(s)/Grant(s): NAS8-02031; Copyright; Avail.: Other Sources; Abstract Only

Highly insulating materials often acquire significant charges when subjected to fluxes of electrons, ions, or photons. This charge can significantly modify the materials properties of the materials and have profound effects on the functionality of the materials in a variety of applications. These include charging of spacecraft materials due to interactions with the severe space environment, enhanced contamination due to charging in Lunar of Martian environments, high power arching of cables and sources, modification of tethers and ion thrusters for propulsion, and scanning electron microscopy, to name but a few examples. This paper describes new techniques and measurements of the electron emission properties and resistivity of highly insulating materials. Electron yields are a measure of the number of electrons emitted from a material per incident particle (electron, ion or photon). Electron yields depend on incident species, energy and angle, and on the material. They determine the net charge acquired by a material subject to a give incident flu. New pulsed-beam techniques will be described that allow accurate measurement of the yields for uncharged insulators and measurements of how the yields are modified as charge builds up in the insulator. A key parameter in modeling charge dissipation is the resistivity of insulating materials. This determines how charge will accumulate and redistribute across an insulator, as well as the time scale for charge transport and dissipation. Comparison of new long term constant-voltage methods and charge storage methods for measuring resistivity of highly insulating materials will be compared to more commonly used, but less accurate methods.
Author
*Electrical Properties; Electrical Resistivity; Scanning Electron Microscopy; Insulation; Charge Transfer; Electron Emission*

**20050215632** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Characteristics Of Ferroelectric Logic Gates Using a Spice-Based Model**
MacLeod, Todd C.; Phillips, Thomas A.; Ho, Fat D.; June 15, 2005; 2 pp.; In English; International Meeting on Ferroelectricity, 5-9 Sep. 2005, Foz do Iguacu, Brazil; No Copyright; Avail.: Other Sources; Abstract Only

A SPICE-based model of an n-channel ferroelectric field effect transistor has been developed based on both theoretical and empirical data. This model was used to generate the I-V characteristic of several logic gates. The use of ferroelectric field effect transistors in memory circuits is being developed by several organizations. The use of FFETs in other circuits, both

analog and digital needs to be better understood. The ability of FFETs to have different characteristics depending on the initial polarization can be used to create logic gates. These gates can have properties not available to standard CMOS logic gates, such as memory, reconfigurability and memory. This paper investigates basic properties of FFET logic gates. It models FFET inverter, NAND gate and multi-input NAND gate. The I-V characteristics of the gates are presented as well as transfer characteristics and timing. The model used is a SPICE-based model developed from empirical data from actual Ferroelectric transistors. It simulates all major characteristics of the ferroelectric transistor, including polarization, hysteresis and decay. Contrasts are made of the differences between FFET logic gates and CMOS logic gates. FFET parameters are varied to show the effect on the overall gate. A recodigurable gate is investigated which is not possible with CMOS circuits. The paper concludes that FFETs can be used in logic gates and have several advantages over standard CMOS gates.
Author
*Ferroelectricity; Field Effect Transistors; Logic Circuits; Models*

**20050215646** Utah State Univ., Logan, UT, USA
**Instrumentation and Measurements for Electron Emission from Charged Insulators**
Sim, Alec M.; February 21, 2005; 18 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS8-03082; Copyright; Avail.: CASI: A03, Hardcopy

The electron was first discovered in 1898 by Sir John Joseph Thomson and has since been the subject of detailed study by nearly every scientific discipline. At nearly the same time Heinrich Rudolf Hertz conducted a series of experiments using cathode tubes, high potentials and ultraviolet light. When applying a large potential to a cathode he found that an arching event across the metal plates would occur. In addition, when shining an ultraviolet light on the metal he found that less potential was required to induce the spark. This result, taken together with other electrical phenomena brought about by the shining of light upon metal and was eventually termed the photoelectric effect. The work of Thomson and Hertz represent the beginning of electron emission studies and a body of ideas that pervade nearly all aspects of physics. In particular these ideas tell us a great deal about the nature of physical interactions within solids. In this thesis we will focus on the emission of electrons induced by an incident electron source over a range of energies, in which one can observe changes in emitted electron flux and energy distribution. In particular, when energetic particles impinge on a solid they can impart their energy, exciting electrons within the material. If this energy is sufficient to overcome surface energy barriers such as the work function, electron affinity or surface charge potential, electrons can escape from the material. The extent of electron emission from the material can be quantified as the ratio of incident particle flux to emitted particle flux, and is termed the electron yield.
Derived from text
*Electron Emission; Insulators; Electron Sources; Electrons; Electric Charge*

**20050215652** NASA Marshall Space Flight Center, Huntsville, AL, USA
**3-D Packaging: A Technology Review**
Strickland, Mark; Johnson, R. Wayne; Gerke, David; June 23, 2005; 69 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC8-247; No Copyright; Avail.: CASI: A04, Hardcopy

Traditional electronics are assembled as a planar arrangement of components on a printed circuit board (PCB) or other type of substrate. These planar assemblies may then be plugged into a motherboard or card cage creating a volume of electronics. This architecture is common in many military and space electronic systems as well as large computer and telecommunications systems and industrial electronics. The individual PCB assemblies can be replaced if defective or for system upgrade. Some applications are constrained by the volume or the shape of the system and are not compatible with the motherboard or card cage architecture. Examples include missiles, camcorders, and digital cameras. In these systems, planar rigid-flex substrates are folded to create complex 3-D shapes. The flex circuit serves the role of motherboard, providing interconnection between the rigid boards. An example of a planar rigid - flex assembly prior to folding is shown. In both architectures, the interconnection is effectively 2-D.
Author
*Circuit Boards; Printed Circuits; Three Dimensional Models; Telecommunication; Electronic Packaging*

**20050216387** NASA Glenn Research Center, Cleveland, OH, USA
**A Hardware and Software Perspective of the Fifth Materials on the International Space Station Experiment (MISSE-5)**
Krasowski, Michael; Greer, Lawrence; Flatico, Joseph; Jenkins, Phillip; Spina, Dan; August 2005; 27 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22R-612-50-81-03-87-01
Report No.(s): NASA/TM-2005-213840; E-15210; No Copyright; Avail.: CASI: A03, Hardcopy

Conducting space experiments with small budgets is a fact of life for many design groups with low-visibility science programs. One major consequence is that specialized space grade electronic components are often too costly to incorporate into the design. Radiation mitigation now becomes more complex as a result of being restricted to the use of commercial off-the-shelf (COTS) parts. Unique hardware and software design techniques are required to succeed in producing a viable instrument suited for use in space. This paper highlights some of the design challenges and associated solutions encountered in the production of a highly capable, low cost space experiment package.
Author
*International Space Station; Spaceborne Experiments; Software Engineering; Hardware; Composite Materials*

**20050216515** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
**Categorizing High Energy Laser Effects for the Joint Munitions Effectiveness Manual**
Markham, James A.; Jun. 1, 2005; 106 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437012; AFIT/GOR/ENS/05-11; No Copyright; Avail.: CASI: A06, Hardcopy

With the high risk and cost in fielding High Energy Laser (HEL) weapon systems, the development process must include computer simulation models of weapon system performance from the engineering level up to predicting the military worth of employing specific systems in a combat scenario. This research effort focuses on defining how to measure lethality for HEL weapons in an Advanced Tactical Laser (ATL) scenario. In order to create an effective measure for direct comparison between the emerging laser weapon system and existing conventionally delivered weapons, lase time in seconds is presented as a measure comparable to rounds required to cause the desired effect at the target. An examination of input parameters which influence the output power of the laser at the target and thus the required lase time is presented with particular attention being paid to atmospheric conditions and vulnerable bucket size. Results include output tables providing the lase time required for meltthrough of a set of generic truck-type vehicular ground target aimpoints.
DTIC
*Costs; High Power Lasers; Laser Weapons; Military Operations; Weapon Systems*

**20050217017** Defence Research and Development Canada, Ottawa, Ontario Canada
**Parabolic Reflector Modelling Techniques with a Laterally Displaced Feed**
Arpin, Frederic; Jul. 1, 2005; 65 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437089; DRDC-OTTAWA-TM-2005-098; No Copyright; Avail.: CASI: A04, Hardcopy

This document looks at two techniques for modelling the radiation pattern of a parabolic reflector antenna. Both these methods use physical optics to determine the induced currents on the reflector due to the feed. The first method uses MATLAB's numerical integration routine to compute the far-field radiation pattern. The second method involves segmenting the reflector surface and approximating the amplitude and phase of the surface currents by a first degree polynomial. This approximation allows the integration to be performed analytically in closed-form. Three different reflector configurations are investigated including two configurations with a laterally displaced feed. Both these techniques yield accurate results but the latter technique had a significant improvement in computational efficiency.
DTIC
*Antenna Radiation Patterns; Parabolic Reflectors*

**20050217072** Naval Research Lab., Washington, DC USA
**SOF Tactical Repeater**
Buchanan, James L.; Aug. 5, 2005; 83 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437036; NRL/MR/7140--05-8885; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report evaluates the effectiveness of the Biot-Stoll model of a poroelastic seabed in predicting experimentally observed phenomena in underwater acoustics. Discussed in the report is the derivation of the model from physical principles, including more recent extensions such as the distributed pore size formulation of Turgut and Yamamoto and a more sophisticated approach to modeling intergranular effects advocated by Chotiros and Isakson. It is found that with the incorporation of these two extensions, the Biot-Stoll model is capable of producing good agreement with experimentally measured values of compressional wave speed and attenuation. It should be noted however, that there are not currently efficacious ways of measuring the new parameters introduced by these extensions other than adjusting them to wave speed and attenuation data measured over multiple decades of frequency. Also discussed in the report are the determination of the Biot-Stoll parameters, reflection and transmission at the ocean sediment surface, models for depth-varying sediment properties

and some of the difficulties with, and controversies concerning, the Biot-Stoll model.
DTIC
*Underwater Acoustics; Wave Attenuation; Compression Waves; Equations of Motion; Acoustic Scattering*

**20050217090** Delta Air Lines, Inc., Atlanta, GA, USA, NASA Langley Research Center, Hampton, VA, USA
**Transmitter Signal Measurements, Task 5C Report**
Horton, Kent; Eppic, Brian; Huffman, Mitch; White, Harrison; September 2005; 38 pp.; In English
Contract(s)/Grant(s): NCC1-381; WBS 23-079-30-10
Report No.(s): NASA/CR-2005-213910; No Copyright; Avail.: CASI: A03, Hardcopy

Signal Measurements were obtained on four (4) different airport systems. Systems measured were Localizer (LOC), Very High Frequency Communication, (VHF), Glideslope, (G/S), and Global Positioning System (GPS). The task calls for path loss measurements to be taken at Hartsfield-Jackson International Airport (ATL) and one smaller airport which was Greenville/ Spartanburg Airport (GSP) to determine relative signal strengths on the airport properties.
Author
*Airports; Global Positioning System; Transmitters; Signal Measurement*

**20050217178** NASA Glenn Research Center, Cleveland, OH, USA
**Lithium-Ion Batteries Being Evaluated for Low-Earth-Orbit Applications**
McKissock, Barbara I.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The performance characteristics and long-term cycle life of aerospace lithium-ion (Li-ion) batteries in low-Earth-orbit applications are being investigated. A statistically designed test using Li-ion cells from various manufacturers began in September 2004 to study the effects of temperature, end-of-charge voltage, and depth-of-discharge operating conditions on the cycle life and performance of these cells. Performance degradation with cycling is being evaluated, and performance characteristics and failure modes are being modeled statistically. As technology improvements are incorporated into aerospace Li-ion cells, these new designs can be added to the test to evaluate the effect of the design changes on performance and life. Cells from Lithion and Saft have achieved over 2000 cycles under 10 different test condition combinations and are being evaluated. Cells from Mine Safety Appliances (MSA) and modules made up of commercial-off-the-shelf 18650 Li-ion cells connected in series/parallel combinations are scheduled to be added in the summer of 2005. The test conditions include temperatures of 10, 20, and 30 C, end-of-charge voltages of 3.85, 3.95, and 4.05 V, and depth-of-discharges from 20 to 40 percent. The low-Earth-orbit regime consists of a 55 min charge, at a constant-current rate that is 110 percent of the current required to fully recharge the cells in 55 min until the charge voltage limit is reached, and then at a constant voltage for the remaining charge time. Cells are discharged for 35 min at the current required for their particular depth-of-discharge condition. Cells are being evaluated in four-cell series strings with charge voltage limits being applied to individual cells by the use of charge-control units designed and produced at the NASA Glenn Research Center. These charge-control units clamp the individual cell voltages as each cell reaches its end-of-charge voltage limit, and they bypass the excess current from that cell, while allowing the full current flow to the remaining cells in the pack. The goal of this evaluation is to identify conditions and cell designs for Li-ion technology that can achieve more than 30,000 low-Earth-orbit cycles. Testing is being performed at the Naval Surface Warfare Center, Crane Division, in Crane, Indiana.
Author
*Low Earth Orbits; Lithium Batteries; Metal Ions; Technology Utilization*

## 34
## FLUID MECHANICS AND THERMODYNAMICS

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

**20050214847** NASA Glenn Research Center, Cleveland, OH, USA
**National Combustion Code Validated Against Lean Direct Injection Flow Field Data**
Iannetti, Anthony C.; Research and Technology 2002; March 2003; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Most combustion processes have, in some way or another, a recirculating flow field. This recirculation stabilizes the reaction zone, or flame, but an unnecessarily large recirculation zone can result in high nitrogen oxide (NOx) values for

combustion systems. The size of this recirculation zone is crucial to the performance of state-of-the-art, low-emissions hardware. If this is a large-scale combustion process, the flow field will probably be turbulent and, therefore, three-dimensional. This research dealt primarily with flow fields resulting from lean direct injection (LDI) concepts, as described in Research & Technology 2001. LDI is a concept that depends heavily on the design of the swirler. The LDI concept has the potential to reduce NOx values from 50 to 70 percent of current values, with good flame stability characteristics. It is cost effective and (hopefully) beneficial to do most of the design work for an LDI swirler using computer-aided design (CAD) and computer-aided engineering (CAE) tools. Computational fluid dynamics (CFD) codes are CAE tools that can calculate three-dimensional flows in complex geometries. However, CFD codes are only beginning to correctly calculate the flow fields for complex devices, and the related combustion models usually remove a large portion of the flow physics.
Derived from text
*Combustion Physics; Nitrogen Oxides; Computer Aided Design; Flame Stability; Fluid Dynamics; Injection*

**20050214852** NASA Glenn Research Center, Cleveland, OH, USA
**Digital Particle Image Velocimetry (DPIV) Used for Space-Time Correlations in Nozzle Flow**
Wernet, Mark P.; Bridges, James E.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

An optical measurement technique known as Digital Particle Image Velocimetry (DPIV) was used previously to characterize the first- and second-order statistical properties of both cold and hot jet flows from externally mixed nozzles in NASA Glenn Research Center's Nozzle Acoustic Test Rig. In this technique, an electronic camera records particles entrained in a flow as a laser light sheet is pulsed at two instances in time. Correlation processing of the recorded particle image pairs yields the two-component velocity field across the imaged plane of the flow. The information acquired using DPIV is being used to improve our understanding of the decay of turbulence in jet flows-a critical element for understanding the acoustic properties of the flow. Recently, two independent DPIV systems were installed in Glenn's Small Hot Jet Acoustic Rig, enabling multiplane correlations in time and space. The data were collected over a range of different Mach numbers and temperature ratios. DPIV system 1 was fixed to a large traverse rig, and DPIV system 2 was mounted on a small traverse system mounted on the large traverse frame. The light sheets from the two DPIV systems were aligned to lie in the same axial plane, with DPIV system 2 being independently traversed downstream along the flow direction. For each measurement condition, the DPIV systems were started at a fully overlapping orientation. A polarization separation technique was used to avoid cross-talk between the two systems. Then, the DPIV systems fields were shifted axially apart, in successively increasing steps. The downstream DPIV system 2 was triggered at a short time delay after the upstream DPIV system 1, where the time delay was proportional to the convective flow velocity in the shear layer of the jet flow and the axial separation of the two DPIV systems. The acquired data were processed to obtain the instantaneous velocity vector maps over a range of time delays and spatial separations. The velocity fields from the different DPIV systems were then cross-correlated to determine the degree of correlation remaining in the flow as the downstream convection distance was increased. The new data provide Lagrangian measurements of the convective turbulent structures in the shear layer of an exhaust nozzle. These measurements, obtained in both cold and hot flows, will be used to validate and correct models for space-time velocity correlations-long a missing key to predicting jet noise.
Author
*Exhaust Nozzles; Jet Aircraft Noise; Nozzle Flow; Particle Image Velocimetry; Optical Measurement*

**20050215018** NASA Glenn Research Center, Cleveland, OH, USA
**Two-Fluid Interface Instability Being Studied**
Niederhaus, Charles E.; Research and Technology 2002; March 2003; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The interface between two fluids of different density can experience instability when gravity acts normal to the surface. The relatively well known Rayleigh-Taylor (RT) instability results when the gravity is constant with a heavy fluid over a light fluid. An impulsive acceleration applied to the fluids results in the Richtmyer-Meshkov (RM) instability. The RM instability occurs regardless of the relative orientation of the heavy and light fluids. In many systems, the passing of a shock wave through the interface provides the impulsive acceleration. Both the RT and RM instabilities result in mixing at the interface. These instabilities arise in a diverse array of circumstances, including supernovas, oceans, supersonic combustion, and inertial confinement fusion (ICF). The area with the greatest current interest in RT and RM instabilities is ICF, which is an attempt to produce fusion energy for nuclear reactors from BB-sized pellets of deuterium and tritium. In the ICF experiments conducted so far, RM and RT instabilities have prevented the generation of net-positive energy. The $4 billion National

Ignition Facility at Lawrence Livermore National Laboratory is being constructed to study these instabilities and to attempt to achieve net-positive yield in an ICF experiment.
Derived from text
*Gravitation; Inertial Confinement Fusion; Shock Waves; Stability; Fluid Flow*

**20050215098** NASA Glenn Research Center, Cleveland, OH, USA
**Navier-Stokes Computations With One-Equation Turbulence Model for Flows Along Concave Wall Surfaces**
Wang, Chi R.; August 2005; 23 pp.; In English
Contract(s)/Grant(s): WBS 22-714-30-15
Report No.(s): NASA/TM-2005-213830; E-15200; No Copyright; Avail.: CASI: A03, Hardcopy

This report presents the use of a time-marching three-dimensional compressible Navier-Stokes equation numerical solver with a one-equation turbulence model to simulate the flow fields developed along concave wall surfaces without and with a downstream extension flat wall surface. The 3-D Navier- Stokes numerical solver came from the NASA Glenn-HT code. The one-equation turbulence model was derived from the Spalart and Allmaras model. The computational approach was first calibrated with the computations of the velocity and Reynolds shear stress profiles of a steady flat plate boundary layer flow. The computational approach was then used to simulate developing boundary layer flows along concave wall surfaces without and with a downstream extension wall. The author investigated the computational results of surface friction factors, near surface velocity components, near wall temperatures, and a turbulent shear stress component in terms of turbulence modeling, computational mesh configurations, inlet turbulence level, and time iteration step. The computational results were compared with existing measurements of skin friction factors, velocity components, and shear stresses of the developing boundary layer flows. With a fine computational mesh and a one-equation model, the computational approach could predict accurately the skin friction factors, near surface velocity and temperature, and shear stress within the flows. The computed velocity components and shear stresses also showed the vortices effect on the velocity variations over a concave wall. The computed eddy viscosities at the near wall locations were also compared with the results from a two equation turbulence modeling technique. The inlet turbulence length scale was found to have little effect on the eddy viscosities at locations near the concave wall surface. The eddy viscosities, from the one-equation and two-equation modeling, were comparable at most stream-wise stations. The present one-equation turbulence model is an effective approach for turbulence modeling in the near solid wall surface region of flow over a concave wall.
Author
*Navier-Stokes Equation; Time Marching; Turbulence Models; Computational Grids; Boundary Layer Flow; Mathematical Models*

**20050215122** NASA Langley Research Center, Hampton, VA, USA
**Hyper-X Mach 7 Scramjet Design, Ground Test and Flight Results**
Ferlemann, Shelly M.; McClinton, Charles R.; Rock, Ken E.; Voland, Randy T.; [2005]; 9 pp.; In English; 13th AIAA/CIRA International Space Planes and Hypersonic Systems Technologies Conference, 16-20 May 2005, Capua, Italy
Contract(s)/Grant(s): 23-065-50-SL; No Copyright; Avail.: CASI: A02, Hardcopy

The successful Mach 7 flight test of the Hyper-X (X-43) research vehicle has provided the major, essential demonstration of the capability of the airframe integrated scramjet engine. This flight was a crucial first step toward realizing the potential for airbreathing hypersonic propulsion for application to space launch vehicles. However, it is not sufficient to have just achieved a successful flight. The more useful knowledge gained from the flight is how well the prediction methods matched the actual test results in order to have confidence that these methods can be applied to the design of other scramjet engines and powered vehicles. The propulsion predictions for the Mach 7 flight test were calculated using the computer code, SRGULL, with input from computational fluid dynamics (CFD) and wind tunnel tests. This paper will discuss the evolution of the Mach 7 Hyper-X engine, ground wind tunnel experiments, propulsion prediction methodology, flight results and validation of design methods.
Author
*Supersonic Combustion Ramjet Engines; Computational Fluid Dynamics; Flight Tests; Ground Tests; Hypersonic Speed; Wind Tunnel Tests; X-43 Vehicle; Engine Design*

**20050215156** NASA Glenn Research Center, Cleveland, OH, USA
**Contact Angle of Drops Measured on Nontransparent Surfaces and Capillary Flow Visualized**
Chao, David F.; Zhang, Nengli; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The spreading of a liquid on a solid surface is important for various practical processes, and contact-angle measurements provide an elegant method to characterize the interfacial properties of the liquid with the solid substrates. The complex physical processes occurring when a liquid contacts a solid play an important role in determining the performance of chemical processes and materials. Applications for these processes are in printing, coating, gluing, textile dyeing, and adhesives and in the pharmaceutical industry, biomedical research, adhesives, flat panel display manufacturing, surfactant chemistry, and thermal engineering.
Derived from text
*Capillary Flow; Liquid Surfaces; Solid Surfaces; Substrates*

**20050215171** NASA Glenn Research Center, Cleveland, OH, USA
**TopMaker: Technique Developed for Automatic Multiblock Topology Generation Using the Medial Axis**
Rigby, David L.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The TopMaker technique was developed in an effort to reduce the time required for grid generation in complex numerical studies. Topology generation accounts for much of the man-hours required for structured multiblock grids. With regard to structured multiblock grids, topology refers to how the blocks are arranged and connected. A two-dimensional multiblock topology generation technique has been developed at the NASA Glenn Research Center. Very general configurations can be addressed by the technique. A configuration is defined by a collection of non-intersecting closed curves, which will be referred to as loops. More than a single loop implies that holes exist in the domain, which poses no problem. This technique requires only the medial vertices and the touch points that define each vertex. From the information about the medial vertices, the connectivity between medial vertices is generated. The physical shape of the medial edge is not required. By applying a few simple rules to each medial edge, a multiblock topology can be generated without user intervention. The resulting topologies contain only the level of complexity dictated by the configurations. Grid lines remain attached to the boundary except at sharp concave turns, where a change in index family is introduced as would be desired. Keeping grid lines attached to the boundary is especially important in computational fluid dynamics, where highly clustered grids are used near no-slip boundaries. This technique is simple and robust and can easily be incorporated into the overall grid-generation process.
Author
*Computational Fluid Dynamics; Computational Grids; Topology*

**20050215240** QSS Group, Inc., Cleveland, OH, USA
**AirShow 1.0 CFD Software Users' Guide**
Mohler, Stanley R., Jr.; August 2005; 33 pp.; In English
Contract(s)/Grant(s): NAS3-00145; WBS 22-066-50-01
Report No.(s): NASA/CR-2005-213891; E-15262; No Copyright; Avail.: CASI: A03, Hardcopy

AirShow is visualization post-processing software for Computational Fluid Dynamics (CFD). Upon reading binary PLOT3D grid and solution files into AirShow, the engineer can quickly see how hundreds of complex 3-D structured blocks are arranged and numbered. Additionally, chosen grid planes can be displayed and colored according to various aerodynamic flow quantities such as Mach number and pressure. The user may interactively rotate and translate the graphical objects using the mouse. The software source code was written in cross-platform Java, C++, and OpenGL, and runs on Unix, Linux, and Windows. The graphical user interface (GUI) was written using Java Swing. Java also provides multiple synchronized threads. The Java Native Interface (JNI) provides a bridge between the Java code and the C++ code where the PLOT3D files are read, the OpenGL graphics are rendered, and numerical calculations are performed. AirShow is easy to learn and simple to use. The source code is available for free from the NASA Technology Transfer and Partnership Office.
Author
*Computational Fluid Dynamics; C++ (Programming Language); Aerodynamic Characteristics; Mach Number; Fluid Flow; Unix (Operating System); Computational Grids*

**20050215247** NASA Glenn Research Center, Cleveland, OH, USA
**Benchmark Tests for Stirling Convertor Heater Head Life Assessment Conducted**
Krause, David L.; Halford, Gary R.; Bowman, Randy R.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A new in-house test capability has been developed at the NASA Glenn Research Center, where a critical component of the Stirling Radioisotope Generator (SRG) is undergoing extensive testing to aid the development of analytical life prediction methodology and to experimentally aid in verification of the flight-design component's life. The new facility includes two test

rigs that are performing creep testing of the SRG heater head pressure vessel test articles at design temperature and with wall stresses ranging from operating level to seven times that (see the following photograph).
Derived from text
*Stirling Cycle; Heaters; Creep Tests*

**20050215276** NASA Glenn Research Center, Cleveland, OH, USA, Toledo Univ., OH, USA
**Linearized Aeroelastic Solver Applied to the Flutter Prediction of Real Configurations**
Reddy, Tondapu S.; Bakhle, Milind A.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A fast-running unsteady aerodynamics code, LINFLUX, was previously developed for predicting turbomachinery flutter. This linearized code, based on a frequency domain method, models the effects of steady blade loading through a nonlinear steady flow field. The LINFLUX code, which is 6 to 7 times faster than the corresponding nonlinear time domain code, is suitable for use in the initial design phase. Earlier, this code was verified through application to a research fan, and it was shown that the predictions of work per cycle and flutter compared well with those from a nonlinear time-marching aeroelastic code, TURBO-AE. Now, the LINFLUX code has been applied to real configurations: fans developed under the Energy Efficient Engine (E-cubed) Program and the Quiet Aircraft Technology (QAT) project. The LINFLUX code starts with a steady nonlinear aerodynamic flow field and solves the unsteady linearized Euler equations to calculate the unsteady aerodynamic forces on the turbomachinery blades. First, a steady aerodynamic solution is computed for given operating conditions using the nonlinear unsteady aerodynamic code TURBO-AE. A blade vibration analysis is done to determine the frequencies and mode shapes of the vibrating blades, and an interface code is used to convert the steady aerodynamic solution to a form required by LINFLUX. A preprocessor is used to interpolate the mode shapes from the structural dynamics mesh onto the computational fluid dynamics mesh. Then, LINFLUX is used to calculate the unsteady aerodynamic pressure distribution for a given vibration mode, frequency, and interblade phase angle. Finally, a post-processor uses the unsteady pressures to calculate the generalized aerodynamic forces, eigenvalues, an esponse amplitudes. The eigenvalues determine the flutter frequency and damping. Results of flutter calculations from the LINFLUX code are presented for (1) the E-cubed fan developed under the E-cubed program and (2) the Quiet High Speed Fan (QHSF) developed under the Quiet Aircraft Technology project. The results are compared with those obtained from the TURBO-AE code. A graph of the work done per vibration cycle for the first vibration mode of the E-cubed fan is shown. It can be seen that the LINFLUX results show a very good comparison with TURBO-AE results over the entire range of interblade phase angle. The work done per vibration cycle for the first vibration mode of the QHSF fan is shown. Once again, the LINFLUX results compare very well with the results from the TURBOAE code.
Author
*Aeroelasticity; Computational Fluid Dynamics; Flutter Analysis; Linearization; Unsteady Aerodynamics; Turbomachinery; Aerodynamic Configurations*

**20050215279** NASA Glenn Research Center, Cleveland, OH, USA, Akron Univ., Akron, OH, USA
**Nonlinear Acoustics Used To Reduce Leakage Flow**
Daniels, Christopher C.; Steinetz, Bruce M.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Leakage and wear are two fundamental problems in all traditional turbine seals that contribute to an engine's inefficiency. The solutions to seal leakage and wear conflict in the conventional design space. Reducing the clearance between the seal and rotating shaft reduces leakage but increases wear because of increased contact incidents. Increasing the clearance to reduce the contact between parts reduces wear but increases parasitic leakage. The goal of this effort is to develop a seal that restricts leakage flow using acoustic pressure while operating in a noncontacting manner, thereby increasing life. In 1996, Dr. Timothy Lucas announced his discovery of a method to produce shock-free high-amplitude pressure waves. For the first time, the formation of large acoustic pressures was possible using dissonant resonators. A pre-prototype acoustic seal developed at the NASA Glenn Research Center exploits this fundamental acoustic discovery: a specially shaped cavity oscillated at the contained fluid's resonant frequency produces high-amplitude acoustic pressure waves of a magnitude approaching those required of today's seals. While the original researchers are continuing their development of acoustic pumps, refrigeration compressors, and electronic thermal management systems using this technology, the goal of researchers at Glenn is to apply these acoustic principles to a revolutionary sealing device. When the acoustic resonator shape is optimized for the sealing device, the flow from a high-pressure cavity to a low-pressure cavity will be restricted by a series of high-amplitude standing pressure waves of higher pressure than the pressure to be sealed. Since the sealing resonator cavity will not touch the adjacent sealing structures, seal wear will be eliminated, improving system life. Under a cooperative agreement between Glenn and the

Ohio Aerospace Institute (OAI), an acoustic-based pre-prototype seal was demonstrated for the first time. A pressurized cavity was attached to one end of the resonator while the other end remained open to ambient pressure. Measurements were taken at several values of applied pressure with the assembly stationary, oscillated at an off-resonance frequency, and then oscillated on-resonance. The three cases show that the flow through the conical resonator can be reduced by oscillating the resonator at the resonance frequency of the air contained within the cavity. The results are currently being compared with results obtained from a commercial computational fluid dynamics code. The objective is to improve the design through numerical simulation before fabricating a next-generation prototype sealing device. Future work is aimed at implementing acoustic seal design improvements to further reduce the leakage flow rate through the device and at reducing the device's overall size.
Author
*Computational Fluid Dynamics; Leakage; Nonlinearity; Acoustics; Fabrication; Turbines*

**20050215292** NASA Glenn Research Center, Cleveland, OH, USA
**Numerical Prediction of Non-Reacting and Reacting Flow in a Model Gas Turbine Combustor**
Davoudzadeh, Farhad; Liu, Nan-Suey; August 2005; 17 pp.; In English; Turbo Expo 2004, 14-17 Jun. 2004, Vienna, Austria
Contract(s)/Grant(s): NCC3-925; WBS 22-714-02-20
Report No.(s): NASA/TM-2005-213898; GT2004-53496; E-15269; No Copyright; Avail.: CASI: A03, Hardcopy

The three-dimensional, viscous, turbulent, reacting and non-reacting flow characteristics of a model gas turbine combustor operating on air/methane are simulated via an unstructured and massively parallel Reynolds-Averaged Navier-Stokes (RANS) code. This serves to demonstrate the capabilities of the code for design and analysis of real combustor engines. The effects of some design features of combustors are examined. In addition, the computed results are validated against experimental data.
Author
*Computational Fluid Dynamics; K-Epsilon Turbulence Model; Turbulent Flow; Gas Turbine Engines; Reacting Flow; Computerized SIMulation; Mathematical Models*

**20050215296** National Center for Microgravity Research on Fluids and Combustion, Cleveland, OH, USA
**Thin-Filament Pyrometry Developed for Measuring Temperatures in Flames**
Sunderland, Peter B.; Research and Technology 2003; May 2004; 4 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Many valuable advances in combustion science have come from observations of microgravity flames. This research is contributing to the improved efficiency and reduced emissions of practical combustors and is benefiting terrestrial and spacecraft fire safety. Unfortunately, difficulties associated with microgravity have prevented many types of measurements in microgravity flames. In particular, temperature measurements in flames are extremely important but have been limited in microgravity. A novel method of measuring temperatures in microgravity flames is being developed in-house at the National Center for Microgravity Research and the NASA Glenn Research Center and is described here. Called thin-filament pyrometry, it involves using a camera to determine the local gas temperature from the intensity of inserted fibers glowing in a flame. It is demonstrated here to provide accurate measurements of gas temperatures in a flame simultaneously at many locations. The experiment is shown. The flame is a laminar gas jet diffusion flame fueled by methane (CH4) flowing from a 14-mm round burner at a pressure of 1 atm. A coflowing stream of air is used to prevent flame flicker. Nine glowing fibers are visible. These fibers are made of silicon carbide (SiC) and have a diameter of 15 m (for comparison, the average human hair is 75 m in diameter). Because the fibers are so thin, they do little to disturb the flame and their temperature remains close to that of the local gas. The flame and glowing filaments were imaged with a digital black-and-white video camera. This camera has an imaging area of 1000 by 1000 pixels and a wide dynamic range of 12 bits. The resolution of the camera and optics was 0.1 mm. Optical filters were placed in front of the camera to limit incoming light to 750, 850, 950, and 1050 nm. Temperatures were measured in the same flame in the absence of fibers using 50-m Btype thermocouples. These thermocouples provide very accurate temperatures, but they generally are not useful in microgravity tests because they measure temperature at only one location at a time. Thermocouple measurements at a height of 11 mm above the burner were used to calibrate the thin-filament pyrometry system at all four wavelengths. This calibration was used to perform thin-filament pyrometry at other heights above the burner. One such profile is shown in this graph; this is for a height of 21 mm. The agreement between the pyrometry measurements and thermocouple results at this height is excellent in the range of 1000 to 2000 K, with an estimated uncertainty of 50 K and an estimated upper limit of 2500 K. Neither the thermocouple nor the thin-filament pyrometry temperatures have been corrected for radiation, but the correction is expected to be nearly the same for both methods. We anticipate that thin-filament pyrometry similar to that developed here will become an important

diagnostic for studies of microgravity flames owing to its accuracy and its ability to simultaneously measure finely spaced temperatures.
Author
*Flames; Filaments; Microgravity; Temperature Measurement*

**20050215297** National Center for Microgravity Research on Fluids and Combustion, Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
**Carbon Dioxide Dispersion in the Combustion Integrated Rack Simulated Numerically**
Wu, Ming-Shin; Ruff, Gary A.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

When discharged into an International Space Station (ISS) payload rack, a carbon dioxide (CO2) portable fire extinguisher (PFE) must extinguish a fire by decreasing the oxygen in the rack by 50 percent within 60 sec. The length of time needed for this oxygen reduction throughout the rack and the length of time that the CO2 concentration remains high enough to prevent the fire from reigniting is important when determining the effectiveness of the response and postfire procedures. Furthermore, in the absence of gravity, the local flow velocity can make the difference between a fire that spreads rapidly and one that self-extinguishes after ignition. A numerical simulation of the discharge of CO2 from PFE into the Combustion Integrated Rack (CIR) in microgravity was performed to obtain the local velocity and CO2 concentration. The complicated flow field around the PFE nozzle exits was modeled by sources of equivalent mass and momentum flux at a location downstream of the nozzle. The time for the concentration of CO2 to reach a level that would extinguish a fire anywhere in the rack was determined using the Fire Dynamics Simulator (FDS), a computational fluid dynamics code developed by the National Institute of Standards and Technology specifically to evaluate the development of a fire and smoke transport. The simulation shows that CO2, as well as any smoke and combustion gases produced by a fire, would be discharged into the ISS cabin through the resource utility panel at the bottom of the rack. These simulations will be validated by comparing the results with velocity and CO2 concentration measurements obtained during the fire suppression system verification tests conducted on the CIR in March 2003. Once these numerical simulations are validated, portions of the ISS labs and living areas will be modeled to determine the local flow conditions before, during, and after a fire event. These simulations can yield specific information about how long it takes for smoke and combustion gases produced by a fire to reach a detector location, how large the fire would be when the detector alarms, and the behavior of the fire until it has been extinguished. This new capability could then be used to optimize the location of fire detectors and fire-suppression ports as well as to evaluate the effectiveness of fire suppressants and response strategies. Numerical data collected from these simulations could also be used to develop a virtual reality fire event for crew training and fire safety awareness. This work is funded by NASA's Bioastronautics Initiative, which has the objective of ensuring and enhancing the health, safety, and performance of humans in space. As part of this initiative, the Microgravity Combustion Science Branch at the NASA Glenn Research Center is conducting spacecraft fire safety research to significantly improve fire safety on inhabited spacecraft.
Author
*Carbon Dioxide Concentration; Computational Fluid Dynamics; SIMulation; Dispersion; International Space Station; Combustion; Direct Numerical SIMulation*

**20050215298** NASA Glenn Research Center, Cleveland, OH, USA
**'Smart' Magnetic Fluids Experiment Operated on the International Space Station**
Agui, Juan H.; Lekan, Jack F.; Research and Technology 2003; May 2004; 5 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

InSPACE is a microgravity fluid physics experiment that was operated on the International Space Station (ISS) in the Microgravity Science Glovebox from late March 2003 through early July 2003. (InSPACE is an acronym for Investigating the Structure of Paramagnetic Aggregates From Colloidal Emulsions.) The purpose of the experiment is to obtain fundamental data of the complex properties of an exciting class of smart materials termed magnetorheological (MR) fluids. MR fluids are suspensions, or colloids, comprised of small (micrometer-sized) superparamagnetic particles in a nonmagnetic medium. Colloids are suspensions of very small particles suspended in a liquid. (Examples of other colloids are blood, milk, and paint.) These controllable fluids can quickly transition into a nearly solid state when exposed to a magnetic field and return to their original liquid state when the magnetic field is removed. Controlling the strength of the magnetic field can control the relative stiffness of these fluids. MR fluids can be used to improve or develop new seat suspensions, robotics, clutches, airplane landing gear, and vibration damping systems. The principal investigator for InSPACE is Professor Alice P. Gast of the Massachusetts Institute of Technology (MIT). The InSPACE hardware was developed at the NASA Glenn Research Center. The InSPACE samples were delivered to the ISS in November 2002, on the Space Shuttle Endeavour, on Space Station Utilization Flight

UF-2/STS113. Operations began on March 31, 2003, with the processing of three different particle size samples at multiple test parameters. This investigation focused on determining the structural organization of MR colloidal aggregates when exposed to a pulsing magnetic field. On Earth, the aggregates take the shape of footballs with spiky tips. This characteristic shape may be influenced by the pull of gravity, which causes most particles initially suspended in the fluid to sediment, (i.e., settle and collect at the bottom of the cell). In the absence of sedimentation effects on the ISS, the behavior and shape of these MR aggregate structures are dominated exclusively by magnetic and surface tension forces. The microscopic detail of these structures was imaged under two orthogonal camera views. The video was downlinked to the InSPACE team at Glenn's Telescience Support Center and to MIT and also recorded onboard the ISS on videotapes that will be brought back to the ground by the space shuttles. The study examined the effect on the structure formation by varying the magnetic field strength and pulse frequency, and particle size. Fundamental data that characterized the structure formation were obtained. InSPACE completed its last planned test run on July 2, 2003. Operations occurred on 21 days over approximately a 3-month period. Forty-one test points were completed during 26 test runs. During the initial testing, the procedures followed by the crew were modified to maximize the observation of some unexpected and interesting aggregate behavior. As a result Dr. Gast has reported on the formation of aggregate shapes that are more extended and diverse than those observed on the ground. Sheets of magnetic material folded over in a labyrinth pattern and large columnar aggregates with complex interfaces with the surrounding fluid are examples of the interesting structures that have been observed on the ISS. In light of these early findings, the understanding of the fundamental properties of MR fluids on the basis of ground-based observations may need to be reconsidered.The experiments on the ISS have provided a vast amount of video data for analysis. While this analysis is ongoing, plans are being made for additional experimental runs. For this purpose, additional hardware and cells containing samples of different magnetic particles and sizes are being fabricated for a future launch to the ISS. The InSPACE hardware will remain on orbit until this testing is completed.

Author

*Magnetorheological Fluids; Microgravity; Smart Materials; International Space Station; Fabrication; Spaceborne Experiments*

**20050215305** Alabama Univ., Huntsville, AL, USA

**Specific Impulse and Mass Flow Rate Error**

Gregory, Don A.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XVIII-1 - XVIII-11; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Specific impulse is defined in words in many ways. Very early in any text on rocket propulsion a phrase similar to .specific impulse is the thrust force per unit propellant weight flow per second. will be found.(2) It is only after seeing the mathematics written down does the definition mean something physically to scientists and engineers responsible for either measuring it or using someone.s value for it.

Derived from text

*Mass Flow Rate; Errors; Propellants; Specific Impulse*

**20050215309** Ohio Northern Univ., Ada, OH, USA

**Convergence Acceleration and Documentation of CFD Codes for Turbomachinery Applications**

Marquart, Jed E.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXVI-1 - XXVI-5; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The development and analysis of turbomachinery components for industrial and aerospace applications has been greatly enhanced in recent years through the advent of computational fluid dynamics (CFD) codes and techniques. Although the use of this technology has greatly reduced the time required to perform analysis and design, there still remains much room for improvement in the process. In particular, there is a steep learning curve associated with most turbomachinery CFD codes, and the computation times need to be reduced in order to facilitate their integration into standard work processes. Two turbomachinery codes have recently been developed by Dr. Daniel Dorney (MSFC) and Dr. Douglas Sondak (Boston University). These codes are entitled Aardvark (for 2-D and quasi 3-D simulations) and Phantom (for 3-D simulations). The codes utilize the General Equation Set (GES), structured grid methodology, and overset O- and H-grids. The codes have been used with success by Drs. Dorney and Sondak, as well as others within the turbomachinery community, to analyze engine components and other geometries. One of the primary objectives of this study was to establish a set of parametric input values which will enhance convergence rates for steady state simulations, as well as reduce the runtime required for unsteady cases. The goal is to reduce the turnaround time for CFD simulations, thus permitting more design parametrics to be run within a given time period. In addition, other code enhancements to reduce runtimes were investigated and implemented. The other primary goal of the study was to develop enhanced users manuals for Aardvark and Phantom. These manuals are intended to

answer most questions for new users, as well as provide valuable detailed information for the experienced user. The existence of detailed user s manuals will enable new users to become proficient with the codes, as well as reducing the dependency of new users on the code authors. In order to achieve the objectives listed, the following tasks were accomplished: 1) Parametric Study Of Preconditioning Parameters And Other Code Inputs; 2) Code Modifications To Reduce Runtimes; 3) Investigation Of Compiler Options To Reduce Code Runtime; and 4) Development/Enhancement of Users Manuals for Aardvark and Phantom
Derived from text
*Computational Fluid Dynamics; Convergence; Turbomachinery; Acceleration*

**20050215315** Louisiana Univ., Lafayette, LA, USA
**A Theoretical Investigation of Oxidation Efficiency of a Volatile Removal Assembly Reactor Under Microgravity Conditions**
Guo, Boyun; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XIX-1 - XIX-5; In English; See also 20050215300; No Copyright; Avail.: CASI: A01, Hardcopy

Volatile Removal Assembly (VRA) is a subsystem of the Closed Environment Life Support System (CELSS) installed in the International Space Station. It is used for removing contaminants (volatile organics) in the wastewater produced by the space station crews. The major contaminants are formic acid, ethanol, and propylene glycol. The VRA contains a slim packbed reactor (3.5 cm diameter and four 28 cm long tubes in series) to perform catalyst oxidation of wastewater at elevated pressure and temperature under microgravity conditions. In the reactor, the contaminants are burned with oxygen gas (O2) to form water and carbon dioxide (CO2) that dissolves in the water stream. Optimal design of the reactor requires a thorough understanding about how the reactor performs under microgravity conditions. The objective of this study was to develop a mathematical model to interpret experimental data obtained from normal and microgravity conditions, and to predict the performance of VRA reactor under microgravity conditions. Catalyst oxidation kinetics and the total oxygen-water contact area control the efficiency of catalyst oxidation for mass transfer, which depends on oxygen gas holdup and distribution in the reactor. The process involves bubbly flow in porous media with chemical reactions in microgravity environment. This presents a unique problem in fluid dynamics that has not been studied. Guo et al. (2004) developed a mathematical model that predicts oxygen holdup in the VRA reactor. No mathematical model has been found in the literature that can be used to predict the efficiency of catalyst oxidation under microgravity conditions.
Author
*Reaction Kinetics; Closed Ecological Systems; Life Support Systems; International Space Station; Contaminants; Waste Water; Formic Acid; Ethyl Alcohol; Propylene; Glycols*

**20050215323** Alabama Univ., Huntsville, AL, USA
**Sub-Grid Modeling of Electrokinetic Effects in Micro Flows**
Chen, C. P.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. VII-1 - VII-5; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Advances in micro-fabrication processes have generated tremendous interests in miniaturizing chemical and biomedical analyses into integrated microsystems (Lab-on-Chip devices). To successfully design and operate the micro fluidics system, it is essential to understand the fundamental fluid flow phenomena when channel sizes are shrink to micron or even nano dimensions. One important phenomenon is the electro kinetic effect in micro/nano channels due to the existence of the electrical double layer (EDL) near a solid-liquid interface. Not only EDL is responsible for electro-osmosis pumping when an electric field parallel to the surface is imposed, EDL also causes extra flow resistance (the electro-viscous effect) and flow anomaly (such as early transition from laminar to turbulent flow) observed in pressure-driven microchannel flows. Modeling and simulation of electro-kinetic effects on micro flows poses significant numerical challenge due to the fact that the sizes of the double layer (10 nm up to microns) are very thin compared to channel width (can be up to 100 s of m). Since the typical thickness of the double layer is extremely small compared to the channel width, it would be computationally very costly to capture the velocity profile inside the double layer by placing sufficient number of grid cells in the layer to resolve the velocity changes, especially in complex, 3-d geometries. Existing approaches using 'slip' wall velocity and augmented double layer are difficult to use when the flow geometry is complicated, e.g. flow in a T-junction, X-junction, etc. In order to overcome the difficulties arising from those two approaches, we have developed a sub-grid integration method to properly account for the physics of the double layer. The integration approach can be used on simple or complicated flow geometries. Resolution of the double layer is not needed in this approach, and the effects of the double layer can be accounted for at the same time. With this approach, the numeric grid size can be much larger than the thickness of double layer. Presented in this report are a

description of the approach, methodology for implementation and several validation simulations for micro flows.
Author
*Microchannels; Flow Geometry; Electrokinetics; Chemical Analysis; Velocity Distribution; Turbulent Flow; Viscous Flow; Electric Fields*

**20050215324** Embry-Riddle Aeronautical Univ., USA
**CFD Multiphysics Tool**
Perrell, Eric R.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXXIII-5 - XXXIII-5; In English; See also 20050215300; No Copyright; Avail.: CASI: A01, Hardcopy

The recent bold initiatives to expand the human presence in space require innovative approaches to the design of propulsion systems whose underlying technology is not yet mature. The space propulsion community has identified a number of candidate concepts. A short list includes solar sails, high-energy-density chemical propellants, electric and electromagnetic accelerators, solar-thermal and nuclear-thermal expanders. For each of these, the underlying physics are relatively well understood. One could easily cite authoritative texts, addressing both the governing equations, and practical solution methods for, e.g. electromagnetic fields, heat transfer, radiation, thermophysics, structural dynamics, particulate kinematics, nuclear energy, power conversion, and fluid dynamics. One could also easily cite scholarly works in which complete equation sets for any one of these physical processes have been accurately solved relative to complex engineered systems. The Advanced Concepts and Analysis Office (ACAO), Space Transportation Directorate, NASA Marshall Space Flight Center, has recently released the first alpha version of a set of computer utilities for performing the applicable physical analyses relative to candidate deep-space propulsion systems such as those listed above. PARSEC, Preliminary Analysis of Revolutionary in-Space Engineering Concepts, enables rapid iterative calculations using several physics tools developed in-house. A complete cycle of the entire tool set takes about twenty minutes. PARSEC is a level-zero/level-one design tool. For PARSEC s proof-of-concept, and preliminary design decision-making, assumptions that significantly simplify the governing equation sets are necessary. To proceed to level-two, one wishes to retain modeling of the underlying physics as close as practical to known applicable first principles. This report describes results of collaboration between ACAO, and Embry-Riddle Aeronautical University (ERAU), to begin building a set of level-two design tools for PARSEC. The 'CFD Multiphysics Tool' will be the propulsive element of the tool set. The name acknowledges that space propulsion performance assessment is primarily a fluid mechanics problem. At the core of the CFD Multiphysics Tool is an open-source CFD code, HYP, under development at ERAU. ERAU is renowned for its undergraduate degree program in Aerospace Engineering the largest in the nation. The strength of the program is its applications-oriented curriculum, which culminates in one of three two-course Engineering Design sequences: Aerospace Propulsion, Spacecraft, or Aircraft. This same philosophy applies to the HYP Project, albeit with fluid physics modeling commensurate with graduate research. HYP s purpose, like the Multiphysics Tool s, is to enable calculations of real (three-dimensional; geometrically complex; intended for hardware development) applications of high speed and propulsive fluid flows.
Author
*Computational Fluid Dynamics; Propulsion System Configurations; Solar Sails; Propellants; Spacecraft Propulsion; Thermodynamics; Electromagnetic Fields; Heat Transfer*

**20050215395** NASA Glenn Research Center, Cleveland, OH, USA
**Operation of Packed-Bed Reactors Studied in Microgravity**
Motil, Brian J.; Balakotaiah, Vemuri; Research and Technology 2003; May 2004; 4 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The operation of a packed bed reactor (PBR) involves gas and liquid flowing simultaneously through a fixed-bed of solid particles. Depending on the application, the particles can be various shapes and sizes but are generally designed to force the two fluid phases through a tortuous route of narrow channels connecting the interstitial space. The PBR is the most common type of reactor in industry because it provides for intimate contact and high rates of transport between the phases needed to sustain chemical or biological reactions. The packing may also serve as either a catalyst or as a support for growing biological material. Furthermore, this type of reactor is relatively compact and requires minimal power to operate. This makes it an excellent candidate for unit operations in support of long-duration human space activities.
Derived from text
*Chemical Reactions; Microgravity; Interstitials; Pressure Drop*

**20050215396** NASA Glenn Research Center, Cleveland, OH, USA

**Two-Photon Fluorescence Microscopy Developed for Microgravity Fluid Physics**

Fischer, David G.; Zimmerli, Gregory A.; Asipauskas, Marius; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Recent research efforts within the Microgravity Fluid Physics Branch of the NASA Glenn Research Center have necessitated the development of a microscope capable of high-resolution, three-dimensional imaging of intracellular structure and tissue morphology. Standard optical microscopy works well for thin samples, but it does not allow the imaging of thick samples because of severe degradation caused by out-of-focus object structure. Confocal microscopy, which is a laser-based scanning microscopy, provides improved three-dimensional imaging and true optical sectioning by excluding the out-of-focus light. However, in confocal microscopy, out-of-focus object structure is still illuminated by the incoming beam, which can lead to substantial photo-bleaching. In addition, confocal microscopy is plagued by limited penetration depth, signal loss due to the presence of a confocal pinhole, and the possibility of live-cell damage. Two-photon microscopy is a novel form of laser-based scanning microscopy that allows three-dimensional imaging without many of the problems inherent in confocal microscopy. Unlike one-photon microscopy, it utilizes the nonlinear absorption of two near-infrared photons. However, the efficiency of two-photon absorption is much lower than that of one-photon absorption because of the nonlinear (i.e., quadratic) electric field dependence, so an ultrafast pulsed laser source must typically be employed. On the other hand, this stringent energy density requirement effectively localizes fluorophore excitation to the focal volume. Consequently, two-photon microscopy provides optical sectioning and confocal performance without the need for a signal-limiting pinhole. In addition, there is a reduction in photo-damage because of the longer excitation wavelength, a reduction in background fluorescence, and a 4 increase in penetration depth over confocal methods because of the reduction in Rayleigh scattering.

Author

*Fluorescence; Microscopy; Microgravity; Fluid Dynamics; Damage*

**20050215484** NASA Langley Research Center, Hampton, VA, USA

**Dynamic Weakening (Extinction) of Simple Hydrocarbon-air Counterflow Diffusion Flames by Oscillatory Inflows**

Pellett, G.; Kabaria, A.; Panigrahi, B.; Sammons, K.; Convery, J.; Wilson, L.; [2005]; 22 pp.; In English; 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA

Contract(s)/Grant(s): 23-065-50-5L

Report No.(s): AIAA Paper 2005-4332; Copyright; Avail.: CASI: A03, Hardcopy

This study of laminar non-premixed HC-air flames used an Oscillatory-input Opposed Jet Burner (OOJB) system developed from a previously well-characterized 7.2-mm Pyrex-nozzle OJB system. Over 600 dynamic Flame Strength (FS) measurements were obtained on unanchored (free-floating) laminar Counterflow Diffusion Flames (CFDF's). Flames were stabilized using plug inflows having steady-plus-sinusoidal axial velocities of varied magnitude, frequency, f, up to 1600 Hz, and phase angle from 0 (most data) to 360 degrees. Dynamic FS is defined as the maximum average air input velocity (U(sub air), at nozzle exit) a CFDF can sustain before strain-induced extinction occurs due to prescribed oscillatory peak-to-peak velocity inputs superimposed on steady inputs. Initially, dynamic flame extinction data were obtained at low f, and were supported by 25-120 Hz Hot-Wire cold-flow velocity data at nozzle exits. Later, expanded extinction data were supported by 4-1600 Hz Probe Microphone (PM) pk/pk P data at nozzle exits. The PM data were first obtained without flows, and later with cold stagnating flows, which better represent speaker-diaphragm dynamics during runs. The PM approach enabled characterizations of Dynamic Flame Weakening (DFW) of CFDF's from 8 to 1600 Hz. DFW was defined as % decrease in FS per Pascal of pk/pk P oscillation, namely, DFW = - 100 d(U(sub air) / U(sub air),0Hz) / d(pkpk P). The linear normalization with respect to acoustic pressure magnitude (and steady state (SS) FS) led to a DFW unaffected by strong internal resonances. For the C2H4/N2-air system, from 8 to 20 Hz, DFW is constant at 8.52 plus or minus 0.20 (% weakening)/Pa. This reflects a quasi-steady flame response to an acoustically induced dU(sub air)/dP. Also, it is surprisingly independent of C2H4/N2 mole fraction due to normalization by SS FS. From 20 to approximately 150 Hz, the C2H4/N2 air-flames weakened progressively less, with an inflection at approximately 70 Hz, and became asymptotically insensitive (DFW approximately 0) at approximately 300 Hz, which continued to 1600 Hz. The DFW of CH4-air flames followed a similar pattern, but showed much greater weakening than C2H4/N2-air flames; i.e., the quasi-steady DFW (8 to approximately 15 Hz) was 44.3 %/Pa, or approximately 5x larger, even though the 0 Hz (SS) FS was only 3.0 x smaller. The quasi-steady DFW's of C3H8-air and C2H6-air were intermediate at 34.8 and 20.9 %Pa, respectively. The DFW profiles of all four fuels, at various frequencies, correlated well but non-linearly with respective SS FS's. Notably, the DFW profile for C3H8 air fell more rapidly in the range greater than 15 to 60 Hz, compared with the 1- and 2-carbon fuels. This may indicate a shift in chemical kinetics, and/or O2 transport to a flame that moved closer to the fuel-side. In conclusion, Dynamic Flame Weakening limits appear significant and unique for each fuel, and correlate closely, but non-linearly, with Steady-State Flame Strengths at any given frequency. For

reasons unknown, the dynamic flames didn't weaken more at intermediate frequencies (e.g., at 20-50 Hz) than they did at low frequencies (less than 15 Hz), where quasi-steady weakening appears to dominate. Quasi-steady flame weakening ostensibly represents a transient input strain rate maximum that just exceeds the steady-state strain-rate-limited extinction limit for a few cycles. Clearly, further detailed mechanistic understanding is needed in the fall-off region.
Author
*Diffusion Flames; Hydrocarbons; Oscillations; Counterflow; Laminar Flow; Air*

**20050215559** NASA Langley Research Center, Hampton, VA, USA
**Application of Parallel Adjoint-Based Error Estimation and Anisotropic Grid Adaptation for Three-Dimensional Aerospace Configurations**
Lee-Rausch, E. M.; Park, M. A.; Jones, W. T.; Hammond, D. P.; Nielsen, E. J.; [2005]; 23 pp.; In English; 23rd AIAA Applied Aerodynamics Conference, 6-9 Jun. 2005, Toronto, Ontario, Canada
Contract(s)/Grant(s): 23-065-30-35
Report No.(s): AIAA Paper 2005-4842; No Copyright; Avail.: CASI: A03, Hardcopy

This paper demonstrates the extension of error estimation and adaptation methods to parallel computations enabling larger, more realistic aerospace applications and the quantification of discretization errors for complex 3-D solutions. Results were shown for an inviscid sonic-boom prediction about a double-cone configuration and a wing/body segmented leading edge (SLE) configuration where the output function of the adjoint was pressure integrated over a part of the cylinder in the near field. After multiple cycles of error estimation and surface/field adaptation, a significant improvement in the inviscid solution for the sonic boom signature of the double cone was observed. Although the double-cone adaptation was initiated from a very coarse mesh, the near-field pressure signature from the final adapted mesh compared very well with the wind-tunnel data which illustrates that the adjoint-based error estimation and adaptation process requires no a priori refinement of the mesh. Similarly, the near-field pressure signature for the SLE wing/body sonic boom configuration showed a significant improvement from the initial coarse mesh to the final adapted mesh in comparison with the wind tunnel results. Error estimation and field adaptation results were also presented for the viscous transonic drag prediction of the DLR-F6 wing/body configuration, and results were compared to a series of globally refined meshes. Two of these globally refined meshes were used as a starting point for the error estimation and field-adaptation process where the output function for the adjoint was the total drag. The field-adapted results showed an improvement in the prediction of the drag in comparison with the finest globally refined mesh and a reduction in the estimate of the remaining drag error. The adjoint-based adaptation parameter showed a need for increased resolution in the surface of the wing/body as well as a need for wake resolution downstream of the fuselage and wing trailing edge in order to achieve the requested drag tolerance. Although further adaptation was required to meet the requested tolerance, no further cycles were computed in order to avoid large discrepancies between the surface mesh spacing and the refined field spacing.
Author
*Adaptation; Anisotropy; Wind Tunnel Tests; Error Analysis; Three Dimensional Models; Computational Fluid Dynamics; Aerospace Engineering; Body-Wing Configurations*

**20050215561** NASA Glenn Research Center, Cleveland, OH, USA
**Fuel Flexible Gas Turbine Combustor Flametube Facility Upgraded**
Little, James E.; Nemets, Steve A.; Tornabene, Robert T.; Smith, Timothy D.; Frankenfeld, Bruce J.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

In fiscal year 2003, test cell 23 of the Research Combustion Laboratory (RCL 23) at the NASA Glenn Research Center was upgraded with the addition of gaseous hydrogen as a working propellant and the addition of a 450-psig air-supply system. Test flexibility was further enhanced by upgrades to the facility control systems. RCL 23 can now test with gaseous hydrogen flow rates up to 0.05 lbm/sec and jet fuel flow rates up to 0.62 lbm/sec. Research airflow rates up to 3 lbm/sec are possible with the 450-psig supply system over a range of inlet temperatures. Nonvitiated, heated air is supplied from a shell and tube heat exchanger. The maximum nonvitiated facility air temperature is 1100 F at 1.5 lbm/sec. Research-section exhaust temperatures are limited to 3200 F because of material and cooling capacity limits. A variety of support systems are available depending on the research hardware configuration. Test section ignition can be provided via either a hydrogen air torch system or an electronic spark system. Emissions measurements are obtained with either pneumatically or electromechanically actuated gas sample probes, and the electromechanical system allows for radial measurements at a user-specified axial location for measurement of emissions profiles. Gas analysis data can be obtained for a variety of species, including carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (NO and NOx), oxygen (O2), unburnt hydrocarbons, and unburnt hydrogen. Facility control is accomplished with a programmable logic control system. Facility operations have been upgraded to a

system based on graphical user interface control screens. A data system is available for real-time acquisition and monitoring of both measurements in engineering units and performance calculations. The upgrades have made RCL 23 a highly flexible facility for research into low emissions gas turbine combustor concepts, and the flame tube configuration inherently allows for a variety of fuel nozzle configurations to be tested in a cost-effective manner. RCL 23 is poised to be a leading facility for developing modern low-emission fuel nozzles for use with jet fuel and alternative fuels.
Author
*Gas Turbines; Flames; Pipes (Tubes); Combustion Chambers; Test Facilities; Jet Engine Fuels*

**20050215583** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Liquid Nitrogen (Oxygen Simulent) Thermodynamic Venting System Test Data Analysis**
Hedayat, A.; Nelson, S. L.; Hastings, L. J.; Flachbart, R. H.; Tucker, S. P.; [2005]; 1 pp.; In English; Cryogenic Engineering Conference & International Cryogenic Materials Conference, 29 Aug. - 2 Sep. 2005, Keystone, CO, USA; No Copyright; Avail.: Other Sources; Abstract Only

In designing systems for the long-term storage of cryogens in low gravity space environments, one must consider the effects of thermal stratification on excessive tank pressure that will occur due to environmental heat leakage. During low gravity operations, a Thermodynamic Venting System (TVS) concept is expected to maintain tank pressure without propellant resettling. The TVS consists of a recirculation pump, Joule-Thomson (J-T) expansion valve, and a parallel flow concentric tube heat exchanger combined with a longitudinal spray bar. Using a small amount of liquid extracted by the pump and passing it though the J-T valve, then through the heat exchanger, the bulk liquid and ullage are cooled, resulting in lower tank pressure. A series of TVS tests were conducted at the Marshall Space Flight Center using liquid nitrogen as a liquid oxygen simulant. The tests were performed at fill levels of 90%, 50%, and 25% with gaseous nitrogen and helium pressurants, and with a tank pressure control band of 7 kPa. A transient one-dimensional model of the TVS is used to analyze the data. The code is comprised of four models for the heat exchanger, the spray manifold and injector tubes, the recirculation pump, and the tank. The TVS model predicted ullage pressure and temperature and bulk liquid saturation pressure and temperature are compared with data. Details of predictions and comparisons with test data regarding pressure rise and collapse rates will be presented in the final paper.
Author
*Cryogenic Fluids; Aerospace Environments; Liquid Nitrogen; Thermodynamics; Systems Analysis*

**20050215628** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Testing of a Spray-Bar Thermodynamic Vent System in Liquid Nitrogen**
Flachbart, R. H.; Hastings, L. J.; Hedayat, A.; Nelson, S. L.; Tucker, S. P.; [2005]; 1 pp.; In English; Cryogenic Engineering Conference and International Cryogenic Materials Conference, 29 Aug. - 2 Sep. 2005, Keystone, CO, USA; Copyright; Avail.: Other Sources; Abstract Only

To support development of a microgravity pressure control capability for liquid oxygen, thermodynamic vent system (TVS) testing was conducted at Marshall Space Flight Center (MSFC) using liquid nitrogen (LN2) as a LOX simulant. The spray bar TVS hardware used was originally designed by the Boeing Company for testing in liquid hydrogen (LH2). With this concept, a small portion of the tank fluid is passed through a Joule- Thomson (J-T) device, and then through a longitudinal spray bar mixed-heat exchanger in order to cool the bulk fluid. To accommodate the larger mass flow rates associated with LN2, the TVS hardware was modified by replacing the recirculation pump with an L N 2 compatible pump and replacing the J-T valve. The primary advantage of the spray-bar configuration is that tank pressure control can be achieved independent of liquid and vapor location, enhancing the applicability of ground test data to microgravity conditions. Performance testing revealed that the spray-bar TVS was effective in controlling tank pressure within a 6.89 kPa band for fill levels of 90%, 50%, and 25%. Tests were also conducted with gaseous helium (GHe) in the ullage. The TVS operated nominally with GHe in the ullage, with performance similar to the tests with gaseous nitrogen (GN2). Testing demonstrated that the spray-bar TVS design was flexible enough for use in two different propellants with minimal hardware modifications.
Author
*Liquid Nitrogen; Vents; Thermodynamics; Mass Flow Rate; Controllability; Ground Tests*

**20050215651** NASA Glenn Research Center, Cleveland, OH, USA
**Milestones Achieved for the Fluids and Combustion Facility**
Gati, Frank G.; Hill, Myron E.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

In 2004, President Bush outlined a new space exploration vision for NASA. The exploration programs will seek profound answers to questions of our origins, whether life exists beyond Earth, and how we could live in other worlds. In response, research projects from NASA s Fluid Physics Research Program were moved into the Exploration Systems Mission Directorate and realigned to support the major milestones of this directorate. A new goal of this research is to obtain an understanding of the physical phenomena that are important in the design of the many space-based and ground-based fluids systems that utilize multiphase flow, such as life support, propulsion, and power systems.
Derived from text
*Combustion Chambers; Fluid Dynamics; Propulsion System Performance; Support Systems*

**20050215682** NASA Glenn Research Center, Cleveland, OH, USA
**Hydrodynamics of Packed Bed Reactor in Low Gravity**
Motil, Brian J.; Nahra, Henry K.; Balakotaiah, Vemuri; August 2005; 13 pp.; In English; 35th International Conference on Environmental Systems, 11-14 Jul. 2005, Rome, Italy; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-101-53-09
Report No.(s): NASA/TM-2005-213806; E-15145; Rept-2005-01-3035; No Copyright; Avail.: CASI: A03, Hardcopy

Packed bed reactors are well known for their vast and diverse applications in the chemical industry; from gas absorption, to stripping, to catalytic conversion. Use of this type of reactor in terrestrial applications has been rather extensive because of its simplicity and relative ease of operation. Developing similar reactors for use in microgravity is critical to many space-based advanced life support systems. However, the hydrodynamics of two-phase flow packed bed reactors in this new environment and the effects of one physiochemical process on another has not been adequately assessed. Surface tension or capillary forces play a much greater role which results in a shifting in flow regime transitions and pressure drop. Results from low gravity experiments related to flow regimes and two-phase pressure drop models are presented in this paper along with a description of plans for a flight experiment on the International Space Station (ISS). Understanding the packed bed hydrodynamics and its effects on mass transfer processes in microgravity is crucial for the design of packed bed chemical or biological reactors to be used for water reclamation and other life support processes involving water purification.
Author
*Chemical Reactors; Hydrodynamics; Life Support Systems; Microgravity; Physiochemistry; Interfacial Tension*

**20050215685** NASA Glenn Research Center, Cleveland, OH, USA
**Approaches to Validation of Models for Low Gravity Fluid Behavior**
Chato, David J.; Marchetta, Jeffery; Hochstein, John I.; Kassemi, Mohammad; September 2005; 21 pp.; In English; 42nd Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2004, Reno, NV, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 22-614-50-04-11
Report No.(s): NASA/TM-2005-213832; E-15202; AIAA Paper 2004-1150; No Copyright; Avail.: CASI: A03, Hardcopy

This paper details the author experiences with the validation of computer models to predict low gravity fluid behavior. It reviews the literature of low gravity fluid behavior as a starting point for developing a baseline set of test cases. It examines authors attempts to validate their models against these cases and the issues they encountered. The main issues seem to be that: Most of the data is described by empirical correlation rather than fundamental relation; Detailed measurements of the flow field have not been made; Free surface shapes are observed but through thick plastic cylinders, and therefore subject to a great deal of optical distortion; and Heat transfer process time constants are on the order of minutes to days but the zero-gravity time available has been only seconds.
Author
*Flow Distribution; Microgravity; Computerized SIMulation; Heat Transfer; Surface Properties*

**20050216523** Air Force Research Lab., Wright-Patterson AFB, OH USA
**A Unified Methodology for Aerospace Systems Integration Based on Entropy and the Second Law of Thermodynamics: Aerodynamics Assessment**
Camberos, Jose A.; Nomura, Shohei; Stewart, Jason; Figliola, Richard; Aug. 1, 2004; 41 pp.; In English
Contract(s)/Grant(s): Proj-A03Q
Report No.(s): AD-A437035; AFRL-VA-WP-TR-2005-3075; No Copyright; Avail.: CASI: A03, Hardcopy

We present a viscous computational fluid dynamics (CFD) simulation over two finite twisted wings configured so as to give a theoretically predicted elliptic and parabolic lift distributions. Local surface integration and farfield methods were used to calculate the induced drag. The objective of this project is to relate work-potential losses (exergy destruction) to the

aerodynamics forces in an attempt to validate a new design methodology based on the second law of thermodynamics. Exergy destruction for the entire flow field was determined from the CFD results. CFD results show that the parabolic case produces smaller induced drag and entropy generation rates than the elliptic case. The entropy generation rates for both cases deviated significantly from the expected values, revealing the inaccuracy of entropy generation rate prediction for a turbulent flow. This project, however, set up a basis in terms of analysis methodology, from which the future work will follow.
DTIC
*Aerodynamics; Aerospace Systems; Computational Fluid Dynamics; Entropy; Lift Drag Ratio; Systems Integration; Thermodynamic Properties*

**20050217032** NASA Glenn Research Center, Cleveland, OH, USA
**Courant Number and Mach Number Insensitive CE/SE Euler Solvers**
Chang, Sin-Chung; September 2005; 45 pp.; In English; 41st Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 22-781-30-69
Report No.(s): NASA/TM-2005-213868; E-15238; AIAA Paper 2005-4355; No Copyright; Avail.: CASI: A03, Hardcopy

It has been known that the space-time CE/SE method can be used to obtain ID, 2D, and 3D steady and unsteady flow solutions with Mach numbers ranging from 0.0028 to 10. However, it is also known that a CE/SE solution may become overly dissipative when the Mach number is very small. As an initial attempt to remedy this weakness, new 1D Courant number and Mach number insensitive CE/SE Euler solvers are developed using several key concepts underlying the recent successful development of Courant number insensitive CE/SE schemes. Numerical results indicate that the new solvers are capable of resolving crisply a contact discontinuity embedded in a flow with the maximum Mach number = 0.01.
Author
*Mach Number; Space-Time CE/SE Method; Euler Equations of Motion; Sensitivity; Numerical Analysis*

**20050217126** Nevada Univ., Reno, NV, USA
**Required Data for Code Validation**
Farmer, Richard; Santoro, Robert; Fifth International Symposium on Liquid Space Propulsion; January 2005; 23 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The issues are: Computational Fluid Dynamics (CFD) is a mature and powerful methodology. Neither CFD nor experimentation can quantify all aspects of a design. CFD is not used without a preliminary validation exercise. The validation experiment is usually not sufficiently definitive or appropriate.
Derived from text
*Computational Fluid Dynamics; Data Acquisition; Experimentation*

**20050217148** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Using CFD as a Rocket Injector Design Tool: Recent Progress at Marshall Space Flight Center**
Tucker, Kevin; West, Jeff; Williams, Robert; Lin, Jeff; Canabal, Francisco; Rocker, marvin; Robles, Bryan; Garcia, Robert; Chenoweth, James; Fifth International Symposium on Liquid Space Propulsion; January 2005; 70 pp.; In English; See also 20050217123; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy

New programs are forcing American propulsion system designers into unfamiliar territory. For instance, industry s answer to the cost and reliability goals set out by the Next Generation Launch Technology Program are engine concepts based on the Oxygen- Rich Staged Combustion Cycle. Historical injector design tools are not well suited for this new task. The empirical correlations do not apply directly to the injector concepts associated with the ORSC cycle. These legacy tools focus primarily on performance with environment evaluation a secondary objective. Additionally, the environmental capability of these tools is usually one-dimensional while the actual environments are at least two- and often three-dimensional. CFD has the potential to calculate performance and multi-dimensional environments but its use in the injector design process has been retarded by long solution turnaround times and insufficient demonstrated accuracy. This paper has documented the parallel paths of program support and technology development currently employed at Marshall Space Flight Center in an effort to move CFD to the forefront of injector design. MSFC has established a long-term goal for use of CFD for combustion devices design. The work on injector design is the heart of that vision and the Combustion Devices CFD Simulation Capability Roadmap that focuses the vision. The SRL concept, combining solution fidelity, robustness and accuracy, has been established as a quantitative gauge of current and desired capability. Three examples of current injector analysis for program support have been presented and discussed. These examples are used to establish the current capability at MSFC for these problems.

Shortcomings identified from this experience are being used as inputs to the Roadmap process. The SRL evaluation identified lack of demonstrated solution accuracy as a major issue. Accordingly, the MSFC view of code validation and current MSFC-funded validation efforts were discussed in some detail. The objectives of each effort were noted. Issues relative to code validation for injector design were discussed in some detail. The requirement for CFD support during the design of the experiment was noted and discussed in terms of instrumentation placement and experimental rig uncertainty. In conclusion, MSFC has made significant progress in the last two years in advancing CFD toward the goal of application to injector design. A parallel effort focused on program support and technology development via the SCIT Task have enabled the progress.
Author
*Computational Fluid Dynamics; Engine Design; Injectors; Measuring Instruments; Combustion*

**20050217152** Pennsylvania State Univ., University Park, PA, USA
**Liquid-Propellant Injection, Mixing, and Combustion at Supercritical Conditions**
Yang, Vigor; Fifth International Symposium on Liquid Space Propulsion; January 2005; 50 pp.; In English; See also 20050217123; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Viewgraphs showing liquid propellant injection, mixing, and combustion at supercritical conditions are presented. The topics include: 1) Why Supercritical Combustion Research? 2) Liquid Rocket Chamber Conditions; 3) Flow Diagram of RD-170 Engine; 4) Worldwide Efforts on Supercritical Combustion Research (1/2); 5) Worldwide Efforts on Supercritical Combustion Research (2/2); 6) Shadowgraph Results-LN2 into GN2; 7) Characteristics of Supercritical Fluid Jet; 8) Effect of Pressure on Turbulence Scales; 9) LES Formulation of Supercritical Fluid Dynamics; 10) Equations of State; 11) Evaluation of Thermodynamic Properties; 12) Thermophysical Properties of Nitrogen; 13) Droplet Vaporization and Combustion in Quiescent and Convective Environments; 14) Spherical Mode (100 atm, 0.2 m/s; t=610 s); 15) Breakup Mode (100 atm, 15 m/s; t=170 s); 16) Flow and Temperature Fields; 17) Effect of Pressure and Velocity on Droplet Lifetime; 18) Supercritical Fluid Injection; 19) Shadowgraph Images of Cryogenic Nitrogen Injection; 20)Computational Domain and Grids; 21) Density Gradient Field; 22) Time Evolution of Density Gradient Field; 23) Snapshots of Density and Temperature Gradient Fields; 24) Most Energy Containing POD Modes of Axial Velocity; 25) Iso-Surfaces of Pressure and Density Gradients; 26) Effect of Pressure on Density and Temperature Fields; 27) Power Spectral Densities of Velocity Fluctuations; 28)Vortex Shedding Frequency; 29) Linear Stability Analysis of Real Fluid Jet; 30) Bi-Propellant Swirl Co-Axial Injector; 31) Large Eddy Simulation of Swirling Oxygen Jet; 32) LOX/Kerosene Preburner Swirl Injector; 33) Time Evolution of Swirling Jet; 34) Disintegration of Swirling Water Jet; 35) Theoretical Analysis of Swirl Injector (1/2); 36) Theoretical Analysis of Swirl Injector (2/2); 37) Limiting Extremes: 2) Diffusion Processes Dominate; 38) Burning LOX Jet at Supercritical Pressure; 39) Supercritical Injector Flow and Flame Dynamics; 40) LOX/Hydrogen Shear Hydrogen Shear-Coaxial Injector Dynamics; 41) Modeling and Simulation of Supercritical Combustion; 42) Effect of Pressure on Mean Temperature Distributions; 43) Effect of Pressure on Mean Velocity Distributions; 44) Frequency Spectral of Radial Velocity Oscillations; 45) Normalized Density and Temperature Distributions along Radial Direction; 45) Numerical Changes; and 46) Normalized Density and Temperature Distributions.
CASI
*Combustion; Liquid Rocket Propellants; Supercritical Fluids; Fluid Injection*

**20050217189** NASA Glenn Research Center, Cleveland, OH, USA, East Central Univ., Ada, OK, USA
**Thermodynamics of Volatile Species in the Silicon-Oxygen-Hydrogen System Studied**
Jacobson, Nathan S.; Opila, Elizabeth J.; Copland, Evan H.; Myers, Dwight; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The volatilization of silica (SiO2) to silicon hydroxides and oxyhydroxides because of reaction with water vapor is important in a variety of high-temperature corrosion processes. For example, the lifetimes of silicon carbide (SiC) and silicon nitride (Si3N4) - based components in combustion environments are limited by silica volatility. To understand and model this process, it is essential to have accurate thermodynamic data for the formation of volatile silicon hydroxides and oxyhydroxides.
Derived from text
*Thermodynamics; Volatility; Silicon Dioxide; Silicon Nitrides*

## 35
## INSTRUMENTATION AND PHOTOGRAPHY

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

**20050215008** NASA Glenn Research Center, Cleveland, OH, USA

**White Light Used to Enable Enhanced Surface Topography, Geometry, and Wear Characterization of Oil-Free Bearings**

Lucero, John M.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A new optically based measuring capability that characterizes surface topography, geometry, and wear has been employed by NASA Glenn Research Center s Tribology and Surface Science Branch. To characterize complex parts in more detail, we are using a three-dimensional, surface structure analyzer-the NewView5000 manufactured by Zygo Corporation (Middlefield, CT). This system provides graphical images and high-resolution numerical analyses to accurately characterize surfaces. Because of the inherent complexity of the various analyzed assemblies, the machine has been pushed to its limits. For example, special hardware fixtures and measuring techniques were developed to characterize Oil- Free thrust bearings specifically. We performed a more detailed wear analysis using scanning white light interferometry to image and measure the bearing structure and topography, enabling a further understanding of bearing failure causes.

Derived from text

*Thrust Bearings; Topography; Wear; Failure*

**20050215094** NASA Glenn Research Center, Cleveland, OH, USA

**Midinfrared Temperature Measurement Technique Developed**

Santosuosso, George R.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Infrared thermography is the measuring of the temperature of an object by examining the spectral quantities of light emission. The microgravity combustion experiment Solid Inflammability Boundary at Low-Speeds (SIBAL) calls for full-field temperature measurements of a thin sheet of cellulosic fuel as a flame front moves across the fuel, and infrared thermography is the only technique that can accomplish this task. The thermography is accomplished by imaging the fuel with a midinfrared camera that is sensitive in the 3.0- to 5.0-microns wavelength region in conjunction with a 3.7 - to 4.1-microns bandpass filter to eliminate unwanted infrared radiation from components other than the fuel.

Derived from text

*Infrared Radiation; Microgravity; Temperature Measurement; Thermography; Gravitational Effects*

**20050215141** NASA Glenn Research Center, Cleveland, OH, USA

**High-Performance Acousto-Ultrasonic Scan System Being Developed**

Roth, Don J.; Martin, Richard E.; Cosgriff, Laura M.; Gyekenyesi, Andrew L.; Kautz, Harold E.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Acousto-ultrasonic (AU) interrogation is a single-sided nondestructive evaluation (NDE) technique employing separated sending and receiving transducers. It is used for assessing the microstructural condition and distributed damage state of the material between the transducers. AU is complementary to more traditional NDE methods, such as ultrasonic cscan, x-ray radiography, and thermographic inspection, which tend to be used primarily for discrete flaw detection. Throughout its history, AU has been used to inspect polymer matrix composites, metal matrix composites, ceramic matrix composites, and even monolithic metallic materials. The development of a high-performance automated AU scan system for characterizing within-sample microstructural and property homogeneity is currently in a prototype stage at NASA. This year, essential AU technology was reviewed. In addition, the basic hardware and software configuration for the scanner was developed, and preliminary results with the system were described. Mechanical and environmental loads applied to composite materials can cause distributed damage (as well as discrete defects) that plays a significant role in the degradation of physical properties. Such damage includes fiber/matrix debonding (interface failure), matrix microcracking, and fiber fracture and buckling. Investigations at the NASA Glenn Research Center have shown that traditional NDE scan inspection methods such as ultrasonic c-scan, x-ray imaging, and thermographic imaging tend to be more suited to discrete defect detection rather than the characterization of accumulated distributed microdamage in composites. Since AU is focused on assessing the distributed microdamage state of the material in between the sending and receiving transducers, it has proven to be quite suitable for assessing the relative composite material state. One major success story at Glenn with AU measurements has been the

correlation between the ultrasonic decay rate obtained during AU inspection and the mechanical modulus (stiffness) seen during fatigue experiments with silicon carbide/silicon carbide (SiC/SiC) ceramic matrix composite samples. As shown in the figure, ultrasonic decay increased as the modulus decreased for the ceramic matrix composite tensile fatigue samples. The likely microstructural reason for the decrease in modulus (and increase in ultrasonic decay) is the matrix microcracking that commonly occurs during fatigue testing of these materials. Ultrasonic decay has shown the capability to track the pattern of transverse cracking and fiber breakage in these composites.
Author
*Performance Prediction; Acoustics; Ultrasonics; Nondestructive Tests; Polymer Matrix Composites*

**20050215176** Massachusetts Inst. of Tech., Cambridge, MA, USA
**MIT Participation in the Data Analysis of the XRS and XIS Instruments on the Astro-E2 Mission**
Bautz, Mark; [2005]; 2 pp.; In English
Contract(s)/Grant(s): NNG05GM92G
Report No.(s): MIT-6898351; No Copyright; Avail.: CASI: A01, Hardcopy

Since the inception of this grant six weeks ago, we have completed the initial activation of the Suzaku X-ray Imaging Spectrometer (XIS) (on 13 August) and we have supported initial calibration observations. The instrument is performing very well in all respects. We have characterized the spectral resolution and effective area of each XIS sensor. We are especially excited about the scientific opportunities provided by the XIS'S back- illuminated sensor, which exhibits spectral resolution in the sub-keV band unmatched by any X-ray CCD currently in orbit. As specified in our proposal, we have established a web site (http://space.mit.edu/XIS) on which we maintain an up-to-date summary of instrument performance characteristics. Gain, spectral resolution and system noise, as well as residual background rates, are currently available on this site. Although the particle background level is low compared with Chandra and XMM, we are currently evaluating methods to reduce it still further. Techniques under study include use of 5x5 mode information and alternative grade selection methods. Although the primary responsibility for development of instrument response functions rests with our Japanese colleagues, we are incorporating our latest measurements of spectral resolution into some temporary response functions which we hope to make available to the Suzaku General Observer Facility and the Science Working Group(SWG). We are also preparing proposals for use of SWG observing time.
Derived from text
*Data Processing; X Ray Imagery; Calibrating; Imaging Spectrometers*

**20050215302** Alabama Univ., Huntsville, AL, USA
**Optical Cryogenic Tank Level Sensor**
Duffell, Amanda; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XIV-1 - XIV-6; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

Cryogenic fluids play an important role in space transportation. Liquid oxygen and hydrogen are vital fuel components for liquid rocket engines. It is also difficult to accurately measure the liquid level in the cryogenic tanks containing the liquids. The current methods use thermocouple rakes, floats, or sonic meters to measure tank level. Thermocouples have problems examining the boundary between the boiling liquid and the gas inside the tanks. They are also slow to respond to temperature changes. Sonic meters need to be mounted inside the tank, but still above the liquid level. This causes problems for full tanks, or tanks that are being rotated to lie on their side.
Derived from text
*Cryogenic Fluids; Optical Measuring Instruments; Thermocouples*

**20050215321** Alabama Univ., Huntsville, AL, USA
**Local Intensity Enhancements in Spherical Microcavities: Implications for Photonic Chemical and Biological Sensors**
Fuller, Kirk A.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XVI-1 - XVI-6; In English; See also 20050215300; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

In this report, we summarize recent findings regarding the use spherical microcavities in the amplification of light that is inelastically scattered by either fluorescent or Raman-active molecules. This discussion will focus on Raman scattering, with the understanding that analogous processes apply to fluorescence. Raman spectra can be generated through the use of a very strong light source that stimulates inelastic light scattering by molecules, with the scattering occurring at wavelengths shifted from that of the source and being most prominent at shifts associated with the molecules natural vibrational frequencies. The

Raman signal can be greatly enhanced by exposing a molecule to the intense electric fields that arise near surfaces (typically of gold or silver) exhibiting nanoscale roughness. This is known as surface-enhanced Raman scattering (SERS). SERS typically produces gain factors of 103 - 106, but under special conditions, factors of 1010 - 1014 have been achieved.
Derived from text
*Electric Fields; Fluorescence; Inelastic Scattering; Light Amplifiers*

**20050215404** NASA Glenn Research Center, Cleveland, OH, USA
**Compact Microscope Imaging System With Intelligent Controls Improved**
McDowell, Mark; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Compact Microscope Imaging System (CMIS) with intelligent controls is a diagnostic microscope analysis tool with intelligent controls for use in space, industrial, medical, and security applications. This compact miniature microscope, which can perform tasks usually reserved for conventional microscopes, has unique advantages in the fields of microscopy, biomedical research, inline process inspection, and space science. Its unique approach integrates a machine vision technique with an instrumentation and control technique that provides intelligence via the use of adaptive neural networks. The CMIS system was developed at the NASA Glenn Research Center specifically for interface detection used for colloid hard spheres experiments; biological cell detection for patch clamping, cell movement, and tracking; and detection of anode and cathode defects for laboratory samples using microscope technology.
Derived from text
*Microscopy; Miniaturization; Computer Vision; Neural Nets; Security*

**20050215407** NASA Glenn Research Center, Cleveland, OH, USA, Northrop Grumman Information Technology, Inc., USA
**Light Microscopy Module Imaging Tested and Demonstrated**
Gati, Frank; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Fluids Integrated Rack (FIR), a facility-class payload, and the Light Microscopy Module (LMM), a subrack payload, are integrated research facilities that will fly in the U.S. Laboratory module, Destiny, aboard the International Space Station. Both facilities are being engineered, designed, and developed at the NASA Glenn Research Center by Northrop Grumman Information Technology. The FIR is a modular, multiuser scientific research facility that is one of two racks that make up the Fluids and Combustion Facility (the other being the Combustion Integrated Rack). The FIR has a large volume dedicated for experimental hardware; easily reconfigurable diagnostics, power, and data systems that allow for unique experiment configurations; and customizable software. The FIR will also provide imagers, light sources, power management and control, command and data handling for facility and experiment hardware, and data processing and storage. The first payload in the FIR will be the LMM. The LMM integrated with the FIR is a remotely controllable, automated, on-orbit microscope subrack facility, with key diagnostic capabilities for meeting science requirements--including video microscopy to observe microscopic phenonema and dynamic interactions, interferometry to make thin-film measurements with nanometer resolution, laser tweezers to manipulate micrometer-sized particles, confocal microscopy to provide enhanced three-dimensional visualization of structures, and spectrophotometry to measure the photonic properties of materials. Vibration disturbances were identified early in the LMM development phase as a high risk for contaminating the science microgravity environment. An integrated FIR-LMM test was conducted in Glenn's Acoustics Test Laboratory to assess mechanical sources of vibration and their impact to microscopic imaging. The primary purpose of the test was to characterize the LMM response at the sample location, the x-y stage within the microscope, to vibration emissions from the FIR and LMM support structures.
Author
*Light Sources; Microscopy; Combustion Chambers; Contamination; Destiny Laboratory Module; Imaging Techniques*

## 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*.

**20050215573** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Thermal Conductivity Based on Modified Laser Flash Measurement**
Lin, Bochuan; Ban, Heng; Li, Chao; Scripa, Rosalia N.; Su, Ching-Hua; Lehoczky, Sandor L.; [2005]; 1 pp.; In English; 28th

International Thermal Conductivity Confrence (ITCC-28), 26-29 Jun. 2005, New Brunswick, Canada; Copyright; Avail.: Other Sources; Abstract Only

The laser flash method is a standard method for thermal diffusivity measurement. It employs single-pulse heating of one side of a thin specimen and measures the temperature response of the other side. The thermal diffusivity of the specimen can be obtained based on a one-dimensional transient heat transfer analysis. This paper reports the development of a theory that includes a transparent reference layer with known thermal property attached to the back of sample. With the inclusion of heat conduction from the sample to the reference layer in the theoretical analysis, the thermal conductivity and thermal diffusivity of sample can be extracted from the temperature response data. Furthermore, a procedure is established to select two points from the data to calculate these properties. The uncertainty analysis indicates that this method can be used with acceptable levels of uncertainty.

Author

*Lasers; Thermal Conductivity; Thermal Diffusivity*

**20050216528** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Tunable Solid-State Mid-IR Laser Engineering**

Schepler, Kenneth L.; Jul. 1, 2005; 15 pp.; In English

Contract(s)/Grant(s): Proj-2301; Proj-2001

Report No.(s): AD-A437054; AFRL-SN-WP-TM-2005-1136; No Copyright; Avail.: CASI: A03, Hardcopy

This report describes in-house efforts to develop advanced tunable mid-IR laser materials and nonlinear frequency conversion techniques useful for IRCM and laser radar sources. We developed a new class of laser materials, Cr2+doped II-VI materials, with broadband tunability in the 2-3 micron region with room temperature operation and 4.2-W output. We fabricated periodically poled ferroelectric materials and demonstrated broadband tuning and narrowband seeding. We demonstrated pulse energies of 60mJ from a stack of periodically poled lithium niobate wafers. Other patterned nonlinear materials such as orientation patterned GaAs were characterized and show great promise for tuning throughout the 1.5-14 micron region.

DTIC

*Detection; Engineering; Infrared Radiation; Remote Sensing; Solid State Lasers; Tunable Lasers*

## 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*.

**20050214854** NASA Glenn Research Center, Cleveland, OH, USA

**A Step Made Toward Designing Microelectromechanical System (MEMS) Structures With High Reliability**

Nemeth, Noel N.; Research and Technology 2002; March 2003; 5 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The mechanical design of microelectromechanical systems-particularly for micropower generation applications-requires the ability to predict the strength capacity of load-carrying components over the service life of the device. These microdevices, which typically are made of brittle materials such as polysilicon, show wide scatter (stochastic behavior) in strength as well as a different average strength for different sized structures (size effect). These behaviors necessitate either costly and time-consuming trial-and-error designs or, more efficiently, the development of a probabilistic design methodology for MEMS. Over the years, the NASA Glenn Research Center s Life Prediction Branch has developed the CARES/Life probabilistic design methodology to predict the reliability of advanced ceramic components. In this study, done in collaboration with Johns Hopkins University, the ability of the CARES/Life code to predict the reliability of polysilicon microsized structures with stress concentrations is successfully demonstrated.

Author

*Reliability; Microelectromechanical Systems; Mechanical Engineering; Life (Durability); Stress Concentration; Service Life*

**20050214863** NASA Glenn Research Center, Cleveland, OH, USA

**Thermal Behavior of High-Speed Helical Gear Trains Investigated**

Handschuh, Robert F.; Research and Technology 2002; March 2003; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

High-speed and heavily loaded gearing are commonplace in the rotorcraft systems employed in helicopter and tiltrotor transmissions. The components are expected to deliver high power from the gas turbine engines to the high-torque, low-speed rotor, reducing the shaft rotational speed in the range of 25:1 to 100:1. These components are designed for high power-to-weight ratios, thus the components are fabricated as light as possible with the best materials and processing to transmit the required torque and carry the resultant loads without compromising the reliability of the drive system. This is a difficult task that is meticulously analyzed and thoroughly tested experimentally prior to being applied on a new or redesigned aircraft.
Derived from text
*Temperature Effects; Tilt Rotor Aircraft; Rotary Wing Aircraft; High Speed; Helical Windings*

**20050214864** NASA Glenn Research Center, Cleveland, OH, USA
**High-Speed, High-Temperature Finger Seal Test Evaluated**
Proctor, Margaret P.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A finger seal, designed and fabricated by Honeywell Engines, Systems and Services, was tested at the NASA Glenn Research Center at surface speeds up to 1200 ft/s, air temperatures up to 1200 F, and pressures across the seal of 75 psid. These are the first test results obtained with NASA s new High-Temperature, High-Speed Turbine Seal Test Rig (see the photograph). The finger seal is an innovative design recently patented by AlliedSignal Engines, which has demonstrated considerably lower leakage than commonly used labyrinth seals and is considerably cheaper than brush seals. The cost to produce finger seals is estimated to be about half of the cost to produce brush seals. Replacing labyrinth seals with fingers seals at locations that have high-pressure drops in gas turbine engines, typically main engine and thrust seals, can reduce air leakage at each location by 50 percent or more. This directly results in a 0.7- to 1.4-percent reduction in specific fuel consumption and a 0.35- to 0.7-percent reduction in direct operating costs . Because the finger seal is a contacting seal, this testing was conducted to address concerns about its heat generation and life capability at the higher speeds and temperatures required for advanced engines. The test results showed that the seal leakage and wear performance are acceptable for advanced engines.
Derived from text
*High Speed; High Temperature Tests; Seals (Stoppers); Fabrication; Design Analysis; Leakage*

**20050214866** NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA
**Magnetic Suspension Being Developed for Future Lube-Free Turbomachinery Application**
Provenza, Andrew J.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center, the U.S. Army, Texas A&M University, and other industrial partners are continuing to work together to develop magnetic suspension technology to withstand the harsh environmental conditions inside current and future turbomachinery. In fiscal year 2002, our third-generation radial magnetic bearing successfully controlled rotor motion while at 1000 F (540 C) and 20 000 rpm. The ability to command the rotor s position while spinning at this speed was also demonstrated. Future work is planned to include radial bearing tests to 1100 F (593 C) and 30 000 rpm. In fiscal year 2003, we plan to test a high-temperature thrust bearing.
Derived from text
*Lubrication; Magnetic Bearings; Magnetic Suspension; Thrust Bearings*

**20050214874** NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA
**Spiral-Bevel-Gear Damage Detected Using Decision Fusion Analysis**
Dempsey, Paula J.; Handschuh, Robert F.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Helicopter transmission integrity is critical to helicopter safety because helicopters depend on the power train for propulsion, lift, and flight maneuvering. To detect impending transmission failures, the ideal diagnostic tools used in the health-monitoring system would provide real-time health monitoring of the transmission, demonstrate a high level of reliable detection to minimize false alarms, and provide end users with clear information on the health of the system without requiring them to interpret large amounts of sensor data. A diagnostic tool for detecting damage to spiral bevel gears was developed. (Spiral bevel gears are used in helicopter transmissions to transfer power between nonparallel intersecting shafts.) Data fusion

was used to integrate two different monitoring technologies, oil debris analysis and vibration, into a health-monitoring system for detecting surface fatigue pitting damage on the gears.
Derived from text
*Damage; Detection; Fatigue (Materials); Gears*

**20050215009** NASA Glenn Research Center, Cleveland, OH, USA
**In Situ, On-Demand Lubrication System Developed for Space Mechanisms**
Marchetti, Mario; Pepper, Stephen V.; Jansen, Mark J.; Predmore, Roamer E.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Many moving mechanical assemblies (MMA) for space mechanisms rely on liquid lubricants to provide reliable, long-term performance. The proper performance of the MMA is critical in assuring a successful mission. Historically, mission lifetimes were short and MMA duty cycles were minimal. As mission lifetimes were extended, other components, such as batteries and computers, failed before lubricated systems. However, improvements in these ancillary systems over the last decade have left the tribological systems of the MMAs as the limiting factor in determining spacecraft reliability. Typically, MMAs are initially lubricated with a very small charge that is supposed to last the entire mission lifetime, often well in excess of 5 years. In many cases, the premature failure of a lubricated component can result in mission failure.
Derived from text
*Lubrication Systems; Tribology; Failure*

**20050215010** NASA Glenn Research Center, Cleveland, OH, USA
**Noninterference Systems Developed for Measuring and Monitoring Rotor Blade Vibrations**
Kurkov, Anatole P.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

In the noninterference measurement of blade vibrations, a laser light beam is transmitted to the rotor blade tips through a single optical fiber, and the reflected light from the blade tips is collected by a receiving fiber-optic bundle and conducted to a photodetector. Transmitting and receiving fibers are integrated in an optical probe that is enclosed in a metal tube which also houses a miniature lens that focuses light on the blade tips. Vibratory blade amplitudes can be deduced from the measurement of the instantaneous time of arrival of the blades and the knowledge of the rotor speed. The in-house noninterference blade-vibration measurement system was developed in response to requirements to monitor blade vibrations in several tests where conventional strain gauges could not be installed or where there was a need to back up strain gauges should critical gauges fail during the test. These types of measurements are also performed in the aircraft engine industry using proprietary in-house technology. Two methods of measurement were developed for vibrations that are synchronous with a rotor shaft. One method requires only one sensor; however, it is necessary to continuously record the data while the rotor is being swept through the resonance. In the other method, typically four sensors are employed and the vibratory amplitude is deduced from the data by performing a least square fit to a harmonic function. This method does not require continuous recording of data through the resonance and, therefore, is better suited for monitoring. The single-probe method was tested in the Carl facility at the Wright- Patterson Air Force Base, and the multiple-probe method was tested in NASA Glenn Research Center's Spin Rig facility, which uses permanent magnets to excite synchronous vibrations. Representative results from this test are illustrated in the bar chart. Nonsynchronous vibrations were measured online during testing of the Quiet High Speed Fan in Glenn s 9- by 15-Foot Low-Speed Wind Tunnel. Three sensors were employed, enabling a reconstruction of the vibratory patterns at the leading and trailing edges at the tip span, as well as a determination of vibratory amplitudes for every blade.
Author
*Rotor Blades (Turbomachinery); Blade Tips; Vibration Measurement*

**20050215099** NASA Glenn Research Center, Cleveland, OH, USA
**Radial Clearance Found To Play a Key Role in the Performance of Compliant Foil Air Bearings**
Radil, Kevin C.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Compliant foil air bearings are at the forefront of the Oil-Free turbomachinery revolution, which supports gas turbine engines with hydrodynamic bearings that use air instead of oil as the working fluid. These types of bearings have been around for almost 50 years and have found a home in several commercial applications, such as in air cycle machines, turbocompressors, and microturbines, but are now being aggressively pursued for use in small and midrange aircraft gas turbine engines. Benefits include higher operating speeds and temperatures, lower maintenance costs, and greater reliability.

The Oil-Free Turbomachinery team at the NASA Glenn Research Center is working to foster the transition of Oil-Free technology into gas turbine engines by performing in-house experiments on foil air bearings in order to gain a greater insight into their complex operating principles. A research program recently undertaken at Glenn focused on the concept of radial clearance and its influence on bearing performance. The tests were conducted on foil bearings with different radial clearances. As defined for a foil bearing, radial clearance is a measure of the small amount of shaft radial motion that is present from play that exists in the elastic support structure, such as between the top and bump foils and the bump foils and bearing shell (see the drawing). With an insufficient amount of radial clearance, the bearing imparts a high preload on the shaft, which when excessive, can reduce the loadcarrying capability of the bearing. On the other hand, systems using foil bearings with excessive radial clearance may experience rotordynamic instabilities because of low bearing preload. Therefore, without a more thorough understanding of radial clearance, it is difficult to accurately predict the performance of a given bearing design. The test program demonstrated that there is a direct correlation between radial clearance and the performance of foil air bearings. As shown in the graph, an optimum radial clearance exists that will maximize the amount of load that the bearing is capable of supporting. With respect to this optimum, two different performance regimes were observed that are a function of the amount of radial clearance. Tests showed that bearings with radial clearances below the optimum in regime I were susceptible to sudden seizure, a failure mode indicative of thermal runaway caused by high preload. The high preload is in response to an insufficient amount of radial clearance available to accommodate the thermal growth of the bearing and shaft. However, radial clearances greater than the optimum in regime II resulted in low bearing preloads that did not cause any heat-related problems, and the failure mode was due to fluid-film breakdown. In fact, bearings operating with radial clearances twice as much as the optimum suffered a decrease in the maximum load capacity of only about 20 percent. Therefore, special attention has to be given to the range of operating conditions expected in the bearing/shaft system since changes in temperature, centrifugal, and hydrodynamic effects can all affect radial clearance. This enhanced understanding of foil air bearing behavior will greatly aid our efforts to transition Oil-Free technology to future aircraft engines.
Author
*Foil Bearings; Gas Bearings; Clearances*

**20050215265** NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA
**High-Temperature Hybrid Rotor Support System Developed**
Montague, Gerald T.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Army Research Laboratory Vehicle Technology Directorate and the NASA Glenn Research Center demonstrated a unique high-speed, high-temperature rotor support system in September 2003. Advanced turbomachinery is on its way to surpassing the capabilities of rolling-element bearings and conventional dampers. To meet these demands, gas turbine engines of the future will demand increased efficiency and thrust-to-weight ratio, and reduced specific fuel consumption and noise. The more-electric engine replaces oil-lubricated bearings, dampers, gears, and seals with electrical devices. One such device is the magnetic bearing. The Vehicle Technology Directorate and Glenn have demonstrated the operation of a radial magnetic bearing in combination with a hydrostatic bearing at 1000 F at 31,000 rpm (2.3 MDN1). This unique combination takes advantage of a high-temperature rub surface in the event of electrical power loss or sudden overloads. The hydrostatic bearings allow load sharing with the magnetic bearing. The magnetic-hydrostatic bearing combination eliminates wear and high contact stress from sudden acceleration of the rolling-element bearings and overheating. The magnetic bearing enables high damping, adaptive vibration control, and precise rotor positioning, diagnostics, and health monitoring. A model of the test facility used at Glenn for this technology demonstration is shown. A high-temperature heteropolar radial magnetic bearing is located at the center of gravity of the test rotor. There is a 0.022-in. radial air gap between the rotor and stator. Two rub surface hydrostatic bearings were placed on either side of the magnetic bearing. The rotor is supported by a 0.002-in. hydrostatic air film and the magnetic field. The prototype active magnetic bearing cost $24,000 to design and fabricate and a set of four high temperature, rub-surface, hydrostatic bearings cost $28,000. This work was funded by the Turbine-Based Combined Cycle program.
Author (revised)
*High Temperature; Rotors; Fabrication; Turbomachinery; Test Facilities; Hybrid Structures*

**20050215273** NASA Glenn Research Center, Cleveland, OH, USA
**Bearingless Switched-Reluctance Motor Improved**
Morrison, Carlos R.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Morrison rotor, named after its inventor, is a hybrid rotor for use in a switched reluctance electric motor. The motor is characterized as bearingless in the sense that it does not rely on conventional mechanical bearings: instead, it functions as

both a magnetic bearing and a motor. Bearingless switched-reluctance motors are attractive for use in situations in which large variations in temperatures and/or other extreme conditions preclude the use of conventional electric motors and mechanical bearings. In the Morrison motor, as in prior bearingless switched-reluctance motors, a multipole rotor is simultaneously levitated and rotated. In the prior motors, simultaneous levitation and rotation are achieved by means of two kinds of stator windings: (1) main motor windings and (2) windings that exert levitating forces on a multipole rotor. The multipole geometry is suboptimum for levitation because it presents a discontinuous surface to the stator pole faces, thereby degrading the vibration suppression capability of the magnetic bearing. The Morrison rotor simplifies the stator design in that it contains only one type of winding. The rotor is a hybrid that includes both (1) a circular lamination stack for levitation and (2) a multipole lamination stack for rotation. Simultaneous levitation and rotation at 6000 rpm were achieved with a prototype that included six rotor poles and eight stator poles. During normal operation, two of the four pairs of opposing stator poles (each pair at right angles to the other pair) levitate the rotor. The remaining two pairs of stator poles exert torque on the six-pole rotor lamination stack to produce rotation. The relative length of the circular and multipole lamination stacks on the rotor can be chosen to tailor the performance of the motor for a specific application. For a given overall length, increasing the length of the multipole stack relative to the circular stack results in an increase in torque relative to the levitation load capacity and vice versa.
Author
*Electric Motors; Reluctance; Rotor Blades (Turbomachinery); Magnetic Switching; Magnetic Bearings*

**20050215275** NASA Glenn Research Center, Cleveland, OH, USA
**New Dynamic Spin Rig Capabilities Used to Determine Rotating Blade Dynamics**
Provenza, Andrew J.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The Dynamic Spin Rig Facility at the NASA Glenn Research Center is used to determine the structural response of rotating engine components without the effects of aerodynamic loading. Recently, this rig's capabilities were enhanced through the replacement of grease-lubricated ball bearings with magnetic bearings. Magnetic bearings offer a number of advantages--the most important here being that they not only fully support the rotor system, but excite it as well. Three magnetic bearings support the rotor and provide five axes of controlled motion: an x- and y-axis translation at each of two radial bearings and a z-axis translation in the vertical or axial direction. Sinusoidal excitation (most commonly used) can be imparted on the rotor through the radial magnetic bearings in either a fixed or rotating frame of reference. This excitation is added directly to the magnetic bearing control output. Since the rotor is fully levitated, large translations and rotations of the rotor system can be achieved. Some of the capabilities of this excitation system were determined and reported. The accelerations obtained at the tip of a titanium flat plate test article versus the swept sine excitation sent to both radial bearings in phase and perpendicular to the plane containing the two blades are shown. Recent tests required the excitation of fundamental bending and torsional blade resonances at rotor speeds up to 10,000 rpm. Successful fixed synchronous rotation of the excitation signal provided the best detectable blade resonant vibrations at excitation frequencies up to 1100 Hz for the particular blades of interest. A noncontacting laser measurement system was used to collect blade-tip motions. From these data, the amplitude and frequency of the motion could be determined as well as the blade damping properties. Damping could be determined using two methods: (1) free decay and (2) curve fitting the vibration amplitude as a function of frequency in and around the resonance of interest and using the half-power method. The free decay of a composite blade vibrating at its first bending resonance while rotating at 3000 rp is shown. This new system is currently being used to support the Efficient Low-Noise Fan project at Glenn. The damping properties of prototype hollow composite blades specially designed to reduce fan noise are currently being determined.
Author (revised)
*Rotor Blades (Turbomachinery); Rotation; Spin; Rotor Dynamics*

**20050215277** NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA
**Conical Magnetic Bearings Developed for Active Stall Control in Gas Turbine Engines**
Trudell, Jeffrey J.; Kascak, Albert F.; Provenza, Andrew J.; Buccieri, Carl J.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Active stall control is a current research area at the NASA Glenn Research Center that offers a great benefit in specific fuel consumption by allowing the gas turbine to operate beyond the onset of stall. Magnetic bearings are being investigated as a new method to perform active stall control. This enabling global aviation safety technology would result in improved fuel efficiency and decreased carbon dioxide emissions, as well as improve safety and reliability by eliminating oil-related delays and failures of engine components, which account for 40 percent of the commercial aircraft departure delays. Active stall control works by perturbing the flow in front of the compressor stage such that it cancels the pressure wave, which causes the

compressor to go into stall. Radial magnetic bearings are able to whirl the shaft so that variations in blade tip leakage would flow upstream causing a perturbation wave that could cancel the rotating stall cell. Axial or thrust magnetic bearings cannot be used to cancel the surge mode in the compressor because they have a very low bandwidth and thus cannot modulate at a high enough frequency. Frequency response is limited because the thrust runner cannot be laminated. To improve the bandwidth of magnetic thrust bearings, researchers must use laminations to suppress the eddy currents. A conical magnetic bearing can be laminated, resulting in increased bandwidth in the axial direction. In addition, this design can produce both radial and thrust force in a single bearing, simplifying the installation. The proposed solution combines the radial and thrust bearing into one design that can be laminated--a conical magnetic bearing. The new conical magnetic bearing test rig, funded by a Glenn fiscal year 2002 Director's Discretionary Fund, was needed because none of the existing rigs has an axial degree of freedom. The rotor bearing configuration will simulate that of the main shaft on a gas turbine engine. One conical magnetic bearing replaces the ball bearing in front of the compressor, and the second replaces the roller bearing behind the burner. The rig was made operational to 10,000 rpm under Smart Efficient Components funding, and both position and current adaptive vibration control have been demonstrated. Upon program completion, recommendations will be made as to the efficacy of the conical magnetic bearing for active stall control.
Author
*Magnetic Bearings; Active Control; Gas Turbine Engines; Rotating Stalls; Conical Bodies*

**20050215290** NASA Glenn Research Center, Cleveland, OH, USA
**Research Capabilities for Oil-Free Turbomachinery Expanded by New Rotordynamic Simulator Facility**
Howard, Samuel A.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A new test rig has been developed for simulating high-speed turbomachinery shafting using Oil-Free foil air bearing technology. Foil air journal bearings are self-acting hydrodynamic bearings with a flexible inner sleeve surface using air as the lubricant. These bearings have been used in turbomachinery, primarily air cycle machines, for the past four decades to eliminate the need for oil lubrication. More recently, interest has been growing in applying foil bearings to aircraft gas turbine engines. They offer potential improvements in efficiency and power density, decreased maintenance costs, and other secondary benefits. The goal of applying foil air bearings to aircraft gas turbine engines prompted the fabrication of this test rig. The facility enables bearing designers to test potential bearing designs with shafts that simulate the rotating components of a target engine without the high cost of building actual flight hardware. The data collected from this rig can be used to make changes to the shaft and bearings in subsequent design iterations. The rest of this article describes the new test rig and demonstrates some of its capabilities with an initial simulated shaft system. The test rig has two support structures, each housing a foil air journal bearing. The structures are designed to accept any size foil journal bearing smaller than 63 mm (2.5 in.) in diameter. The bearing support structures are mounted to a 91- by 152-cm (3- by 5-ft) table and can be separated by as much as 122 cm (4 ft) and as little as 20 cm (8 in.) to accommodate a wide range of shaft sizes. In the initial configuration, a 9.5-cm (3.75-in.) impulse air turbine drives the test shaft. The impulse turbine, as well as virtually any number of 'dummy' compressor and turbine disks, can be mounted on the shaft inboard or outboard of the bearings. This flexibility allows researchers to simulate various engine shaft configurations. The bearing support structures include a unique bearing mounting fixture that rotates to accommodate a laserbased alignment system. This can measure the misalignment of the bearing centers in each of 2 translational degrees of freedom and 2 rotational degrees of freedom. In the initial configuration, with roughly a 30.5-cm-(12-in.-) long shaft, two simulated aerocomponent disks, and two 50.8-cm (2-in.) foil journal bearings, the rig can operate at 65,000 rpm at room temperature. The test facility can measure shaft displacements in both the vertical and horizontal directions at each bearing location. Horizontal and vertical structural vibrations are monitored using accelerometers mounted on the bearing support structures. This information is used to determine system rotordynamic response, including critical speeds, mode shapes, orbit size and shape, and potentially the onset of instabilities. Bearing torque can be monitored as well to predict the power loss in the foil bearings. All of this information is fed back and forth between NASA and the foil bearing designers in an iterative fashion to converge on a final bearing and shaft design for a given engine application. In addition to its application development capabilities, the test rig offers several unique capabilities for basic bearing research. Using the laser alignment system mentioned earlier, the facility will be used to map foil air journal bearing performance. A known misalignment of increasing severity will be induced to determine the sensitivity of foil bearings to misalignment. Other future plans include oil-free integral starter generator testing and development, and dynamic load testing of foil journal bearings.
Author
*Foil Bearings; Gas Turbine Engines; Rotor Dynamics; SIMulators; Test Facilities; Turbomachinery; Technology Utilization; Fabrication*

**20050215303** Texas Univ., El Paso, TX, USA

**The Plunge Phase of Friction Stir Welding**

McClure, John C.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXVII-1 - XVII-10; In English; See also 20050215300; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

The many advantages of Friction Stir Welding have led to a relatively rapid acceptance in the often conservative welding community. Because the process is so different from traditional fusion welding, with which most investigators are most familiar, there remain many aspects of FSW for which there is no clear consensus. For example, the well known onion rings seen in transverse sections have been variously interpreted as grain size variations, variation in density of second phase particles and parts of the carousel of material rotating with the pin that have been shed from the carousel. Using Orientation Imaging Microscopy, Schneider has recently noted that the onion rings have a different orientation (and hence etch differently) than the surrounding material, and this orientation is consistent with slip plane orientations at the edge of the carousel. Likewise, the forces and torque exerted by the FSW tool on the work piece largely remain unaccounted for. Although these forces are routinely measured by investigators with commercial instrumented welders, they are rarely reported or even qualitatively analyzed. This paper will introduce a model based on a carousel or disk of material that rotates with the tool to estimate the torque and plunge force required to plunge a tool into the work piece. A stationary tool is modeled rather than the moving tool because effects such as thermal transients and metallurgical changes in the sample (primarily aging in aluminum) can be more easily accounted for. It is believed, however, that with some modifications the model should be applicable to a moving tool also.

Derived from text

*Friction Stir Welding; Mathematical Models; Plungers; Fusion Welding*

**20050215578** ATK-Thiokol Propulsion, USA

**Using SPC and Trending to Reduce FOD**

Wallentine, Mark; August 2005; 42 pp.; In English; National Aerospace FOD Prevention Institute 26th Annual Convention, 9-11 Aug. 2005, Denver, CO, USA; Original contains color illustrations

Contract(s)/Grant(s): NAS8-97238; No Copyright; Avail.: CASI: A03, Hardcopy

This paper presents viewgraphs showing the trends and Statistical Process Control (SPC) used by ATK-Thiokol to reduce Foreign Object Debris (FOD). Some of the topics include: 1) Amazing Little Known and Less Used Facts; 2) Critical Nature of Rocket Manufacturing; 3) ATK-Thiokol Foreign Object Debris (FOD) Philosophy; 4) FOD Trending and SPC at ATK-Thiokol Philosophy; 5) Trending and Statistical Process Control (SPC) Basic Philosophy; 6) Trending and Statistical Process Control (SPC); 7) FOD Trending and SPC at ATK-Thiokol Trending; 8) FOD Trending and SPC at ATK-Thiokol Specific Instances; 9) FOD Trending and SPC at ATK-Thiokol Contamination in Air; and 10) FOD Trending and SPC at ATK-Thiokol Nitrogen Dewpoint.

CASI

*Debris; Manufacturing; Process Control (Industry); Statistical Analysis*

**20050215580** NASA Glenn Research Center, Cleveland, OH, USA

**Hybrid Power Management Program Evaluated Fuel Cell/Ultracapacitor Combinations and Developed Other New Applications**

Eichenberg, Dennis J.; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

In fiscal year 2003, the continuation of the Hybrid Power Management (HPM) Program through NASA Glenn Research Center's Commercial Technology Office resulted in several new successful applications of this pioneering technology. HPM is the innovative integration of diverse, state-of-the-art power devices in an optimal configuration for space and terrestrial applications. The appropriate application and control of the various power devices significantly improves overall system performance and efficiency. The advanced power devices include ultracapacitors, fuel cells, and photovoltaics. HPM has extremely wide potential, with applications from nanowatts to megawatts--including power generation, transportation systems, biotechnology systems, and space power systems. HPM has the potential to significantly alleviate global energy concerns, improve the environment, and stimulate the economy. Fuel cells provide excellent efficiency and energy density, but do not have good power density. In contrast, ultracapacitors have excellent power density and virtually unlimited cycle life. To improve the power density of the fuel cell, the combination of fuel cells and ultracapacitors was evaluated.

Derived from text

*Fuel Cells; Capacitors; Photovoltaic Conversion; Electric Power Supplies*

**20050216395** NASA Glenn Research Center, Cleveland, OH, USA

**Investigations of Shuttle Main Landing Gear Door Environmental Seals**

Finkbeiner, Joshua; Dunlap, Pat; Steinetz, Bruce; DeMango, Jeff; Newswander, Daniel; September 2005; 25 pp.; In English; 41st Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22R-617-44-03-76-01

Report No.(s): NASA/TM-2005-213860; E-15230; AIAA Paper 2005-4155; No Copyright; Avail.: CASI: A03, Hardcopy

The environmental seals for the main landing gear doors of the Shuttle Orbiters were raised by the Columbia Accident Investigation Board as a potential safety concern. Inspections of seals installed on the Shuttle Discovery revealed that they were permanently deformed and no longer met certified seal compression requirements. Replacement of the seals led to the inability to fully close the main landing gear doors. Johnson Space Center requested that Glenn Research Center conduct tests on the main landing gear door environmental seals to assist in installing the seals in a manner to allow the main landing gear doors to fully close. Further testing was conducted to fill out the seal performance database. Results from the testing indicated that the method of bonding the seals was important in reducing seal loads on the main landing gear doors. Also, the replacement seals installed in Shuttle Discovery were found to have leakage performance sufficient to meet the certification requirements.

Author

*Discovery (Orbiter); Doors; Landing Gear; Seals (Stoppers)*

**20050216431** Texas A&M Univ., TX, USA

**Hybrid Electric Vehicle: Overview and State of the Art**

Ehsani, Mehrdad; Gao, Yimin; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 10 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Electric traction is one of the most promising technologies that can lead to significant improvements in vehicle performance, energy utilization efficiency, and polluting emissions. Among several technologies, hybrid electric vehicle (HEV) traction is the most promising technology that has the advantages of high performance, high fuel efficiency, low emissions and long operating range. Moreover, the technologies of all the component hardware are technically and markedly available. At present, almost all the major automotive manufacturers are developing hybrid electric vehicles, and some of them have marketed their productions, such as Toyota and Honda. This paper reviews the present technologies of hybrid electric vehicle in the range of drivetrain configuration, electric motor drives and energy storages.

Author

*Electric Motor Vehicles; Traction; Energy Conservation; Mechanical Drives*

**20050217034** NASA Glenn Research Center, Cleveland, OH, USA

**Modeling and Development of a Magnetic Bearing Controller for a High Speed Flywheel System**

Dever, Timothy P.; Brown, Gerald V.; Duffy, Kirsten P.; Jansen, Ralph H.; September 2005; 19 pp.; In English; Second International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-319-20-M1

Report No.(s): NASA/TM-2005-213877; E-15248; AIAA Paper 2004-5626; No Copyright; Avail.: CASI: A03, Hardcopy

This paper describes a modeling effort used to develop an improved type of magnetic bearing controller, called a modal controller, for use on high speed flywheel systems. The controller design is based on models of the flywheel system, is designed to directly control the natural dynamics of the spinning rotor, and is generic enough to be readily adapted to future flywheel systems. Modeling and development are described for two key controller subsystems: the modal controller subsystem, which allows direct control over the rotor rigid body modes, and the bending mode compensation subsystem, which tracks, and prevents interference from, the rotor bending modes during flywheel operation. Integration of modeling results into the final controller is described and data taken on the NASA Glenn D1 flywheel module during high speed operation are presented and discussed. The improved modal controller described in this paper has been successfully developed and implemented and has been used for regular hands-free operation of the D1 flywheel module up to its maximum operating speed of 60,000 RPM.

Author

*Controllers; Flywheels; Magnetic Bearings; Mathematical Models*

**20050217188** Toledo Univ., OH, USA

**Integrated Power and Attitude Control System Demonstrated With Flywheels G2 and D1**

Jansen, Ralph H.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

On September 14, 2004, NASA Glenn Research Center's Flywheel Development Team experimentally demonstrated a full-power, high-speed, two-flywheel system, simultaneously regulating a power bus and providing a commanded output torque. Operation- and power-mode transitions were demonstrated up to 2000 W in charge and 1100 W in discharge, while the output torque was simultaneously regulated between plus or minus 0.8 N-m. The G2 and D1 flywheels--magnetically levitated carbon-fiber wheels with permanent magnet motors--were used for the experiment. The units were mounted on an air bearing table in Glenn's High Energy Flywheel Facility. The operational speed range for these tests was between 20,000 and 60,000 rpm. The bus voltage was regulated at 125 V during charge and discharge, and charge-discharge and discharge-charge transitions were demonstrated by changing the amount of power that the power supply provided between 300 and 0 W. In a satellite system, this would be the equivalent of changing the amount of energy that the solar array provides to the spacecraft. In addition to regulating the bus voltage, we simultaneously controlled the net torque produced by the two flywheel modules. Both modules were mounted on an air table that was restrained by a load cell. The load cell measured the force on the table, and the torque produced by the two flywheels on the table could be calculated from that measurement. This method was used to measure the torque produced by the modules, yielding net torques from -0.8 to 0.8 N-m. This was the first Glenn demonstration of the Integrated Power and Attitude Control System (IPACS) at high power levels and speeds.
Author

*Attitude Control; Flywheels; Control Systems Design; Power Transmission*

## 38
## QUALITY ASSURANCE AND RELIABILITY

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

**20050214859** NASA Glenn Research Center, Cleveland, OH, USA

**Dynamic Spin Rig Upgraded With a Five- Axis-Controlled Three-Magnetic-Bearing Support System With Forward Excitation**

Morrison, Carlos R.; Mehmed, Oral; Research and Technology 2002; March 2003; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center Dynamic Spin Rig is used for experimental evaluation of vibration analysis methods and dynamic characteristics for rotating systems. Measurements are made while rotors are spun and vibrated in a vacuum chamber. The rig has been upgraded with a new active magnetic bearing rotor support and excitation system. This design is expected to provide operational improvements over the existing rig. The rig will be able to be operated in either the old or new configuration. In the old configuration, two ball bearings support the vertical shaft of the rig, with the test article located between the bearings. Because the bearings operate in a vacuum, lubrication is limited to grease. This limits bearing life and speed. In addition, the old configuration employs two voice-coil electromagnetic shakers to apply oscillatory axial forces or transverse moments to the rotor shaft through a thrust bearing. The excitation amplitudes that can be imparted to the test article with this system are not adequate for components that are highly damped. It is expected that the new design will overcome these limitations.
Derived from text

*Ball Bearings; Dynamic Characteristics; Dynamic Structural Analysis; Magnetic Bearings*

**20050215425** Rensselaer Polytechnic Inst., Troy, NY, USA

**The Effects of a k-fold Reliability Improvement in Log Location-Scale Families**

Sullo, Pasquale; IPSI 2005 Amalfi Proceedings; [2005]; 18 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The mean time to failure (MTTF) criterion is an inadequate indicator of reliability. For example, an engineering center s reliability improvement program goals for electronic power systems are: 2X, 4X and 10X by years five, seven, and ten. Knowing only MTTFs for existing systems gives no indication of the necessary improvement. In this paper an answer is given to the question: What does a k-fold improvement in reliability mean? Also: What are the effects of improvement on the

characteristics of the original life distribution? These effects are described for log location-scale families, e.g., the Weibull and lognormal distributions. Examples are presented.
Author
*Reliability Engineering; Reliability; Mtbf*

**20050215447** Sheffield Hallam Univ., Sheffield, UK
**Assessing the Life Cycle Costs and Performance of Product Design Changes**
Xie, Xiaoling; Simon, Matthew; IPSI 2005 Amalfi Proceedings; [2005]; 10 pp.; In English; See also 20050215422; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes an ongoing research of the development of a dynamic model which enables the investigation of the effects of product design changes on life cycle performance and cost. The model consists of databases, knowledge base and simulation. ARENA (a system modelling for supply chain management) is employed to build the model. VBA (Visual Basic for Applications) is used for augmenting ARENA model logic and integrating 'MS Excel' and 'MS Access' with the simulation. CAD is applied for the animation. The model integrates the design, manufacture, service and end of life stage in product life cycle and evaluates 'what if' scenarios for different configurations over time. As a result, the changes in availability and cost from adding new features can be quantified and assessed. This paper presents the background of research, a prototype model and results by running the model for a refrigeration product adding in ELIMA (a life cycle data collection and information management system). The results indicate that the model can be used as an assessment tool in the future which may help decision-making for managers in the development of a new system for a product.
Author
*Life Cycle Costs; Dynamic Models; Decision Making; Computer Aided Design; Data Acquisition; Service Life; Life (Durability); Information Management*

**20050216445** NASA Glenn Research Center, Cleveland, OH, USA
**Nondestructive Evaluation Tests Performed on Space Shuttle Leading- Edge Materials Subjected to Impact**
Roth, Don J.; Martin, Richard E.; Bodis, James R.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

In support of the space shuttle Return To Flight efforts at the NASA Glenn Research Center, a series of nondestructive evaluation (NDE) tests were performed on reinforced carbon/carbon (RCC) composite panels subjected to ballistic foam impact. The impact tests were conducted to refine and verify analytical models of an external tank foam strike on the space shuttle leading edge. The NDE tests were conducted to quantify the size and location of the resulting damage zone as well as to identify hidden damage.
Derived from text
*Nondestructive Tests; Composite Structures; Carbon-Carbon Composites; Damage; Impact Tests*

**20050216446** NASA Glenn Research Center, Cleveland, OH, USA
**Molecular Rayleigh Scattering Techniques Developed for Measuring Gas Flow Velocity, Density, Temperature, and Turbulence**
Mielke, Amy F.; Seasholtz, Richard G.; Elam, Kristie A.; Panda, Jayanta; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Nonintrusive optical point-wise measurement techniques utilizing the principles of molecular Rayleigh scattering have been developed at the NASA Glenn Research Center to obtain time-averaged information about gas velocity, density, temperature, and turbulence, or dynamic information about gas velocity and density in unseeded flows. These techniques enable measurements that are necessary for validating computational fluid dynamics (CFD) and computational aeroacoustic (CAA) codes. Dynamic measurements allow the calculation of power spectra for the various flow properties. This type of information is currently being used in jet noise studies, correlating sound pressure fluctuations with velocity and density fluctuations to determine noise sources in jets. These nonintrusive techniques are particularly useful in supersonic flows, where seeding the flow with particles is not an option, and where the environment is too harsh for hot-wire measurements.
Derived from text
*Aeroacoustics; Computational Fluid Dynamics; Gas Flow; Rayleigh Scattering; Density (Mass/Volume); Temperature Measurement; Turbulence*

**20050217019** NASA Glenn Research Center, Cleveland, OH, USA

**Ability of Impedance-Based Health Monitoring To Detect Structural Damage of Propulsion System Components Assessed**

Martin, Richard E.; Gyekenyesi, Andrew L.; Sawicki, Jerzy T.; Baaklini, George Y.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Impedance-based structural-health-monitoring uses piezoelectric (PZT) patches that are bonded onto or embedded in a structure. Each individual patch behaves as both an actuator of the surrounding structural area as well as a sensor of the structural response. The size of the excited area varies with the geometry and material composition of the structure, and an active patch is driven by a sinusoidal voltage sweep. When a PZT patch is subjected to an electric field, it produces a mechanical strain; and when it is stressed, it produces an electric charge. Since the patch is bonded to the structure, driving a patch deforms and vibrates the structure. The structure then produces a localized dynamic response. This structural system response is transferred back to the PZT patch, which in turn produces an electrical response. The electromechanical impedance method is based on the principle of electromechanical coupling between the active sensor and the structure, which allows researchers to assess local structural dynamics directly by interrogating a distributed sensor array. Because of mechanical coupling between the sensor and the host structure, this mechanical effect is picked up by the sensor and, through electromechanical coupling inside the active element, is reflected in electrical impedance measured at the sensor s terminals. Derived from text

*Structural Design; Composition (Property); Dynamic Structural Analysis; Electrical Impedance*

## 39
## STRUCTURAL MECHANICS

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

**20050215117** NASA Langley Research Center, Hampton, VA, USA

**Torsion of Noncircular Composite Cylinders**

Rouse, Marshall; Hyer, Michael W.; Haynie, Waddy T.; [2005]; 24 pp.; In English; American Society for Composites 20th Annual Technical Conference, 7-9 Sep. 2005, Philadelphia, PA, USA

Contract(s)/Grant(s): 23-064-30-34; Copyright; Avail.: CASI: A03, Hardcopy

The paper presents a brief overview of the predicted deformation and failure characteristics of noncircular composite cylinders subjected to torsion. Using a numerical analysis, elliptical cylinders with a minor-to-major diameter ratio of 0.7 are considered. Counterpart circular cylinders with the same circumference as the elliptical cylinders are included for comparison. The cylinders are constructed of a medium-modulus graphite-epoxy material in a quasi-isotropic lay-up. Imperfections generated from the buckling mode shapes are included in the initial cross-sectional geometry of the cylinders. Deformations until first fiber failure, as predicted using the maximum stress failure criterion and a material degradation scheme, are presented. For increasing levels of torsion, the deformations of the elliptical cylinders, in the form of wrinkling of the cylinder wall, occur primarily in the flatter regions of the cross section. By comparison the wrinkling deformations of the circular cylinders are more uniformly distributed around the circumference. Differences in the initial failure and damage progression and the overall torque vs. twist relationship between the elliptical and circular cylinders are presented. Despite differences in the response as the cylinders are being loaded, at first fiber failure the torque and twist for the elliptical and circular cylinders nearly coincide.

Author

*Torsion; Elliptical Cylinders; Graphite-Epoxy Composites; Deformation; Circular Cylinders; Failure*

**20050215159** NASA Glenn Research Center, Cleveland, OH, USA

**Vibration Characteristics Determined for Stainless Steel Sandwich Panels With a Metal Foam Core for Lightweight Fan Blade Design**

Ghosn, Louis J.; Min, James B.; Raj, Sai V.; Lerch, Bradley A.; Holland, Frederic A., Jr.; May 2004; 4 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The goal of this project at the NASA Glenn Research Center is to provide fan materials that are safer, weigh less, and cost less than the currently used titanium alloy or polymer matrix composite fans. The proposed material system is a sandwich fan construction made up of thin solid face sheets and a lightweight metal foam core. The stiffness of the sandwich structure

is increased by separating the two face sheets by the foam layer. The resulting structure has a high stiffness and lighter weight in comparison to the solid facesheet material alone. The face sheets carry the applied in-plane and bending loads (ref. 1). The metal foam core must resist the transverse shear and transverse normal loads, as well as keep the facings supported and working as a single unit. Metal foams have ranges of mechanical properties, such as light weight, impact resistance, and vibration suppression (ref. 2), which makes them more suitable for use in lightweight fan structures. Metal foams have been available for decades (refs. 3 and 4), but the difficulties in the original processes and high costs have prevented their widespread use. However, advances in production techniques and cost reduction have created a new interest in this class of materials (ref. 5). The material chosen for the face sheet and the metal foam for this study was the aerospace-grade stainless steel 17-4PH. This steel was chosen because of its attractive mechanical properties and the ease with which it can be made through the powder metallurgy process (ref. 6). The advantages of a metal foam core, in comparison to a typical honeycomb core, are material isotropy and the ease of forming complex geometries, such as fan blades. A section of a 17-4PH sandwich structure is shown in the following photograph. Part of process of designing any blade is to determine the natural frequencies of the particular blade shape. A designer needs to predict the resonance frequencies of a new blade design to properly identify a useful operating range. Operating a blade at or near the resonance frequencies leads to high-cycle fatigue, which ultimately limits the blade's durability and life. So the aim of this study is to determine the variation of the resonance frequencies for an idealized sandwich blade as a function of its face-sheet thickness, core thickness, and foam density. The finite element method is used to determine the natural frequencies for an idealized rectangular sandwich blade. The proven Lanczos method (ref. 7) is used in the study to extract the natural frequency.
Author
*Fan Blades; Vibration; Sandwich Structures; Stainless Steels; Cost Reduction; Honeycomb Cores; Mechanical Properties; Powder Metallurgy*

**20050215264** NASA Glenn Research Center, Cleveland, OH, USA
**New Tool Released for Engine-Airframe Blade-Out Structural Simulations**
Lawrence, Charles; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Researchers at the NASA Glenn Research Center have enhanced a general-purpose finite element code, NASTRAN, for engine-airframe structural simulations during steady-state and transient operating conditions. For steady-state simulations, the code can predict critical operating speeds, natural modes of vibration, and forced response (e.g., cabin noise and component fatigue). The code can be used to perform static analysis to predict engine-airframe response and component stresses due to maneuver loads. For transient response, the simulation code can be used to predict response due to bladeoff events and subsequent engine shutdown and windmilling conditions. In addition, the code can be used as a pretest analysis tool to predict the results of the bladeout test required for FAA certification of new and derivative aircraft engines. Before the present analysis code was developed, all the major aircraft engine and airframe manufacturers in the USA and overseas were performing similar types of analyses to ensure the structural integrity of engine-airframe systems. Although there were many similarities among the analysis procedures, each manufacturer was developing and maintaining its own structural analysis capabilities independently. This situation led to high software development and maintenance costs, complications with manufacturers exchanging models and results, and limitations in predicting the structural response to the desired degree of accuracy. An industry-NASA team was formed to overcome these problems by developing a common analysis tool that would satisfy all the structural analysis needs of the industry and that would be available and supported by a commercial software vendor so that the team members would be relieved of maintenance and development responsibilities. Input from all the team members was used to ensure that everyone's requirements were satisfied and that the best technology was incorporated into the code. Furthermore, because the code would be distributed by a commercial software vendor, it would be more readily available to engine and airframe manufacturers, as well as to nonaircraft companies that did not previously have access to this capability.
Author
*Airframes; Structural Analysis; Finite Element Method; Computer Programming; Computerized SIMulation; Software Engineering; Structural Failure*

**20050215270** NASA Glenn Research Center, Cleveland, OH, USA
**Prototype Morphing Fan Nozzle Demonstrated**
Lee, Ho-Jun; Song, Gang-Bing; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NCC3-839; No Copyright; Avail.: CASI: A01, Hardcopy

Ongoing research in NASA Glenn Research Center's Structural Mechanics and Dynamics Branch to develop smart

materials technologies for aeropropulsion structural components has resulted in the design of the prototype morphing fan nozzle shown in the photograph. This prototype exploits the potential of smart materials to significantly improve the performance of existing aircraft engines by introducing new inherent capabilities for shape control, vibration damping, noise reduction, health monitoring, and flow manipulation. The novel design employs two different smart materials, a shape-memory alloy and magnetorheological fluids, to reduce the nozzle area by up to 30 percent. The prototype of the variable-area fan nozzle implements an overlapping spring leaf assembly to simplify the initial design and to provide ease of structural control. A single bundle of shape memory alloy wire actuators is used to reduce the nozzle geometry. The nozzle is subsequently held in the reduced-area configuration by using magnetorheological fluid brakes. This prototype uses the inherent advantages of shape memory alloys in providing large induced strains and of magnetorheological fluids in generating large resistive forces. In addition, the spring leaf design also functions as a return spring, once the magnetorheological fluid brakes are released, to help force the shape memory alloy wires to return to their original position. A computerized real-time control system uses the derivative-gain and proportional-gain algorithms to operate the system. This design represents a novel approach to the active control of high-bypass-ratio turbofan engines. Researchers have estimated that such engines will reduce thrust specific fuel consumption by 9 percent over that of fixed-geometry fan nozzles. This research was conducted under a cooperative agreement (NCC3-839) at the University of Akron.
Author
*Nozzle Geometry; Smart Materials; Shape Memory Alloys; Structural Design; Active Control; Noise Reduction; Vibration Damping*

**20050215318** Alabama Agricultural and Mechanical Univ., Normal, AL, USA
**Effects of Piezoelectric (PZT) Sensor Bonding and the Characteristics of the Host Structure on Impedance Based Structural Health Monitoring**
Jalloh, Abdul; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXII-1 - XXII-11; In English; See also 20050215300; No Copyright; Avail.: CASI: A03, Hardcopy

This study was conducted to investigate the effects of certain factors on the impedance signal in structural health monitoring. These factors were: the quality of the bond between the sensor and the host structure, and the characteristics of the host structure, such as geometry, mass, and material properties. This work was carried out to answer a set of questions, related to these factors, that were developed by the project team. The project team was comprised of Dr. Doug Ramers and Dr. Abdul Jalloh of the Summer Faculty Fellowship Program, Mr. Arnaldo Colon- Perez, a student intern from the University of Puerto Rico of Turabo, and Mr. John Lassiter and Mr. Bob Engberg of the Structural and Dynamics Test Group at NASA Marshall Space Flight Center (MSFC). This study was based on a review of the literature on structural health monitoring to investigate the factors referred to above because there was not enough time to plan and conduct the appropriate tests at MSFC during the tenure of the Summer Faculty Fellowship Program project members. The surveyed literature documents works on structural health monitoring that were based on laboratory tests that were conducted using bolted trusses and other civil engineering type structures for the most part. These are not the typical types of structures used in designing and building NASA s space vehicles and systems. It was therefore recommended that tests be conducted using NASA type structures, such as pressure vessels, to validate the observations made in this report.
Author
*Dynamic Structural Analysis; Bonding; Piezoelectricity; Joints (Junctions); Structural Engineering; Trusses; Dynamic Tests; Impedance*

**20050216513** Maine Univ., Orono, ME USA
**Design and Analysis of a Hybrid Composite/Metal Structural System for Underwater Lifting Bodies**
Thompson, Larry; Walls, Josh; Caccese, Vincent; Jun. 30, 2005; 107 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0916
Report No.(s): AD-A436999; UM-MACH-RPT-01-08; No Copyright; Avail.: CASI: A06, Hardcopy

This report summarizes the analysis and design of a hybrid underwater lifting body structure. It is part of an effort to investigate the response of hybrid composite/metal construction techniques and hybrid connection connections in U.S. Navy vessels. This effort includes structural analysis of a lifting body structure designed by Navatek, Ltd of Honolulu HI that was constructed of aluminum for the SES 200. Analysis of this structural system as an e-glass/ vinylester - aluminum hybrid was undertaken. Additionally, a hydrostatic test system was developed used for a proof-of-concept study for a hybrid structural system, based upon the lifting body design.
DTIC
*Design Analysis; Hybrid Composites; Lifting Bodies; Structural Analysis*

**20050216520** Army Command and General Staff Coll., Fort Leavenworth, KS USA

**The Transformation of the Fleet Hospital Program from a Platform-Based Hospital to a Modular, Capability-Based Hospital**

Loefstedt, Brian E.; Jun. 17, 2005; 98 pp.; In English; Original contains color illustrations

Report No.(s): AD-A437026; No Copyright; Avail.: CASI: A05, Hardcopy

The USA has entered a new security environment, causing its military to conduct operations in remote areas of the world with limited resources to support its troops. The Fleet Hospital Program is responsible for providing health service support ashore, mainly medical and surgical capabilities, to Navy and Marine Corps personnel during intense combat operations. The requirement for forces to be lighter, more maneuverable, and more readily deployed and employed in the 2001 'Quadrennial Defense Review' has created the need for change in this program. This study answers the following question: Should the Navy Fleet Hospital Program transform from a platform-based hospital to a modular, capabilities-based hospital? The study utilizes five future mission scenarios for deployable medical systems to evaluate the applicability of a capabilities-based fleet hospital to perform those missions. The study leads to the conclusion that, to remain a relevant deployable medical asset, the current fleet hospitals require reconfiguration to capabilities-based hospitals to meet the operational needs of the warfighter. The current fleet hospitals are simply too large and cumbersome to provide a flexible, modular, and maneuverable medical facility necessary to operate in today's security environment.

DTIC

*Combat; Construction; Deployment; Hospitals; Support Systems*

**20050216692** EPM Technology, Oslo, Norway

**New Business Opportunities in the Growing IFC Market**

Anfindsen, Ole Jorgen; Balaton, Erik; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 7 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The civil engineering and construction industry represents one of the biggest industries in the global marketplace. It is also a challenging industry to manage, and has a considerable potential for improvement in its use of IT. An important standard in this respect is IFC (Industry Foundation Classes), which is being developed by the International Alliance for Interoperability (IAI). IFC is used as a common data model for applications, and thus becomes a universal framework enabling information sharing and interoperability. This creates significant new business opportunities for vendors serving various phases of the building life cycle, including design, construction, operation, maintenance, and administration. The importance of IFC for the entire Architecture, Engineering, and Construction (AEC) sector is rapidly growing, evidenced e.g. by the decision of the US Federal Government s GSA, which houses 1.1 million Federal employees (making it one of the world s largest building administrators), to demand IFC-based building information modeling for all projects by 2006. Index Terms-- IFC, IAI, STEP, EXPRESS, ISO, AEC, interoperability, collaboration, data sharing, data exchange.

Author

*Construction Industry; Interoperability; Data Transfer (Computers)*

**20050217093** NASA Langley Research Center, Hampton, VA, USA

**Enhancements of Tow-Steering Design Techniques: Design of Rectangular Panel Under Combined Loads**

Tatting, Brian F.; Setoodeh, Shahriar; Gurdal, Zafer; September 2005; 39 pp.; In English

Contract(s)/Grant(s): NAS1-00135; WBS 23-064-30-34

Report No.(s): NASA/CR-2005-213911; No Copyright; Avail.: CASI: A03, Hardcopy

An extension to existing design tools that utilize tow-steering is presented which is used to investigate the use of elastic tailoring for a flat panel with a central hole under combined loads of compression and shear. The elastic tailoring is characterized by tow-steering within individual lamina as well as a novel approach based on selective reinforcement, which attempts to minimize compliance through the use of Cellular Automata design concepts. The selective reinforcement designs lack any consideration of manufacturing constraints, so a new tow-steered path definition was developed to translate the prototype selective reinforcement designs into manufacturable plies. The minimum weight design of a flat panel under combined loading was based on a model provided by NASA-Langley personnel and analyzed by STAGS within the OLGA design environment. Baseline designs using traditional straight fiber plies were generated, as well as tow-steered designs which incorporated parallel, tow-drop, and overlap plies within the laminate. These results indicated that the overlap method provided the best improvement with regards to weight and performance as compared to traditional constant stiffness monocoque panels, though the laminates did not measure up to similar designs from the literature using sandwich and isogrid constructions. Further design studies were conducted using various numbers of the selective reinforcement plies at the core

and outer surface of the laminate. None of these configurations exhibited notable advantages with regard to weight or buckling performance. This was due to the fact that the minimization of the compliance tended to direct the major stresses toward the center of the panel, which decreased the ability of the structure to withstand loads leading to instability.
Author
*Loads (Forces); Rectangular Panels; Steering; Manufacturing; Cellular Automata*

**20050217138** NASA Glenn Research Center, Cleveland, OH, USA
**Advances In High Temperature (Viscoelastoplastic) Material Modeling for Thermal Structural Analysis**
Arnold, Steven M.; Saleeb, Atef F.; Fifth International Symposium on Liquid Space Propulsion; January 2005; 36 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Typical High Temperature Applications High Temperature Applications Demand High Performance Materials: 1) Complex Thermomechanical Loading; 2) Complex Material response requires Time-Dependent/Hereditary Models: Viscoelastic/Viscoplastic; and 3) Comprehensive Characterization (Tensile, Creep, Relaxation) for a variety of material systems.
Derived from text
*Thermal Analysis; Structural Analysis; Elastoplasticity; Viscoelasticity; Viscoplasticity; High Temperature; Tensile Creep*

## 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 42 through 48*.

**20050215631** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Analysis of plasmaspheric plumes: CLUSTER and IMAGE observations and numerical simulations**
Darouzet, Fabien; DeKeyser, Johan; Decreau, Pierrette; Gallagher, Dennis; Pierrard, Viviane; Lemaire, Joseph; Dandouras, Iannis; Matsui, Hiroshi; Dunlop, Malcolm; Andre, Mats; [2005]; 1 pp.; In English; Session C5 of the General Congress of the French Physical Society and Belgian Physical Society, 29 Aug. - 2 Sep. 2005, Lille, France; Copyright; Avail.: Other Sources; Abstract Only

Plasmaspheric plumes have been routinely observed by CLUSTER and IMAGE. The CLUSTER mission provides high time resolution four-point measurements of the plasmasphere near perigee. Total electron density profiles can be derived from the plasma frequency and/or from the spacecraft potential (note that the electron spectrometer is usually not operating inside the plasmasphere); ion velocity is also measured onboard these satellites (but ion density is not reliable because of instrumental limitations). The EUV imager onboard the IMAGE spacecraft provides global images of the plasmasphere with a spatial resolution of 0.1 RE every 10 minutes; such images acquired near apogee from high above the pole show the geometry of plasmaspheric plumes, their evolution and motion. We present coordinated observations for 3 plume events and compare CLUSTER in-situ data (panel A) with global images of the plasmasphere obtained from IMAGE (panel B), and with numerical simulations for the formation of plumes based on a model that includes the interchange instability mechanism (panel C). In particular, we study the geometry and the orientation of plasmaspheric plumes by using a four-point analysis method, the spatial gradient. We also compare several aspects of their motion as determined by different methods: (i) inner and outer plume boundary velocity calculated from time delays of this boundary observed by the wave experiment WHISPER on the four spacecraft, (ii) ion velocity derived from the ion spectrometer CIS onboard CLUSTER, (iii) drift velocity measured by the electron drift instrument ED1 onboard CLUSTER and (iv) global velocity determined from successive EUV images. These different techniques consistently indicate that plasmaspheric plumes rotate around the Earth, with their foot fully co-rotating, but with their tip rotating slower and moving farther out.
Author
*Cluster Mission; Plasmasphere; Plumes; Image Satellite; Numerical Analysis; SIMulation*

**20050215647** National Space Science and Technology Center, Huntsville, AL, USA, NASA Marshall Space Flight Center, Huntsville, AL, USA
**Probabilisitc Geobiological Classification Using Elemental Abundance Distributions and Lossless Image Compression in Recent and Modern Organisms**
Storrie-Lombardi, Michael C.; Hoover, Richard B.; [2005]; 2 pp.; In English; International Symposium of Optical Science and Technology SPIE's 50th Annual Meeting: Instruments, Methods, and Missions for Astrobiology IX, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Last year we presented techniques for the detection of fossils during robotic missions to Mars using both structural and chemical signatures[Storrie-Lombardi and Hoover, 2004]. Analyses included lossless compression of photographic images to estimate the relative complexity of a putative fossil compared to the rock matrix [Corsetti and Storrie-Lombardi, 2003] and elemental abundance distributions to provide mineralogical classification of the rock matrix [Storrie-Lombardi and Fisk, 2004]. We presented a classification strategy employing two exploratory classification algorithms (Principal Component Analysis and Hierarchical Cluster Analysis) and non-linear stochastic neural network to produce a Bayesian estimate of classification accuracy. We now present an extension of our previous experiments exploring putative fossil forms morphologically resembling cyanobacteria discovered in the Orgueil meteorite. Elemental abundances (C6, N7, O8, Na11, Mg12, Ai13, Si14, P15, S16, Cl17, K19, Ca20, Fe26) obtained for both extant cyanobacteria and fossil trilobites produce signatures readily distinguishing them from meteorite targets. When compared to elemental abundance signatures for extant cyanobacteria Orgueil structures exhibit decreased abundances for C6, N7, Na11, All3, P15, Cl17, K19, Ca20 and increases in Mg12, S16, Fe26. Diatoms and silicified portions of cyanobacterial sheaths exhibiting high levels of silicon and correspondingly low levels of carbon cluster more closely with terrestrial fossils than with extant cyanobacteria. Compression indices verify that variations in random and redundant textural patterns between perceived forms and the background matrix contribute significantly to morphological visual identification. The results provide a quantitative probabilistic methodology for discriminating putatitive fossils from the surrounding rock matrix and &om extant organisms using both structural and chemical information. The techniques described appear applicable to the geobiological analysis of meteoritic samples or in situ exploration of the Mars regolith. Keywords: cyanobacteria, microfossils, Mars, elemental abundances, complexity analysis, multifactor analysis, principal component analysis, hierarchical cluster analysis, artificial neural networks, paleo-biosignatures Author

*Classifications; Abundance; Bacteria; Microorganisms; Biomarkers; Morphology; Fossils; Principal Components Analysis; Cluster Analysis; Chemical Analysis*

## 43
## EARTH RESOURCES AND REMOTE SENSING

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

**20050216448** Army Engineer District, Sacramento, CA USA

**Fault Evaluation Study. Marysville Lake Project, Parks Bar Alternate, Yuba River, California: Butte, Yuba, Nevada and Placer Counties, California**

May 1, 1977; 118 pp.; In English

Report No.(s): AD-A436872; No Copyright; Avail.: CASI: A06, Hardcopy

The purpose of the study was threefold: (1) To determine if there had been any surface cracking or faulting within the project area related to the Oroville earthquake sequence; (2) to investigate structures associated with the Swain Ravine and other lineaments and to determine the relationship between them and the 1975 faulting that occurred on the Cleveland Hill fault; and (3) to determine if there has been recent seismic activity within the project area. The study included a comprehensive review of geological reports and maps of the region; the use of data from interpretation of vertical and low-sun-angle aerial photographs; sidelooking airborne radar (SLAR) and Earth Resources Technology Satelite (ERTS) imagery; the compilation of data collected by other agencies investigating the Oroville earthquake and regional tectonics; reconnaissance geological field mapping throughout the regional shear zone; detailed mapping in the project area; and subsurface exploration of the Swain Ravine lineament by trenching.

DTIC

*Evaluation; Lakes; Rivers; System Effectiveness*

**20050217111** Scripps Institution of Oceanography, La Jolla, CA, USA

**Remote Sensing of Particulate Organic Carbon Pools in the High-Latitude Oceans**

Stramski, Dariusz; Stramska, Malgorzata; [2005]; 15 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-12397; NAG5-12396; No Copyright; Avail.: CASI: A03, Hardcopy

The general goal of this project was to characterize spatial distributions at basin scales and variability on monthly to interannual timescales of particulate organic carbon (POC) in the high-latitude oceans. The primary objectives were: (1) To collect in situ data in the north polar waters of the Atlantic and in the Southern Ocean, necessary for the derivation of POC

ocean color algorithms for these regions. (2) To derive regional POC algorithms and refine existing regional chlorophyll (Chl) algorithms, to develop understanding of processes that control bio-optical relationships underlying ocean color algorithms for POC and Chl, and to explain bio-optical differentiation between the examined polar regions and within the regions. (3) To determine basin-scale spatial patterns and temporal variability on monthly to interannual scales in satellite-derived estimates of POC and Chl pools in the investigated regions for the period of time covered by SeaWiFS and MODIS missions.
Derived from text
*Oceans; Remote Sensing; Polar Regions; Particulates; Carbon*

**20050217157** NASA Langley Research Center, Hampton, VA, USA
**Detection and Retrieval of Multi-Layered Cloud Properties Using Satellite Data**
Minnis, Patrick; Sun-Mack, Sunny; Chen, Yan; Yi, Helen; Huang, Jian-Ping; Nguyen, Louis; Khaiyer, Mandana M.; [2005]; 9 pp.; In English; SPIE 12th International Symposium on Remote Sensing, 19-22 Sep. 2005, Bruges, Belgium
Contract(s)/Grant(s): 23-621-35-96
Report No.(s): SPIE-5979-09; Copyright; Avail.: CASI: A02, Hardcopy

Four techniques for detecting multilayered clouds and retrieving the cloud properties using satellite data are explored to help address the need for better quantification of cloud vertical structure. A new technique was developed using multispectral imager data with secondary imager products (infrared brightness temperature differences, BTD). The other methods examined here use atmospheric sounding data (CO2-slicing, CO2), BTD, or microwave data. The CO2 and BTD methods are limited to optically thin cirrus over low clouds, while the MWR methods are limited to ocean areas only. This paper explores the use of the BTD and CO2 methods as applied to Moderate Resolution Imaging Spectroradiometer (MODIS) and Advanced Microwave Scanning Radiometer EOS (AMSR-E) data taken from the Aqua satellite over ocean surfaces. Cloud properties derived from MODIS data for the Clouds and the Earth's Radiant Energy System (CERES) Project are used to classify cloud phase and optical properties. The preliminary results focus on a MODIS image taken off the Uruguayan coast. The combined MW visible infrared (MVI) method is assumed to be the reference for detecting multilayered ice-over-water clouds. The BTD and CO2 techniques accurately match the MVI classifications in only 51 and 41% of the cases, respectively. Much additional study is need to determine the uncertainties in the MVI method and to analyze many more overlapped cloud scenes.
Author
*Cloud Physics; Detection; MODIS (Radiometry); Earth Observing System (EOS); Data Acquisition*

## 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*.

**20050215028** NASA Glenn Research Center, Cleveland, OH, USA
**International Space Station Solar Array Bifacial Electrical Performance Model Developed**
Delleur, Ann M.; Kerslake, Thomas W.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The first U.S. photovoltaic array (PVA) was activated on the International Space Station (ISS) in December 2000. Though normally Sun-tracking, U.S. ISS arrays are held stationary to minimize plume impingement from the space shuttle during docking and undocking, as well as during ISS assembly operations. Because of these operational constraints, it is not always possible to point the front side of the arrays at the Sun. In these cases, sunlight directly illuminates the backside of the PVA as well as albedo illumination on either the front or the back. Since the solar cells are mounted on a thin, solar transparent substrate, appreciable backside power (about one-third of the front-side power) is produced. To provide a more detailed assessment of the ISS power production capability, researchers at the NASA Glenn Research Center developed a PVA electrical performance model applicable to generalized bifacial illumination conditions. The model validation was done using on-orbit PVA performance.
Derived from text
*Solar Arrays; Solar Cells; Performance Prediction; Performance Tests; Photovoltaic Cells*

**20050215596** NASA Glenn Research Center, Cleveland, OH, USA

**Composite Arbors Built and Tested to Improve the Specific Energy of Flywheel Batteries**

Konno, Kevin E.; Thompson, Richard C.; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Energy storage flywheels are quickly becoming an attractive alternative to electrochemical batteries. Their advantages of long cycle life, high turnaround efficiency, and insensitivity to operating temperatures have led to growing interest in terrestrial and space applications, including International Space Station and low-Earth-orbit satellites. This effort to develop composite arbor technology greatly increases the flywheel rotor specific energy potential and has the added advantage of relieving the high radial compressive stresses that limit durability, life, and operating temperature range.

Author

*Flywheels; Energy Storage; Life (Durability); Compressibility; Electric Batteries*

**20050216501** Dayton Univ., OH USA

**Aerospace Power Scholarly Research Program. Delivery Order 0013: Volume 1. Development of Performance/Design Equations for a Direct Methanol Fuel Cell**

Sandhu, Sarwan S.; Jul. 1, 2005; 94 pp.; In English

Contract(s)/Grant(s): F33615-98-D-2891-0013; Proj-3145

Report No.(s): AD-A436943; UDR-TR-2002-00089-VOL-1; AFRL-PR-WP-TR-2005-2130; No Copyright; Avail.: CASI: A05, Hardcopy

This first volume, of a two volume report, consists of the development and prediction of the reversible open-circuit voltage equation for direct methanol fuel cells (DMFC). This equation, applicable when the effects of electrode poisoning and methanol crossover are not present, includes the effects of nonideal behavior of the fluid phases and differing total pressures in the anode and cathode compartments of the fuel cell. The developed equation is capable of predicting the open-circuit voltage at any desired fuel cell temperature, pressure, and methanol concentration. The optimal DMFC conditions, based on the thermodynamic development, occur when the cathode pressure is high, the anode pressure is low, the concentration of methanol is high, and the cell temperature is low. Other factors affect the actual optimal fuel cell conditions due to electrode kinetics and methanol crossover, but, the effort here delineates the true maximal thermodynamic potential available.

DTIC

*Electric Networks; Equations; Fuel Cells; Methyl Alcohol; Network Analysis; Open Circuit Voltage; Thermodynamics*

**20050217028** NASA Glenn Research Center, Cleveland, OH, USA

**Process Developed for Fabricating Engineered Pore Structures for High- Fuel-Utilization Solid Oxide Fuel Cells**

Sofie, Stephen W.; Cable, Thomas L.; Salamone, Sam M.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Solid oxide fuel cells (SOFCs) have tremendous commercial potential because of their high efficiency, high energy density, and flexible fuel capability (ability to use fossil fuels). The drive for high-power-utilizing, ultrathin electrolytes (less than 10 microns), has placed an increased demand on the anode to provide structural support, yet allow sufficient fuel entry for sustained power generation. Concentration polarization, a condition where the fuel demand exceeds the supply, is evident in all commercial-based anode-supported cells, and it presents a significant roadblock to SOFC commercialization.

Derived from text

*Solid Oxide Fuel Cells; Fabrication; Commercialization*

**20050217161** NASA Glenn Research Center, Cleveland, OH, USA

**Nonhumidified High-Temperature Membranes Developed for Proton Exchange Membrane Fuel Cells**

Kinder, James D.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Fuel cells are being considered for a wide variety of aerospace applications. One of the most versatile types of fuel cells is the proton-exchange-membrane (PEM) fuel cell. PEM fuel cells can be easily scaled to meet the power and space requirements of a specific application. For example, small 100-W PEM fuel cells are being considered for personal power for extravehicular activity suit applications, whereas larger PEM fuel cells are being designed for primary power in airplanes and in uninhabited air vehicles. Typically, PEM fuel cells operate at temperatures up to 80 C. To increase the efficiency and power density of the fuel cell system, researchers are pursuing methods to extend the operating temperature of the PEM fuel cell to 180 C. The most widely used membranes in PEM fuel cells are Nafion 112 and Nafion 117--sulfonated perfluorinated polyethers that were developed by DuPont. In addition to their relatively high cost, the properties of these membranes limit

their use in a PEM fuel cell to around 80 C. The proton conductivity of Nafion membranes significantly decreases above 80 C because the membrane dehydrates. The useful operating range of Nafion-based PEM fuel cells can be extended to over 100 C if ancillary equipment, such as compressors and humidifiers, is added to maintain moisture levels within the membrane. However, the addition of these components reduces the power density and increases the complexity of the fuel cell system. Derived from text

*Extravehicular Activity; Fuel Cells; High Temperature; Membranes; Moisture; Polymers*

**20050217166** NASA Glenn Research Center, Cleveland, OH, USA

**Novel Elastomeric Membranes Developed for Polymer Electrolytes in Lithium Batteries**

Tigelaar, Dean M.; Meador, Maryann B.; Kinder, James D.; Bennett, William R.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Lithium-based polymer batteries for aerospace applications need to be highly conductive from -70 to 70 C. State-of-the-art polymer electrolytes are based on polyethylene oxide (PEO) because of the ability of its ether linkages to solvate lithium ions. Unfortunately, PEO has a tendency to form crystalline regions below 60 C, dramatically lowering conductivity below this temperature. PEO has acceptable ionic conductivities (10(exp -4) to 10(exp -3) S/cm) above 60 C, but it is not mechanically strong. The room-temperature conductivity of PEO can be increased by adding solvent or plasticizers, but this comes at the expense of thermal and mechanical stability. One of NASA Glenn Research Center s objectives in the Polymer Rechargeable System program (PERS) is to develop novel polymer electrolytes that are highly conductive at and below room temperature without added solvents or plasticizers.

Derived from text

*Elastomers; Electrolytes; Lithium Batteries; Membranes*

**20050217195** NASA Glenn Research Center, Cleveland, OH, USA, QSS Group, Inc., USA

**Process Developed for Generating Ceramic Interconnects With Low Sintering Temperatures for Solid Oxide Fuel Cells**

Zhong, Zhi-Min; Goldsby, Jon C.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Solid oxide fuel cells (SOFCs) have been considered as premium future power generation devices because they have demonstrated high energy-conversion efficiency, high power density, and extremely low pollution, and have the flexibility of using hydrocarbon fuel. The Solid-State Energy Conversion Alliance (SECA) initiative, supported by the U.S. Department of Energy and private industries, is leading the development and commercialization of SOFCs for low-cost stationary and automotive markets. The targeted power density for the initiative is rather low, so that the SECA SOFC can be operated at a relatively low temperature (approx. 700 C) and inexpensive metallic interconnects can be utilized in the SOFC stack. As only NASA can, the agency is investigating SOFCs for aerospace applications. Considerable high power density is required for the applications. As a result, the NASA SOFC will be operated at a high temperature (approx. 900 C) and ceramic interconnects will be employed. Lanthanum chromite-based materials have emerged as a leading candidate for the ceramic interconnects. The interconnects are expected to co-sinter with zirconia electrolyte to mitigate the interface electric resistance and to simplify the processing procedure. Lanthanum chromites made by the traditional method are sintered at 1500 C or above. They react with zirconia electrolytes (which typically sinter between 1300 and 1400 C) at the sintering temperature of lanthanum chromites. It has been envisioned that lanthanum chromites with lower sintering temperatures can be co-fired with zirconia electrolyte. Nonstoichiometric lanthanum chromites can be sintered at lower temperatures, but they are unstable and react with zirconia electrolyte during co-sintering. NASA Glenn Research Center s Ceramics Branch investigated a glycine nitrate process to generate fine powder of the lanthanum-chromite-based materials. By simultaneously doping calcium on the lanthanum site, and cobalt and aluminum on the chromium site, we could sinter the materials below 1400 C. The doping concentrations were adjusted so that the thermal expansion coefficient matched that of the zirconia electrolyte. Also, the investigation was focused on stoichiometric compositions so that the materials would have better stability. Co-sintering and chemical compatibility with zirconia electrolyte were examined by X-ray diffraction, scanning electron microscopy, and energy dispersive spectroscopy (line scanning and dot map). The results showed that the materials bond well, but do not react, with zirconia electrolyte. The electric conductivity of the materials measured at 900 C in air was about 20 S/cm.

Author

*Technology Assessment; Ceramics; Solid Oxide Fuel Cells*

**20050217199** NASA Glenn Research Center, Cleveland, OH, USA

**Lithium-Ion Cell Charge-Control Unit Developed**

Reid, Concha M.; Manzo, Michelle A.; Buton, Robert M.; Gemeiner, Russel; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A lithium-ion (Li-ion) cell charge-control unit was developed as part of a Li-ion cell verification program. This unit manages the complex charging scheme that is required when Li-ion cells are charged in series. It enables researchers to test cells together as a pack, while allowing each cell to charge individually. This allows the inherent cell-to-cell variations to be addressed on a series string of cells and reduces test costs substantially in comparison to individual cell testing.
Derived from text
*Lithium; Ions; Electrolytic Cells; Control Equipment*

**20050217204** Analex Corp., OH, USA
**Closed-Cycle Engine Program Used to Study Brayton Power Conversion**
Johnson, Paul K.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

One form of power conversion under consideration in NASA Glenn Research Center's Thermal Energy Conversion Branch is the closed-Brayton-cycle engine. In the tens-of-kilowatts to multimegawatt class, the Brayton engine lends itself to potential space nuclear power applications such as electric propulsion or surface power. The Thermal Energy Conversion Branch has most recently concentrated its Brayton studies on electric propulsion for Prometheus. One piece of software used for evaluating such designs over a limited tradeoff space has been the Closed Cycle Engine Program (CCEP). The CCEP originated in the mid-1980s from a Fortran aircraft engine code known as the Navy/NASA Engine Program (NNEP). Components such as a solar collector, heat exchangers, ducting, a pumped-loop radiator, a nuclear heat source, and radial turbomachinery were added to NNEP, transforming it into a high-fidelity design and performance tool for closed-Brayton-cycle power conversion and heat rejection. CCEP was used in the 1990s in conjunction with the Solar Dynamic Ground Test Demonstration conducted at Glenn. Over the past year, updates were made to CCEP to adapt it for an electric propulsion application. The pumped-loop radiator coolant can now be n-heptane, water, or sodium-potassium (NaK); liquid-metal pump design tables were added to accommodate the NaK fluid. For the reactor and shield, a user can now elect to calculate a higher fidelity mass estimate. In addition, helium-xenon working-fluid properties were recalculated and updated.
Author
*Closed Cycles; Power Converters; Thermal Energy; Electric Propulsion; Energy Conversion*

**20050217205** Sest, Inc., OH, USA
**Stirling Convertor System Dynamic Model Developed**
Lewandowski, Edward J.; Regan, Timothy F.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Free-piston Stirling convertors are being developed for potential use on NASA exploration missions. In support of this effort, the NASA Glenn Research Center has developed the Stirling convertor System Dynamic Model (SDM). The SDM models the Stirling cycle thermodynamics; heat flow; gas, mechanical, and mounting dynamics; the linear alternator; and the controller. The SDM s scope extends from the thermal energy input to thermal, mechanical, and electrical energy output, allowing one to study complex system interactions among subsystems. Thermal, mechanical, fluid, magnetic, and electrical subsystems can be studied in one model. The SDM is a nonlinear time-domain model containing sub-cycle dynamics, which simulates transient and dynamic phenomena that other models cannot. The entire range of convertor operation is modeled, from startup to full-power conditions.
Derived from text
*Dynamic Models; Piston Engines; Stirling Cycle; Energy Conversion*

## 45
## ENVIRONMENT POLLUTION

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

**20050215291** Hamilton Sundstrand Corp., Windsor Locks, CT, USA, NASA, USA
**Development of an Amine-based System for Combined Carbon Dioxide, Humidity, and Trace Contaminant Control**
Nalette, Tim; Reiss, Julie; Filburn, Tom; Seery, Thomas; Smith, Fred; Perry, Jay; [2005]; 9 pp.; In English; 35th International Conference on Environmental Systems, 11-14 Jul. 2005, Rome, Italy
Contract(s)/Grant(s): 03-OBPR-01
Report No.(s): Paper 2005-01-2865; No Copyright; Avail.: CASI: A02, Hardcopy

A number of amine-based carbon dioxide (CO2) removal systems have been developed for atmosphere revitalization in closed loop life support systems. Most recently, Hamilton Sundstrand developed an amine-based sorbent, designated SA9T,

possessing approximately 2-fold greater capacity compared to previous formulations. This new formulation has demonstrated applicability for controlling CO2 levels within vehicles and habitats as well as during extravehicular activity (EVA). System volume is competitive with existing technologies. Further enhancements in system performance can be realized by incorporating humidity and trace contaminant control functions within an amine-based atmosphere revitalization system. A 3-year effort to develop prototype hardware capable of removing CO2, H2O, and trace contaminants from a cabin atmosphere has been initiated. Progress pertaining to defining system requirements and identifying alternative amine formulations and substrates is presented.
Author
*Amines; Carbon Dioxide Removal; Humidity; Trace Contaminants; Feedback Control*

**20050215416** NASA Glenn Research Center, Cleveland, OH, USA
**NASA Glenn's Advanced Subsonic Combustion Rig Supported the Ultra-Efficient Engine Technology Project's Emissions Reduction Test**
Beltran, Luis R.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The Advanced Subsonic Combustor Rig (ASCR) is NASA Glenn Research Center's unique high-pressure, high-temperature combustor facility supporting the emissions reduction element of the Ultra-Efficient Engine Technology (UEET) Project. The facility can simulate combustor inlet test conditions up to a pressure of 900 psig and a temperature of 1200 F (non-vitiated). ASCR completed three sector tests in fiscal year 2003 for General Electric, Pratt & Whitney, and Rolls-Royce North America. This will provide NASA and U.S. engine manufacturers the information necessary to develop future low-emission combustors and will help them to better understand durability and operability at these high pressures and temperatures.
Derived from text
*Combustion Chambers; Exhaust Emission; Reduction (Chemistry); Performance Tests*

**20050215439** Petroleum Research Centre, Tripoli, Libyan Arab Jamahiriya
**Soil Contamination with Some Petroleum Products and Lead Around Fuel Stations**
Althalb, Hakima Ahmed; IPSI 2005 Amalfi Proceedings; [2005]; 10 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study was conducted to determine the extent of pollution that was caused by the accumulation of organic matter (hydrocarbons) and total lead in soil near by fuel stations. The areas of investigation are; ABN, AGM, GRN I, GRN II and TGA in April 1999. Samples were collected from selected fuel stations in the area of the study from surface and subsurface soil at a depth of (\h10cm) and (10-20cm) respectively, in April 1999. The samples were analysed for hydrocarbon and total lead contents. The results obtained from this study showed that the concentration of hydrocarbons and total lead content generally decreased with the increase of soil depth. However, there were some exceptions which may be attributed to topographical variations or due to surface run off effects. The highest hydrocarbon concentration was found in GRN I location, in which 48930 (ppm) were extracted from surface soil sample inside the service station. While sub surface sample of this site showed the lowest hydrocarbon content approx. 131 ppm. The highest total lead content was 701 (ppm) in TGA surface soil and the lowest was 41 (ppm) in ABN subsurface soil samples, both values were from samples collected from outside the station. However, for both studied contaminants TGA showed on average the highest level of contamination. Compared with other reports, this study showed that high levels of contamination with petroleum products do exist, urgent measures should be taken to reduce the contamination level.
Author
*Soil Pollution; Fuel Contamination; Petroleum Products; Contaminants; Organic Materials*

**20050216405** Auburn Univ., AL, USA
**Refuse and Time Demarcation as Filters of Time and Space**
Orgen, A. Tarik; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 11 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

At the initial stage of this proposed project a perimeter wall is erected on a given site. Small concrete waste storage cubicles are erected, within which controlled amounts and varieties of waste is dumped. Once the cubicles are filled then the prisoner holding facility is built on top utilizing the walls of the units as foundation. A main frame structure is erected and

the cell blocks are then individually hung to this frame. All cell units face south thus giving the prisoner a clear understanding of the passage of time through the created shadows. The prisoners spend their incarceration working at the landfill from which their holding facility is born. They take turns working at bailing, sorting banding etc. This way the 'waste' of society will be working literally with the waste the society produced, thus paying their debt to the system. The Landfill Gas that normally becomes a hazard and a problem in itself is now utilized to heat and cool as well as provide electricity to the prisoner holding facility through the use of boilers and fuel cells respectively. Thus the facility gets its birth, its beginning as well as its maintenance from the landfill site that it is built upon. Both owners and managers of these facilities have difficulties in procuring a suitable site location. As mentioned above, nobody wants either one of these facilities in their community. I further propose a solution by placing them at the edge of the community as a boundary. The German philosopher Heidegger defines boundary as not that at which something stops but, as the Greeks also recognized, that from which something begins its presencing.
Derived from text
*Central Processing Units; Procurement; Birth; Hazards*

## 46
## GEOPHYSICS

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

**20050215462** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Compact FUV camera concept for Space Weather applications**
Spann, James; [2005]; 1 pp.; In English; SPIE Optics and Photonics Conference, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Far ultraviolet (FUV) images of Earth from space have proven invaluable in revealing contextual phenomena associated with space weather in the high latitude auroral regions and, more recently with TIMED and IMAGE in the mid and equatorial regions. Images of this nature can be used to investigate compelling questions associated with the interaction of the ionosphere/mesosphere-magnetosphere-solar wind. Three such questions are: 1. What are the critical time and spatial scales that determine the coupling between the magnetosphere and ionosphere? 2. What are the sources and characteristics of ionospheric variability? 3. How does the configuration of the magnetosphere change as a function of internal boundary conditions established by the mesosphere/ionosphere and the external driving conditions of the solar wind? Observations that lead to quantitative analyses are required to significantly advance the state of knowledge with regard to the affects of space weather and the interaction between and within these regions of Geospace. Current available image data sets are sufficient for qualitative analysis and morphological investigations, and while quantitative analyses are possible, they are difficult and limited to few events at best. In order to qualitatively access the time, spatial, and causal phenomena on global scales, simultaneous images of various FUV emissions with a combination of better spatial, temporal and spectral resolution and sensitivity than currently available is required. We present an instrument concept that is being developed to improve the spatial, temporal and spectral resolution and sensitivity needed to perform the quantitative analysis that enable significant advancement in our understanding of the impact of space weather on Geospace. The approach is to use the self-filtering concept that combines the imaging and filtering functions and thus reduces the size of the 4-mirror off-axis optical system. The optical and filter design will de described and results of preliminary breadboard tests will be provided.
Author
*Cameras; Far Ultraviolet Radiation; Imaging Techniques; Space Weather*

**20050215577** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Analysis of Iron Meteorites Using Computed Tomography and Electron-probe Microanalysis**
Carpenter, P. K.; Gillies, D. C.; [2005]; 2 pp.; In English; 2005 Microscopy and Microanalysis Meeting, 31 Jul. - 4 Aug. 2005, Honolulu, HI, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAS8-02096; No Copyright; Avail.: CASI: A01, Hardcopy

Computed tomography (CT) imaging and electron-probe microanalysis (EPMA) have been used to study samples of the Mundrabilla and Colomera iron meteorites in order to perform structural, textural, and mineralogical analysis. Both gamma-ray (Co-60 source, essentially monochromatic 1.25MeV avg.) and x-ray (420 KeV, continuous) sources have been used, with effective resolution of approximately 1 mm and 0.25 mm, respectively. The gamma-ray source provides approx. 15 cm penetration through steel and is used for larger samples, whereas the x-ray source provides superior resolution at

reduced penetration but exhibits beam hardening artifacts. Here we present a combined approach where CT and EPMA imaging and microanalysis aid in the identification of structural and compositional features in iron meteorites.
Author
*Microanalysis; Iron Meteorites; Mineralogy; Cobalt 60; Tomography; X Ray Sources*

**20050215618** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Anaerobic decomposition of cellulose by allcaliphilic microbial Community of Owens Lake, California**
Pikuta, Elena V.; Itoh, Takashi; Hoover, Richard B.; [2005]; 1 pp.; In English; International Symposium of Optical Science and Technology 50th Annual Meeting: Instruments, Methods, and Missions for Astrobiology IX, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The study of communities of microbial extremophiles from anaerobic sediments of Owens Lake and Mono Lake in California has established the presence of active microbial cellulolytic processes in both lakes. The prior study of the microbial diversity in Mono Lake showed that the trophic chain of organic decomposition includes secondary anaerobes that were found to be previously unknown species (Spirochaeta americana, Tindallia californiensis, and Desulfonatronum thiodismutans). And as we published earlier, the secondary anaerobes of Owens Lakes were morphologically very similar to those of Mono Lake. However, continuing comparison of the physiology and genetics has led to the conclusion that some links of organic decomposition in the trophic chain of Owens Lake are represented by different unknown species. A new isolate of a sugarlytic spirochete from Owens Lake, which was morphologically very similar to S. americana isolated from Mono Lake, was found to have different metabolic capacity such as the lack of capability to produce hydrogen during glucose fermentation. Furthermore, from the same bacterial community (from Owens Lake) another sugarlytic spore-forming alkaliphile (strain SCA) was isolated in pure culture. Here we discuss the geology and chemistry of Owens Lake as a unique ecosystem of Astrobiological significance. This paper also presents some of the characteristics for the novel isolates and describes their participation in the process of cellulose degradation.
Author
*Microorganisms; Exobiology; Ecosystems; Geology; Hydrolysis; Bacteria; Cellulose*

**20050215627** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Geospace Missions**
Spann, James; [2005]; 1 pp.; In English; AIAA Space 2005, 30 Aug. - 1 Sep. 2005, Long Beach, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Geospace Missions - Understanding and being able to predict the behavior of the Earth's near space environment, called Geospace, is important for several reasons. These include the fact that most of the space-based commercial, military, and space research assets are exposed to this environment and that investigating fundamental plasma processes at work through out the solar system can most readily be accomplished in Geospace, the only place we can access the processes. NASA missions that are directed toward understanding, characterizing, and predicting the Geospace environment are described in this presentation. Emphasis is placed on those missions that investigate those phenomena that most affect life and society. The significance of investigating ionospheric irregularities, the radiation belt dynamics with the LWS Geospace Mission will be discussed.
Author
*NASA Space Programs; Space Missions; Aerospace Environments; Geophysics*

**20050216483** Air Force Research Lab., Hanscom AFB, MA USA
**Optical Imaging Provides a Clear Picture of Ionospheric Disturbances**
Esposito, R.; Pedersen, T.; Aug. 15, 2005; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2311
Report No.(s): AD-A436917; AFRL-VS-HA-TR-2005-1084; No Copyright; Avail.: CASI: A02, Hardcopy

During daylight hours, ultraviolet light from the sun ionizes the neutral gas of the earth's upper atmosphere (70-1500 km altitude), creating a partially ionized plasma. This plasma then gradually decays throughout the night. The atmospheric region associated with this phenomenon is called the ionosphere, and this zone is of great practical importance to the Department of Defense and civilian industries because of its effect on radio waves. Depending on the frequency of a radio wave, the ionosphere will either reflect or transmit its energy; however, when disturbances cause the ionosphere to behave irregularly, it instead distorts reflection and transmission signals, affecting satellite-to-ground and ground-to-ground communications, Global Positioning System (GPS) navigation and correction signals, and space surveillance radars. In order for scientists to understand and accurately model the ionosphere, they must obtain enough data to identify the locations of both current and

future disruptions. Using low-light-level imaging equipment to observe the optical emissions, or airglow, produced by reactions in the ionosphere, scientists can now detect and monitor disturbances over wide areas of the earth.
DTIC
*Images; Imaging Techniques; Ionospheres; Ionospheric Disturbances*

**20050217107** Scripps Institution of Oceanography, San Diego, CA, USA
**Development of a Real-Time GPS/Seismic Displacement Meter: Applications to Civilian Infrastructure in Orange and Western Riverside Counties, California**
Bock, Yehuda; September 23, 2005; 18 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-13269
Report No.(s): UCSD-22-8825; No Copyright; Avail.: CASI: A03, Hardcopy

We propose a three-year applications project that will develop an Integrated Real-Time GPS/Seismic System and deploy it in Orange and Western Riverside Counties, spanning three major strike-slip faults in southern California (San Andreas, San Jacinto, and Elsinore) and significant populations and civilian infrastructure. The system relying on existing GPS and seismic networks will collect and analyze GPS and seismic data for the purpose of estimating and disseminating real-time positions and total ground displacements (dynamic, as well as static) during all phases of the seismic cycle, from fractions of seconds to years. Besides its intrinsic scientific use as a real-time displacement meter (transducer), the GPS/Seismic System will be a powerful tool for local and state decision makers for risk mitigation, disaster management, and structural monitoring (dams, bridges, and buildings). Furthermore, the GPS/Seismic System will become an integral part of California's spatial referencing and positioning infrastructure, which is complicated by tectonic motion, seismic displacements, and land subsidence. Finally, the GPS/Seismic system will also be applicable to navigation in any environment (land, sea, or air) by combining precise real-time instantaneous GPS positioning with inertial navigation systems. This development will take place under the umbrella of the California Spatial Reference Center, in partnership with local (Counties, Riverside County Flood and Water Conservation District, Metropolitan Water District), state (Caltrans), and Federal agencies (NGS, NASA, USGS), the geophysics community (SCIGN/SCEC2), and the private sector (RBF Consulting). The project will leverage considerable funding, resources, and R&D from SCIGN, CSRC and two NSF-funded IT projects at UCSD and SDSU: RoadNet (Real-Time Observatories, Applications and Data Management Network) and the High Performance Wireless Research and Education Network (HPWREN). These two projects are funded to develop both the wireless networks and the integrated, seamless, and transparent information management system that will deliver seismic, geodetic, oceanographic, hydrological, ecological, and physical data to a variety of end users in real-time in the San Diego region. CSRC is interested in providing users access to real-time, accurate GPS data for a wide variety of applications including RTK surveying/GIS and positioning of moving platforms such as aircraft and emergency vehicles. SCIGN is interested in upgrading sites to high-frequency real-time operations for rapid earthquake response and GPS seismology. The successful outcome of the project will allow the implementation of similar systems elsewhere, particularly in plate boundary zones with significant populations and civilian infrastructure. CSRC would like to deploy the GPS/Seismic System in other parts of California, in particular San Diego, Los Angeles County and the San Francisco Bay Area.
Author
*California; Global Positioning System; Real Time Operation; Seismology; Displacement; Geophysics*

**20050217155** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Fossil Microorganisms in Archaean deposits of Northern Karelia**
Astafieva, M. M.; Hoover, R. B.; Rozanov, A. Y.; Vrevskiy, A. B.; [2005]; 1 pp.; In English; SPIE Optics and Photonics 2005, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Newly found biomorphic microstructures from the Upper Archaean (lopian) rocks from Northern Karelia are described. The presence of various microorganisms of bacterial nature and even cyanobacteria (and possibly eukaryotic forms) is suggested. The necessity of employing methods of electron microscopy, as well as traditional methods, while studying the very early manifestations of life in Archaean and Early Proterozoic is noted.
Author
*Fossils; Microorganisms; Precambrian Period; Mineral Deposits*

## 47
## METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

**20050215109** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Assimilation of ozone profiles from the Improved Limb Atmospheric Spectrometer, 2, Study on Antarctic Ozone**

Stajner, Ivanka; Wargan, Krzysztof; Chang, Lang-Ping; yashi, Hiroo; Pawson, Steve; Nakajima, Hideaki; July 2005; 19 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Ozone data from the Improved Limb Atmospheric Spectrometer-II (ILAS-II) were included in addition to other satellite observations in the ozone assimilation system at the Global Modeling and Assimilation Office (GMAO) of NASA/Goddard. The control run assimilated data from NOAA 16 Solar Backscatter Ultraviolet/2 (SBUV/2) and Polar Ozone and Aerosol Measurement III (POAM III) instruments. Persistent impacts over Antarctica and transient impacts over northern middle and high latitudes are seen from April to October 2003, when ILAS-II provided good coverage. The largest improvements with respect to independent ozone sonde data are seen over the South Pole station. Ozone analyses and forecasts from the assimilation of SBUV/2, POAM III and ILAS-II data b e used to investigate the transport of ozone to southern middle latitudes following the breakup of the Antarctic vortex. The quality of analyses and forecasts is evaluated by comparison with independent Stratospheric Aerosol and Gas Experiment III (SAGE III) ozone data near 46degs. Anomaly correlations between SAGE III data and forecasts'exceed 0.6 for up to five to seven days at 30,50, and 70 ma. The loss of skill with advancing forecast length is related to dynamical errors due to an excessively persistent vortex in longer forecasts, which hampers the transport of low ozone air into middle latitudes.

Author

*Assimilation; Ozone; Solar Backscatter UV Spectrometer; Satellite Observation; Sage Satellite; Backscattering; Aerosols*

**20050215322** Santa Clara Univ., CA, USA

**Analysis of Upper Air, Ground and Remote Sensing Data for the Atlas Field Campaign in San Juan, Puerto Rico**

Gonzalez-Cruz, Jorge E.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XVII-1 - XVII-5; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The general climate of the island of Puerto Rico is dominated by the easterly trade winds from the Atlantic Ocean, and during synoptically calm days by the topographic and local land surface characteristics [1]. The urban canopy of the metropolitan area of San Juan, capital city of the Island, may introduce a new microclimate that changes the characteristics of the low atmosphere and interacts with the other microclimates already present in the island. The primitive land cover and land use (LCLU) of the metropolitan area of San Juan was composed by broadleaf trees, moist soils, and very dense vegetation in general. The urban LCLU changes the balance for the mass, momentum and energy between the bottom boundary and the lower atmosphere, creating different climate conditions over urban and rural regions. Some of these differences are low relative humidity and high temperatures observed in urban areas when compared to rural areas. These in turn produces a convective circulation over the urban areas, a phenomenon compared to the sea and land breezes, commonly known as heat islands (UHI). Factors that contribute to the formation of the UHI are anthropogenic heat sources, aerosols from pollutants, fast water canalization due to the presence of buildings and streets, among others. The comparison between urban and rural climates is the most common approach to analyze the UHI. These contrasts are larger in clear and calm conditions and tend to disappear in cloudy and windy weather. The UHI was recognized in the early 1950 s as closed isotherms that separates the city from the general temperature field [2]. The impact of the urban LCLU in San Juan, Puerto Rico, was quantified calculating the difference between historical data sets for the air temperature over an identified urban area and a rural area dT(U-R). The analysis of the climatological data revealed that a UHI exists in the metropolitan area of San Juan, Puerto Rico. The data reveals a permanent urban heat island effect present in the SJMA during the year, which is increasing at a rate of 0.41oC/decade. These findings encouraged the planning and execution of an intense field campaign in February 2004 referred as the ATLAS San Juan mission. The focus of the remaining of this report is the analysis of the data for this field campaign.

Author

*Climatology; Upper Atmosphere; Temperature Distribution; Remote Sensing; Kinetic Energy; Heat Sources; Ground Tests; Contaminants*

**20050215433** iQuest Technologies, Romania

**MEDIOGRID System in Meteorological and Environment Applications**

Ordean, Mihaela; Melenti, Cornelia; Gorgan, Dorian; IPSI 2005 Amalfi Proceedings; [2005]; 5 pp.; In English; See also 20050215422; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The MEDIOGRID system aims to accomplish a pilot program to process the images acquired in real time from meteorological and resource satellites by using grid computing technology, in order to extract the meteorological and environment parameters that characterize the atmospheric and terrestrial state. The immediate system application consists in early prognostication of wood fires and water floods. This paper intends to present the scope and proposed objectives of the system. microelectronics technology has determined the improvement of the computing and storing power and, for a while, the supercomputer concept was not on the top. The development of network technologies, of parallel and distributed computing concepts and moreover the characteristics of the human society (specializing and cooperation) have brought again in attention the concept of the grid computing but this time not only in the sphere

Author

*Meteorological Satellites; Grid Computing (Computer Networks); Parallel Processing (Computers); Meteorological Parameters; Real Time Operation*

**20050215496** University of West Florida, Pensacola, FL, USA

**Applications of Principled Search Methods in Climate Influences and Mechanisms**

Glymour, Clark; [2005]; 24 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NCC2-1399; No Copyright; Avail.: CASI: A03, Hardcopy

Forest and grass fires cause economic losses in the billions of dollars in the U.S. alone. In addition, boreal forests constitute a large carbon store; it has been estimated that, were no burning to occur, an additional 7 gigatons of carbon would be sequestered in boreal soils each century. Effective wildfire suppression requires anticipation of locales and times for which wildfire is most probable, preferably with a two to four week forecast, so that limited resources can be efficiently deployed. The USA Forest Service (USFS), and other experts and agencies have developed several measures of fire risk combining physical principles and expert judgment, and have used them in automated procedures for forecasting fire risk. Forecasting accuracies for some fire risk indices in combination with climate and other variables have been estimated for specific locations, with the value of fire risk index variables assessed by their statistical significance in regressions. In other cases, the MAPSS forecasts [23, 241 for example, forecasting accuracy has been estimated only by simulated data. We describe alternative forecasting methods that predict fire probability by locale and time using statistical or machine learning procedures trained on historical data, and we give comparative assessments of their forecasting accuracy for one fire season year, April- October, 2003, for all U.S. Forest Service lands. Aside from providing an accuracy baseline for other forecasting methods, the results illustrate the interdependence between the statistical significance of prediction variables and the forecasting method used.

Derived from text

*Climate; Statistical Analysis; Prediction Analysis Techniques; Forest Fires; Forecasting*

**20050216477** Naval Research Lab., Bay Saint Louis, MS USA

**Northern Adriatic Response to a Wintertime Bora Wind Event**

Lee, C. M.; Askari, F.; Book, J.; Carniel, S.; Dorman, C.; Doyle, J.; Harris, C. K.; Jones, B. H.; Kuzmic, M.; Martin, P.; Apr. 19, 2005; 5 pp.; In English

Report No.(s): AD-A436910; NRL/JA/7330-04-5060; No Copyright; Avail.: CASI: A01, Hardcopy

During winters, the northern Adriatic Sea experiences frequent, intense cold-air outbreaks that drive oceanic heat loss and imprint complex but predictable patterns in the underlying waters. This strong, reliable forcing makes this region an excellent laboratory for observational and numerical investigations of air-sea interaction, sediment and biological transport, and mesoscale wind-driven flow.

DTIC

*Adriatic Sea; Air Water Interactions; Cold Weather; Winter*

**20050216529** Naval Research Lab., Stennis Space Center, MS USA

**Tactical Environmental Data Services (TEDServices) Post FBE-K Technical Execution Report**

Warner, Elizabeth G.; Ladner, Roy V.; Katikaneni, Udaykiran; McCreedy, Frank P.; Sample, John T.; Shaw, Kevin B.; Aug. 8, 2005; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A437055; NRL/MR/7440-05-8898; No Copyright; Avail.: CASI: A03, Hardcopy

This report reviews the technical execution of the Tactical Environmental Data Services (TEDServices) in the context of the Fleet Battle Experiment-Kilo (FBE-K). The report includes a comprehensive description of TEDServices features executed

in FBE-K. Also detailed are high-level TEDServices concepts and software components as well as operational concepts and specific data flow scenarios.
DTIC
*Data Systems; Meteorological Parameters; Oceanographic Parameters*

**20050217052** Naval Research Lab., Washington, DC USA
**SOF Tactical Repeater**
Klein, Peter M.; Aug. 15, 2005; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437041; NRL/MR/7005--05-8893; No Copyright; Avail.: CASI: A03, Hardcopy

In 2004, four hurricanes (Charley, Frances, Ivan and Jeanne) made landfall in the USA within 6 weeks. Each of these storms posed significant challenges to forecasters and Navy Fleet Commanders alike, particularly with respect to making sortie decisions and preparing Naval Stations for the approach of destructive weather. Sortie decisions are now based on the location of \g50 kt wind and \g12 ft seas, and unnecessary sorties are viewed as wasteful of resources. This Memorandum Report has two purposes: (1) to review the concerns and requirements of Naval Commanders with respect to safeguarding stations, ships, planes, and personnel from the destructive powers of tropical cyclones (TCs); and (2) to use this context as a framework to learn from the track and intensity forecasts of the four 'Florida Hurricanes' of August through September 2004. In this Memorandum Report, a brief discussion of Navy Guidelines and hypothetical scenarios regarding avoidance of TCs at sea, as well as Sortie Conditions (SCs) and Tropical Cyclone Conditions of Readiness (CORs) is presented first. Review of the track and intensity forecasts in the cases of Hurricanes Charley, Frances, Ivan, and Jeanne follows. A Summary and Conclusions section presents lessons learned from the experience as well as suggestions on how guidance provided to the Navy for the purposes of setting CORs and ordering sorties could be improved.
DTIC
*Hurricanes; Forecasting; Tropical Storms; Storms; Cyclones*

## 48
## OCEANOGRAPHY

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

**20050215567** Scripps Institution of Oceanography, San Diego, CA, USA
**A Global Rapid Integrated Monitoring System for Water Cycle and Water Resource Assessment (Global-RIMS)**
Roads, John; Voeroesmarty, Charles; [2005]; 3 pp.; In English
Contract(s)/Grant(s): NAG5-11738; No Copyright; Avail.: CASI: A01, Hardcopy

The main focus of our work was to solidify underlying data sets, the data processing tools and the modeling environment needed to perform a series of long-term global and regional hydrological simulations leading eventually to routine hydrometeorological predictions. A water and energy budget synthesis was developed for the Mississippi River Basin (Roads et al. 2003), in order to understand better what kinds of errors exist in current hydrometeorological data sets. This study is now being extended globally with a larger number of observations and model based data sets under the new NASA NEWS program. A global comparison of a number of precipitation data sets was subsequently carried out (Fekete et al. 2004) in which it was further shown that reanalysis precipitation has substantial problems, which subsequently led us to the development of a precipitation assimilation effort (Nunes and Roads 2005). We believe that with current levels of model skill in predicting precipitation that precipitation assimilation is necessary to get the appropriate land surface forcing.
Author
*Hydrometeorology; Water Resources; Systems Integration; Meteorological Parameters; Energy Budgets; Assimilation*

## 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*.

**20050215002** Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil
**Environment for Teaching Support in the Medical Area**
Vicari, Rosa Maria; Flores, Cecilia Dias; deSeixas, Louise Jeanty; Silvestre, Andre Meyer; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s);

[2002]; 8 pp.; In English; See also 20050214876; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The paper presents an environment for teaching support in the medical area based on expert systems and student modelling, developed through probabilistic networks. Technology of Bayesian networks is ideal for uncertainty treatment, and enables expert knowledge modelling in an intuitive way. The project is the result of a partnership between a private enterprise and university.

Author

*Expert Systems; Diagnosis; Medical Science; Bayes Theorem; Education; Diseases*

**20050215058** Medical Univ. of South Carolina, Charleston, SC, USA

**Computer Model of the Human Circulatory System**

Chiaramida, Salvatore; Sun, Ying; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 6 pp.; In English; See also 20050215042

Contract(s)/Grant(s): NIH-RR-16457; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over a decade we have developed a computer model of the circulatory system based on an analog circuit model defined mathematically by 28 nonlinear and time-varying differential equations with 78 coefficients. Hemodynamics are characterized utilizing an analog computer model incorporating mechanisms for myocardial function and cardiovascular physiology. Utilizing direct data input or curve tracing input techniques the model is able to correctly predict cardiovascular physiology in a large array of normal and pathological physiological states. Validation studies have been done supporting the reliability of the model. Applicability has been demonstrated in confirming previous clinical investigative results, predicting efficacy of new clinical approaches and in computer assisted instruction. Software has been made available to students, other investigators and soon, will be available via the Internet. The model has been demonstrated to be useful as a teaching device, as a method to reassess previously held clinical concepts and to explore new yet unanswered questions. Future model-based applications may include quantitative assessment of cardiopulmonary therapy, therapeutic servo control and assessment of fundamental biochemical and physiological relationships.

Author

*Computerized SIMulation; Circulatory System; Biochemistry; Hemodynamics; Heart Function; Cardiovascular System*

**20050215065** Temple Univ., Philadelphia, PA, USA

**Improving Clinical Cardiovascular Care by Using a Telemedicine System**

Santamore, William P.; Mather, Paul; Zhang, Xi Yu; Bove, Alfred A.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 7 pp.; In English; See also 20050215042; Original contains color illustrations

Contract(s)/Grant(s): NIH HL-065073; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Heart failure constitutes the most frequent and expensive hospital discharge diagnosis in the USA, costing annually over $10 billion. Optimal care requires an understanding of their illness, participating in clinical decisions, and frequent communication. Current surveillance is labor intensive and expensive. Follow-up is often inadequate, incomplete, and inconsistent. To address these problems, we developed an Internet-based telemedicine system, consisting of a secure server and database. Patients send/receive data to/from their care provider via the Internet. The system optimizes function and minimizes cost (all hardware is off the shelf and FDA approved). This paper describes our initial experience with this system. We are currently using this Telemedicine system in a prospective, randomized clinical trial, comparing Class III or IV heart failure patients with standard care versus standard care plus telemedicine.

Author

*Cardiovascular System; Clinical Medicine; Telemedicine; Heart Diseases*

**20050215116** Dynamac Corp., Cocoa Beach, FL, USA

**Reproductive Ecology Of The Florida Scrub-Jay (Aphelocoma Coerulescens) On John F. Kennedy Space Center/ Merritt Island National Wildlife Refuge: A Long-Term Study**

Carter, Geoffry M.; Breininger, David R.; Larson, Vicky L.; Oddy, Donna M.; Smith, Rebecca B.; Stolen, Eric D.; August 15, 2005; 26 pp.; In English

Contract(s)/Grant(s): NAS10-02001

Report No.(s): NASA/TM-2005-212562; No Copyright; Avail.: CASI: A03, Hardcopy

From 1988 to 2002 we studied the breeding ecology of Florida Scrub-Jays (Aphelocoma coerulescens) on John F. Kennedy Space Center/Merritt Island National Wildlife Refuge. We examined phenology, clutch size, hatching failure rates, fledgling production, nest success, predation rates, sources egg and nestling mortality, and the effects of helpers on these measures. Nesting phenology was similar among sites. Mean clutch size at Titan was significantly larger than at HC or T4. Pairs with helpers did not produce larger clutches than pairs without helpers. Fledgling production at T4 was significantly greater than at HC and similar to Titan. Pairs with helpers at HC produced significantly more fledglings than pairs without helpers; helpers did not influence fledgling production at the other sites. Nest success at HC and Titan was low, 19% and 32% respectively. Nest success at T4 was 48% and was significantly greater than at HC. Average predation rates at all sites increased with season progression. Predation rates at all sight rose sharply by early June. The main cause of nest failure at all sites was predation, 93%.

Author

*Breeding (Reproduction); Ecology; Phenology; Wildlife; Merritt Island (Fl)*

**20050215299** NASA Kennedy Space Center, Cocoa Beach, FL, USA, Dynamac Corp., Cocoa Beach, FL, USA

**Demonstration of a Porous Tube Hydroponic System to Control Plant Moisture and Growth**

Dreschel, T. W.; Hall, C. R.; Foster, T. E.; October 2003; 24 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS10-02001

Report No.(s): NASA/TM-2004-211533; No Copyright; Avail.: CASI: A03, Hardcopy

Accurate remote detection of plant health indicators such as moisture, plant pigment concentrations, photosynthetic flux, and other biochemicals in canopies is a major goal in plant research. Influencing factors include complex interactions between wavelength dependent absorbing and scattering features from backgrounds as well as canopy biochemical and biophysical constituents. Accurately controlling these factors in outdoor field studies is difficult. Early testing of a porous tube plant culture system has indicated that plant biomass production, biomass partitioning, and leaf moisture of plants can be controlled by precisely managing the root water potential. Managing nutrient solution chemistry can also control plant pigments, biochemical concentrations, plant biomass production, and photosynthetic rates. A test bed was developed which utilized the porous tube technology with the intent of evaluating remote sensing systems, spectral analyses procedures, gas-exchange, and fluorescence measurements for their ability to detect small differences in plant water status. Spectral analysis was able to detect small differences in the mean leaf water content between the treatments. However these small differences were not detectable in the gas-exchange or fluorescence measurements.

Author

*Hydroponics; Moisture Content; Plants (Botany); Porosity; Remote Sensing; Vegetation Growth; Pipes (Tubes)*

**20050215359** Bridgewater State Coll., Bridgewater, MA, USA

**Chemical Sensitivity in the Workplace**

Decker, James T.; Lowe, Charles; Peck, Peggy; Gentlewarrior, Sabrina; IPSI 2005 Hawaii Proceedings; [2005]; 26 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The debate continues to rage in the medical community and amongst policy makers. The debate centers on a new disease mechanism commonly known as Multiple Chemical Sensitivity (MCS). Magill & Suruda (1998) grouped the theories of etiology of MCS into four broad categories: physical, stress, misdiagnosis, and illness belief. A new name for this illness has recently been advanced as well, toxin-induced loss of tolerance (TILT). Problems with chemical sensitivity are especially troubling for workers and their employers. Employees seeking relief under the Americans with Disability Act of 1990 (AD) are requesting accommodations in the workplace, disability claims, and worker s compensation claims. Courts are trying to make sense of chemical sensitivity with respect to accommodations in the workplace. Court decisions regarding MCS issues are varied and oftentimes highly controversial. Primary social problems and mental health issues associated with chemical sensitivities are economic costs and loss of enjoyment of life by MCS sufferers. Economic costs are spread throughout the system; however, their major manifestations are lost worker production, increased demands on services, and the longterm costs associated with supporting a growing disabled subset of the population comprised of chemically injured workers. Social and mental health costs are seen in escalating cases of depression, divorces, behavioral acting out, isolation, anxiety attacks, and chronic medical problems. Social workers are particularly well suited to advocate for accommodations in the workplace and for social policy change on behalf of those suffering from chemical sensitivity. Their training in systems and ecosystems theory makes them well aware of the importance of the environment on the individuals. That training includes knowledge of utilizing

strengths based approach to problem solving, and clinical training in mental health, which leads to empowerment for the client.
Author
*Toxins and Antitoxins; Diseases; Ecosystems; Sicknesses; Personnel; Anxiety; Disabilities*

**20050215370** Intercultural Communications Coll., Honolulu, HI, USA
**Physicians, Public Health Practitioners, Educators and Linguists: A League of Extraordinary Bedfellows**
Janik, Daniel S.; Bills, Margaret; Saito, Hisako; IPSI 2005 Hawaii Proceedings; [2005]; 28 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

from disease. Public health professionals have long been striving to understanding and control the causes of morbidity and mortality factors that affect human populations. Together their intense, unremitting focus within public health has contained 'classical' epidemics, such as puerperal fever and milk-related diseases of childhood, to more contemporary ones such as peptic ulcer disease, smoking, alcohol consumption, gun control, and even longevity. Yet, interestingly, one of the oldest and perhaps the furthest-reaching human nemeses, violence, continues to elude us, even though all measures of outcome rank it far beyond other causes of mortality and morbidity. Of the infamous Four Horsemen of the Apocalypse: Conquest, War, Famine, Death, the original Axis of Evil, is based on a single common factor: violence, the result of which, in medical terms, is trauma.
Author (revised)
*Public Health; Education; Diseases; Mortality*

**20050215371** Dolphin Therapy Innovations, Inc., USA
**The Effects of Dolphin Interactions with Children Diagnosed with Posttraumatic Stress Disorder**
Faye, Elissa; IPSI 2005 Hawaii Proceedings; [2005]; 3 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Individuals who experience the most extreme traumas have a greater tendency to act out on their victimization through aggressive means towards the aggressor and the aggressor s affiliations be it country, state, business, family or otherwise. Such acting out can be seen in an overt or covert manner as noted by manipulation, seduction as well, identity thefts. Their recruiting of others and the others excitement of such goals, constitutes them all, as terrorists, as even in, affiliation, association or family. Those responsible for the fateful day of the September 11, 2001 attacks had in mind to bring our troops away from our homeland, so that their further plans on longitudinal destruction could go into place.
Derived from text
*Human Behavior; Human Relations; Children; Destruction; Injuries*

**20050215373** Belgrade Univ., Yugoslavia
**APS: Creating Bilingual Medical Electronic Dictionary**
Micic, Sofija; IPSI 2005 Hawaii Proceedings; [2005]; 12 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To prepare people to cope with multilingual situations it is not enough to teach them foreign languages, there is also a need to give them tools - printed and electronic bilingual dictionaries that actually serve their purpose. It is time to develop a new generation of dictionaries (Teubert, 1996:190). Current bilingual dictionaries are by no means adapted to use, so new pragmatic contrastive dictionaries that will help students to communicate in both languages and acquire action competence are needed (Schmitt, 1998:91). In many fields, dictionaries are only found for the most general level of specialized knowledge, and bilingual and multilingual dictionaries are uncommon in restricted domains (Chodkiewicz, Bourigault, Humbley, 1996:250). Both researchers interested in improving the quality and usefulness of dictionaries and lexicographers have welcomed the advent and availability of large computerized corpora (Alsina, De Cesaris, 1996:215). Computers have made it possible to store ever larger collections of texts in electronic form and to analyse them using increasingly sophisticated, versatile and user-friendly software tools. Lexis lends itself perfectly to the form-based research at which computers excel (Altenberg, Granger, 1996:4). Computers have opened up new possibilities of research on the basis of bilingual or multilingual corpora and experiments in natural language processing, e.g. in the fields of machine translation, information retrieval and computational lexicography
Author
*Natural Language Processing; Information Retrieval; Machine Translation; Dictionaries; Computers*

**20050215403** National Center for Microgravity Research on Fluids and Combustion, Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA

**Reduced-Gravity Experiments Conducted to Help Bioreactor Development**

Niederhaus, Charles E.; Nahra, Henry K.; Kizito, John P.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center and the NASA Johnson Space Center are collaborating on fluid dynamic investigations for a future cell science bioreactor to fly on the International Space Station (ISS). Project Manager Steven Gonda from the Cellular Biotechnology Program at Johnson is leading the development of the Hydrodynamic Focusing Bioreactor--Space (HFB-S) for use on the ISS to study tissue growth in microgravity. Glenn is providing microgravity fluid physics expertise to help with the design and evaluation of the HFB-S. These bioreactors are used for three-dimensional tissue culture, which cannot be done in ground-based labs in normal gravity. The bioreactors provide a continual supply of oxygen for cell growth, as well as periodic replacement of cell culture media with nutrients. The bioreactor must provide a uniform distribution of oxygen and nutrients while minimizing the shear stresses on the tissue culture.

Derived from text

*Bioreactors; Culture Techniques; Fluid Dynamics; Microgravity; Tissues (Biology)*

**20050215413** NASA Glenn Research Center, Cleveland, OH, USA

**Remote Arrhythmia Monitoring System Developed**

York, David W.; Mackin, Michael A.; Liszka, Kathy J.; Lichter, Michael J.; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Telemedicine is taking a step forward with the efforts of team members from the NASA Glenn Research Center, the MetroHealth campus of Case Western University, and the University of Akron. The Arrhythmia Monitoring System is a completed, working test bed developed at Glenn that collects real-time electrocardiogram (ECG) signals from a mobile or homebound patient, combines these signals with global positioning system (GPS) location data, and transmits them to a remote station for display and monitoring. Approximately 300,000 Americans die every year from sudden heart attacks, which are arrhythmia cases. However, not all patients identified at risk for arrhythmias can be monitored continuously because of technological and economical limitations. Such patients, who are at moderate risk of arrhythmias, would benefit from technology that would permit long-term continuous monitoring of electrical cardiac rhythms outside the hospital environment. Embedded Web Technology developed at Glenn to remotely command and collect data from embedded systems using Web technology is the catalyst for this new telemetry system (ref. 1). In the end-to-end system architecture, ECG signals are collected from a patient using an event recorder and are transmitted to a handheld personal digital assistant (PDA) using Bluetooth, a short-range wireless technology. The PDA concurrently tracks the patient's location via a connection to a GPS receiver. A long distance link is established via a standard Internet connection over a 2.5-generation Global System for Mobile Communications/General Packet Radio Service (GSM/GPRS)1 cellular, wireless infrastructure. Then, the digital signal is transmitted to a call center for monitoring by medical professionals.

Author

*Architecture (Computers); Heart; Internets; Mobile Communication Systems; Telemedicine*

**20050215448** Freie Univ., Berlin, Germany

**Computer Based Questioning System 'e-Anamnesis 2003/4' for the Occupational Medicine**

Scutaru, Cristian; Schaecke, Gustav; IPSI 2005 Amalfi Proceedings; [2005]; 4 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The human health is subject to the various and complex acting parameters of lifestyle. The WHO estimated in 1999 that 30% of all death cases and 30% of the loss of handicap free life years in the European region are related to environment and lifestyle factors. But the impact of physical, chemical and microbiological factors toward the environment is not stated in this study (WHO, 1999). Important basics for the assessment of the aetiology come from the health status, occupational and also social biography. In occupational medicine diagnosis and differential diagnosis are based on the following important columns: a) Anamnesis, b) Occupational biography with its work-related strain and exposure, c) Status and function of human organs and organ systems, and d) Progress monitoring. Additionally, the status is supplemented by morphological, physical, chemical and biological investigations (Hegglin & Siegenthaler 1980). The quality of differential diagnosis and the quality of risk assessment depend on the reliability of the clinical and biochemical findings in biological material (e.g. blood, urine). Here safe and actual reference values, as appraisal factors are mandatory. A literature research in the field of reference values discovered a series of problems with which this sector is confronted, such as: 1) Lack of background information, 2) Insufficient standardisation, and 3) Insufficient presentation. We are now concentrating on the first aspect, the lack of

background information. This aspect is bonded to the fact that large parameters gatherings by means of paper and pen questionnaire is extremely elaborate. This is why more and more electronic questionnaire systems are being developed. We evaluated the actual solutions in the field and came to the conclusion that none of them was applicable in the field of occupational medicine and for gathering large amounts of data. We also wanted a solution that would be applicable on international scale as more and more international networks are being created. This implies that the questioning system must be language independent in order to make statistical analysis on this data.
Author
*Medical Services; Biochemistry; Health; Statistical Analysis; Reliability; Microbiology*

**20050215543** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Morphology and Elemental Composition of Recent and Fossil Cyanobacteria**
SaintAmand, Ann; Hoover, Richard B.; Jerman, Gregory; Rozanov, Alexei Yu.; [2005]; 1 pp.; In English; International Symposium of Optical Science and Technology SPIE's 50th Annual Meeting, 31 Jul. - 4 aug. 2005, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

Cyanobacteria (cyanophyta, cyanoprokaryota, and blue-green algae) are an ancient, diverse and abundant group of photosynthetic oxygenic microorganisms. Together with other bacteria and archaea, the cyanobacteria have been the dominant life forms on Earth for over 3.5 billion years. Cyanobacteria occur in some of our planets most extreme environments - hot springs and geysers, hypersaline and alkaline lakes, hot and cold deserts, and the polar ice caps. They occur in a wide variety of morphologies. Unlike archaea and other bacteria, which are typically classified in pure culture by their physiological, biochemical and phylogenetic properties, the cyanobacteria have historically been classified based upon their size and morphological characteristics. These include the presence or absence of heterocysts, sheath, uniseriate or multiseriate trichomes, true or false branching, arrangement of thylakoids, reproduction by akinetes, binary fission, hormogonia, fragmentation, presence/absence of motility etc. Their antiquity, distribution, structural and chemical differentiation, diversity, morphological complexity and large size compared to most other bacteria, makes the cyanobacteria ideal candidates for morphological biomarkers in returned Astromaterials. We have obtained optical (nomarski and phase contrast)/fluorescent (blue and green excitation) microscopy images using an Olympus BX60 compound microscope and Field Emission Scanning Electron Microscopy images and EDAX elemental compositions of living and fossil cyanobacteria. The S-4000 Hitachi Field Emission Scanning Electron Microscope (FESEM) has been used to investigate microfossils in freshly fractured interior surfaces of terrestrial rocks and the cells, hormogonia, sheaths and trichomes of recent filamentous cyanobacteria. We present Fluorescent and FESEM Secondary and Backscattered Electron images and associated EDAX elemental analyses of recent and fossil cyanobacteria, concentrating on representatives of the genera Calothnx, Leptolyngbya, Lyngbya, Planktolyngbya and Oscillatoria.
Author
*Bacteria; Microorganisms; Fossils; Field Emission; Chemical Composition; Biochemistry*

**20050215586** Royal Air Force, Buckingham, UK
**Injuries in Fatal Aircraft Accidents**
Cullen, S. A.; Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation; August 2005, pp. 3-1 - 3-13; In English; See also 20050215585; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

aircraft hits the ground or water. However the forces acting upon the occupants are frequently less than those applied to the aircraft. This is because the aircraft structures absorb some energy as they collapse or are crushed. Modern design can aid the collapse of the aircraft so that it is controlled and the forces applied to the occupants are reduced. However lack of harness restraint may mean that the forces are magnified. The acceleration due to gravity is 9.81 m/sq s and is termed g. It is usual to refer to acceleration in terms of G, which is the acceleration applied to the individual divided by g. Therefore 10 G is 98.1 m/sq s. It is to be noted that deceleration is the layman's term for negative acceleration.
Derived from text
*Deceleration; Gravitation; Harnesses; Injuries*

**20050215591** Institute of Aviation Medicine, Fuerstenfeldbruck, Germany
**Toxicological and Pathological Findings**
Kraemer, Michael; Pathological Aspects and Associated Biodynamics in Aircraft Accident Investigation; August 2005, pp. 5-1 - 5-10; In English; See also 20050215585; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

When investigating a fatal aircraft accident, the medical experts must also consider the requirements of the local public prosecution. The peculiarities in the toxicological and histological examination result on the one hand from the complexity of the matter and on the other hand from the elevated demands of conclusiveness and the variety of the examinations to be performed. The answering of the relevant questions regarding the aircraft accident investigation in connection with the critical assessment and interpretation of the findings makes highest demands on the investigators. The specific aspects and pitfalls regarding the assessment of the post-mortal alcohol detection, the diagnostics of chronic alcohol abuse, the analysis of POL substances and combustion gases, the diagnostics of disturbances of the glucose metabolism and the microscopic examination of the heart will be discussed.
Author
*Accident Investigation; Diagnosis; Heart; Toxicology; Histology*

**20050215634** NASA Glenn Research Center, Cleveland, OH, USA
**Finite Element Modeling Used to Study Stress Distribution on the Foot**
Morales, Nelson; Davis, Brian; Tajaddini, Azita; Research and Technology 2003; May 2004; 4 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

A method to study the stress distribution inside the forefoot during walking was developed at the Cleveland Clinic Foundation by a researcher from the NASA Glenn Research Center. In this method, a semiautomated process was outlined to create a three-dimensional, patient-specific, finite element model (FEM) of the forefoot using magnetic resonance images (MRI). The images were processed in Matlab using the k-nearest neighbor (k-NN) classification algorithm and Sobel edge detection to separate the different tissue types: bone, skin, fat, and muscle. This information was used to create curves and surfaces that were exported to an FEM preprocessor known as Truegrid. In Truegrid, eight-noded or brick elements were created by using surface mapping. The FEM was processed and postprocessed in Abaqus. Material properties of the models were obtained from past experiments such as fat pad confined compression, skin axial and biaxial tests, muscle in vivo compressive tests, and reference literature (bone properties). Nonlinear (hyperelastic) material models were used for the skin (epidermis and dermis), fat, and muscles; and a linear elastic model was used for the bones. Muscle activation during walking yielded uncertainties in the muscle material model since contracted muscles are stiffer than relaxed muscles. These uncertainties were resolved by performing a sensitivity analysis of the muscle material properties. The original properties were multiplied by arbitrary factors of 2, 3, 0.5, and 0.33. The strain and stress distributions, as well as the locations of peak values, were similar in all cases. The peak contact pressure P obtained for each case varied with respect to the applied factor f as follows:
Author
*Finite Element Method; Bones; Compressibility; In Vivo Methods and Tests; Muscular Function*

**20050215684** NASA Glenn Research Center, Cleveland, OH, USA
**By Different Cellular Mechanisms, Lymphatic Vessels Sprout by Endothelial Cell Recruitment Whereas Blood Vessels Grow by Vascular Expansion**
Parsons-Wingerter, Patricia; McKay, Terri L.; Leontiev, Dmitry; Condrich, Terence K.; DiCorleto, Paul E.; August 2005; 23 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): IRD04-54
Report No.(s): NASA/TM-2005-213824; E-15183; No Copyright; Avail.: CASI: A03, Hardcopy

The development of effective vascular therapies requires the understanding of all modes of vessel formation contributing to vasculogenesis, angiogenesis (here termed hemangiogenesis) and lymphangiogenesis. We show that lymphangiogenesis proceeds by blind-ended vessel sprouting via recruitment of isolated endothelial progenitor cells to the tips of growing vessels, whereas hemangiogenesis occurs by non-sprouting vessel expansion from the capillary network, during middevelopment in the quail chorioallantoic membrane (CAM). Blood vessels expanded out of capillaries that displayed transient expression of alpha smooth muscle actin (alphaSMA), accompanied by mural recruitment of migratory progenitor cells expressing SMA. Lymphatics and blood vessels were identified by confocal/fluorescence microscopy of vascular endothelial growth factor (VEGF) receptors VEGFR-1 and VEGFR-2, alphaSMA (expressed on CAM blood vessels but not on lymphatics), homeobox transcription factor Prox-1 (specific to CAM lymphatic endothelium), and the quail hematopoetic/vascular marker, QH-1. Expression of VEGFR-1 was highly restricted to blood vessels (primarily capillaries). VEGFR-2 was expressed intensely in isolated hematopoietic cells, lymphatic vessels and moderately in blood vessels. Prox-1 was absent from endothelial progenitor cells prior to lymphatic recruitment. Although vascular endothelial growth factor-165 (VEGF(sub 165)) is a key regulator of numerous cellular processes in hemangiogenesis and vasculogenesis, the role of VEGF(sub 165) in lymphangiogenesis is less clear. Exogenous VEGF(sub 165) increased blood vessel density without changing endogenous

modes of vascular/lymphatic vessel formation or marker expression patterns. However, VEGF(sub 165) did increase the frequency of blood vascular anastomoses and strongly induced the antimaturational dissociation of lymphatics from blood vessels, with frequent formation of homogeneous lymphatic networks.
Author
*Blood Vessels; Cardiovascular System; Cytology; Lymphatic System; Endothelium*

**20050216409** National Univ. of Lesotho, Roma, Lesotho
**Traditional Remedies of Lesotho: A Change of Attitude**
Qhotsokoane, Mats'Eliso; Mahlelebe, Tau; Letuka, Kometsane; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 17 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The paper illustrates the change in attitude towards the use of traditional medicine. The discussion centers around traditional herbal medicine which is in regular use for various ailments including treatment of patients with common AIDS related diseases. Included in the paper is a report of the survey on the medicinal uses of the plants, the chemical constituents where such information was available and a report on the cultivation of some of these plants and other indigenous plants of medicinal value.
Author
*Diseases; Lesotho; Chemical Composition*

**20050216447** Agency for Healthcare Research and Quality, Rockville, MD USA
**Prescribing Safety in Ambulatory Care: Physician Perspectives**
Rundall, Thomas G.; Hsu, John; Lafata, Jennifer E.; Fung, Vicki; Paez, Kathryn A.; Simpkins, Jan; Simon, Steven R.; Robinson, Scott B.; Uratsu, Connie; Gunter, Margaret J.; Soumerai, Stephen B.; Selby, Joseph V.; May 1, 2005; 12 pp.; In English
Contract(s)/Grant(s): U18; HS12019
Report No.(s): AD-A433933; No Copyright; Avail.: CASI: A03, Hardcopy

Objective: This study was undertaken to describe physicians' views regarding ambulatory medication prescribing safety. Methods: We conducted 17 semistructured interviews among a sample of practicing physicians from 3 integrated health delivery systems. We asked about current safety practices, perceptions of ambulatory prescribing safety. Using a content analysis approach, three investigators independently coded responses into thematic categories. For 90 percent of responses, investigators agreed on the coding. Discrepant response codes were resolved through consultation among the investigators. Results: Current prescribing safety practices most frequently noted by physicians included using reference material (e.g., guidelines on hand-held devices, online drug information, electronic formulary booked), verbal communication with pharmacists, and attention to educational materials on medication prescribing (posters, educational alerts, and faxes). Some subjects reported using point-of-care information technology, i.e., personal digital assistant-based drug information, as very helpful. Other subjects used pharmacy support systems. The most commonly cited safety concerns were adverse events associated with drug-drug interactions, drug allergies and side effects, prescribing for the elderly, and chronic medication use. Commonly suggested new safety approaches ranged from low-cost initiatives such as education to improve patients' knowledge of current medications, to more elaborate electronic medical record-based alert systems that automatically flag potential errors. Conclusions: Despite a number of safety strategies currently in use, physicians perceive significant problems with ambulatory prescribing safety. Recommended solutions range from better patient education to employing new information technology, but their effectiveness may vary depending on the underlying cause of the prescribing safety issue. DTIC
*Drugs; Medical Services; Physicians; Safety*

**20050216449** Wisconsin Univ., Madison, WI USA
**Exploring a Link Between NF-KB and G2/M Cell Cycle Arrest in Breast Cancer Cells**
Davis, Shelly M.; Miyamoto, Shigeki; Apr. 1, 2005; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0623
Report No.(s): AD-A436875; No Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this grant is to understand how activation of the NF-kB/Rel family of transcription factors leads to breast cancer cell survival following treatment with radiation. The NF-kB/Rel family of transcription factors are known to greatly affect survival of various cancer cell types, including breast cancer cells. Our hypothesis is that activation of NF-kB in breast

cancer cells contributes to a G2/M cell cycle arrest, affording these cells extra opportunity to repair damaged DNA and thus allowing them to evade death inducing effects of radiation. Cell cycle analysis and levels of apoptosis were determined following exposure to ionizing irradiation. Cells capable of NF-kB activation efficiently arrested in G2/M cell cycle phase while those that are not capable of activating NF-kB, do not efficiently arrest. Using RPA analysis we identified a gene, p2lwat1/cip1, and have now shown that it is involved in maintaining the G2/M phase cell cycle arrest following IR. Through the use of stable RNAi interference, we found that the G2/M arrest is partially dependent on p2lWatl/ Cipl. Understanding how NF-kB is activated and how NF-KB provides protection from cell death will be important for designing strategies to circumvent this resistance mechanism to improve efficacy of radiation therapy.
DTIC
*Breast; Cancer; Mammary Glands*

**20050216451** Minnesota Univ., Minneapolis, MN USA
**A Model DOD Systems Approach for Tobacco Cessation**
Lando, Harry A.; Oct. 1, 2004; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0586
Report No.(s): AD-A436881; No Copyright; Avail.: CASI: A02, Hardcopy

Military personnel have a smoking rate of approximately 30%, and recent evidence indicates this rate is no longer decreasing. Given the costs in terms of health care expenditures and decreased troop readiness, more must be done to decrease smoking in the military. This project is a group-randomized trial to test the effectiveness of intervention programs in increasing smoking cessation rates of active duty personnel and TRICARE Prime beneficiaries. Approximately 150 smokers and 100 nonsmokers per base will be followed after the 18-month intervention to assess smoking status. Fourteen military installations have been chosen (4 Army and 10 Air Force) to participate in this project to date, with seven installations randomly assigned to Organizational Support/Enhanced Programs (OSEP) and seven to Usual Practice (UP). The OSEP includes tobacco cessation intervention training for health care providers as well as other members in the community, pharmacological support, policy changes, and a media campaign. The UP installations will be provided intervention materials following the completion of follow-up surveys, approximately 24 months after the baseline survey. Currently, 4 sites have completed the intervention and the cohort selected for follow-up is being surveyed. The next 4 sites are starting the intervention and have completed the baseline survey. The final 6 sites are projected to begin the baseline survey and the intervention this fall and winter.
DTIC
*Medical Services; Military Personnel; Smoke; Tobacco*

**20050216453** California Univ., Berkeley, CA USA
**How Does Nuclear Organization Maintain Normal Mammary Phenotype?**
Lelievre, Sophie A.; Mar. 1, 2005; 68 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0226
Report No.(s): AD-A436884; No Copyright; Avail.: CASI: A04, Hardcopy

Degradation of the basement membrane (BM) surrounding breast epithelial units (acini) is associated with tumor progression. It is crucial to understand the molecular mechanisms that underlie the maintenance of an intact EM in order to develop anti-cancer strategies. Using non-neoplastic human breast epithelial S1 cells that differentiate into acini in the presence of extracellular matrix, we have shown a link between the nuclear organization of the protein NuMA and the maintenance of acinar differentiation, notably BM integrity. Sequence analysis of the distal portion of NuMA C-terminus (NuMA-CTDP) revealed that this region may be restricted to vertebrates and may adopt a structure possessing organizational and signaling properties. In addition, NuMA-CTDP shares similarities with sequences of proteins involved in chromatin structure. Expression of NuMA-CTDP in S1 cells altered chromatin structure and impaired acinar differentiation and formation of the EM. Cell fractionation showed that NuMA interacts with the chromatin compartment and suggested that NuMA might be associated with multi-protein complexes. NuMA has been recently identified as a possible candidate for breast cancer predisposition. By establishing a role for NuMA in chromatin organization critical for mammary epithelial differentiation, our work sheds light on how alterations in NuMA function may lead to cancer development.
DTIC
*Breast; Cancer; Mammary Glands; Phenotype*

**20050216454** University of South Florida, Tampa, FL USA
**Robust Detection of Masses in Digitized Mammograms**
Li, Lihua; Jun. 1, 2004; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0245
Report No.(s): AD-A436885; No Copyright; Avail.: CASI: A03, Hardcopy

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 in fourth year is on data collection, evaluation of clinical significance of CAD system, and the final documentation and manuscript reports. By reviewing more than 1334 cases, a total of 83 serial cancer cases were collected, A group truth file was generated by an experienced radiologist. This work is continuing and more cases will be collected to achieve the goal of 100 cases before the end of May 2004. However, due to the difficulty and the huge working load in database generation, the testing of clinical significance of CAD system could not be finished in this year. We are requesting a no-cost extension of this grant. The results of this part will be reported in the final report next year.
DTIC
*Breast; Cancer; Computer Techniques; Diagnosis; Mammary Glands*

**20050216455** Jackson (Henry M.) Foundation, Rockville, MD USA
**Vietnam Head Injury Study Phase III: A 30 Year Post-Injury Follow-Up Study**
Grafman, Jordan H.; Oct. 1, 2004; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0675
Report No.(s): AD-A436886; No Copyright; Avail.: CASI: A01, Hardcopy

Implementation of the Vietnam Head Injury Study Phase III (VHIS - PIII) has begun. By November 2003 all study staff had been hired, and underwent subsequent training to administer the battery of tests. By April 2004 we had received all the required protocol approvals and inter-agency cooperative agreements, and began testing subjects. To date, 28 head-injured subjects and 6 non-head injured control subjects have been assessed, and these data have been entered into the VHIS - Phase III computer database. Of those who were examined in Phase II, 320 head-injured subjects and 31 control subjects have agreed to further participation. We have publicized the study in both veteran, military and the national press, and are in the process of recruiting additional control subjects. The assessments have already identified four cases with significant undetected medical pathology.
DTIC
*Data Bases; Injuries; Vietnam; Warfare*

**20050216456** Beth Israel Deaconess Medical Center, Boston, MA USA
**Structural Basis for BRCA1 Function in Breast Cancer**
Ladias, John A.; Apr. 1, 2005; 19 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0300
Report No.(s): AD-A436887; No Copyright; Avail.: CASI: A03, Hardcopy

The Breast Cancer Susceptibility gene 1 (BRCA1) encodes an 1863-amino acid protein that has important functions in cell cycle checkpoint control and DNA repair and plays a central role in the pathogenesis of breast cancer. Two tandem BRCA1 C-terminal domains (BRCT1 and BRCT2) are essential for the tumor suppression activity of BRAC1 and interact in a phosphorylation-dependent manner with proteins involved in DNA damage-induced checkpoint control, including the DNA helicase BACH1 and the CtBP-interacting protein (CtIP). The present project has resulted in the structure determination of the BRCA1 BRCT domains complexed with the phopshopeptide PTRVSpSPVFGAT from human CtIP (residues 322-333) at 2.5 A resolution, using X-ray crystallography. Several hydrogen bonds and salt bridges that stabilize the BRCA1-BACH1 complex are missing in the BRCA1-CtIP interaction, offering a structural basis for the 5-fold lower affinity of BRCA1 for CtIP than BACH1, as determined by isothermal titration calorimetry. The information obtained from these experiments has elucidated the mechanisms underlying regulation of BRCA1 by BACH1 and CtIP and has revealed the molecular changes induced by cancer-causing mutations in the BRCA1 domains that affect their interaction with these proteins.
DTIC
*Breast; Cancer; Genes; Mammary Glands*

**20050216457** Institut National de la Sante et de la Recherche Medicale, Paris, France
**Role of Mitochondrial DNA Mutations in Cellular Vulnerability to Mitochondria-Specific Environmental Toxins**
Hirsch, Etienne C.; Jun. 1, 2005; 17 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0547
Report No.(s): AD-A436888; No Copyright; Avail.: CASI: A03, Hardcopy

In recent years, growing evidence has shown that mutations of mitochondrial DNA (mtDNA) are an important cause of mitochondrial disorders in humans, and have been associated with common neurodegenerative disorders, aging and cancers. In line with this, it has been proposed that those mutations could genetically predispose an individual to some environmental factors thereby initiating the disease process. To test such a hypothesis in Parkinson's disease we proposed to: 1) develop an animal model with accumulated mtDNA mutations in catecholaminergic neurons by creating a transgenic mouse containing a tyrosine hydroxylase (TH) promoter-driven transgene encoding a proofreading-deficient mouse mtDNA polymerase (Pol gamma), 2) testing whether those animals are more susceptible to mitochondria-specific environmental toxins and aging 3) investigating the underlined molecular mechanism. In this annual report, we describe the characterization of a transgenic mouse line which produces at high level a proofreading-deficient mouse mtDNA polymerase (pol gamma) in TH expressing tissues at different developmental stages (from embryogenesis to adult). Then, we describe the strategy that we are currently using to perform a sequence analysis of the mtDNA isolated from the ventral mesencephalon of transgenic animals. This study should tell us whether mtDNA mutations accumulate in catecholaminergic tissues in this experimental model.
DTIC
*Deoxyribonucleic Acid; Diseases; Mitochondria; Mutations; Toxins and Antitoxins; Vulnerability*

**20050216458** New York Hospital-Cornell Medical Center, New York, NY USA
**Combination Therapy Employing Retinoids and Chromatin Remodeling Agents in Human Breast Carcinomas**
Xu, Juliana; Gudas, Lorraine J.; Oct. 1, 2004; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0218
Report No.(s): AD-A436889; No Copyright; Avail.: CASI: A03, Hardcopy

Retinoids (vitamin A and related compounds), important regulators of cell proliferation and differentiation, are used clinically in the treatment of various skin conditions and in cancer therapies. How retinoids cause cell differentiation is one focus of the laboratory. The Rex-1 gene (Fig. 1) was identified by a subtractive hybridization screen as a gene that was transcriptionally down-regulated by retinoids. The Rex-1 gene encodes a protein of 32.3 kilodaltons that contains four copies of a cys-his zinc finger motif, suggesting that Rex-1 may function as a transcriptional regulatory protein. Rex-1 protein is involved in both embryonic development, spermatogenesis, and is expressed at high levels in F9 teratocarcinoma cells and embryonic stem (ES) cells.
DTIC
*Breast; Cancer; Carotenoids; Chromatin; Mammary Glands; Proteins; Therapy*

**20050216459** Tripler Army Medical Center, Honolulu, HI USA
**Vasopressin Regulation and Renal Fluid and Electrolyte Handling in Rat Models of Acute and Chronic alcohol Exposure**
Uyehara, Catherine F.; Oct. 1, 2004; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0673
Report No.(s): AD-A436890; No Copyright; Avail.: CASI: A03, Hardcopy

Fluid and electrolyte balance appears to be affected differently at different stages of alcohol use. In rat models of acute and chronic alcohol exposure and alcohol withdrawal, we systematically elucidated the role of vasopressin, an important hormone in body fluid regulation, in the physiological response to alcohol. Changes in vasopressin circulating levels do not account for altered fluid handling with alcohol exposure. Rather, alcohol-induced changes in renal responsiveness to vasopressin appear to be responsible for the pattern of diuresis, impaired water excretion, and recovery in the different phases of alcohol exposure. The primary mechanisms behind this is the up and down regulation of renal vasopressin V2 receptors involved with renal tubular water reabsorption. In addition, alcohol exposure disrupts the relationships between vasopressin synthesis, brain vasopressin receptors, and blood toxicity, and thus, may affect the ability to respond to physiologic stimuli. The results of this research contribute to a better understanding of alcohol effects on vasopressin regulation of fluid handling, and should be used to implement better strategies for management of fluid and electrolyte imbalance associated with alcohol use.
DTIC
*Alcohols; Antidiuretics; Body Fluids; Diuresis; Electrolytes; Exposure; Rats; Vasopressins*

**20050216460** Fox Chase Cancer Center, Philadelphia, PA USA
**Regulation of IAP (Inhibitor of Apoptosis) Gene Expression by the p53 Tumor Suppressor Protein**
Murphy, Maureen E.; May 1, 2005; 31 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0383
Report No.(s): AD-A436891; No Copyright; Avail.: CASI: A03, Hardcopy

This research proposal sought to utilize information on p53-dependent programmed cell death toward the design of more effective avenues of breast cancer therapy. Key findings in the past three years included our - - finding that a common polymorphism in the p53 tumor suppressor protein influences the ability of this protein to induce cell death. Specifically, the arginine 72 form of p53 induces cell death over fifteen-fold better than the proline 72 form. As the latter form is the exclusive form used for gene therapy, these findings have direct implications for this field. We found by mass spectrometry that the arginine 72 form of p53 interacts with the mitochondrial protein BAK. Molecular modeling of the p53-BAK interaction has led to the identification of a 'BH3-like' domain in p53 (residues 278-289); mutation of residues in this domain abrogates the ability of p53 to oligomerize BAK. These findings will be extended with the creation of peptidomimetics for this domain of p53, with the goal of effecting increased apoptosis of tumor cells.
DTIC
*Apoptosis; Gene Expression; Gene Therapy; Inhibitors; Tumor Suppressor Proteins*

**20050216461** Meharry Medical Coll., Nashville, TN USA
**Is Peripheral Benzodiazepine Receptor (PBR) Gene Expression Involved in Breast Cancer Suppression by Dietary Soybean Protein**
Das, Salil K.; May 1, 2005; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0352
Report No.(s): AD-A436892; No Copyright; Avail.: CASI: A03, Hardcopy
Localization of PBR in nucleus, and nuclear cholesterol transport are implicated in breast cancer development. Our previous report suggested that the soybean protein may protect against the development of a more aggressive mammary gland adenocarcinoma. Furthermore, there was a delay in the development of breast cancer in the soybean group challenged with DMBA in comparison to the animals fed casein and challenged with DMBA. The objective of the present task was to confirm whether the beneficial effect of soybean protein in breast cancer development is mediated via PERs. Breast cancer was developed by gavage administration of single dose of DMBA (80 mg/kg) into 50-day old female rats, maintained on a standard AIN-76A diet containing either 20% casein or 20% soybean protein. After 122 days of DMBA administration, the animals were sacrificed. All tumors were detected by palpation and at autopsy biopsy specimens were taken for histological grading. The casein group had 20% grade I (non-aggressive), 60% grade II (moderately aggressive) and 20% grade III (aggressive) mammary gland adenocarcinoma. However, the soybean group had 100% grade I adenocarcinoma and no aggressive grade II or grade III. Control animals had no tumor. Bmax of PBRs was significantly higher in cancerous tissues than that in control tissues. However, the increase was significantly less in soybean protein group (53%) than that in casein group (128%). Nuclear cholesterol uptake as well as NTPase activity was significantly higher in cancerous tissues than control tissues. However, while there was no significant change in the cholesterol uptake between casein group and soybean protein group, endogenous cholesterol level was more in casein group than soybean group.
DTIC
*Breast; Cancer; Diets; Gene Expression; Mammary Glands; Proteins; Soybeans*

**20050216462** Northern California Inst. for Research and Education, San Francisco, CA USA
**Mitochondrial Structure and Reactive Oxygen Species in Mammary Oncogenesis**
Lau, Yun-Fai C.; Apr. 1, 2005; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0247
Report No.(s): AD-A436893; No Copyright; Avail.: CASI: A02, Hardcopy
Oxidative stress may play a role in human oncogenesis, including breast cancer. The mitochondria are most common sources of reactive oxygen species (ROS) responsible for most oxidative stress. This project evaluates the role of mitochondrial abnormalities in oxidative stress in breast cancer development. Transgenic mice harboring mutant mitochondrial Complex II subunit targeted in the mammary glands will be characterized in terms of mitochondrial functions, ROS production and oncogenesis. The effects of oxidative stress in other transgenic mouse models of breast cancer or predisposed mice will be generated by cross-breeding and analyzed in terms of their courses of oncogenesis in the presence or absence of the mitochondrial mutant transgene, and hence oxidative stress. This study should provide significant information regarding the role of oxidative stress in breast cancer development and progression, and insights on whether antioxidants are beneficial in prevention and treatment of such important cancer in Women.
DTIC
*Breast; Cancer; Mammary Glands; Mitochondria; Oxygen; Reactivity; Tumors*

**20050216463** Texas Univ., Houston, TX USA
**Tumor Immunity by Hydrophobic Bearing Antigens**
Ioannides, Constantin G.; Jul. 1, 2004; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0299
Report No.(s): AD-A436894; No Copyright; Avail.: CASI: A03, Hardcopy

CD8+ cells expressing high numbers of TCR per cell (TCRhi) are important mediators of anti-tumor effects. To understand the relationship between TCR density and Ag affinity for TCR in the outcome of differentiation of CTL recognizing tumor Ag, we analyzed perforin induction in ovarian tumor-associated lymphocytes in response to the smallest possible changes in the atomic forces of interaction between Ag and TCR. Stimulating undifferentiated, apoptosis-resistant CD8+ cells expressing high levels of E75-TCR (TCRhi) with variants of the CTL epitope E75, HER-2 (369-377), induced their stepwise differentiation, first to IFN-gamma+ Perf-, and then to TCRhi IFN-gamma+ Perf+ cells. Blocking caspase-9 activation at Ag stimulation also enhanced the generation of TCRhi Perf+ cells, demonstrating that TCR density dictated the pathway of death activated by stimulation with the same agonist. Expansion and differentiation of TCRhi Perf+ CTL required an agonist of optimal CH2 side chain length. Side chains one CH2 shorter or longer than optimal were either less stimulatory or induced death of TCRhi Perf+ cells. Differentation of TCRhi CD8+ cells can be finely tuned by side chains which induce small increments in the affinity of the Ag for TCR below the affinity which induce apoptosis.
DTIC
*Antigens; Breast; Cancer; Hydrophobicity; Immunity; Mammary Glands; Tumors*

**20050216464** Georgetown Univ., Washington, DC USA
**EGF Regulation of Nuclear Co-Activator AIB1 Function in Breast Cancer**
Oh, Annabell S.; Apr. 1, 2005; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0394
Report No.(s): AD-A436895; No Copyright; Avail.: CASI: A03, Hardcopy

Various growth factor receptor pathways promote human breast tumorigenesis of hormone-independent tumors. The nuclear receptor coactivator AIB1 (amplified in breast cancer 1) can be phosphorylated and regulated by growth factor-induced signaling pathways such as MAP kinase and IkB kinase. Our lab has found a splice variant of AIB1, called delta exon3 ATB1, which has a higher co-activating ability than the full-length protein. This study determined the ability of delta exon3 splice variant compared with AIB1 in potentiating growth factor signaling and to determine the mechanism of this potentiation using a growth factor responsive promoter.
DTIC
*Activation; Breast; Cancer; Hormones; Mammary Glands*

**20050216465** Yale Univ., New Haven, CT USA
**Met nuclear Localization and Signaling in Breast Cancer**
Pozner-Moulis, Sharon A.; May 1, 2005; 14 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0438
Report No.(s): AD-A436896; No Copyright; Avail.: CASI: A03, Hardcopy

Hepatocyte Growth Factor/Met signaling is associated with tumor aggression and poor prognosis in many cancers, including lymph node negative breast carcinomas. High HOP levels have been correlated with worse patient outcome and over-expression of the cytoplasmic region of Met is associated with poor prognosis in lymph node negative breast carcinomas. Immunohistologic assay, using antibodies to the cytoplasmic domain of Met, show Met in the nucleus in cell lines and in germinal regions of tissues. Cell fractionation of A43 1 and HEK293 cells reveal a 60kDa band recognized by C-terminal antibodies of Met localizing to the nucleus. This 60kDa fragment can be enriched by the presence of proteosome inhibitors and is independent of HOF treatment. GFP fusion proteins of the cytoplasmic domain of Met transfected into HEK293 cells are found in the nucleus while the full length Met-GFP fusion is membranous. Further deletions of the Met-OFP fusions identify a region of the juxtamembrane domain required for nuclear translocation. This work suggests processing of the Met receptor, in a manner similar to ErbB4, resulting in the release of the cytoplasmic domain and its translocation to the nucleus.
DTIC
*Breast; Cancer; Mammary Glands; Position (Location)*

**20050216466** Boston Univ., Boston, MA USA

**The Nigrostriatal Dopamine System and Methamphetamine: Roles for Excitotoxicity and Environmental, Metabolic and Oxidative Stress**

Yamamoto, Bryan; Jul. 1, 2005; 176 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9479

Report No.(s): AD-A436897; No Copyright; Avail.: CASI: A09, Hardcopy

Degeneration of the nigrostriatal dopamine system is linked to the pathophysiology of Parkinson's disease. Similarly, the psychostimulant drug, methamphetamine also produces relatively selective damage to nigrostriatal dopamine neurons and is a widespread problem and drug of abuse throughout the U. S. However, the neurochemical underpinnings that mediate methamphetamine toxicity and Parkinson's disease are unknown. Several variables common to methamphetamine toxicity and Parkinson's disease, each of which may be important but alone are insufficient, may account for the neurodegeneration of the nigrostriatal dopamine path. It is hypothesized that the convergence of excitotoxicity, free radicals and a depleted bioenergetic state produces damage to dopamine neurons. Moreover, environmental stressors, which also increase free radicals and excitatory amino acids predispose dopamine neurons to damage. Consequently, environmental stress may be synergistic with oxidative and metabolic insults as well as glutamate to culminate in dopamine cell death. The major objective is to examine the interaction between environmental stress and methamphetamine and the convergent action of excitotoxicity and bioenergetic and oxidative stress to produce damage to nigrostriatal dopamine neurons. A multidisciplinary approach will be used as well as pharmacological strategies that we posit to be neuroprotective against methamphetamine, excitotoxicity, and bioenergetic and oxidative stress will be examined.

DTIC

*Dopamine; Environment Effects; Metabolism; Oxidation; Stresses*

**20050216467** Yale Univ., New Haven, CT USA

**Spectral Analysis of Breast Cancer on Tissue Microarrays: Seeing Beyond Morphology**

Rimm, David L.; Apr. 1, 2005; 49 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0634

Report No.(s): AD-A436898; No Copyright; Avail.: CASI: A03, Hardcopy

Spectral imaging is a mechanism of tissue examination that combines spectral (color) with spatial information. The Varispec(exp TM) device fractionates the light into 10 nm bands and then collects images containing a frill spectral profile for each pixel. The resulting spectral profile is then analyzed using a genetic algorithm based software package called GENIE. GENIE allows combination of spectral and spatial information for binary inclusion into user defined classes. This IDEA grant proposed examination of the spectral signatures of breast cancer to distinguish benign cells from malignant cells allowing diagnosis, classification, and possibly prediction of outcomes in breast cancer. The first stages of the grant analyzed tissue microarray spots, to assess our ability to distinguish benign from malignant tissue using very 'easy' cases. This has been completed with good sensitivity and specificity and more challenging specimens are now being assessed. This has progressed to more challenging cases, but the technology failed to distinguish outcome. The second part of the proposal focused on application of this technology to cytology specimens. Due to some difficulties in obtaining optimal material for breast cytology, urine cytology specimens have been used as a model system. Using this model, we have been able to distinguish benign from malignant cells with high accuracy and even shown good accuracy in adjudication of 'atypical' specimens.

DTIC

*Breast; Cancer; Mammary Glands; Morphology; Spectrum Analysis*

**20050216468** Mount Sinai Medical Center, New York, NY USA

**Gene-Environment Interaction and Breast Cancer on Long Island, NY**

Teitelbam, Susan L.; May 1, 2005; 7 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0507

Report No.(s): AD-A436899; No Copyright; Avail.: CASI: A02, Hardcopy

This research project will build upon the Long Island Breast Cancer Study Project (LIBCSP), a large population based, case-control study of the environment and breast cancer. Participants completed an in-person interviewer-administered interview, donated blood and urine samples and had home environment samples (dust, soil and water) collected. For this study, 200 cases and 200 controls who donated urine samples will be selected and their urine samples will be analyzed for a panel of EE biomarkers. In addition, these same women will be screened for polymorphisms in both the estrogen receptor alpha and beta genes. Breast cancer risk in relation to the combination of these multiple EE exposures and gene-environment interaction will be investigated using sophisticated statistical methods such as hierarchical regression models and factor analysis.

Additionally, a pilot investigation of the correlation between EE levels in house dust and urinary biomarker levels will be conducted. Currently, samples for this study have been selected and the laboratory analyses are underway. Results of the proposed research project will be of enormous public health relevance since they may advance our knowledge of modifiable breast cancer risk factors and newly identified EEs, thereby providing information that is essential for primary prevention.
DTIC
*Blood; Breast; Cancer; Epidemiology; Genes; Long Island (Ny); Mammary Glands; Sampling*

**20050216469** Duke Univ., Durham, NC USA
**Definition of the Molecular Mechanisms Which Distinguish Between Selective Estrogen Receptor Modulators (SERMs) and Full Antiestrogens**
Huang, Huey-Jing; May 1, 2005; 15 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0371
Report No.(s): AD-A436900; No Copyright; Avail.: CASI: A03, Hardcopy

Tamoxifen, a SERM (Selective Estrogen Receptor Modulator), is the most commonly used endocrine treatment for all stages of breast cancer. However, progression from tamoxifen sensitivity to tamoxifen resistance occurs in a substantial portion of the tumors. Full antiestrogens, such as ICI 182,7&0, are currently used as the second line therapy after-failure of long-term tamoxifen therapy. To facilitate the design and characterization of more appropriate therapeutic agents for endocrine therapy of breast cancer, it is very important to understand the functional mechanisms that distinguish full antiestrogens from SERMs. It has been shown that estrogen receptor (ER) can recruit corepressors NCoR (nuclear receptor corepressor) and SMRT (silencing mediator of retinoid and thyroid receptors) in the presence of tamoxifen, suggesting a possible role of N-CoR/SMRT in mediating the antagonist activity of tamoxifen. However, it is not clear if apo-ER or ICI 182,780-bound ER can recruit NCoR/SMRT or other corepressors. To investigate the possible involvement of different corepressors in the actions of different antiestrogens and unliganded ER, we have constructed a focused phage display library which contains the 'CoRNR box' motif, a binding site important for N-CoR/SMRT to interact with the nuclear receptors. In this report, we have shown that screening of the CoRNR box library with ER treated with no hormone or different antiestrogens led to the isolation of peptides that differentially interact with apo-ER, tamoxifen bound ER, or ICI 182,780-bound ER. These interactions observed in vitro have also been confirmed in vivo using a mammalian two-hybrid assay. Using a series of ER mutants, we were able to show that these CoRNR box-containing peptides have different binding characteristics from the peptides that contain the coactivator LXXLL motif.
DTIC
*Breast; Cancer; Estrogens; Mammary Glands; Modulators; Molecular Properties*

**20050216470** Purdue Univ., West Lafayette, IN USA
**Chemical Probes of Rapid Estrogen Signaling in Breast Cancer Treatment and Chemoprevention**
Weatherman, Ross V.; Apr. 1, 2005; 43 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0447
Report No.(s): AD-A436901; No Copyright; Avail.: CASI: A03, Hardcopy

Estrogens and antiestrogens are important in the development, treatment and possible chemoprevention of breast cancer. Rapid estrogen responses happen too quickly to involve transcription and there is much debate as to the mechanisms by which they operate and their relevance to breast cancer. This proposal aims to design and use selective chemical probes to answer those questions. Progress has been made in the synthesis of a screening panel to probe the role of rapid estrogen responses in breast cancer proliferation and resistance chemotherapy. We have generated new, potent compounds based on tamoxifen and estradiol core structures including endoxifen, a compound since discovered to be a major bioactive metabolite of tamoxifen and possibly a predictor of successful tamoxifen response in patients. We have shown for the first time that a number of SERMs like tamoxifen and raloxifene can activate ERK phosphorylation identically to estradiol. We have also generated the first tamoxifen-polymer conjugate that is capable to binding to estrogen receptor in vitro as well as activate rapid responses in breast cancer cell lines. Ongoing studies will use these compounds to better understand rapid estrogen signaling and make better therapeutic and chemopreventive agents for breast cancer.
DTIC
*Breast; Cancer; Chemotherapy; Estrogens; Mammary Glands*

**20050216471** University of Southern California, Los Angeles, CA USA

**Pharmacoligcal and Behavioral Enhancement of Neuroplasticity in the MPTP-Lesioned Mouse and Non-Human Primate**

Petzinger, Giselle M.; Jakowec, Michael W.; May 1, 2005; 96 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0444

Report No.(s): AD-A436902; No Copyright; Avail.: CASI: A05, Hardcopy

The purpose of this proposal is to investigate the molecular mechanisms involving pharmacological and behavioral (exercise) enhanced neuroplasticity of the injured basal ganglia. Our central hypothesis is that exercise and pharmacological intervention specifically the administration of a D2 dopamine receptor agonist enhances neuroplasticity by modulating glutamate-dopamine interactions. The following proposal has two complementary components using two animal models to address the molecular mechanisms underlying exercise- and pharmacologically-enhanced neuroplasticity. Using the MPTP C57BL/6 mouse Component One will test the hypothesis that exercise enhances plasticity of the MPTP-injured basal ganglia through glutamate by modulating dopamine biosynthesis. This hypothesis will be tested through changes in dopamine, and proteins involved in dopamine biosynthesis and uptake (tyrosine hydroxylase and dopamine transporter) and changes in glutamatergic synapses and receptor subtype. This hypothesis will be further tested through determining whether exercise-enhanced neuroplasticity may be attenuated with a glutamate antagonist. Using the MPTP lesioned non-human primate Component Two will test the hypothesis that the administration of a D2 receptor agonist (Pramipexole) enhances neuroplasticity of the MPTP-injured basal ganglia through its effect on pre- and post-synaptic dopamine biosynthesis, uptake and receptor expression as well as glutamatergic synapses. This hypothesis will be tested through changes in dopamine and its metabolites, proteins involved in dopamine biosynthesis, uptake, and storage (tyrosine hydroxylase, dopamine transporter, and vesicular monoamine transporter), changes in dopamine receptor subtypes and their respective neuropeptides, and changes in glutamatergic synapses.

DTIC

*Augmentation; Cells (Biology); Ganglia; Lesions; Mice; Nervous System; Pharmacology; Primates*

**20050216472** Harvard Medical School, Boston, MA USA

**BRCA1 Protein Complexes: Dynamic Changes and Functions Important in Breast Cancer**

Horwitz, Andrew A.; Apr. 1, 2005; 11 pp.; In English

Contract(s)/Grant(s): W81XWH-04-0371

Report No.(s): AD-A436903; No Copyright; Avail.: CASI: A03, Hardcopy

In the past year, I have made substantial progress towards completion of the tasks outlined in my Statement of Work. I have established a variety of stable cell lines, conducted preliminary purifications, and tested the functions of the BRCA1/BARD1 complex in in vitro assays for ubiquitination and transcription.

DTIC

*Breast; Cancer; Diseases; Genes; Genetics; Mammary Glands; Proteins*

**20050216473** Texas Univ., Austin, TX USA

**Genome-Wide Chromosomal Targets of Oncogenic Transcription Factors**

Iyer, Vishwanath R.; Apr. 1, 2005; 17 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0472

Report No.(s): AD-A436905; No Copyright; Avail.: CASI: A03, Hardcopy

The overall objective of this Idea Award was to develop a novel method for identifying the direct transcriptional targets of oncogenic transcription factors that are important in breast cancer. We have developed STAGE (Sequence Tag Analysis of Genomic Enrichment) as a novel genome-wide method for identifying the chromosomal targets of DNA binding proteins in any sequenced genome. STAGE is based on high-throughput sequencing of concatamerized tags derived from DNA associated with transcription factors that is isolated by chromatin immunoprecipitation. The application of STAGE to oncogenic transcription factors involved in breast cancer can help elucidate their role in gene regulatory networks underlying the disease. We have used STAGE to identify several novel targets of E2F4 in human cells. E2F4 is a transcription factor that is a member of the E2F family of transcription factors that is important in cell proliferation. We have verified many of the novel targets we predicted by STAGE using independent means such as promoter specific PCR and ChIP-chip. We have successfully carried out chromatin immunoprecipitation for c-myc and ER in human cells and are currently analyzing those samples using STAGE.

DTIC

*Breast; Cancer; Carcinogens; Chromosomes; Enrichment; Genome; Mammary Glands; Targets; Tumors*

**20050216474** Tulane Univ., New Orleans, LA USA
**Retroelements and Genetic Instability in Breast Cancer**
Belancio, Victoria P.; Deininger, Prescott L.; Apr. 1, 2005; 23 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0597
Report No.(s): AD-A436906; No Copyright; Avail.: CASI: A03, Hardcopy

LINE1 is a mammalian retroelement that contributes to genomic instability. The full extent of LINE-1 mobility in somatic tissues and tumors is not known. L1 expression is extremely low in most differentiated cells except for testis, but it is significantly elevated in breast malignancies. This suggests that posttranscriptional mechanisms are involved in limitation of L1 expression. We demonstrated that the use of the poly A sites located within the L1.3 genome limits the amount of full-length L1.3 mRNAs. L1 polyA signals can be functional when fragments of L1.3 element are inserted into 3' UTRs of genes. This unique attenuation mechanism helps to minimize the rate of L1 retrotransposition, but may also increase the negative impact of these events on the genome after their insertion. Human EST database searches suggest that the polyA signals may also play a role in regulation of L1 expression in a tissue and/or tumor specific manner with breast cancer tissues supporting the least efficient L1 polyadenylation. The EST data are strengthened by significant differences in the L1 RNA profiles between transiently transfected breast cancer and nonbreast cancer cell lines. These observations suggest a potential global change in the mechanism of polyadenylation process upon malignant transformation of mammary gland.
DTIC
*Breast; Cancer; Genes; Genetics; Genome; Mammary Glands*

**20050216475** New Mexico Univ., Albuquerque, NM USA
**University of New Mexico Undergraduate Breast Cancer Training Program: Pathway to Research Careers**
Griffith, Jeffrey K.; Apr. 1, 2005; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0513
Report No.(s): AD-A436908; No Copyright; Avail.: CASI: A03, Hardcopy

We have established a three-phase training program to motivate talented undergraduate students, especially students from under-represented Southwestern minorities, to pursue careers in breast cancer research. Phase I provides a well-rounded introduction to the theory and practice of breast cancer research. This phase includes inquiry-based tutorials that integrate key concepts in normal and cancer breast biology; visits to specialized laboratories that utilize state-of-the-art technologies for breast cancer research; structured interactions with surgeons, medical oncologists and their patients, radiologists and pathologists in settings that introduce the clinical realities of breast cancer diagnosis and treatment; seminars presented by the Program's research mentors; a weekly, journal club that introduces current issues in breast cancer research while developing presentation and critical reading skills and a research project supervised by one of the program's mentors. During phases II and III, trainees have opportunities to continue their research projects throughout their senior years, and then in graduate school, respectively. The success of the program will be evaluated in the short term by the satisfaction of the trainees and mentors, and in the longer term by the number of trainees that goes on to graduate studies in breast cancer-related programs.
DTIC
*Breast; Cancer; Education; Mammary Glands; Medical Science; Occupation; Schools*

**20050216476** Pennsylvania Univ., Philadelphia, PA USA
**Immunotherapy of Breast Cancer Using Novel Her2/neu-Based Vaccines**
Maciag, Paulo; Paterson, Ivonne; Apr. 1, 2005; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0545
Report No.(s): AD-A436909; No Copyright; Avail.: CASI: A02, Hardcopy

NY-ESO-1 is expressed in 40% of malignant breast tumors and is a promising antigen for breast cancer immunotherapy. Recombinant Listeria monocytogenes expressing specific target antigens is a highly effective vaccine vector, inducing cell-mediated immunity capable of regressing established tumors. The full-length and partial sequences (residues 1-108, 101-156 and 148-180) of NY-ESO-1 were cloned as fusion genes with listeriolysin-O (LLO) and expressed in Listeria. Secretion of the fusion proteins from constructs containing the hydrophobic C-term region of NY-ESO-1 was poor or absent. Vaccination of mice with Listeria expressing either the full-length NY-ESO-1 or its fragments did not significantly impact tumor growth of the mammary carcinoma 4T1 cell line, which was engineered to express NY-ESO-1. We observed that these Listeria constructs were deficient in intracellular proliferation in murine J774 cells, and are highly attenuated in mice. New constructs were made, fusing NY-ESO-1 to the LLO PEST sequence only, which is an immunologically important domain in LLO. The PEST-NY-ESO-1 constructs showed a better proliferation in J774 cells between B and 24 hours. We are also trying to express

NY-ESO-1 under the control of the listerial actA promoter, which is activated in the cytosol of the infected cell. These new constructs are currently being tested in animal studies.
DTIC
*Breast; Cancer; Mammary Glands; Vaccines*

**20050216478** Winston-Salem State Univ., Winston-Salem, NC USA
**Mechanism of FADD-DN-Induced Apoptosis in Normal Breast Cells**
Thomas, Lance R.; Apr. 1, 2005; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0611
Report No.(s): AD-A436911; No Copyright; Avail.: CASI: A02, Hardcopy

Normal cells undergo apoptosis in response to inappropriate growth signals or the lack of overt survival signals. Tumor cells possess defects in apoptosis regulatory pathways and do not undergo apoptosis in these situations. Because FADD is an essential component of receptor mediated apoptosis, a dominant-negative version (FADD-DN) is able to block apoptosis induced by death ligands in many cell lines. While studying FADD signaling, our laboratory made the surprising discovery that FADD-DN can induce apoptosis in normal breast epithelial cells. Because FADD-DN induces apoptosis in normal but not cancerous breast epithelial cells, we hypothesize that FADD-DN interacts with one or more proteins expressed in breast epithelia. Since breast tumor cells do not die in response to FADD- DN, the potential FADD-DN interacting partners are likely to be involved in carcinogenesis. Since defects in apoptotic pathways are a prerequisite to cancer, understanding the nature of these defects may bring about potential treatments. FADD-DN signaling presents a novel apoptotic pathway that is fundamental in normal breast epithelia, but not breast cancer cells. Components of this pathway may identify potential therapeutic targets that allow the reactivation of this apoptotic response in cancer cells.
DTIC
*Apoptosis; Breast; Cancer; Mammary Glands*

**20050216479** Winston-Salem State Univ., Winston-Salem, NC USA
**A Novel Apoptosis Pathway that is Defective in Early Breast Cancer**
Cramer, Scott; Apr. 1, 2005; 54 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0612
Report No.(s): AD-A436912; No Copyright; Avail.: CASI: A04, Hardcopy

This grant was awarded to Dr. A. Thorburn but transferred to Dr. S. Cramer when Dr. Thorburn left Wake Forest University in Sept. 2004. The project examines a novel cell death pathway that is induced by the death domain of the adaptor protein FADDD (FADD-DD) FADD-DD-induced cell death occurs only in normal primary epithelial cells (from the breast or prostate) and can be inhibited when epithelial cells are immortalized e.g. by the expression of the telomerase catalytic subunit and the large and small T/t antigens from SV40 virus. The objectives of the project were to determine if T/t antigens cause resistance on their own and to determine how they do so. We found that Large T antigen was sufficient to confer selective resistance to this cell death pathway but that this resistance was not caused by the known activities of T antigen that are involved in immortalization including p53 inactivation or Rb inactivation. Moreover, we were able to expand our studies beyond that proposed in the grant and showed that the FADD-DD cell death pathway occurs in genetically-defined mouse epithelial cells and is selectively inactivated by spontaneous immortalization and that the cell death pathway involves both apoptosis and autophagy.
DTIC
*Antigens; Apoptosis; Breast; Cancer; Defects; Mammary Glands*

**20050216480** Burnham Inst., La Jolla, CA USA
**BARC: A Novel Apoptosis Regulator**
Jin, Can; Zhang, Hong; Chae, Han J.; Reed, John C.; Jul. 1, 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9096
Report No.(s): AD-A436913; No Copyright; Avail.: CASI: A02, Hardcopy

Breast cancers arise due to an imbalance in cell production relative to cell turnover, resulting in a net accumulation of abnormal cells. Cell turnover is normally achieved through programmed cell death, also known as apoptosis. Effects in apoptosis occur in breast cancers and other types of malignancies, making tumor cells difficult to kill by chemotherapy, hormonal therapy, and radiation. Restoring function of cell death pathways is a strategy for improving treatment of breast cancer. This project focused on two anti-apoptotic proteins discovered by our laboratory, BI-1 and BI-2 (also known as BAR).

The findings provided insights into the mechanism by which these proteins protect cancer cells from specific types of death stimuli. Proof of concept experiments demonstrated that interfering with expression or function of BI-2 (BAR) restores sensitivity of tumor cells to the killing mechanisms employed by immune cells, such as activators of the TNF-family receptor member Fas (CD95). We also observed that BI-1 protects cells from cell death induced by ER stress reagents, and regulates homeostasis of Ca(2+) in the ER. We found that regulating ER ca(2+) homeostasis is a common way for anti-apoptotic proteins such as Bcl-2 and Bcl-xL to protect cells. Green tea compounds that inhibit Bcl-2 can restore normal ER calcium regulation. These findings provide new insights into cell death regulation in breast cancer.
DTIC
*Apoptosis; Breast; Cancer; Mammary Glands; Regulators*

**20050216481** Pennsylvania State Univ., University Park, PA USA
**Roles of Osteonectin in Breast Cancer Metastasis to Bone**
Campo, Dianalee A.; May 1, 2005; 21 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0535
Report No.(s): AD-A436915; No Copyright; Avail.: CASI: A03, Hardcopy

The focus of this study is to gain insight into the role(s) of osteonectin in the preferential metastasis of breast cancer cells to bone. Osteonectin was isolated from conditioned media of several cell lines including breast cancer (MDA-MB-435, MDA-MB-468), osteoblasts (hFOB1.19), non-neoplastic breast epithelial (hTERT-HME1), and vascular endothelial cells isolated from bone biopsies (HBME-1). Analysis of translational and post-translational properties of osteonectin from these five sources revealed that a unique configuration of the protein does not exist; thus there is no detectable chemotactic isoform. Osteonectin increased motility of the breast cancer cells (MDA-MB-231) on culture plate surfaces. However, in transwell migration assays the MDA-MB-231 cells were not attracted to bone-derived osteonectin. Bone extracts from both wild-type and osteonectin-null mice had a profound stimulatory effect on migration in transwell chambers. We conclude that osteonectin does not stimulate breast cancer migration and therefore is not a chemotactic factor in the development of skeletal metastases. However, osteonectin enhances random undirected motility of breast cancer cells and therefore likely has a supportive role in breast cancer metastasis.
DTIC
*Bones; Breast; Cancer; Mammary Glands; Metastasis*

**20050216482** Beth Israel Deaconess Medical Center, Boston, MA USA
**Effects of Csk Homologous Kinase Overexpression on HER2/Neu-Mediated Signal Transduction Pathways in Breast Cancer Cells**
Zagozdzon, Radoslaw; Avraham, Hava; Apr. 1, 2005; 62 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0302
Report No.(s): AD-A436916; No Copyright; Avail.: CASI: A04, Hardcopy

Our proposal aimed to investigate the potential function of CHK as a signal transducer in the signaling pathway from HER2/Neu receptor. Our major accomplishments are as follows: 1) a) We described the effects of CHK on the HER2/Neu signal transduction towards RAFTX and kt kinases. b) We have identified modulation by CHX of CXCR4 expression in breast cancer cells. 2) a) We described the correlation of the binding affinity of CHK to HER2/Neu with the effectiveness of the inhibition Cf Src kinase by CHIC. b) We evaluated the role of CHIC in the development of Neu induced mammary tumors in transgenic mice. 3) We generated CHIC protein derivatives and evaluated their usefulness as potential tools for protein therapy of breast cancer in vitro. Our results confirm the notion that CHIC is a signal transduction modulator HER2/Neu-mediated pathway in breast cancer cells. However, the effects elicited by CHIC are ambiguous. CHIC is capable of elic iting both inhibitory and stimulatory effects in breast cancer cells. The results obtained in transgenic mouse model do not reaffirm the potential role of CHK in formation of Neu-induced mammary carcinomas. However, in the inhibitory effects of CHIC suggest potential role of CHIC in breast cancer invasion and metastasis. These findings warrant further investigations.
DTIC
*Breast; Cancer; Genetics; Mammary Glands; Transferring*

**20050216484** Texas Univ., Houston, TX USA
**The Role of Sigma Receptor in Breast Cancer**
Pusztai, Lajos; Apr. 1, 2005; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0456
Report No.(s): AD-A436919; No Copyright; Avail.: CASI: A02, Hardcopy

We completed specific tasks #1 and #2 and have published the results (Breast Cancer Res Treat 87:205-214, 2004). We also extended the SiR mRNA correlative studies to gene expression data obtained from 600 breast cancers. There continued to be no consistent correlation between SiR mRNA expression and prognosis or lymph node or estrogen receptor status. However the data confirmed frequent mRNA expression of SiR in breast cancer. Progress has been made in task #3. Eleven breast cancer cell lines were screened for SiR expression with Western blot and one cell line T47D were negative. This cell line was successfully transfected with SIR using PcDNA 3.1 construct. No change in cell proliferation, apoptosis or sensitivity to chemotherapy was seen at baseline or after SiR ligand (SKF 10047) exposure. This was consistent with the negative results previously observed in SiR-positive cell lines treated with SKF 10047. SiR appears to play a role in regulating cell migration. SKF 10047 inhibits migration of MDA 231 and MDA 435 cells in vitro. Gene expression analysis after exposure to SKF 10047 suggests that this compound inhibits small UTPase-mediated signaling pathways. We are currently examining the molecular mechanism of SiR mediated inhibition of cell migration by measuring the activity of Rho, Rac and CDC42 before and after SKF 10047 exposure. We are also in the process of developing SiR knock down cells by using siRNA technology.
DTIC
*Breast; Cancer; Mammary Glands; Sense Organs*

**20050216485** California Univ., Los Angeles, CA USA
**Angiogenesis Inhibitors in Breast Cancer**
Luque, Alfonso; Iruela-Arispe, Luisa; Apr. 1, 2005; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0329
Report No.(s): AD-A436920; No Copyright; Avail.: CASI: A03, Hardcopy

ADAMTSl is a secreted metalloprotease with a disintegrin-like motif and three type-1 thrombospondin domains. ADAMTS1 has been shown to inhibit both endothelial cell proliferation in vitro, as well as angiogenesis in vivo. However, inactivation of the catalytic domain of this protease suppressed its inhibitory activity. Hence, it was important to identify substrates for ADAMTS1 to gain insight into its mechanism of action. We have identified Thrombospondin-1 (TSP-1) as a novel substrate of ADAMTS-1. This study demonstrated that incubation of TSP-1 with ADAMTS-1 results in a single cleavage adjacent to the procollagen homology domain. Proteolysis by ADANTS-1 releases a C-terminal fragment from a trimerized N-terminal fragment. Analysis of TSP-1 within T47D breast carcinoma tumors reveals that ADAMTS-1 is able to cleave TSP-1 in vivo. Studies using recombinant TSP-1 fragments demonstrated that such fragments are active and possess anti-migratory, anti-proliferative activity (Hizie and Murphy-Ulirich, 2004; Iruela-Arispe et al., 1999; Murphy-Ulirich et al., 1993). We predict that cleavage of TSP-1 by ADAMTS-1 results in the release of bioactive TSP fragments with the potential to suppress angiogenesis. Overall these findings predict an additional mechanism for the inhibitory effects of ADAMTS-1 in tumor angiogenesis.
DTIC
*Angiogenesis; Breast; Cancer; In Vivo Methods and Tests; Inhibitors; Mammary Glands*

**20050216486** Wisconsin Univ., Madison, WI USA
**Regulated GDNF Delivery In Vivo using Neural Stem Cells**
Svendsen, Clive N.; Apr. 1, 2005; 38 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0122
Report No.(s): AD-A436921; No Copyright; Avail.: CASI: A03, Hardcopy

In this progress report we show that human neural progenitor cells have been grown in culture, modified to release the potent growth factor GDNP, and survive transplantation into both the rodent and primate brain. In addition we have developed new PET techniques for monitoring the brain following GDNP delivery and produced new more efficient vectors for the regulation of GDNP. We feel that this progress is leading towards the potential use of the cells in clinical trials for patients and army veterans with Parkinson's disease.
DTIC
*Brain; In Vivo Methods and Tests; Nervous System; Stem Cells*

**20050216487** South Carolina Univ., Columbia, SC USA
**Effects of Naturally-Occurring Estrogen-Fatty Acid Esters on Mammary Cell Growth and Carcinogenesis in Female Rats**
Lee, Won J.; Jun. 1, 2004; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0567
Report No.(s): AD-A436922; No Copyright; Avail.: CASI: A02, Hardcopy

Research work completed thus far: (1) We have already evaluated the stimulatory effects of estradiol-17 beta-stearate on the growth of mammary vs. uterine cells in ovariectomized female Sprague-Dawley rats. Their effects have been compared with the effects of unesterified estradiol. (2) We have also determined the circulating levels of prolactin, FSH, and LH in all the animals. Right now we are still studying the growth-stimulatory effects of estradiol-17 beta-stearate and unesterified estradiol in pituitary, thymus, and liver of female rats. (3) We have completed comparing the carcinogenic activity of estradiol-17 beta-stearate and estradiol mammary vs. uterine cells in female ACI rats. We have also compared and correlated the differential carcinogenic activity of these two classes of estrogens with their differential growth stimulatory effects in various target organs. The results of our studies sheds light on the physiologic and pathophysiologic roles of endogenously-formed estrogen-fatty acid esters in the body. Also, our findings may lead to the development of new strategies to mammary cancer prevention through inhibition of esterase-catalyzed release of bioactive estrogen.
DTIC
*Breast; Cancer; Carcinogens; Cell Division; Esters; Estrogens; Fatty Acids; Females; Mammary Glands; Rats; Tumors*

**20050216488** Texas Univ. Health Science Center, San Antonio, TX USA
**The Roles of the BLM Helicase in Homologous Recombination and DNA Repair**
Bussen, Wendy L.; May 1, 2005; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0410
Report No.(s): AD-A436923; No Copyright; Avail.: CASI: A02, Hardcopy

In humans, homologous recombination (HR) represents a major pathway for the repair of DNA double strand breaks (DSBs), harmful lesions that can lead to genomic instability, cell death, or tumorigenesis. There is an emerging role in the HR pathway for the RecQ family of helicases. Mutation of the BLM protein, one of five RecQ helicases in humans, causes Bloom's syndrome, a rare autosomal recessive disease in which patients are predisposed to cancer, including breast cancers. Cells isolated from these patients display genomic instability and hyper-recombination. BLM protein contains a robust ATP hydrolysis activity and the ability to unwind several complex DNA structures believed to arise during HR repair, and it interacts with components of the recombination machinery, including the Rad51 recombinase. These findings suggest that BLM functions to regulate the HR pathway; however, its mechanism of action remains elusive. In the current study, we characterize the effects of purified BLM protein on the Rad51 presynpatic filament, a key intermediate in the HR repair pathway. We also address the importance of ATP hydrolysis in the role of BLM. This study begins to elucidate how BLM functions in the HR pathway, and through this role it may act to maintain genome stability and prevent cancer formation.
DTIC
*Deoxyribonucleic Acid; Genome; Maintenance; Recombination Reactions*

**20050216490** Duke Univ., Durham, NC USA
**Inhibition of Nitric Oxide Synthase Through Depletion of Its Cofactor Tetrahydrobiopterin as a Novel Strategy for Breast Cancer Anti-Angiogenic Therapy**
Batinic-Haberle, Ines; Sep. 1, 2004; 53 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0731
Report No.(s): AD-A436925; No Copyright; Avail.: CASI: A04, Hardcopy

We showed previously that low molecular weight water-soluble antioxidant, manganese (III) tetrakis (N- ethylpyridinium-2-yl) porphyrin (Mn(exp III)TE-2-PyP(exp 5+) is effective catalyst for the elimination of reactive oxygen and nitrogen species in different rodent models of oxidative stress injuries. We further showed that this porphyrin can oxidize cellular reductants, among them redox cofactor of nitric oxide synthase (NOS), tetrahydrobiopterin, BR(sub 4). It has been well- established that nitric oxide is essential for angiogenesis, stimulating endothelial cell proliferation in vitro. Tumors, being under oxidative stress, express iNOS, which leads to greatly increased levels of NO up to muM levels. Increased levels of BH(SUB 4)(sub 4) were thus required, and, reportedly, parallel increased NO production. When tetrahydrobiopterin is depleted NOS is inhibited and synthesizes superoxide rather than nitric oxide. We are testing here the hypothesis that depletion of BH(SUB 4) by MnTE-2-PyP(exp 5+) would inhibit NOS, decrease NO levels and thus inhibit angiogenesis. Within a scope of the project (Specific Aim 1), we showed that MnTE-2-PyP(exp 5+), when given to mice caused drastic decrease in tumor vasculature density of 4Tl mammary carcinoma. We also defined the thermodynamics and kinetics of BR(SUB 4) reaction with MnTE-2-PyP(exp 5+) (Batinic-Haberle et al, 20024), and adopted the HPLC method for measuring BR(SUB 4) and its oxidation product, 7,8-dihydrobiopterin in tumors.
DTIC
*Angiogenesis; Blood Vessels; Breast; Cancer; Depletion; Manganese; Nitric Oxide; Oxygen; Therapy*

**20050216491** Pennsylvania Univ., Philadelphia, PA USA
**Structural Studies of the BRCA1-Associated Human SWI/SNF Complex**
Holbert, Marc A.; Apr. 1, 2005; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0630
Report No.(s): AD-A436926; No Copyright; Avail.: CASI: A03, Hardcopy

Mutations in the tumor suppressor gene, BRCA1, account for 45% of families with a high incidence of breast cancer and the majority of families with high incidences of both breast and ovarian cancers. Recent data has shown BRCA1 to be associated to be associated with a human SWI/SNF complex, serving to link breast cancer to chromatin remodeling (3). Current evidence points to the idea that BRCA1 works through SWI/SNF; therefore, a molecular understanding of the SWI/SNF complex and other human chromatin remodeling complexes will offer insight into the biology of BRCA1. The central catalytic ATPase subunit of SWI/SNF is BRG1; the central catalytic subunit of a related human chromatin-remodeling complex, NURF, is SNF2H. Initially, crystallization and X-ray structural determination of the core AThase domain in addition to the full-length proteins was undertaken with much difficulty. Currently crystals have been grown for the AThase domain of Brgl and crystallization trials are underway for the related full-length human protein, SNF2H. Initial purification and expression of a SWI/SNF functional core and the SNF2H containing NURF complex were unsuccessful. The conserved core ATPase domain was identified in two organisms that are more primitive. A recombinant homologous ATPase domain from both organisms was expressed, purified, and three-dimensional crystals were grown. Optimization and refinement of these initial crystals was underway to obtain X-ray diffraction quality crystals for structural determination of these homologous archaeal ATPase domains, but were derailed by a recently published X-ray structure of the Sulfolobus sulfataricus SWI2/SNF2 ATPase core and its complex with DNA (18).
DTIC
*Breast; Cancer; Genes; Mammary Glands; Ovaries*

**20050216492** California Univ., Irvine, CA USA
**Combined Biology and Bioinformatics Approaches to Breast Cancer**
Lu, Zhongxian; Apr. 1, 2005; 21 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0483
Report No.(s): AD-A436927; No Copyright; Avail.: CASI: A03, Hardcopy

We identified a novel transcription factor LMO4 and found that LMO4 is highly expressed in breast epithelial cells and is related to cell proliferation and/or invasion in vivo. Because these cellular features are associated with breast carcinogenesis and because LMO4 is overexpressed in more than 50% of breast cancer cases, we hypothesize that LMO4 may play roles in oncogenesis of breast epithelial cells by regulating proliferation, invasion and/or other cellular features. As the initial step of the whole projects, we established several permanent cell line (including breast normal epithelial cells and cancer cells), which stably overexpress LMO4 protein or express LMO4 RNAi to delete LNO4 protein. Using these cell lines. We will analyze the biological effects of LMO4 on cell proliferation, invasion and other cellular features in vitro, and screen the target gene of LMO4 by gene microarray. We have obtained some exciting results and found that LMO4 modulates TGF-beta signaling, which plays the crucial roles in both development and cancer. Our results show LMO4 associated with TGF-beta signaling target gene promoter by interacting with Smad proteins, and enhanced the inhibitory effect of TGF-beta on cell proliferation of mammary gland epithelial cells. These results strengthen the hypothesis that LMO4 may contribute to the oncogenesis of breast tissue and indicates that our whole work will play a role in solving the breast cancer problem on the support of the Army.
DTIC
*Breast; Cancer; Mammary Glands; Proteins; Regeneration (Physiology)*

**20050216493** California Univ., San Francisco, CA USA
**DNA Damage and Genomic Instability Induced by Inappropriate DNA Re-Replication**
Green, Brian M.; Apr. 1, 2005; 37 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0409
Report No.(s): AD-A436928; No Copyright; Avail.: CASI: A03, Hardcopy

Chromosomal rearrangements and changes in copy number at various genomic loci are hallmarks of cancer cells and may be very early steps in tumorigenesis. The origins of genomic insults are poorly understood and this proposal aims to characterize one potential source of genomic instability, inappropriate DNA re-replication. In a normal eukaryotic cell cycle, the chromosomal DNA of a cell is replicated once, and only once, during S phase to ensure that each daughter cell receives exactly one complement of genomic material. By perturbing the regulation of several proteins involved in replication initiation, our laboratory has been able to conditionally induce varying amounts of re-replication in yeast cells. In this reporting

period, we have shown that re-replication induces a rapid and significant decrease in cell viability and a cellular DNA damage response. Strikingly, we have observed DNA damage in the absence of a classical replication stress response. These results indicate that re-replication generates DNA damage, and raise the possibility that this could in turn lead to genomic instability.
DTIC
*Cancer; Damage; Deoxyribonucleic Acid; Genome*

**20050216494** Minnesota Univ., Minneapolis, MN USA
**Dietary Fat, Eicosanoids and Breast Cancer Risk**
Raatz, Susan K.; Apr. 1, 2005; 16 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0448
Report No.(s): AD-A436929; No Copyright; Avail.: CASI: A03, Hardcopy

Epidemiological and animal studies associate high levels of dietary fat with increased risk of sex hormone mediated cancer, such as breast cancer. A high intake of total fat and omega-6 fatty acids increases risk while omega-3 (n3) fatty acids are associated with risk reduction. Our proposal is testing the effect of dietary fat and fatty acids on sex hormone concentrations in post-menopausal women. The objectives are to evaluate 1) the effects of total fat and n3 intake on plasma and urinary sex hormone levels, 2) the relationship between plasma fatty acids and plasma and urinary sex hormones, and 3) the effects of total fat and n3 on the association between sex hormone concentrations and urinary prostaglandin E2 (PGE2). We are performing a randomized, Latin square-designed controlled feeding study testing High Fat, Low Fat, and Low Fat + n3 diets, each of 8 week duration. In order to determine the estrogenic effects of the diets, sex hormone endpoints will be measured reflecting availability, metabolism, and action. Plasma fatty acids fractions and urinary PGE2 will be measured to evaluate mechanistic effects. At present 14 women have been screened and 5 are currently enrolled in the trial. No data has yet been generated.
DTIC
*Breast; Cancer; Diets; Fats; Fatty Acids; Hormones; Mammary Glands; Risk; Sex*

**20050216497** Stanford Univ., Stanford, CA USA
**The Role of Replication in Activation of the DNA Damage Checkpoint**
Byun, Tony S.; Mar. 1, 2005; 27 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0311
Report No.(s): AD-A436935; No Copyright; Avail.: CASI: A03, Hardcopy

The ATR-dependent DNA damage response pathway can respond to a diverse group of lesions as well as inhibitors of DNA replication. Using the Xenopus egg extract system, we show that lesions induced by UV irradiation and cis-platinum cause the functional uncoupling of MCM helicase and DNA polymerase activities, an event previously shown for aphidicolin. Inhibition of uncoupling during elongation with inhibitors of MCM7 or Cdc45, a putative helicase cofactor, results in abrogation of Chk1 phosphorylation, indicating that uncoupling is necessary for activation of the checkpoint. However, uncoupling is not sufficient for checkpoint activation, and DNA synthesis by Polalpha is also required. Finally, using plasmids of varying size, we demonstrate that all of the unwound DNA generated at a stalled replication fork can contribute to the level of Chk1 phosphorylation, suggesting that uncoupling amplifies checkpoint signaling at each individual replication fork. Taken together, these observations indicate that functional uncoupling of MCM helicase and DNA polymerase activities occurs in response to multiple forms of DNA damage and that there is a general mechanism for generation of the checkpoint-activating signal following DNA damage.
DTIC
*Activation; Damage; Deoxyribonucleic Acid; Inhibitors; Lesions*

**20050216498** Michigan Univ., Ann Arbor, MI USA
**Significance of Pathways Leading to RhoC Overexpression in Breast Cancer**
Alford, Sharon H.; Merajver, Sofia; Gruber, Stephen; Apr. 1, 2005; 5 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0395
Report No.(s): AD-A436938; No Copyright; Avail.: CASI: A01, Hardcopy

Tumor biology is a recognized determinant of tumor behavior, including growth rate, motility and metastatic potential, and therapeutic resistance. This project was funded to investigate the regulation and expression of an excellent marker for aggressive breast tumors: RhoC-GTPase. When overactive, RhoC transforms mammary epithelial cells into a highly motile and invasive phenotype. We hypothesize that RhoC overexpression may be regulated by the transcription factor NF-kappa B

and that at the same time RhoC is overexpressed the tumor also acquires therapy resistance. The objective of this study is to utilize existing breast cancer cohorts with tumor tissue and treatment response data available to assess the correlation between NF-kappa B and RhoC, individually and in combination, to treatment response. The specific aims of the project are to determine 1) if RhoC and NF-kappa B are correlated; 2) if RhoC and NF-kappa B are associated, individually and in combination, with aggressive breast cancer; and 3) if NF-kappa B and RhoC are associated with therapy resistance. Human subjects review was completed for the project the end of February 2005. Tumor array protocols have been written and pathological specimens are currently being collected. Subjects have been identified and recurrence information has been abstracted.
DTIC
*Breast; Cancer; Mammary Glands*

**20050216499** Queensland Inst. of Tech., Brisbane, Australia
**A Novel Method to Screen for Dominant Negative ATM Mutations in Familial Breast Cancer**
Khanna, Kum K.; Chenevix-Trench, Georgia; Grimmond, Sean; Apr. 1, 2005; 20 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0556
Report No.(s): AD-A436939; No Copyright; Avail.: CASI: A03, Hardcopy

The aim of this proposal is to identify families carrying potentially pathogenic A TM mutations by assaying for ATM kinase activity in cell lines derived from individuals with multiple cases of breast cancer in their family but no pathogenic BR CA1 or BRCA2 mutation (BRCAx' families). We have analysed 252 cell lines established from index cases from BRCAx families for ATM expression and activity. Overall, analysis of the data suggests that impaired activation of ATM can not be used as a screening tool to identify families that carry dominant negative mutation in ATM due to natural variation amongst LCLs. Microarrays have been performed to determine differences in gene expression between heterozygotes or homozygotes for the T7271G mutation against each other and wild type control pools. These data have suggested candidate genes that are altered in their expression in ATMmutation carriers. The validation of this data in carriers of different ATM mutation indicated that the heterozygous carriers of T7271G mutation display a gene expression phenotype that appears identical to carriers of protein truncating mutations in ATM, suggesting that the expression signature may not be specific for this particular mutation in ATM but rather can be used to assess the downstream effects of any germ-line change in the ATM gene.
DTIC
*Breast; Cancer; Mammary Glands; Mutations*

**20050216500** New Jersey Medical School, New Brunswick, NJ USA
**RNA-Binding Proteins as Novel Oncoproteins and Tumor Suppressors in Breast Cancer**
Brewer, Gary; May 1, 2004; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0267
Report No.(s): AD-A436941; No Copyright; Avail.: CASI: A03, Hardcopy

The level of an mRNA depends not only on its rates of synthesis, processing, and transport, but also its rate of turnover. This is particularly important for oncoproteins and cell cycle proteins because their sustained synthesis can favor cell growth rather than differentiation, a hallmark of the neoplastic phenotype. This control is exerted via a balance between the action of at least two RNA-binding proteins, AUF1 and HuR. AUF1 targets the degradation of mRNA like the c-myc proto-oncogene and the cell cycle regulator cyclin D1. By contrast, HuR promotes stabilization of mRNAs. C-myc and cyclin D1 are particularly important in this regard, since both can play a causative role in mammary tumorigenesis. In Phase I, we are examining the effects of AUF1 and HuR expression levels on gene expression in cultured cells. In Phase II, we will assess the roles of AUF1 and HuR in cell growth and tumorigenesis in vivo. During this funding period, we have initiated work on Phase I by creating the expression vectors that will permit either overexpression or knocked-down expression of AUF1 or HuR (e.g. low, medium, or high expression levels) in human breast carcinoma cells. Selection of stably transfected cells has also begun.
DTIC
*Breast; Cancer; Mammary Glands; Proteins; Ribonucleic Acids; Stability; Suppressors; Tumors*

**20050216502** Michigan Univ., Ann Arbor, MI USA
**Identification of Potential Therapeutc Mechanisms for HIP1 Inhibition in Breast Cancer**
Ross, Theodora S.; May 1, 2005; 55 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0534
Report No.(s): AD-A436944; No Copyright; Avail.: CASI: A04, Hardcopy

The first hypothesis we proposed to the DOD was that HIP1 expression is necessary the breast cancer evolution. To test this we generated a cohort of breast cancer prone transgenic mice (MMTV-Myc) that are deficient (n=20) or replete for HIP1 (n=20). Our preliminary data indicates that HIP1 deficiency inhibits the progression of breast tumors in this mouse model. This is similar to our recently published work showing that HIP1 is necessary for the progression of prostate cancer (Bradley et al., 2005 Ca Res). These MMTV-Myc experiments are ongoing and we expect to have results on this first cohort of mice available for report at the Era of Hope meeting in June of this year. The second hypothesis we proposed to the DOD was that dysregulation of endocytosis of EGFR by HIP1 is a mechanism by which HIP1 promotes breast cancer evolution. Indeed, we have found that HIP1 overexpression inhibits the degradation the EGFR (Hyun et al., 2004 J Biol Chem). Showing that HIP1 is necessary for breast cancer progression and modulates key growth factor receptors involved in breast cancer, fuels the idea that HIP1 inhibition has excellent therapeutic potential. We will continue to explore the activity of HIP1 and search for inhibitors of HIP1 that may be useful in the treatment of breast cancer.
DTIC
*Breast; Cancer; Mammary Glands; Mice*

**20050216503** Walter Reed Army Medical Center, Washington, DC USA
**Outcomes of Telehealth Group Psychosocial Interventions for Breast Cancer Patients and Their Partners**
Dunivin, Debra L.; Mar. 1, 2005; 7 pp.; In English
Contract(s)/Grant(s): MIPR-3GD3DN3081
Report No.(s): AD-A436945; No Copyright; Avail.: CASI: A02, Hardcopy

Over 2000 DoD beneficiaries are diagnosed annually with breast cancer and approximately 1500 active duty service members received treatment for breast cancer during the past decade. This has major implications for immediate and long-term readiness of active duty personnel who are themselves diagnosed with breast cancer or experience this diagnosis within their families. An important component of treatment is psychosocial support for both patients with breast cancer and their partners/caregivers. The WRAMC Department of Psychology and Clinical Breast Care Project (CBCP), in collaboration with the American Psychological Association (APA), developed a group psychosocial intervention program specifically designed for military beneficiaries - an 8-week intervention for patients with breast cancer, and a 6-week intervention for their partners. It is especially important that intervention is provided soon after initial diagnosis because the sooner an intervention is provided, the more effective in preventing long-term stress reactions in response to traumatic events. In implementing this program at WRAMC, we have found that attendance is affected by a number of factors, thereby inhibiting the effectiveness of the intervention. Obstacles to a consistent participation in the program include treatment side effects (in approximately 25% of interested women), difficulty traveling to the medical center (approximately 32%), unavailability of psychosocial support services for personnel stationed in remote locations (12%) and TDY of active duty personnel who have returned to duty post-treatment (10%). Use of video-teleconferencing (VTC) in the WRAMC CBCP program has allowed participation by active duty service members stationed where no support services are available, but who are in proximity to a VTC site. Preliminary data provides proof of concept for participation in the WRAMC group program via telecommunications.
DTIC
*Breast; Cancer; Clinical Medicine; Mammary Glands; Medical Services; Military Operations; Patients; Social Factors; Teleconferencing*

**20050216504** Fox Chase Cancer Center, Philadelphia, PA USA
**Developing Inhibitors of Ovarian Cancer Progression by Targeted Disruption of the Gamma-Synuclein Activated Migratory and Survival Signaling Pathways**
Godwin, Andrew K.; Apr. 1, 2005; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0115
Report No.(s): AD-A436948; No Copyright; Avail.: CASI: A03, Hardcopy

Synucleins are a family of highly conserved small proteins that are normally expressed predominantly in neurons. Very little is known about the physiological functions of the synucleins. We have reported that g-synuclein (also known as BCSG1) is dramatically up-regulated in the vast majority (\g70%) of late-stage breast and ovarian cancers (Bruening, et al., 2000). When over-expressed, g-synuclein significantly stimulates cell proliferation and metastasis in some breast cancer cell lines. We have shown that DNA hypomethylation is a common mechanism underlying the abnormal expression of this gene in tumor cells (Gupta et al., 2003) and hypothesize that g-synuclein may be a proto-oncogene and that abberant expression of this protein may contribute to the development and progression of ovarian cancer. We also found that g-synuclein can promote cancer cell survival and inhibit stress- and chemotherapy drug-induced apoptosis by modulating MAPKs. Specifically, over-expression of g-synuclein lead to constitutive activation of ERK1/2, and down-regulation of JNK1 in response to a host

of environmental stress signals, including UV, heat shock, sodium arsenate, nitric oxide and chemotherapeutic drugs (Pan, Z-Z, et al., 2002). Because of its high frequency of expression in late-stage ovarian cancers, we hypothesized that g-synuclein may be a promising target for cancer therapy.
DTIC
*Breast; Cancer; Genes; Inhibitors; Mammary Glands; Ovaries; Proteins; Survival; Tumors*

**20050216505** Pennsylvania Univ., Philadelphia, PA USA
**Structural Basis for the Pharmacological Rescue of Mutant p53 with Small Molecule Compounds**
Ho, William C.; Apr. 1, 2005; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0629
Report No.(s): AD-A436949; No Copyright; Avail.: CASI: A03, Hardcopy

The p53 protein is a tumor suppressor crucial to maintaining genomic integrity. In the event of DNA damage, p53 is responsible for transcribing genes leading to cell death. A class of mutations which occur in the core domain (102-292) leads to thermodynamic destabilization and inability to bind its cognate DNA sequence. Small molecules which bind to and stabilize mutant p53 core domain have potential to be therapeutically useful. Two potential 'hot spots' on the surface of the mouse p53 core domain have been discovered which can be targeted by small molecule compounds. One hot spot was discovered by soaking the crystal lattice with various organic solvents and locating the solvents in the electron density. Another potential hot spot was located in the high resolution structure of the mouse core domain where a molecule of tris(hydroxymethyl)aminomethane (Tris) was observed to bind on the surface of the protein, making numerous hydrogen bonding contacts. Urea denaturation experiments show an increase in stability (^.37kcalcal/mol) in the presence of 1mM Tris when compared to protein in the absence of Tris. Although the gain in stability is relatively modest, the structural data acquired in this study can guide the way to designing compounds with increased activity.
DTIC
*Deoxyribonucleic Acid; Genes; Genome; Molecules; Mutations; Pharmacology; Rescue Operations; Solvents*

**20050216506** California Univ., San Diego, La Jolla, CA USA
**Optimized NSAIDS for Breast Cancer Prevention**
Carson, Dennis A.; Apr. 1, 2005; 9 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0453
Report No.(s): AD-A436961; No Copyright; Avail.: CASI: A02, Hardcopy

Population studies have shown that women who use non-steroidal anti-inflammatory drugs (NSAIDs) develop breast cancer less frequently. However, these drugs have side effects toward the stomach, liver and kidneys, particularly at the high doses potentially required to prevent breast cancer. Also, how these agents prevent breast cancer is not understood. This project will develop an optimized NSAID for breast cancer prevention that can be taken safely at high doses, and will determine its mechanisms of action. The side effects of NSAIDs are mainly due to inhibition of the cyclo-oxygenase (COX) enzyme. Eased on preliminary experiments, we hypothesize that the preventative action of NSAIDs in breast cancer is not due to COX inhibition, but rather to alterations of other biochemical pathways in breast cells that control their proliferation. We have isolated modified NSAIDs that do not inhibit COX inhibitors, but still retain chemopreventative activity. We will study genetically modified mice that frequently develop breast cancer. The mice will be fed diets supplemented with placebo or with the modified NSAID that does not inhibit COX. We shall determine if the new agent prevents breast cancer without toxicity to normal cells, and will measure biochemical parameters associated with its proposed mechanisms of action.
DTIC
*Breast; Cancer; Carcinogens; Drugs; Health; Mammary Glands; Prevention; Tumors; Viruses*

**20050216507** Baylor Coll. of Medicine, Houston, TX USA
**INT6 May Influence Breast Cancer Formation by Regulating the 26S proteasome**
Sha, Zhe; Chang, Eric; Apr. 1, 2005; 13 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0380
Report No.(s): AD-A436962; No Copyright; Avail.: CASI: A03, Hardcopy

Inactivation of int6 has been linked to breast cancer formation, but its molecular function and precise role in tumorigenesis are largely unknown. This project tests the hypothesis that int6 is a tumor suppressor gene, regulating the proteasome to mediate genetic stability and cell division. The specific aims of this proposal are to determine whether disrupting Int6 function can influence (1) proteasome functioning and (2) chromosome segregation in human cells. I have generated siRNAs that

successfully knock-down Int6 expression in HeLa and human mammary epithelial cells, and HeLa cells with reduced Int6 expression display mitotic defects. The next step is to generate stable human mammary cells with reduced Int6 level to carry out detailed studies on chromosomal segregation and proteasome functioning. In addition, I engaged in mechanistic study in S. pombe to better understand the regulation of the proteasome by Int6. Like many proteasome subunits, Int6 contains a PCI domain, and it may play an important role in influencing tumorigenesis. I have identified an essential residue in the PCI domain, and have validated its importance in Int6 and a proteasome subunit Rpn7. Furthermore, my data suggests that nuclear import of proteasome subunits might involve an importin alpha-independent mechanism, specifically mediated by the importin beta Kap 123. In the future, I will next examine whether Int6 regulates Kapl23 in both yeast and humans.
DTIC
*Breast; Cancer; Cell Division; Mammary Glands; Molecules; Yeast*

**20050216508** Texas Univ. Health Science Center, San Antonio, TX USA
**Phosphorylation of hRad17 by atr is Required for Cell Cycle Checkpoint Activation**
Tan, Wei; Apr. 1, 2005; 27 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0588
Report No.(s): AD-A436963; No Copyright; Avail.: CASI: A03, Hardcopy

Targeted protein phosphorylation is a key event that serves to transduce DNA damage- induced cell signals from upstream sensors to downstream effectors. ATR kinase phosphorylates BRCA1 and Rad17 upon DNA damage. As a first approach to evaluate the functional consequence of IR-induced site-specifically phosphorylated residues on BRCA1, -we have established a BRCA1-dependent transcription-based assay which assesses the BRCA1-dependent repression function of ZBRK1 in mammalian cell from a reporter template bearing ZBRK1 DNA-binding sites. I found that ZBRK1 formed a homo-tetramer on the target gene promoter functioning as a DNA-binding dependent repressor as well as a DNA-binding independent corepressor. Functional dissection of ZBRK1 led to identification and characterization of a novel BRCA1-dependent repression domain encompassing ZBRK1 zinc fingers 5-8 and the unique C-terminus. This C-terminal repression domain functions in a BRCA1-dependent, histone deactylase-dependent and promoter-specific manner. Significantly, BRCA1 mediates ZBRK1 transcriptional repression function by modulating- two properties of ZBRK1 as a transcription factor: its DNA-binding and the recruitment of other co-repressor proteins. BRCA1-dependent ZBRK1 repression assay may now be' exploited to evaluate the influence of IR-induced site-specific phosphorylation of BRCA1 on its sequence-specific co-repressor function.
DTIC
*Breast; Cancer; Deoxyribonucleic Acid; Mammary Glands; Phosphorylation; Zinc*

**20050216509** Texas A&M Univ., College Station, TX USA
**Inhibitory Ah Receptor-Androgen Receptor Crosstalk in Prostate Cancer**
Safe, Stephan H.; Feb. 1, 2005; 25 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0147
Report No.(s): AD-A436964; No Copyright; Avail.: CASI: A03, Hardcopy

Treatment for prostate cancer depends on multiple factors including the stage of the tumor and expression of the androgen receptor (AR) . Endocrine therapy can be used for treatment of early stage androgen-responsive tumors, whereas chemotherapy for later stage androgen- nonresponsive tumors is problematic. We have investigated the aryl hydrocarbon receptor (AhR) as a potential target for treating prostate cancer using a new series of relatively non-toxic selective AhR modulators (SAhRMs) . Initial studies show that 22RV1, PC3 and LNCaP prostate cancer are Ah-responsive and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) induces CYP1A1-dependent activities in all three cell lines. Moreover, two SAhRMs, namely diindolylmethane (DIM) and 6-methyl-1,3,8-trichlorodibenzofuran (6-MCDF) inhibit growth of AR-positive 22RVl and AR-negative PC3 prostate cancer cells. In addition, AhR ligands inhibit dihydrotestosterone- induced upregulation of AR protein in 22RVl cells suggesting a possible mechanism for inhibitory AhR-AR crosstalk. The growth inhibitory effects of SAhRMs in PC3 cells suggests that AhR ligands also inhibit growth of androgen- nonresponsive cells. In addition, substituted DIMs inhibit growth of prostate cancer cells and modulate AR expression, and these are currently being investigated.
DTIC
*Cancer; Crosstalk; Hormones; Males; Prostate Gland*

**20050216522** Scripps Research Inst., La Jolla, CA USA
**An Oral DNA Vaccine Encoding Endoglin Eradicates Breast Tumors by Blocking Their Blood Supply**
Reisfeld, Ralph A.; May 1, 2005; 17 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0489
Report No.(s): AD-A437032; No Copyright; Avail.: CASI: A03, Hardcopy

Among novel strategies preventing or slowing breast cancer metastasis are those blocking continuous new blood vessel growth, i.e. angiogenesis in the tumor vasculature mediated by proliferating endothelial cells lining such vessels. These cells overexpress a glycoprotein called endoglin which stimulates such vessels. We successfully constructed and evaluated an oral endoglin-based DNA vaccine and demonstrated its capability to induce a robust CD8(+) T cell response that specifically killed proliferating endothelial cells in the breast tumor vasculature. This, in turn, was shown to markedly decrease tumor angiogenesis resulting in a decisive suppress ion of breast tumor metastases leading to doubling in life-span of successfully vaccinated mice in a prophylactic breast tumor metastasis model.
DTIC
*Blocking; Blood Volume; Breast; Cancer; Coding; Deoxyribonucleic Acid; Mammary Glands; Tumors; Vaccines*

**20050216535** Hutchinson (Fred) Cancer Research Center, Washington, DC USA
**Molecular Analysis of Olfactory Neural Circuits**
Buck, Linda; Jul. 1, 2005; 4 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0170
Report No.(s): AD-A437074; FHCRC-102565; ARO-44033.1-LS; No Copyright; Avail.: CASI: A01, Hardcopy

The olfactory system detects odorants that elicit diverse odor perceptions as well as pheromones that stimulate instinctive behaviors. We previously identified a large family of odorant receptors and determined how signals derived from those receptors are organized in the nose and then the olfactory bulb and cortex. To explore neural circuits in higher brain areas that control olfactory perception and behavior, new technologies are needed. We took the first steps in this direction in this project. First, we showed that a fusion protein containing Cre recombinase, the transfer domain of Diphtheria toxin, and barley lectin (BL), a transneuronal tracer, has Cre recombinase activity, setting the stage for its potential use as a regenerative transneuronal tracer for the visualization of complex neural circuits. Second, we prepared a series of inducer' and reporter' transgenic mouse lines that, when crossed, may allow the expression of a standard, or regenerative, transneuronal tracer in specific neurons to be controlled by an antibiotic or hormone analog. Third, we showed Cre-dependent, conditional expression of a transneuronal tracer in one of the reporter mouse lines. By crossing this line with mice expressing Cre in neurons with known functions (e.g. appetite), it will now be possible to elucidate neural circuits and genes that control specific functions.
DTIC
*Circuits; Genes; Nerves; Neural Nets; Olfactory Perception*

**20050216543** Michigan State Univ., East Lansing, MI USA
**Advance Care Planning: Experience of Women With Breast Cancer**
Doorenbos, Ardith Z.; May 1, 2005; 44 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0469
Report No.(s): AD-A437091; No Copyright; Avail.: CASI: A03, Hardcopy

Advance care planning (ACP) enables women with breast cancer to proactively document their end-of-life preferences. The purpose of this study is to describe the prevalence and predictors of ACP during and following chemotherapy treatment among women with breast cancer enrolled in a cognitive behavioral trial for symptom management. Interim analyses of 110 women with breast cancer were conducted. Predictors entered in the logistic regression were demographic (education, marital status, number in household, and age), health (quality of life, stage and recurrence of cancer, co-morbidities, hospital admissions, and symptom interference), and emotional (depression and optimism) . Forty-one women (32%) reported having ACP. The predictors reliably distinguished between women with an ACP and those without (57% and 76% prediction success respectively). Age was the most reliable predictor of ACP. All predictors accounted for 32% of the variance in ACP. ACP prevalence among women with breast cancer is greater than previously reported. As age increased women with breast cancer were more likely to have ACP; however, none of the health factors were found to be significant predictors of ACP. This suggests that greater communication may need to occur about ACP in relation to health status.
DTIC
*Breast; Cancer; Females; Mammary Glands; Planning*

**20050216546** Chicago Univ., Chicago, IL USA
**Undergraduate Summer Training Program in Breast Cancer Imaging**
Giger, Maryellen L.; May 1, 2005; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0310
Report No.(s): AD-A437094; No Copyright; Avail.: CASI: A03, Hardcopy

Imaging is used in virtually every cancer patient, in many animal models of cancer, and in a large number of in vitro cancer-related experiments. Imaging research is thus fundamental to advanced cancer research. The medical physics program at the University of Chicago is recognized internationally for its research excellence and for its training of investigators at the pre-doctoral and post-doctoral level. Many of the trainees go on to careers in cancer research. We believe that exposure and immersion of undergraduate students in summer research in breast cancer imaging is expected to provide a forum for establishing a set of next-generation researchers who will pursue breast cancer research via Ph.D. or Ph.D./M.D. programs as their career. Six undergraduate students participate in research in breast cancer imaging at the University of Chicago within the laboratory and administrative structure of the well-established Graduate Programs in Medical Physics. Six summer students in the Summer 2004 quarter learned and experienced research in breast cancer imaging through didactic lectures, hands-on research, interactive research project meetings, formal research seminars, and in the writing and oral presentation of their research. All four of the mentors who participated as primary summer advisors in the grant (Giger, Halpern, Jiang, and Nishikawa) have a long history of breast cancer research and funding. In addition, the summer students have attended research presentations of others in the labs (such as post-doctoral fellows, graduate students, and faculty) and each presented their research at the end of summer to researchers at the University of Chicago.
DTIC
*Breast; Cancer; Education; Images; Imaging Techniques; Mammary Glands; Medical Science; Summer*

**20050216547** Virginia Commonwealth Univ., Richmond, VA USA
**The Role of Sphingosine Kinase 2 in Apoptosis of Human Breast Cancer**
Sankala, Heidi; Spiegel, Sarah; May 1, 2005; 16 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0393
Report No.(s): AD-A437095; No Copyright; Avail.: CASI: A03, Hardcopy

The sphingolipid metabolite sphingosine-1-phosphate (S1P) is the ligand for a family of five specific G protein-coupled receptors (S1P sub 1-5) that regulate a wide variety of important cellular functions, including growth, survival, and cell motility. However, whether it also has an intracellular action is still a matter of debate. S1P is formed by the ATP-dependent phosphorylation of sphingosine catalyzed by types 1 and 2 sphingosine kinase (SphK). Many studies have shown that SphK1 stimulates cell proliferation and protects cells from apoptosis. In contrast, expression of SphK2 inhibits growth and enhances apoptosis independently of SlP receptor activation. We investigated the role of SphK2 in apoptosis of human breast carcinoma MCF7 cells in response to the DNA damaging agent dioxopurine. Expression of SphK2, which is predominantly localized to the nucleus of MCF7 cells, enhanced apoptosis induced by doxorubicin. Expression of SphK2 also significantly increased beta-galactosidase activity, a marker of senescence. However, in contrast to doxorubicin which WAF1 increases the cyclin-dependent kinase inhibitor P21 and p53 levels, SphK2 expression increased p53-independent expression of P21 (WAF1) and hypophosphorylation of the retinoblastoma protein (pRb) . importantly, down-regulation of endogenous SphK2 protected MCF7 cells from doxoruhicin-induced apoptosis and its effects on p21 without affecting p53.
DTIC
*Apoptosis; Breast; Cancer; Lipids; Mammary Glands*

**20050216549** Kentucky Univ., Lexington, KY USA
**Defining the Molecular Actions of Dietary Fatty Acids in Breast Cancer: Selective Modulation of Peroxisome Proliferator-Activated Receptor Gamma**
Allred, Clinton D.; May 1, 2005; 21 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0532
Report No.(s): AD-A437097; No Copyright; Avail.: CASI: A03, Hardcopy

Stark differences in the actions of lenoleic acid (LAA), an omega-6 fatty acid, and eicosapentaenoic acid (EPA), an omega-3 fatty acid, on breast cancer tumors have been described. We propose that transactivation of peroxisome proliferators-activated receptor gamma (PPAR-gamma) mediates the physiological effects of different dietary fatty acids on breast cancer. PPAR-gamma plays a role in the development and progression of breast cancer tumors. We have demonstrated that individual ligands of PPAR-gamma can selectively activate PPAR-gamma in three different ways. Selective activation of PPAR-gamma by a single ligand occurs between tissue types and between individual breast cancer cell lines. Also, unique

ligands selectively activate PPAR-gamma within a single cell type. We propose that fatty acids will elicit their effects on breast cancer cells in a similar manner. The objectives of forth coming studies will be to assess the necessity of transactivation of PPAR-gamma by LAA and EPA in mediating the effects of fatty acids on breast cancer cells and to determine what effect this selective activation has on gene transcription. We hypothesize that LAA and EPA can selectively regulate gene expression profiles that favor either cellular differentiation or proliferation and that these effects are dependent on transactivation of PPAR-gamma.
DTIC
*Breast; Cancer; Diets; Fatty Acids; Mammary Glands; Modulation*

**20050216550** Northern California Inst. for Research and Education, San Francisco, CA USA
**The Role of the Y-Located TSPY Gene in Prostatic Oncogenesis**
Lau, Yun-Fai C.; Feb. 1, 2005; 33 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0081
Report No.(s): AD-A437099; No Copyright; Avail.: CASI: A03, Hardcopy

The TSPY gene is the only functional gene within the critical region harboring the gonadoblastoma locus on the Y chromosome (GBY). Expression studies demonstrated that it is aberrantly expressed in prostate cancer. This project is designed to address the role of this putative oncogene on the Y chromosome in this male-specific cancer. The objectives are: l) to identify the oncogenic or tumor promoting domain in TSPY, and 2) to correlate TSPY over-expression with prostatic oncogenesis in transgenic mice. We have analyzed the expression of TSPY in additional cases of gonadoblastoma and samples from a tissue recombination model of human prostate cancer. Our results, so far, provide a detailed morphologic evolution of the oncogenic process in gonadoblastoma and testicular germ cell tumors and demonstrated that TSPY is co-expressed with several known germ tumor markers. We also detect TSPY expression in a hormone-induced prostate cancer model in Noble rat. Over-expression of TSPY potentiates cell proliferation. We attribute such phenomenon to a shortening of the G2/M stage of the cell cycle. We show that TSPY might exert such an effect by binding to type B cyclins. The present research provides significant insights into the probable mechanism of TSPY function in oncogenesis.
DTIC
*Cancer; Genes; Prostate Gland; Tumors*

**20050216552** Peter Bent Brigham Hospital, Boston, MA USA
**Developing a Novel Mouse Model for Breast Cancer by Targeting Oncogenes to Mammary Progenitor Cells**
Li, Yi; Apr. 1, 2005; 28 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0458
Report No.(s): AD-A437101; No Copyright; Avail.: CASI: A03, Hardcopy

Mouse models are very valuable for preclinical testing of new therapeutic drugs against breast cancer and for studying how breast cancer cells invade and spread, but most mammary tumors arising in mice are different from human breast cancer. Most mouse models are created by targeting oncogenic lesions primarily to the more mature differentiated breast cells. Clinical breast cancer, however, are believed to arise from undifferentiated progenitor cells. Therefore, if we can induce mouse breast tumors specifically from progenitor cells, we may be able to produce models that more closely resemble human breast cancer. No promoter that is exclusively expressed in the mammary progenitor cells has yet been reported, but the promoter of keratin 6 is a likely candidate. In order to determine whether keratin 6 is indeed a progenitor cell marker, and whether targeting oncogenes to progenitor cells may yield better models, we have succeeded in creating a BAC transgenic line expressing from the keratin 6 promoter the TVA viral receptor, for selective targeting of reporters and oncogenes using a viral vector RCAS. Next, we will use this line of mice to determine whether these K6-positive cells are indeed progenitor cells, and whether they will give rise to tumors that better resemble human breast cancers.
DTIC
*Breast; Cancer; Mammary Glands; Mice; Oncogenes*

**20050216553** California Univ., Los Angeles, CA USA
**Therapeutic Insights From a Novel Breast Tumor Suppressor Pathway**
Colicelli, John J.; Apr. 1, 2005; 10 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0443
Report No.(s): AD-A437102; No Copyright; Avail.: CASI: A02, Hardcopy

Epigenetic gene silencing is a common element of breast cancers. The specific genes targeted and the mechanisms of

silencing, and how these relate to disease progression and outcome, are not well understood. This research project has 1) identified a new breast tumor suppressor gene (RIN1) that is silenced in the majority of breast tumor cell lines and most tumor tissue samples tested; 2) begun to describe a breast tumor suppressor locus with three genes (B3GNT6; BRMS1, RIN1) that appear to be coordinately silenced in breast cancer; 3) uncovered multiple mechanisms of gene silencing operating at this locus and 4) demonstrated the development of specific tumorigenic phenotypes resulting from loss of RIN1 expression.
DTIC
*Breast; Cancer; Diseases; Genetics; Mammary Glands; Suppressors; Therapy; Tumors*

**20050216555** Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
**Filovirus-Like Particles as Vaccines and Discovery Tools**
Warfield, Kelly L.; Swenson, Dana L.; Demmin, Gretchen L.; Bavari, Sina; Jun. 1, 2005; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437104; RPP-05-140; No Copyright; Avail.: CASI: A03, Hardcopy

Ebola and Marburg viruses are members of the family Filoviridae, which cause severe hemorrhagic fevers in humans. Filovirus outbreaks have been sporadic, with mortality rates currently ranging from 30 to 90%. Unfortunately, there is no efficacious human therapy or vaccine available to treat disease caused by either Ebola or Marburg virus infection. Expression of the filovirus matrix protein, VP40, is sufficient to drive spontaneous production and release of virus-like particles (VLPs) that resemble the distinctively filamentous infectious virions. The addition of other filovirus proteins, including virion proteins (VP)24, 30 and 35 and glycoprotein, increases the efficiency of VLP production and results in particles containing multiple filovirus antigens. Vaccination with Ebola or Marburg VLPs containing glycoprotein and VP40 completely protects rodents from lethal challenge with the homologous virus. These candidate vaccines are currently being tested for immunogenicity and efficacy in nonhuman primates. Furthermore, the Ebola and Marburg VLPs are being used as a surrogate model to further understand the filovirus life cycle, with the goal of developing rationally designed vaccines and therapeutics. Thus, in addition to their use as a vaccine, VLPs are currently being used as tools to learn lessons about filovirus pathogenesis, immunology, replication and assembly requirements.
DTIC
*Antibodies; Lymphocytes; Vaccines; Viruses*

**20050216698** Skoevde Univ., Skoevde, Sweden
**Towards In-Depth Automatic Understanding of Biomedical Texts**
Gawronska, Barbara; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 10 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An essential part of bioinformatic research concerns the iterative process of validating hypotheses by analyzing facts stored in databases and in published literature. This process can be enhanced by language technology methods, in particular by automatic in-depth text understanding. A high-quality system for extracting relevant information from biological texts must include a strategy for identification of main object and relations. This, in turn, requires a strategy for anaphora recognition (identification of different phrases pointing out the same object). A prerequisite for this is an adequate syntactic and semantic analysis. The paper focuses on these issues in automatic processing of abstracts in the domain of genetics and biomedicine. Author
*Biomedical Data; Medical Science; Texts; Data Bases; Hypotheses*

**20050216710** NCI Information Systems, Inc., Cleveland, OH, USA
**Cross-curricular, Global Learning Communities Enhance Science Education**
Petersen, Ruth; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 19 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Science education, indeed all education, is in need of reform. Many students view science as dull; too often students are not interested in studying science because they believe it has no relevance to their lives. Many students see no connection between science and the real world or between science and other disciplines. Students need opportunities to link with science and engineering professionals, to encounter them as people, and to learn what it means to be a scientist. The need for reform in science education has contributed to a critical shortage of scientists and engineers in the USA. Another contributor to this shortage is the fact that in recent years, other countries have increased their investments in science and engineering education

and workforces in order to combat their shortage of scientists and engineers. As a result, many foreign-born, American-trained scientists and engineers have returned to their homelands to work.
Derived from text
*Education; Students; Internets*

**20050217051** Pennsylvania Univ., Philadelphia, PA USA
**The Role of Dynamic in the Regulation of Signaling by the erbB Family of Receptor Tyrosine Kinases**
King, Megan C.; Lemmon, Mark; Mar. 1, 2005; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0546
Report No.(s): AD-A436937; No Copyright; Avail.: CASI: A03, Hardcopy

Improper regulation of the level and duration of activated erbB family growth factor receptors at the cell surface can lead to uncontrolled cell proliferation and transformation via over-stimulation of mitogenic signaling cascades. The large GTPase dynamin is a key regulator both of transport of receptors to the plasma membrane after receptor biosynthesis and down-regulation of receptors via receptor-mediated endocytosis (RME), during which it is involved in the scission of endocytic vesicles. Disruption of RME has been shown to render the epidermal growth factor receptor (erbB1) oncogenic (1), illustrating the importance of proper attenuation of signaling by down-regulation. This proposal addresses the mechanistic role of the pleckstrin homology (PR) domain in dynamin function, which may provide a pharmacologic target for modulating dynamin activity. The PR domain binds phosphatidylinositol (4,5) bisphosphate (PI(4,5)P(sub 2)) at the plasma membrane (PM), but the role of this binding is not yet understood. The experiments detailed below address whether PI(4,5)P(sub 2) binding is involved in targeting of dynamin to the PM, or whether phosphoinositide binding instead plays a more physical role in the scission of endocytic vesicles, and therefore receptor downregulation.
DTIC
*Tyrosine; Receptors (Physiology)*

**20050217066** Cedars-Sinai Medical Center, Los Angeles, CA USA
**Expression Profiling of Cell Lines Expressing Regulated NP2 Transcripts**
Pulst, Stefan M.; Sep. 1, 2004; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0703
Report No.(s): AD-A436907; No Copyright; Avail.: CASI: A03, Hardcopy

Expression profiling is a powerful novel technique to examine changes in the expression of a large number of genes at the same time. Different phenotypic states of a cell can be translated into specific gene expression signatures. As a complement to yeast two hybrid studies we proposed using gene expression profiling to determine changes in gene expression as a function of expression of the neurofbromatosis-2 (NF2) gene in schwannoma cells. The strength of our approach is that we will not use tissues from patients, but will concentrate on cell lines in which NF2 expression can be controlled through the Tet/On system. In this system, treatment of cells with tetracycline (tet) induces expression of a tet-regulated gene, which in turn regulates the expression of the gene of interest. We have now generated several cell lines that express NF2 in a regulated fashion. The parent lines are RT4 schwannoma cells and mouse embryonic fibroblasts. A time course for NF2 expression has been established. A total of four cell lines have been tested on microarrays to detect expression changes. Surprisingly, no changes common to expression of isoform 1 and 2 have been detected so far. In the last year, we have used cell lines that express HRS in the tet system to study expression changes induced by HRS in the presence or absence of EGF. We established a time-course of EGF-induced genes and then examined the effects of long-term treatment (18hrs) with EGF in the presence or absence of exogenous HRS. The results will provide a framework for the interpretation of future gene expression studies in vitro and in NF2 tumors.
DTIC
*Genes; Gene Expression; Cells (Biology); Transcription (Genetics)*

**20050217206** NASA Johnson Space Center, Houston, TX, USA
**Neuro-vestibular and Sensory-motor Challenges Associated with NASA Mission Architectures for Moon and Mars**
Paloski, William H.; [2004]; 1 pp.; In English; Barancy Society XXIII International Congress, 7-9 Jul. 2004, Paris, France; No Copyright; Avail.: Other Sources; Abstract Only

Data from six-month low Earth orbit space flight missions suggest that that substantial neuro-vestibular/sensory-motor adaptation will take place during six-month transit missions to and from Mars. Could intermittent or continuous artificial gravity be used to offset these effects? To what degree would the effects of adaptation to this rotational cure affect its potential

benefits? Also, little information exists regarding the gravity thresholds for maintaining functional performance of complex sensory-motor tasks such as balance control and locomotion. Will sensory-motor coordination systems adapt to 30- 90 days of 1/6 g on the lunar surface or 18 months of 3/8 g on the Martian surface? Would some form of gravity replacement therapy be required on the surface? And, will transitions between 0 g and 1/6 g or 1/3 g present as great a challenge to the vestibular system as transitions between 0 g and 1 g? Concerted research and development efforts will be required to obtain the answers. Author

*Mars Missions; Moon; Artificial Gravity; Sensorimotor Performance; Lunar Surface; Mars Surface; Gravitation*

## 52
## AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

**20050215017** NASA Glenn Research Center, Cleveland, OH, USA

**Ocular Blood Flow Measured Noninvasively in Zero Gravity**

Ansari, Rafat R.; Manuel, Francis K.; Geiser, Martial; Moret, Fabrice; Messer, Russell K.; King, James F.; Suh, Kwang I.; Research and Technology 2002; March 2003; 5 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

In spaceflight or a reduced-gravity environment, bodily fluids shift to the upper extremities of the body. The pressure inside the eye, or intraocular pressure, changes significantly. A significant number of astronauts report changes in visual acuity during orbital flight. To date this remains of unknown etiology. Could choroidal engorgement be the primary mechanism and a change in the curvature or shape of the cornea or lens be the secondary mechanism for this change in visual acuity? Perfused blood flow in the dense meshwork of capillaries of the choroidal tissue (see the preceding illustration) provides necessary nutrients to the outer layers of the retina (photoreceptors) to keep it healthy and maintain good vision. Unlike the vascular system, the choroid has no baroreceptors to autoregulate fluid shifts, so it can remain engorged, pushing the macula forward and causing a hyperopic (farsighted) shift of the eye. Experiments by researchers at the NASA Glenn Research Center could help answer this question and facilitate planning for long-duration missions. We are investigating the effects of zero gravity on the choroidal blood flow of volunteer subjects. This pilot project plans to determine if choroidal blood flow is autoregulated in a reduced-gravity environment.

Derived from text

*Blood Flow; Ocular Circulation; Cornea; Eye (Anatomy)*

**20050215019** NASA Glenn Research Center, Cleveland, OH, USA

**Growth and Remodeling in Blood Vessels Studied In Vivo With Fractal Analysis**

Parsons-Wingerter, Patricia A.; Research and Technology 2002; March 2003; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Every cell in the human body must reside in close proximity to a blood vessel (within approximately 200 mm) because blood vessels provide the oxygen, metabolite, and fluid exchanges required for cellular existence. The growth and remodeling of blood vessels are required to support the normal physiology of embryonic development, reproductive biology, wound healing and adaptive remodeling to exercise, as well as abnormal tissue change in diseases such as cancer, diabetes, and coronary heart disease. Cardiovascular and hemodynamic (blood flow dynamics) alterations experienced by astronauts during long-term spaceflight, including orthostatic intolerance, fluid shifts in the body, and reduced numbers of red (erythrocyte) and white (immune) blood cells, are identified as risk factors of very high priority in the NASA task force report on risk reduction for human spaceflight, the 'Critical Path Roadmap.'

Derived from text

*Blood Vessels; Abnormalities; Blood Flow; Cardiovascular System; In Vivo Methods and Tests*

**20050215021** NASA Glenn Research Center, Cleveland, OH, USA

**Design Study Conducted of a Stirred and Perfused Specimen Chamber for Culturing Suspended Cells on the International Space Station**

Nelson, Emily S.; Kizito, John P.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A tightly knit numerical/experimental collaboration among the NASA Ames Research Center, NASA Glenn Research

Center, and Payload Systems, Inc., was formed to analyze cell culturing systems for the International Space Station. The Cell Culture Unit is a facility scheduled for deployment on the space station by the Cell Culture Unit team at Ames. The facility houses multiple cell specimen chambers (CSCs), all of which have inlets and outlets to allow for replenishment of nutrients and for waste removal. For improved uniformity of nutrient and waste concentrations, each chamber has a pair of counterrotating stir bars as well. Although the CSC can be used to grow a wide variety of organic cells, the current study uses yeast as a model cell. Previous work identified groundbased protocols for perfusion and stirring to achieve yeast growth within the CSC that is comparable to that for yeast cultures grown in a shaken Ehrlenmeyer flask.
Derived from text
*Cell Culturing; Cells (Biology); Culture Techniques*

**20050215375** NASA Glenn Research Center, Cleveland, OH, USA
**Calibration Experiments Conducted for Noninvasive Blood Glucose Sensing Through the Eye**
Ansari, Rafat R.; Bockle, Stefan; Suh, Kwang I.; Rovati, Luigi L.; Research and Technology 2003; May 2004; 4 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

There are more than 16 million diabetics in the USA and more than 100 million worldwide. Diabetes can lead to severe complications over time such as blindness, renal and cardiovascular diseases, and peripheral neuropathy in the limbs. Poor blood circulation in diabetics can lead to gangrene and the subsequent amputation of extremities. In addition, this pathology is the fourth leading cause of death in the USA. The most effective way to manage diabetes is frequent blood glucose monitoring performed by the patients themselves. However, because of pain, inconvenience, and the fear of developing infections from finger-prick blood tests or implants, many patients monitor their blood glucose levels less frequently than is recommended by their physicians. Therefore, a noninvasive, painless, and convenient method to monitor blood glucose would greatly benefit diabetics. Likewise, detecting, preventing, and treating the untoward effects of prolonged space travel (e.g., a human mission to Mars) in real-time requires the development of noninvasive diagnostic technologies that are compact and powerful. As a 'window to the body,' the eye offers the opportunity to use light in various forms to detect ocular and systemic abnormalities long before clinical symptoms appear and to help develop preventative and therapeutic countermeasures early. The noninvasive feature of these technologies permits frequent repetition of tests, enabling an evaluation of the response to therapy.
Derived from text
*Metabolic Diseases; Glucose; Eye (Anatomy)*

**20050216541** Defence Research and Development Canada, Toronto, Ontario Canada
**Effects of Sea Motion on the Crew of the Petro Canada Terra Nova FPSO (floating, Production, Storage and Offloading) Vessel**
Cheung, Bob; Brooks, Chris J.; Simoes-Re, Antonio; Hofer, Kevin; Oct. 1, 2004; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437087; DRDC-TORONTO-TR-2004-117; No Copyright; Avail.: CASI: A05, Hardcopy

Current oil and gas exploration requirements to exploit resources in both deep and shallow water have changed the method of oil extraction. Floating Production Storage and Offloading (FPSO) vessels are increasingly being used to operate in deep water where the operating environment can be very extreme. The Terra Nova FPSO vessel is the first of its kind built for operations on the Grand Banks in Newfoundland at the Terra Nova field and is the first to operate in Canadian waters. The crew on this vessel must often work under extreme weather conditions, in shifts throughout the day and night for up to three weeks at a time, or even longer if the weather prevents crew changes. Seasickness and its after-effects, motion-induced fatigue and motion-induced interruptions are a potential problem for the safety and health of crewmembers at sea. Understanding the incidence, severity and the effects of seasickness on performance can improve effective scheduling, task assignment, and reduce the likelihood of personal injury both on- and off-duty. In extreme circumstances, this understanding may prevent major injury, loss of life and even loss of the FPSO itself. The previous questionnairebased survey (Cheung, Brooks & Hofer 2002) results revealed that crew complained of a variety of problems including sleep disturbance, task completion, task performance, loss-of concentration, decision-making and memory disorders. These problems were correlated with increasing ship motion, however, in the previous study, the ship motion data were obtained indirectly through the radio operator from the FPSO Offshore Installation.
DTIC
*Canada; Floating; Motion Sickness; Seas; Ships*

**20050217202** NASA Johnson Space Center, Houston, TX, USA
**Antimicrobial Medication Stability During Space Flight**
Putcha, Lakshmi; Berens, Kurt; Du, Jianping; [2004]; 1 pp.; In English
Report No.(s): NRA-04-OBPR-01; No Copyright; Avail.: Other Sources; Abstract Only

The current vision for manned space flight involves lunar and Martian exploration within the next two decades. In order for NASA to achieve these goals, a significant amount of preparation is necessary to assure crew health and safety. A mission critical component of this vision centers around the stability of pharmaceutical preparations contained in the space medicine kits. Evidence suggests that even brief periods of space flight have significant detrimental effects for some pharmaceutical formulations. The effects observed include decreases in physical stability of drug formulations of sufficient magnitude to effect bioavailability. Other formulations exhibit decreases in chemical stability resulting in a loss of potency. Physical or-chemical instability of pharmaceutical formulations i n space medicine kits could render the products ineffective. Of additional concern is the potential for formation of toxic degradation products as a result of the observed product instability. This proposal addresses Question number 11 of Clinical Capabilities in the Critical Path Roadmap. In addition, this proposal will reduce the risks and/or enhance the capabilities of humans exposed to the environments of space flight or an extraterrestrial destination by identifying drugs that may be unstable during spaceflight.
Derived from text
*Manned Space Flight; Lunar Exploration; Pharmacology; Microorganisms; Antiinfectives and Antibacterials; Antibiotics; Aerospace Medicine*

## 53
## BEHAVIORAL SCIENCES

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

**20050214921** Walden Univ., Minneapolis, MN, USA
**Integrating the Teaching of Psychology with Distance Learning: Practicum and Internship**
Leaver, V. W.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 9 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

With the increase of mid-life career changes and the growth of the Internet many fully accredited universities have started providing distance-learning opportunities in a number of fields of study. Integrating the teaching of psychology with distance learning is one of the fastest growing areas. Nowhere is this more challenging than in the area of practicum and internship in the field of psychology. Practicum and Internship are traditional requirements at the Masters and Doctoral levels of psychology. Both require face-to-face interaction of the student with the supervisor and do not automatically present themselves as likely requirements to adapt to distance learning or the use of the Internet. This paper will identify some of the critical issues and challenges of integrating the teaching of psychology, particularly practicum and internship, with distance learning and will describe a model developed at Walden University to address such issues and to maintain and improve the delivery and quality of psychological education.
Author
*Psychology; Education; Universities*

**20050216711** Center for Scientific Computing, Espoo, Finland
**Managing Ignorance through Knowledge of its Substance**
Martikainen, Viljo K.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 9 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper I am going to review ignorance simply seen as the lack of knowledge. This means that we need to know what the substance, structure, functions, and the other features of knowledge are. After understanding the substance and dimensions of knowledge we might be able to detect the reasons, causes, and consequences of ignorance in individuals and organisations. In my dissertation work (Martikainen 2004) I have built a system model of Man and his concepts and mind as his mental dimensions. In this model I am supposing that Man is Rational Actor (RA) created by the evolutionary processes. The RA-model is based on some results of modern neuropsychology, brain research, and the basic postulations of the empirical memory research. Thus the explanations of the human mental can be based on the dynamic but empirically testable memory representations. They are forming the structures and functions of our concepts and all the other entities in our mental worlds

(Baddeley 1997). The titles on the cover page of my dissertation maintain that: 1. Concepts and mind as dynamic memory representations are structuring the human mental and 2. The new models of concepts and mind enable us to see many of the eternal problems of philosophy, psychology, and human sciences such as knowledge, values, language, culture, etc. from a new point of view.
Derived from text
*Knowledge; Psychology; Neurology*

## 54
## MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

**20050214920** University of Northern Colorado, Greeley, CO, USA
**Integrating Emerging E-Technologies into Traditional Classroom Settings**
Lightfoot, Jay M.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Academic institutions are racing to incorporate emerging technologies into the curriculum. At the same time, corporations and investors are vying for the potential profits of educational outsourcing. The unfortunate result of this competition is a rush to bring courses on-line without concern for the learning environment that is created. This paper examines and discusses the conflict from the point of view that technology alone does not guarantee a better learning environment. Instead, a good educational environment is enhanced by adding the appropriate technology components in the proper places. The discussion includes a description of the emerging technologies best suited for e-learning.
Author
*Education; On-Line Systems; Organizations; Technology Utilization*

**20050214947** Belgrade Univ., Yugoslavia
**Infrastructure in Education - Time to Learn Lessons from Elsewhere?**
Shaw, Tony; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To many, the education sector is viewed as a leader in the development and adoption of modern technology. Whilst this is certainly true in some cases, this may be a false picture overall, and one that may be obscuring the need for change in how things are achieved. From a commercial perspective, the education sector may be a largely undeveloped market for IT service provision. Pressures are increasing on those that provide the underlying services and infrastructure. Some of these pressures are due to the rapid developments in basic requirements. Other pressures are associated with the financial constraints associated with the demand for increased provision at lower overall cost. Similarly the risks of failure are becoming more important as dependencies on technical services increase. Understandable and reasonable customer-led demands for 24 x 7 services and e-everything help increase the pressure further. This paper looks at some of the areas of activity that are a fundamental part of education services for the future and compares the method of provision with how equivalent services are typically provided in the commercial sector. The areas of activity that are compared range from basic network infrastructure to deployment of corporate portals. Some specific examples of the use of outsourcing are described, including those at the author s and other education institutions. In some activities, commercial organisations could claim to be further ahead than education, or at least to have more experience of the types of problem that education is likely to encounter as it moves forward. The paper reflects on what has been learned so far and how commercial experiences are relevant to education. Some of the difficulties that may be more specific to education are also considered and how these might influence decision makers. Index Terms Outsourcing, education, infrastructure, services
Author
*Education; Organizations; Deployment; Risk*

**20050215100** NASA Marshall Space Flight Center, Huntsville, AL, USA
**International Space Station Bacteria Filter Element Service Life Evaluation**
Perry, J. L.; April 2005; 44 pp.; In English
Report No.(s): NASA/TM-2005-213846; M-1136; No Copyright; Avail.: CASI: A03, Hardcopy

The International Space Station (ISS) uses high-efficiency particulate air filters to remove particulate matter from the cabin atmosphere. Known as bacteria filter elements (BFEs), there are 13 elements deployed on board the ISS's U.S. segment in the flight 4R assembly level. The preflight service life prediction of 1 yr for the BFEs is based upon engineering analysis of data collected during developmental testing that used a synthetic dust challenge. While this challenge is considered reasonable and conservative from a design perspective, an understanding of the actual filter loading is required to best manage the critical ISS program resources. Testing was conducted on BFEs returned from the ISS to refine the service life prediction. Results from this testing and implications to ISS resource management are provided.
Author
*Air Filters; Life Support Systems; Cabin Atmospheres; Particulates; Fluid Filters; Dust*

**20050215316** Military Academy, USA
**Optimal Configuration of Human Motion Tracking Systems: A Systems Engineering Approach**
Henderson, Steve; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XX-1 - XX-24; In English; See also 20050215300; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Human motion tracking systems represent a crucial technology in the area of modeling and simulation. These systems, which allow engineers to capture human motion for study or replication in virtual environments, have broad applications in several research disciplines including human engineering, robotics, and psychology. These systems are based on several sensing paradigms, including electro-magnetic, infrared, and visual recognition. Each of these paradigms requires specialized environments and hardware configurations to optimize performance of the human motion tracking system. Ideally, these systems are used in a laboratory or other facility that was designed to accommodate the particular sensing technology. For example, electromagnetic systems are highly vulnerable to interference from metallic objects, and should be used in a specialized lab free of metal components.
Derived from text
*Human Factors Engineering; Psychology; Robotics*

**20050215437** Wolverhampton Univ., Wolverhampton, UK
**Technology Transfer to SMEs: A Force for Good? A UK West Midlands Project**
Thompson, Diana; Homer, Garry; IPSI 2005 Amalfi Proceedings; [2005]; 14 pp.; In English; See also 20050215422; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes the role of technology transfer from UK Universities to small and medium sized enterprises (SMEs). The benefits and the pitfalls from the University and company perspective are considered. Quantitative data is provided from a European Regional Development Project IT Futures Centre. The authors draw several conclusions for the successful technology transfer experience. 1) Academic staff with commercial acumen need to be recruited/seconded onto the project; 2) Adequate support staff need to be recruited in the areas of marketing and communications; 3) A career path for academics who become involved with technology transfer needs to be provided by Universities to achieve continuity; 4) The majority of the collaboration (especially training) needs to be carried out on site; 5) SME staff need to feel that they have contributed to the new development; 6) The time scales must be adhered to throughout the project; and 7) Measurable targets such as jobs created etc. can be achieved if SMEs feel satisfied with the assistance they have received.
Author
*Technology Transfer; Marketing; Education; Tasks*

**20050215562** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Materials and Manufacturing Research and Collaboration with the Marshall Space Flight Center**
Vickers, John H.; January 2005; 1 pp.; In English; Space and Missile Defense Conference and Exhibition, 16-18 Aug. 2005, Huntsville, AL, USA; No Copyright; Avail.: Other Sources; Abstract Only

A strong materials and manufacturing base is an essential element to enable sustained and affordable human and robotic space exploration. NASA requires development and implementation of advanced technologies from wide-ranging segments

of materials and manufacturing to provide capabilities in areas such as propulsion, power, vehicle and habitat structures, optics, radiation protection, thermal protection, in-situ manufacturing, and information technologies. This presentation will explore the latest challenges, opportunities, initiatives, and developments aimed at addressing NASA technological needs.
Author
*Manufacturing; Space Exploration; Robotics; Thermal Protection; Radiation Protection; Habitats; Propulsion*

**20050215606** NASA Marshall Space Flight Center, Huntsville, AL, USA
**SIAM-SERVIR: An Environmental Monitoring and Decision Support System for Mesoamerica**
Irwin, Daniel E.; Sever, Tom; Graves, Sara; Hardin, Danny; [2005]; 1 pp.; In English; Lecture for the City of Knowledge Foundation, 18 aug. 2005, Pana City, Panama; Copyright; Avail.: Other Sources; Abstract Only

In 2002/2003 NASA, the World Bank and the USA Agency for International Development (USAID) joined with the Central American Commission for Environment and Development (CCAD) to develop an advanced decision support system for Mesoamerica (named SERVIR) as part of the Mesoamerican Environmental Information System (SIAM). Mesoamerica - composed of the seven Central American countries and the five southernmost states of Mexico - make up only a small fraction of the world s land surface. However, the region is home to seven to eight percent of the planet s biodiversity (14 biosphere reserves, 31 Ramsar sites, 8 world heritage sites, 589 protected areas) and 45 million people including more than 50 different ethnic groups. Today Mesoamerica s biological and cultural diversity is severely threatened by extensive deforestation, illegal logging, water pollution, and uncontrolled slash and burn agriculture. Additionally, Mesoamerica's distinct geology and geography result in disproportionate vulnerability to natural disasters such as earthquakes, hurricanes, drought, and volcanic eruptions. NASA Marshall Space Flight Center, together with the University of Alabama in Huntsville (UAH) and the SIAM-SERVIR partners are developing state-of-the-art decision support tools for environmental monitoring as well as disaster prevention and mitigation in Mesoamerica. These partners are contributing expertise in space-based observation with information management technologies and intimate knowledge of local ecosystems to create a system that is being used by scientists, educators, and policy makers to monitor and forecast ecological changes, respond to natural disasters and better understand both natural and human induced effects. In its first year of development and operation, the SIAM-SERVIR project has already yielded valuable information on Central American fires, weather conditions, and the first ever real-time data on red tides. This paper presents the progress thus far in the development of SIAM-SERVIR and the plans for the future.
Author
*Decision Support Systems; Environmental Monitoring; Information Management; Information Systems; Real Time Operation*

**20050216556** Defense Technical Information Center, San Diego, CA USA
**Directory of Design Support Methods**
Alley, Teresa; Aug. 1, 2005; 222 pp.; In English
Report No.(s): AD-A437106; No Copyright; Avail.: CASI: A10, Hardcopy

This Directory contains references to human systems integration (HSI) design and interface tools, techniques, databases, guides and standardization documents. HSI encompasses human factors, human performance, training, manpower and personnel systems analysis and design. Contributors include: U.S. Department of Defense (DoD), Federal Aviation Administration (FAA), National Aeronautical and Space Administration (NASA), other U.S. government agencies, NATO countries, academia, and private industry.
DTIC
*Directories; Human Factors Engineering*

## 55
## EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

**20050215630** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Microbiological Methodology in Astrobiology**
Abyzov, S. S.; Gerasimenko, L. M.; Hoover, R. B.; Mitskevich, I. N.; Mulyukin, A. L.; Poglazova, M. N.; Rozanov, A. Y.; [2005]; 1 pp.; In English; The International Symposium of Optical Science and Technology 50th Annual Meeting: Instruments, Methods, and Missions for Astrobiology, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

Searching for life in astromaterials to be delivered from the future missions to extraterrestrial bodies is undoubtedly related to studies of the properties and signatures of living microbial cells and microfossils on Earth. As model terrestrial analogs of Martian polar subsurface layers are often regarded the Antarctic glacier and Earth permafrost habitats where alive microbial cells preserved viability for millennia years due to entering the anabiotic state. For the future findings of viable microorganisms in samples from extraterrestrial objects, it is important to use a combined methodology that includes classical microbiological methods, plating onto nutrient media, direct epifluorescence and electron microscopy examinations, detection of the elemental composition of cells, radiolabeling techniques, PCR and FISH methods. Of great importance is to ensure authenticity of microorganisms (if any in studied samples) and to standardize the protocols used to minimize a risk of external contamination. Although the convincing evidence of extraterrestrial microbial life will may come from the discovery of living cells in astromaterials, biomorphs and microfossils must also be regarded as a target in search of life evidence bearing in mind a scenario that alive microorganisms had not be preserved and underwent mineralization. Under the laboratory conditions, processes that accompanied fossilization of cyanobacteria were reconstructed, and artificially produced cyanobacterial stromatolites resembles by their morphological properties those found in natural Earth habitats. Regarding the vital importance of distinguishing between biogenic and abiogenic signatures and between living and fossil microorganisms in analyzed samples, it is worthwhile to use some previously developed approaches based on electron microscopy examinations and analysis of elemental composition of biomorphs in situ and comparison with the analogous data obtained for laboratory microbial cultures and fossilized microorganisms. This communication will be focused on the analysis of our experience in working with ancient microorganisms and fossils and discussion of some issues that are crucial for development of the program for future finding of extraterrestrial life and its evidence.

Author

*Extraterrestrial Life; Microbiology; Microorganisms; Cells (Biology); Bacteria; Exobiology; Fossils; Fishes*

## 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*.

**20050214876** Belgrade Univ., Yugoslavia

**International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s)**

[2002]; In English; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine on the Internet, 29 Jul. - 4 Aug. 2002, L'Aquila, Italy; See also 20050214877 - 20050215007; Copyright; Avail.: CASI: C01, CD-ROM

Topics discussed include: A center for Knowledge Factory Network Services (KoFNet) as a support to e-business A Concept-Oriented Math Teaching and Diagnosis System A Contradiction-Free Proof Procedure with Visualization for Extended Logic Programs A Framework For Developing Emerging Information Technologies Strategic Plan A Generic Approach to the Design of Linear Output Feedback Controllers; A Knowledge Management Framework for Integrated design; A Method Component Programming Tool with Object Databases; A New Approach to the Construction of Parallel File Systems for Clusters; A New Paradigm for Network Management: Business Driven Device Management; A Reuse-Oriented Approach for the Construction of Hypermedia Applications; A Scientific Paradigm On Image Processing's Lecture; A Theory of Programming for e-Science and Software Engineering; A video based laboratory on the Internet, and the experiences obtained with high-school teachers; Web Engineering: Methods & Tools for Education; Adding Security to Quality of Service Architectures; Advanced Mobile Multipoint Real-Time Military Conferencing System (AMMCS); Advanced Optical Infrastructure for the Emerging Optical Internet Services; Agent-based Intelligent Clinical Information System; An Approach for Implementing Object Persistence in C++ using Broker; An Efficient and Adaptive Method for Reservation of Multiple Multicast Trees; Distributed Information Systems Building Techniques; An eye-gaze input device for people with severe motor disabilities; Australian and Asia-Pacific Grid Developments and Information Spaces; Askemos - A distributed settlement; Automatic Determination of Cluster Size Using Machine Learning Algorithm; CAL-Visual, an E-Education Tool for the Management of Digital Resources; and Casual Databases.

Derived from text

*Computer Programming; Data Bases; Education; Real Time Operation; Resources Management; Software Engineering; Management Methods; Machine Learning; Internets; Information Systems*

**20050214881** Hebrew Univ., Jerusalem, Israel

**Complexity and the Emergent Web**

Solomon, Sorin; Shir, Eran; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 12 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The main conceptual tool of Complexity is to express, explain and control the complex collective objects arising at a certain space-time scale as emerging from the simpler interactions of their components at a finer scale. This is a sort of extension of the 'atomic-molecular' stochastic thinking and computational methods to social, biological, cognitive and information technology problems. The integration it implies is not a juxtaposition of various expertises but rather a much more intimate fusion of knowledge. This involves a coordinated shift in the very objectives, scope and ethos of the affected disciplines. Complexity is not offering just a way of answering a question from one science using concepts from another: it is introducing a new language which allows the formulation of novel questions or rather a new grammar which allows novel interrogative forms. Complexity induces a new relation between theoretical and applied science. In the past, as technology was acting on hardware objects, applied science was mainly experimental science applied to real life situations. Today, when technology is acting on information, applied science consists often of theoretical/abstract operations applied to real life information items. One may have to get used to the expression 'Theoretical Applied Science'

Author

*Information Systems; Biotechnology; Stochastic Processes*

**20050214906** Wuhan Univ., China

**Multi-grid Parallel Algorithm with Virtual Boundary Forecast for Solving 2D Transient Equation**

Qingping, Guo; Parker, Yakup; Parkinson, Dennis; Jialin, Wei; Sheng, Zhang; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876

Contract(s)/Grant(s): NSFC 60-173046; Proj. Q724; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This article discusses a multi-grid parallel algorithm of 2D heat transient initial-boundary problem with Virtual Boundary Forecast (VBF). The numerical results show that this algorithm has high speedup, less calculative time than no-VBF algorithm.

Author

*Algorithms; Computational Grids; Boundary Value Problems; Parallel Processing (Computers)*

**20050214917** DaimlerChrysler Aerospace A.G., Ulm, Germany

**Extending SOAP to Adhere to Session-oriented Communication Principles**

Jeckle, Mario C.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Session-oriented communication is well known to Web users today since it is implemented by the most common Web browsers. Unfortunately current Web service implementations do not offer a way to add session orientation to exposed services in such a way as to insure interoperability. This paper proposes a SOAP extension which conforms to the W3C standard, thus enhancing the SOAP protocol to adhere to session-oriented communication. Additionally, the extension neither relies on a specific protocol binding nor does it exploit any semantics offered by transport protocols used to transfer the actual SOAP calls. Keywords SOAP, Session-oriented Communication, Statefull Communication, Lightweight Transactions.

Author

*Interoperability; World Wide Web; Semantics*

**20050214928** Electronics and Telecommunications Research Inst., Daejon, Korea, Republic of

**Wavelet-based Blind Watermark Embedding Technique**

Joo, Sanghyun; Seo, Yongseok; Suh, Youngho; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper, we propose a blind watermarking method that embeds a binary pseudo-random sequence (watermarks) into wavelet dc components. To embed watermarks, we prepare a reference DC sub-band through a kind of low pass filtering process to the original DC that is often classified as LL sub-band. The watermarks generated from the first key are embedded into locations decided from the second key by comparing the magnitudes between DC and DC . Our embedding uses two keys: the first key for generating watermarks and the second key for deciding locations to embed the watermarks. This embedding process is repeated until the relationship between DC and DC becomes stable, because changes in DC lead to some changes in the leading DC . Our robustness is compared to some results registered to the ChechMark [1] that is one of the most popular benchmarking tools.
Author
*Embedding; Robustness (Mathematics); Wavelet Analysis; Random Numbers; Digital Systems*

**20050214933** Texas Univ., Austin, TX, USA
**Evaluating Network Intrusion Detection Algorithm Performance As Attack Complexity Increases**
Ourston, Dirk; Matzner, Sara; Stump, William; Hopkins, Bryan; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper examines the issues involved with responding to complex Internet attacks. Such attacks characteristically occur in stages over extended periods of time and allow specific actions in a particular stage to be interchangeable. The stages can be extremely difficult to correlate because they are separated in time, and actions can be deliberately obscured to achieve the goals of the attacker. We have chosen an approach to intrusion detection using Hidden Markov Models (HMMs) that explicitly addresses these issues. When compared with two classic machine learning algorithms, decision trees and neural nets, the HMM algorithm provides at least a five-percent performance advantage over the decision tree algorithm and at least a thirty percent advantage over neural nets at all training levels. The HMM performance advantage over decision trees increases in cases with high attack complexity or where few training examples exist. The HMM performance advantage also increases as the number of training examples decreases. This last result indicates that the HMM algorithm may have additional benefit when data describing a particular attack type is rare. This work is an extension to the work reported at last year s SSGRR conference. The new work reported here assesses the impact of increasing attack complexity on classification performance. We model attack complexity by the length of the attack sequence. We also include an analysis of the effect of few training examples on detection performance. Index Terms Intrusion detection, complex internet attacks, Hidden Markov Models, machine learning.
Author
*Internets; Warning Systems; Machine Learning; Classifications; Algorithms; Decision Theory; Detection*

**20050214934** Saint Petersburg State Univ., Saint Petersburg, Russia
**Evolution and Convergence in Telecommunications**
Yanovsky Gennady G.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002], pp. 1-7; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Today telecom landscape changes with very high speed. Every some months the new network technologies, new products and new services are developed. Key factors, driving forces and megatrends of telecommunications technologies and services evolution are described, including liberalization, globalization, growth of Internet and mobile communications. Different directions of convergence (convergence of voice and data services, fixed/mobile convergence, computer-telephony integration, etc.) are considered in details.
Author
*Telecommunication; High Speed; Internets; Mobile Communication Systems*

**20050214935** Simula Research Lab., Lysaker, Norway
**Evaluation of Minimal Deterministic Routing in Irregular Networks**
Skeie, Tor; Theiss, Ingebjorg; Lysne, Olav; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 9 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

New technologies like InfiniBand(TradeMark) has put a renewed focus on deterministic routing in irregular networks. One problem related to such topologies is that the combination of shortest path routing and deadlock freedom is difficult, and therefore existing methods allow shortest path routing only relative to some constraint. In this paper we demonstrate that because of this, the predominant routing strategy for irregular networks, Up*/Down*, scales poorly with network size when restricted to deterministic routing. We evaluate a technique, LASH routing, that guarantees true shortest path routing for all (source, destination) pairs, guarantees in-order delivery of packets, and that uses virtual channels for deadlock avoidance. We have performed extensive random experiments in which the method needed six or less virtual channels for all tested networks of sizes up to 128 switches. Through simulation we demonstrate gains in throughput close to 200% compared to standard Up*/Down* routing under otherwise equal conditions.
Author
*Computer Networks; Topology*

**20050214936** Nippon Telegraph and Telephone Public Corp., Musashino, Japan
**How to Find Similar Web Sites by Using Only Link Information**
Kurihara, Satoshi; Hirotsu, Toshio; Takada, Toshihiro; Akashi, Osamu; Sugawara, Toshiharu; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are studying techniques that allow even ordinary end users to make efficient use of the Internet. We previously proposed an algorithm for determining the degree of similarity between web sites by using link information to find web sites that are mirrors of each other and ones that are not mirrors but have similar content and can be used as substitutes for each other. As a result of verifying the basic effectiveness of that algorithm, we found that when trying to find similar web sites to site-A, in addition to ones found to have almost 100% similarity to site-A, there were also ones that were thoroughly adequate for use as substitutes for site-A, even though they had a low degree of similarity of 50% or less. Therefore, for practical use of that algorithm, it is essential to be able to automatically judge whether web sites that can be inferred to have some kind of similarity are actually mirror sites or similar sites that can be used as substitutes. To solve this problem, in this paper, we propose and evaluate the basic effectiveness of an automatic judgment methodology, and we focus on its operation and propose a methodology for effectively finding candidates for a similar site by using a user's Internet access history. Index Terms Internet, Mirror site, Access history, Link
Author
*Internets; Mirrors; Websites; Algorithms; Analogies; Data Links*

**20050214937** Belgrade Univ., Yugoslavia
**Genetic Algorithms for Internet Search: Examining the Sensitivity of Internet Search by Varying the Relevant Components of Genetic Algorithm**
Vesna, Sesum; Dragana, Cvetkoviae; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The quantity of presentations on the Internet is constantly increasing. This implies the problem of searching and quickly retrieving the appropriate information. The efficient way for solving this problem is by using genetic algorithms. This paper considers some existing solutions of the problem and describes the implementation of different components of genetic algorithm s structure with the focus on genetic operator of selection and other relevant parameters of genetic algorithm. For measuring the performance of the applied genetic algorithm, the testing was done and the obtained results show potentials. Index Terms genetic algorithms, intelligent agent, roulette selection, fitness scaling.
Author
*Genetic Algorithms; Genetics; Internets*

**20050214938** Hewlett-Packard Labs., Bristol, UK
**Identity Management: A Key e-Business Enabler**
Casassa, M.; Bramhall, P.; Gittler, M.; Pato, J.; Rees, O.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 10 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Digital identities, profiles and their management are increasingly required to enable interactions and transactions on the Internet among people, enterprises, service providers and government institutions. Recent initiatives, including Microsoft .MyServices and Liberty Alliance Project, are eager to supply mechanisms to enable identity management and simplify the overall consumer experience. Enterprises and government institutions are exploring the usage of meta-directories, PKI and electronic identity cards. This paper describes the state of the art of identity management, looks at trends, requirements and hard problems that need to be addressed - including trust, privacy and security - and presents some HP research activities in this area.
Author
*Electronic Commerce; Identities; Internets; Directories*

**20050214939** Universidad de Malaga, Malaga, Spain
**Implementation of a Remote-assistant Application via Web Over IP Networks: CIMA Project**
Canete, F. J. Gonzalez; Palomo, F. M. Garcia; Casilari, E.; Sandoval, F.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Original contains color illustrations
Contract(s)/Grant(s): CICYT-TEL99-0755; CEC-1FD97-0918; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper an architecture to provide remote assistance services over IP networks is presented. The architecture includes elements which perform as Automatic Call Distributor (ACD). The ACDs, which are embedded in a Web environment, manage and distribute incoming client calls among assistance agents, who are assigned to a determined profile or human-assisted service. The clients petitions are sent via a simple Web page in a 'click to call' manner. The election of the agent is performed according to information related to this Web page and data transparently extracted from the client. The multimedia calls are supported on IP with the H.323 set of standards. The system also has the capability to put through the call to a standard or a cellular phone using an H.323 gateway and it can interact with classical Call Centers to offer a mixed service via web and phone.
Author
*Video Communication; Teleconferencing; Multimedia*

**20050214940** Belgrade Univ., Yugoslavia
**Hardware RAID-5 versus Non-RAID Solution under UNIX Operating System**
Djordjevic, B.; Miskovic, S.; Javanovic, N.; Milutinovic, V.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 9 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper concentrates on the problem of performance comparison between Hardware RAID5 and Non-RAID solution under UNIX Operating System. Evaluation for both configurations was made on the same class of disks and the same CPU configuration. The tests were performed on both controllers for the same disk kernel-cache memory size. A few kinds of test were created: a random-transfer test, a random-removing test, a sequential read test, a sequential write test and real-application tests.
Author
*Controllers; Kernel Functions; Unix (Operating System)*

**20050214950** Jyvaskyla Univ., Finland
**Optimal Link Allocation and Charging Model**
Hamalainen, Timo; Joutsensalo, Jyrki; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Multiservice networks will carry different kinds of applications in the near future. Bandwidth requirements change rapidly, and the network resource management will play an important role to guarantee the use of the limited resources in the most efficient way. We approach the channel capacity allocation problem by studying customers willingness to pay in such

a way that the satisfactory of the customers as well as the revenue is maximized.
Author
*Mathematical Models; Allocations; Approximation; Communication Networks*

**20050214969** Vrije Univ., Brussels, Belgium
**Scalability and Knowledge Reusability in Ontology Modeling**
Jarrar, Mustafa; Meersman, Robert; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color and black and white illustrations
Contract(s)/Grant(s): EEC-IST-1999-12392; EEC-IST-2000-29243; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The thesis of this paper is to present and discuss the scalability and reusability capabilities of DOGMA, an ontology modeling approach. Ontologies are repositories of domain knowledge and essential for knowledge management in organizations and for achieving interoperation among information systems. In the DOGMA ontology server architecture we implement ontologies as classical database resources separating the 'fact base' from the constraints, rules, derivations etc. that commit an application to such a given ontology 'base'. This separation allows an increased degree of scalability and reusability for the activities of ontology building. These issues are key in the context of the so-called Semantic Web where very large numbers of partial ontologies will emerge. Index Terms ontology, scalability, knowledge reusability, ontologies, ontology base, modeling, methodology, commitment layer.
Author
*Information Systems; Knowledge Based Systems; Data Bases*

**20050214976** North Dakota State Univ., Fargo, ND, USA
**Learning Objects: Pedagogy Based Structuring of Course Materials**
Juell, Paul; Smith, Elizabeth; Daniels, Lisa; Shanmugasundaram, Vijayakumar; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 11 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We are actively trying to improve education with a project called ' Learning Objects'. Learning Objects provide a pedagogy based outline structure that is visible to the instructor and the student. Learning Objects are used to provide structure to on-line course material and to provide consistent and useful indexing of the course material. This indexing is then used to provide user selectable displays, searches and editing capabilities. Both instructors and students can use the web based editing system. The editing facilities simplify creation and maintenance of the on-line material and support a notebook system for students. The student can annotate the on-line tree of the course material with notes, search the material and the notes and selectively display notes and other material.
Author
*Display Devices; On-Line Systems; Education; Training Devices; Visual Aids; Support Systems*

**20050215001** Koc Univ., Istanbul, Turkey
**Epidemic Communication Mechanisms in Distributed Computing**
Ozkasap, Oznur; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A substantial class of large-scale distributed applications is insensitive to small inconsistencies among participants, as long as these events are temporary and not frequent. An efficient way for propagating information to participants in such cases is referred to as epidemic protocols. These communication mechanisms has been mainly used for resolving inconsistencies in distributed database updates, failure detection, message loss recovery in multicast communication, network news distribution, group membership management, scalable system management, and resource discovery. Epidemic protocols are simple, scale well and robust again common failures, and provide eventual consistency as well. They combine benefits of efficiency in hierarchical data dissemination with robustness in flooding protocols. One of the fundamental results of epidemic theory shows that simple epidemics eventually infect the entire population. If there is a single infected process at the beginning, full infection is achieved in expected time proportional to the logarithm of the population size. In this article, we first review

epidemic mechanisms in distributed computing, examples of epidemic processes, and their variations. Then, we describe the Bimodal Multicast protocol and its epidemic loss recovery mechanism that we study. We conclude with our simulation results discussing the performance of epidemic loss recovery mechanisms in scalable multicast communication.
Author
*Distributed Processing; Communication Networks; Protocol (Computers); Robustness (Mathematics); Management Systems; Data Bases*

**20050215004** Villanova Univ., PA, USA
**Coordinatized Graphs: Interplay Between Graphical Properties and Adjacency Systems**
Woldar, Andrew J.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 14 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The authors investigated graphs in which the vertex sets consist of coordinate vectors and the edge sets are determined by certain systems of coordinate relating equations, here called 'adjacency systems.' Surprisingly, there is a wealth of properties inherent in all such graphs, and in many cases one can ensure additional properties by judiciously choosing the systems. One of the goals of the program initiated in [28] is to formulate graphical properties in terms of adjacency systems. In particular, there is a special focus on properties which are application driven, such as high edge density and girth, vertex- and edge-transitivity, connectivity, etc. Standard applications exist in communication network design and cryptography to name a few, but there are additional applications of more theoretical nature that also motivate our investigation.
Author
*Communication Networks; Cryptography; Graphs (Charts)*

**20050215007** Gesellschaft fuer Mathematik und Datenverarbeitung, Darmstadt, Germany
**Infrastructures for Mobile Services in e-Medicine**
Thielmann, Heinz; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 16 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mobile e-Services ('m-Services') are and will be the driving force both for the rapid evolution in mobile communication (from GSM via GPRS towards UMTS) and in new applications for IP-based solutions/platforms. The segment of 'e/m-Medicine' is one of the most encouraging areas, since it is relevant for the overall society and will have a major impact on most of the other public e/m-Services, such as e/m-learning, e/m-government, etc. Connected with Mobile Services in general the aspect of real-time location dependent services has a strategic importance for e/m-Medicine. Location-based services (LBS) can tremendously enhance the living conditions of disabled, elderly and other citizens, which need permanent control or access to medical services. Such applications could also provide emergency, remote monitoring and tracking features. Location-based services & applications are being developed by many companies and it is one of the hottest arena in the cellular world these days. However, these services are targeted to the mass market such as youth and corporate markets. Elderly and disabled citizens require a different set of applications and services. Thus the requirements from such location systems, i.e., accuracy, availability and type of applications are quite different from those offered by some vendors/carriers for example, a location-based service for blind citizens should be voice activated and voice instructed as a must.
Author
*Mobile Communication Systems; Real Time Operation; Medical Services; Emergencies*

**20050215042** Belgrade Univ., Yugoslavia
**International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s)**
[2003]; In English; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet, 28 Jul. - 3 Aug. 2003, L'Aquila, Italy; See also 20050215043 - 20050215091; Copyright; Avail.: CASI: C01, CD-ROM

Topics discussed include: Designing IT Infrastructures for e-Governments: The Case of Digital Repositories; Digital Publishing; World Wide Web Database Integration via Mobile Agents; Computer Model of the Human Circulatory System; Storage Management as Means to Cope with Exponential Information Growth; Towards Team-Orientation in Agent Design: Social Plan Execution; Is Word Sense Disambiguation Useful in Information Retrieval?; To Search or not to Search: this is

the Question; QoS Architecture for Caching in Middleware; Graduate Research and Education in Electrical and Computer Engineering; A Study on efficient transmission method Using Space-Time Block Code; Managing Wide Area Network with GPL products; Evolution of Mobile IP; Concept of e-OJT; A Taxonomy of Execution Replay Systems A Carrier-centric assessment of network architectures for providing optical transport services to IP Client networks; Management Method of Transport Connection in Diameter-Based Authentication, Authorization and Accounting System; The Next Generation of IP - Flow Routing; Swan: Small-world Wide Area Networking; Out of Order Incremental CRC Computation; and Designing Efficient Address Lookup Algorithms for IPv6. Hierarchical Associative Memories for Path Prediction Using Parallel Slackness for Extracting ILP from Sequential Threads Integration of speech and text based search technologies Semantic Web Derived from text

*Applications Programs (Computers); Computer Information Security; Natural Language Processing; Wide Area Networks; World Wide Web; Data Bases; Information Retrieval; Computerized SIMulation*

**20050215044** Marian (Daniela), Napoca, Romania

**Some Properties of Circular Distance in Directed Networks**

Marian, Daniela; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 11 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We firstly define circular distance in directed networks and we study some properties of the circular distance. We study then location problems in directed networks: we define circular centers, circular absolute centers and circular continuous centers. We present algorithms for establish circular absolute centers and circular continuous centers. We adopt the definition of network as metric space in the sense of Dearing and Francis (1974).

Author

*Computer Networks; Metric Space; Position (Location); Algorithms*

**20050215080** Air Force Inst. of Tech., OH, USA

**Graduate Research and Education in Electrical and Computer Engineering**

Terzuoli, Andrew J., Jr.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes the various research and education programs in the Department of Electrical and Computer Engineering at the Air Force Institute of Technology (AFIT), USA. The Institute is a graduate school wholly owned by the US Air Force. Its primary mission is research based education for students from the USA and allied nations, so that they possess the skills necessary to succeed in the rapidly changing strategic and technological environment of today s world. The students are challenged with in-depth graduate research and classroom education.

Author

*Electrical Engineering; Education; Research*

**20050215086** Belgrade Univ., Yugoslavia

**Ubiquitous Computing: Current Trends and Questions of the Next Computing Era**

Bosnjakovic, Andrew M.; Ilic, Vlado M.; Milutinovic, Veljko M.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 9 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Abstract This document describes major trends in the past, the present, and what authors reckon as the future of computing. Analysis is presented of everything that has spawned from Mark Weiser s original idea concerning tons of information at our fingertips and new, ubiquitous kind of computing, so relaxing as ‘a walk in the woods’. After introductory part on early related work in this field, current trends are presented through several diverse projects in this field of computing. Facts and dogma about ubiquitous computing, its significance, hardware issues and social impact are discussed. Authors point of view and vision of future work in this field of computer science is also included.

Author

*Quantum Computers; Trends; Technology Utilization; Inspiration*

**20050215089** Catholic Univ. of Korea, Korea, Republic of

**Robust Multiagent Decision-Making in Time-Critical Environments**

Noh, Sanguk; Gmytrasiewicz, Piotr J.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 6 pp.; In English; See also 20050215042; Original contains color illustrations

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To perform rational decision-making, autonomous agents need considerable computational resources. When other agents are present in the environment, these demands are even more severe. In these settings an agent has to make decisions considering not only the state of the environment, but also the beliefs, goals, and intentions of the other agents as well as the other agent's beliefs about others, and so on. The flexible decision-making methods explicitly consider a tradeoff between decision quality and computation time. Our framework limits resources used for agent deliberation and produces results that are not necessarily optimal, but provide autonomous agents with the best decision under time pressure. We validate our framework with experiments in a simulated anti-air defense domain. The experiments show that flexible decision-making procedures reduce computation time while offering good performance.

Author

*Autonomy; Computation; Decision Making; Time Dependence*

**20050215347** Belgrade Univ., Yugoslavia

**International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005)**

[2005]; In English; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2005), 7-8 Jan. 2005, HI, USA; See also 20050215348 - 20050215374; Copyright; Avail.: CASI: C01, CD-ROM

Topics discussed include: Aviation Maintenance Online - Multimedia and Multidimensional Approaches to Engineering Technology; The Non-specific Intelligent Guided-View System Based On RFID Technology; Transferring Critical Path Technology to Financial Planning; Building Lightweight Ontologies for E-Learning Environment; The MOMENTS Integrated Metamodel - Future Multidisciplinary Teaching-Studying-Learning (TSL) Processes and Knowledge Construction in Network-Based Mobile Education (NBME); Managing Project Knowledge: The Contribution of Lessons Learned; Valuation and Hedging of Power-Sensitive Contingent Claims for Power with Spikes: a Non-Markovian Approach; LYEE Agent System Development Method; Service Quality Improvement Using Quality Function Deployment in the Application Service Provider Industry; Use of knowledge mapping to elicit knowledge flows and gaps in an insurance organization; User Profiles with Common Modules for Multiple Domains; Mobility and Computation Protocols for Enhancing Gateway Dependability in Hybrid Mobile Ad Hoc Networks; Chemical Sensitivity in the Workplace; Teaching Mathematical Modeling in Chemistry; Physicians, Public Health Practitioners, Educators and Linguists: A League of Extraordinary Bedfellows; The Effects of Dolphin Interactions with Children Diagnosed with Posttraumatic Stress Disorder; Toward Next Generation Business Information Systems: Four Inherent Capabilities of Service Oriented Computing; Modeling System Integrity of a Security Critical System using Coloured Petri Nets; An Ethical Perspective on Internet Commerce; Modelling Software Metric Data with XML; Design of Advanced Guidance Law against Hypersonic Attacking Targets: Robust Adaptive Neural Network Approach; and Multi-Population Genetic Algorithm for Protein Folding.

Derived from text

*Knowledge Based Systems; Neural Nets; Hypersonics; Genetic Algorithms; Electronic Modules; Document Markup Languages; Technological Forecasting; Systems Engineering; Internets*

**20050215349** Middle Tennessee State Univ., Murfreesboro, TN, USA

**Valuation and Hedging of Power-Sensitive Contingent Claims for Power with Spikes: a Non-Markovian Approach**

Kholodnyi, Valery A.; IPSI 2005 Hawaii Proceedings; [2005]; 34 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present and further develop a new approach to modeling spikes in power prices proposed earlier by the author. In contrast to the standard approaches, we model power prices with spikes as a non-Markovian stochastic process that allows for modeling spikes directly as self-reversing jumps. We also show how this approach can be used to value and hedge European contingent claims on power with spikes.

Author

*Stochastic Processes; Claiming; Reversing*

**20050215351** Saint Joseph's Univ., Philadelphia, PA, USA

**Teaching Mathematical Modeling in Chemistry**

Rash, Agnes M.; IPSI 2005 Hawaii Proceedings; [2005]; 6 pp.; In English; See also 20050215347; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The intention of this article is to suggest how the process of integrating mathematics and chemistry in an introductory college course might enhance the learning process for undergraduate non-mathematics and non-science majors. This paper also discusses factors that a faculty member should consider when designing and planning a similar course. Finally, examples from three of the units from the course, temperature-humidity indices, drug concentration in the bloodstream and symmetry groups, will be explained in slightly more detail. This course was developed by Rash and Zurbach at Saint Joseph's University. The article is an expansion on two previous works appearing in Primus.

Author

*Mathematical Models; Education; Symmetry; Humidity*

**20050215442** National Sun Yat-Sen Univ., Kaohsiung, China

**Primer Set Selection in Multiple PCR Experiments**

Liu, Wei-Ting; Yang, Chang-Biau; Shiau, Shyue-Horng; Shiue, Yow-Ling; IPSI 2005 Amalfi Proceedings; [2005]; 11 pp.; In English; See also 20050215422

Contract(s)/Grant(s): NSC-93-2213-E-110-004; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The selection of a suitable set of primers is crucial to the multiple PCR (polymerase chain reaction) experiment, which is one of the most important techniques in molecular biology. The minimum primer set (MPS) problem is to minimize the number of primers required to amplify a set of DNA sequences, so that the experimental costs and time will be reduced. However, the MPS problem has been proved to be NP-complete. In this paper, we propose an efficient heuristic algorithm for solving the MPS problem. In our algorithm, the kernel procedure is to choose a set of possible good primer candidates, each may be able to amplify more than one target DNA sequence. The kernel procedure is accomplished by the local motif finding method, which is based on the combination of the Gibbs sampler method, the ant colony optimization (ACO) strategy, and Liao's algorithm for finding motifs. We add a new weight parameter to the method, which can guide us to find local motifs with the local view. Then, the complementary sequences of those local motifs (possible primer candidates) are input into the binary integer programming for getting the near optimal set. With the concept of possible primer candidates, the size of the solution space in the binary integer programming can be reduced drastically. We perform experiments on some artificial domains and two gene families. The experimental results show that the time required for our algorithm is reduced drastically, while the performance of our algorithm is comparable to that obtained by the exhaustive search.

Author

*Algorithms; Molecular Biology; Sequencing; Kernel Functions; Heuristic Methods; Deoxyribonucleic Acid; Integers*

**20050216390** NASA Glenn Research Center, Cleveland, OH, USA

**Application of an Extended Parabolic Equation to the Calculation of the Mean Field and the Transverse and Longitudinal Mutual Coherence Functions Within Atmospheric Turbulence**

Manning, Robert M.; August 2005; 25 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 22-612-30-81-03

Report No.(s): NASA/TM-2005-213841; E-15211; No Copyright; Avail.: CASI: A03, Hardcopy

Solutions are derived for the generalized mutual coherence function (MCF), i.e., the second order moment, of a random wave field propagating through a random medium within the context of the extended parabolic equation. Here, 'generalized' connotes the consideration of both the transverse as well as the longitudinal second order moments (with respect to the direction of propagation). Such solutions will afford a comparison between the results of the parabolic equation within the pararaxial approximation and those of the wide-angle extended theory. To this end, a statistical operator method is developed which gives a general equation for an arbitrary spatial statistical moment of the wave field. The generality of the operator method allows one to obtain an expression for the second order field moment in the direction longitudinal to the direction of propagation. Analytical solutions to these equations are derived for the Kolmogorov and Tatarskii spectra of atmospheric permittivity fluctuations within the Markov approximation.

Author

*Diffraction Propagation; Optical Communication; Statistical Analysis; Distribution Moments*

**20050216411** SUPELEC, Gif-sur-Yvette, France

**Flat Heterogeneous Modeling**

Boulanger, Frederic; Mbobi, Mokhoo; Feredi, Mohamed; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 7 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Most heterogeneous modeling environments allow only one model of computation at each hierarchical level of a model. The consequences are that (1) the transformations that occur at the boundary of two models of computation depend on the modeling tool and (2) the hierarchical structure of the model is perturbed by layers introduced to allow changes of model of computation. We introduce 'heterogeneous interface components' to allow flat heterogeneous modeling. Such components have inputs and outputs that obey different models of computation. We present an execution model that allows the use of these components with any model of computation. the vocabulary used in the Ptolemy II project [1], a domain is an implementation of a model of computation: it is a set of rules for computing the behavior of the components of a model. In the following, we often use 'domain' to mean 'model of computation'. Heterogeneous modeling is simply modeling using several models of computation or domains. Since most systems are heterogeneous in nature, heterogeneous modeling provides more natural and Author

*Computation; Heterogeneity; Domains; Hierarchies*

**20050216428** Multimedia Univ., Cyberjaya, Malaysia

**Hardware Prototyping of Boolean Function Classification Schemes for Lossless Data Compression**

Reaz, M. B. I.; Mohd-Yasin, F.; Sulaiman, M. S.; Tho, K. T.; Yeow, K. H.; Ibrahimy, M. I.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 5 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper, we present the realization of Boolean function classification schemes on Altera FLEX10K FPGA device for lossless data compression. The compression algorithm is performed by incorporating Boolean function classification into Huffman coding. This allows for more efficient compression because the data has been categorized and simplified before the encoding is done. The design is followed by the timing analysis and circuit synthesis for the validation, functionality and performance of the designated circuit which supports the practicality, advantages and effectiveness of the proposed hardware realization for the applications. The average compression ratio is 25% to 37.5% from numerous testing with various text inputs with a maximum clock frequency of 27.9 MHz.

Author

*Data Compression; Boolean Functions; Coding; Field-Programmable Gate Arrays; Classifications*

## 60
## COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

**20050214888** Gunma Univ., Kiryu, Japan

**A Method Component Programming Tool with Object Databases**

Aritsugi, Masayoshi; Takamizawa, Hidehisa; Yoshida, Yusuke; Kanamori, Yoshinari; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Object database applications are constructed with invocations of methods of persistent objects. In order to realize flexible development environments, it is important to enable application developers to manipulate methods flexibly. In this paper, the concept of method components is proposed. A method of persistent objects can have multiple implementations and be shared in a network in our system. Users can retrieve an implementation of the method to be processed from the network, according to their needs, and apply it to objects. A system supporting method component programming that we have developed is presented. Several illustrative examples of method retrievals are shown for the ease of understanding. Keywords Method component, Object database, Programming environment.

Author

*Data Bases; Programming Environments*

**20050214975** California Univ., San Diego, La Jolla, CA, USA

**Elearning, Metacognition and Visual Design**

Kirsh, David; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Original contains color and black and white illustrations

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Metacognition is associated with planning, monitoring, evaluating and repairing performance Designers of elearning systems can improve the quality of their environments by explicitly structuring learning contexts to facilitate metacognition. Typically page layout and visual design are not viewed as significant factors in metacognition. It is argued here that the way visual cues are structured, however, can have a significant effect on metacognition. Documents that make effective use of markers such as headings, callouts, italics etc can improve students ability to comprehend documents and plan the way they review and process content. The apt use of illustrations also encourages metacognition. One consequence of this view is that is that metacognition is a more pervasive component of information rich environments than traditionally assumed.

Author

*Visual Stimuli; Human Performance; Design Analysis*

**20050216705** Kyushu Inst. of Tech., Japan

**Information Extraction on Presupposed Items and/or Presupposed Topics from Text Documents**

Nomura, Hirosato; Ohmoto, Satoshi; Nagai, Hidetoshi; Nakamura, Teigo; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 6 pp.; In English; See also 20050216686; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents a computer system which can extract certain kinds of information from text documents. The documents are newspaper articles announcing new products. The extraction on presupposed items picks up information concerning Product Species, Product Name, Company Name, Marketing Date, and Price. The extraction task on the presupposed topics finds and then picks up information that will be of importance and interest. In order to avoid the heavy computation, we propose a pattern-match process which utilizes templates. During the extraction process, several kinds of scoring tasks are performed to evaluate its usefulness and accuracy. As an additional task, the system generates a short sentence from the extracted information. This sentence might be considered a short summary of the original document. According to our examination, this system has achieved 94% accuracy. The old version of the system has been available for public use on the Internet since March 1997.

Author

*Computation; Extraction; Internets*

## 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.

**20050214880** Indonesia Univ., Depok, Indonesia

**A Scientific Paradigm On Image Processing's Lecture**

Sardy, Sar; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Human biological information processing is mostly started from vision through eye s lens, followed by imaging on retina, then pattern recognition in our biological neural networks, and finally image understanding and decision making in our brain. Vision, imaging, and soft-computing are multidisciplinary scientific paradigm that can imitate the above biological phenomena. It is a bottom up procedure and follows the sequence levels of processing, which is nowadays found in many areas of scientific applications. Within the context of the proposed paradigm, it was developed image processing s lecture for undergraduate students at the Faculty of Engineering, University of Indonesia. The use of available computer software for presentation and evaluation, and the setting up student s study groups for the dissemination of teaching materials, are

investigated for a certain period of teaching. The impact of the teaching approach indicates some significant progress in learning process, which is reflected from the student s grades at each semester, and the increasing intention to select various topics in image processing fields for their final job assignments in the completion of their undergraduate program. Index Terms Educational Objectives, Scientific Paradigm, Digital Image Processing, Lecture s Presentation, Educational Evaluation. Author

*Bioprocessing; Computer Programs; Image Processing*

**20050214883** Universidad Carlos 3 de Madrid, Madrid, Spain

**A New Approach to the Construction of Parallel File Systems for Clusters**

Garcia, F.; Calderon, A.; Carretero, J.; Perez, J. M.; Fernandez, J.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 10 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Traditional network and distributed file systems support a global and persistent name space that allow multiple clients to share the same storage devices, but does not provide parallel access to data, becoming the file servers in a major bottleneck in the system. The use of parallelism in file systems alleviates the growing disparity in computational and I/O capability of the parallel and distributed architectures. Parallelism in file systems is obtained using several independent server nodes supporting one o more secondary storage devices. Data are declustered among these nodes and devices to allow parallel access to different files, and parallel access to the same file. This approach increases the performance and scalability of the system. All current parallel file systems and parallel I/O libraries lack generality and flexibility for general purpose distributed environments. Furthermore, all parallel file systems do not use standard servers, thus it is very difficult to use these systems in heterogeneous environments as, for example, clusters of workstations. However, why use proprietary, special-purpose servers on the server end of a parallel file-system when you have most of the necessary functionality in NFS servers already, and with simple rules and workarounds other necessary features can be more or less accommodated? This is the idea of the paper: to show a new approach to the construction of parallel file systems for heterogeneous clusters. The result of this approach is a new parallel file system, called Expand (Expandable Parallel File System). Expand allows the transparent use of multiple NFS servers as a single file system. Different NFS servers are combined to create a distributed partition where files are declustered. Expand combines multiple NFS servers to create a distributed partition where files are declustered. Expand requires no changes to the NFS server and uses RPC operations to provide parallel access to the same file. Expand is also independent of the clients, because all operations are implemented using RPC and NFS protocol. The paper describes the design, the implementation and the evaluation of Expand with MPI-IO. This evaluation has been made in Linux clusters and compares Expand and PVFS. Keywords Keywords: Parallel File System, NFS, data declustering, clusters, b e. io, out-of-core. Author

*Computer Systems Performance; Protocol (Computers); Workstations; Parallel Processing (Computers); Document Storage*

**20050214884** National Central Univ., Taiwan

**A Concept-Oriented Math Teaching and Diagnosis System**

Shann, Wei-Chang; Chen, Peng-Chang; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 15 pp.; In English; See also 20050214876 Contract(s)/Grant(s): NSC-90-2521-S-008-001; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Like reading and writing, mathematics is a basic required skill to live in today's world. The math ability is largely determined by the understanding of math concepts. Nowadays math-concept and problem- solving are the two important themes in math education. By observing the actions of a student's problem- solving procedure, instructors have a chance to identify the possible misconception and the quality of prerequisites. Thus, we are motivated to design a new kind of computer software that can on the one hand enforce the math concepts for students, and on the other hand collect the problem-solving steps in order to help instructors diagnose the misconceptions. The proposed software has the following key points: 1. Over the internet and executable by a web browser. 2. Apply the techniques and concepts of object-oriented programming, encapsulate all arithmetic steps inside objects. 3. Graphical User Interface. All operations are done by mouse actions on menu and icons. Students shall read the word problem, choose appropriate concepts from math toolboxes. Each concept provides a template, and the key quantities of the word problem are objects referred to as icons. Students solve the problem by drag-and-dropping the objects into correct templates at correct positions. 4. All moves are sequentially recorded in a remote server as raw data. The data have many possible consequent applications. For instance, one can analyze the misconception patterns and design reactions based on them, or the steps can be re-played by other students to observe good moves. Within

this software system, students actively interact with the computer in order to build correct and concrete concepts. For implementation, we choose Java (and Javascript). Because it is so far the most natural language for OOP and internet. We also apply other common web-design and network programming tools. The proposed software system is expected to provide students, and instructors, an assistant tool for learning and teaching math concepts. The tool can enforce students to focus on the relationship between quantity and quantity, and to focus on the connections between concept and concept. It temporarily relieves students from the distraction of numerical values and the burden of arithmetic procedures.
Author
*Computer Design; Computer Programs; Diagnosis; Object-Oriented Programming*

**20050214885** Daimler-Benz Aerospace A.G., Ulm, Germany
**.NET - All New?**
Ruetschlin, Jochen; Sellentin, Juergen; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

'.NET is the Microsoft platform for XML Web services'. This or a similar phrase is used by the Redmonder company to introduce almost every new crowd-puller in its range of products. But what remains if the smoke screen made up by buzzwords like XML and Web services disappears? Targeting this question, we give a survey of the technological concepts used in the .NET framework. Completely new concepts are separated from those already known from other contexts. In addition, we compare .NET to open standards such as J2EE. The issues discussed are related to ongoing work at Daimler-Chrysler Research: Does .NET offer us brand-new opportunities we did not have before? Keywords .NET, J2EE, Web technology. were able to solve most of the problems simply by avoiding fat clients (by aiming at an HTML solution) and dividing the integration server's functionality into several EJBs (Enterprise JavaBeans). Nevertheless, on a long-term perspective, our goal is to deploy a component architecture based on a lightweight Web-based framework (cf. [2]). When .NET appeared on the scene, it seemed that a giant step had been taken in the direction of system evolution and interaction. Unfortunately, similar announcements had been made for CORBA and (some years later)
Author
*Document Markup Languages; World Wide Web; Computer Programs; Product Development; Software Development Tools*

**20050214889** Koblenz-Landau Univ., Koblenz, Germany
**Living Book: An Interactive and Personalized Book**
Baumgartner, Peter; Gross-Hardt, Margret; Simon, Anna B.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 11 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the era of information technology, providing high quality and state of the art educational material is quite a challenge and requires the use of new media. The In2Math project at the University of Koblenz-Landau develops in this context the Living Book; Living Book means personalized user oriented educational material together with interactive components. The Living Book aims at supporting the fundamental parts of undergraduate classes in theoretical computer science. The main goal is to support the active, explorative and self-determined learning in lectures, tutorials and selfstudy. This paper describes the main aspects of the Living Book and explains the concepts and ideas behind it as well as the techniques used to realized these concepts. As the title of the paper already indicate, the main aspects that have driven the development of the Living Book are: personalization of content according to the user s needs, and support of explorative and interactive learning techniques by means of embedded systems.
Derived from text
*Education; Information Systems*

**20050214890** Technological Univ. of Malaysia, Johor Bahru, Malaysia
**A Framework For Developing Emerging Information Technologies Strategic Plan**
Rasli, Amran Md.; Suleiman, Ebi Shahrin; Rahman, Ismail Abd.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Abstract--While many organizations have developed information systems strategies that incorporate existing information technology, only a small number of firms have developed a proactive approach to identify potential business applications of emerging information technologies. Even fewer firms have incorporated emerging information technology platforms into their information technology master plan. A four-round Delphi assessment by 15 experts was used to identify 'considerations' for Universiti Teknologi Malaysia in their effort to integrate existing information technology systems used by the university. Kendall s Coefficients of Concordance were used to measure the level of consensus among the experts and were found to be statistically significant. To conclude, fourteen considerations recommended by the panel of experts were incorporated in the traditional strategic planning process to form a schematic model known as The AEI IT Strategic Planning Framework. Index Terms Delphi assessment, strategic planning, integrative framework

Author

*Information Systems; Strategy; Planning*

**20050214893** softeyes G.m.b.H., Dresden, Germany

**Askemos: A Distributed Settlement**

Wittenberger, Joerg F.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents Askemos, an autonomous, distributed operating system on top of peer to peer networks which significantly raises the level of abstraction in comparison with today s operating systems. Askemos addresses safe, secure and correct (forge proof) information processing while securing intellectual property in an innovative way. Askemos defines a virtual machine on document level, which is de- fined in terms of abstract trees and pure functional transformation of them, both described in XML. This virtual machine has no physical representation at any single machine. Instead it works distributed among independent components which appear as if they observed it. To achieve that effect, the participating machines compute the process steps of the virtual machine independent and vote among each other about the correct result. To prevent illegal attacks, there exists no concept of unique resources like super-user rights or unique name spaces.

Author

*Operating Systems (Computers); Autonomy; Computer Programs*

**20050214897** Ljubljana Univ., Ljubljana, Slovenia

**Local Telematics Services for Higher Education**

Rugelj, Joze; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The evolution of Internet and Intranet use in higher education is having a profound impact on the evolution of computer use and the curricular integration of new learning technologies for distance learning and for conventional courses. The Internet itself is a communications channel offering the potential for communication and collaboration. It also provides a medium through which learning materials and many other information relevant to students and instructors are available. Widespread use of telematics in higher education has mostly to do with the easy availability of computer and networks. However, it also has to do with mature, motivated students capable of the usage of the services and faculty familiar enough with network applications to offer such services. The presence of good technical support in terms of computer software, networks, and instructional development is also a major factor.

Author

*Education; Information Systems; Computer Assisted Instruction; Internets; Computer Networks; Computer Programming; Software Engineering*

**20050214898** Warsaw Univ. of Technology, Warsaw, Poland

**Parallel Solutions of Coupled Problems**

Okulicka-Dluzewska, Felicja; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The structure of the set of equations obtained in the process of modeling the coupled problems is analyzed. The block

methods to solve such system is presented. The existing standard libraries available from the World Wide Web are presented and their adequacy for the coupled consolidation problem is analyzed.
Author
*Algorithms; Problem Solving; Parallel Programming; Iteration*

**20050214902** Kyungpook National Univ., Daegu, Japan
**Agent-based Intelligent Clinical Information System**
Kim, I. K.; Yun, J.H.; Lee, S. M.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Original contains color illustrations
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Hospital systems are heterogeneous and the clinical information scattered. The development of a clinical information system to integrate the information among hospitals and make legacy systems cooperate is thus difficult. For efficient clinical information management and system integration, clinical data, patient data privacy and integration of records need to be well organized and conform to relevant standards. In this paper we develop an agent-based Intelligent Clinical Information System. Functional entities are divided according to tasks and implemented as collaborating agents. These agents reside on a multiagent platform which provides communication and invocation of execution functionality. We adopt HL7 standards for both clinical data and web services, in order to provide a user-environment via the internet.
Author
*Data Integration; Information Management; Information Systems; Systems Integration*

**20050214904** Coastal Carolina Univ., Conway, SC, USA
**Development of Computer-Based Activities for Peer-Led Team Learning in University-Level General Chemistry**
Goodwin, John A.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hybrid print and computer based study materials have been developed as supplements to the 'Peer-Led Team Learning General Chemistry'. These have been used in the General Chemistry course at Coastal Carolina University. Their effectiveness in the PLTL setting has been assessed. Students self-assessment of process skill level and an objective evaluation of overall student performance level both increased.
Author
*Computer Assisted Instruction; Computer Techniques; Hybrid Computers*

**20050214910** Teesside Univ., Middlesbrough, UK
**Web Engineering: Methods and Tools for Education**
Cormack, G. E.; Griffiths, G.; Hebbron, B. D.; Lockyer, M. A.; Oates, B. J.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 9 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper we propose a simple method for web engineering: The Simple Web Method (SWM, pronounced swim ). We also discuss tool support for Web Engineering and introduce our prototype WIPSE (Web Integrated Project Support Environment). Both are described in use and evaluated.
Author
*Internets; Computer Programs; Websites*

**20050214911** Memorial Univ. of Newfoundland, Saint Johns, Newfoundland, Canada
**Interconnecting Networks and the Performance of Multithreaded Multiprocessors**
Zuberek, W. M.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Original contains color illustrations
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The effects of interconnecting networks on the performance of distributed memory multiprocessor systems are studied in this paper. The paper shows that the inter-connecting networks can be characterized by a small number of modeling parameters, and that networks with different topologies are equivalent with respect to their performance if the values of their critical parameters satisfy certain relations. This equivalence can be used to simplify the simulation{based performance evaluation by analyzing systems which are equivalent with respect to performance to the original ones, but are significantly simpler. Keywords| multiprocessor systems, distributed{memory systems, interconnecting networks, multithreaded systems, performance bottlenecks, discrete{event simulation.
Author
*Network Analysis; Distributed Memory; Multiprocessing (Computers); Topology*

**20050214912** Lucid Ventures, New York, NY, USA
**Computing Our Way to the Ultimate Toy**
Thorisson, Kristinn R.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper proposes the idea of a construction toy that gives children of all ages access to the extreme limits of knowledge, from the smallest particles to the edges of the universe, and everything in between. Scientific computer models would be interconnected in ways that allows players to construct at multiple scales and levels of detail. Galaxies and solar systems, planets and cities, growing plants and thinking creatures, viruses and bacteria all could serve as building blocks in worlds of your own creation. The toy would not only be fun, it would be a fantastic learning tool. It could also be the most powerful science delivery medium proposed to date. I call this toy Constructa. Index Terms Educational technology, simulation, virtual worlds, toys.
Author
*Computerized SIMulation; Children; Construction; Education*

**20050214916** Claremont Graduate School, CA, USA
**Evaluating Java Applets for Teaching on the Internet**
Healy, Michael R.; Berger, Dale E.; Romero, Victoria L.; Aberson, Christopher L.; Saw Amanda; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Web Interface for Statistics Education (http://wise.cgu.edu) is a website built around interactive tutorials designed to teach introductory and advanced statistical concepts. The tutorials use Java applets that dynamically illustrate the statistical concepts being taught. By using Java applets, we teach statistics in a manner not possible in a traditional classroom environment. In this paper, we provide examples of the applets, illustrate how students use them, and we report the outcome of a study that examined tutorial effectiveness as a learning tool.
Author
*Applications Programs (Computers); Java (Programming Language); Education*

**20050214923** Sao Paulo Univ., Brazil
**Maestro: A Middleware for Distributed Applications based in Components Software**
Becerra, Jorge L. R.; Ferreira, Claudio L. P.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 9 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This article s main proposition is the specification of a middleware and its internal components, highlighting its principal characteristics and functionalities as well as the execution of distributed applications. For the middleware s specification the reference model was the ISO/IEC s ODP (Open Distributed Processing), which facilitates the visualisation of the system according to five distinctive viewpoints. OMG s Unified Modelling language (UML) is also used as a modelling tool in each viewpoint. A software projects automation system is then specified at the end of the article to illustrate the middleware s functionality.
Author
*Computer Programs; Distributed Processing; Applications Programs (Computers); Automatic Control*

**20050214925** Edinburgh Univ., UK

**Oral Metaphor Construct New Directions in Cognitive Linguistics**

Stepak, Asa M.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 9 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Oral Metaphor Construct,(OMC), is a new concept in Cognitive Linguistics based upon metaphor dynamics that ,also, has significance in numerous related fields such as Artificial Intelligence, Anthropology, Automated Voice Systems, Clinical Psychology, Psychiatry, Communicative Disorders, Second Language Acquisition, etc. The Oral Metaphor Construct is a language imprint that identifies the predisposed space time metaphorical configuration of articulation and semantic objects of the Mind that is passed from one generation to the next via the genome which mediates language acquisition and facilitates the learning of a second language.

Author

*Linguistics; Cognition; Artificial Intelligence*

**20050214927** Michigan Univ., Ypsilanti, MI, USA

**Software Solutions for Science e-Education: A Case Study from the VISIT Project**

Xie, Yichun; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 15 pp.; In English; See also 20050214876; Original contains color illustrations

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e-Education, using the web as virtual schools or classrooms and Internet as primary delivery mechanism, has increasingly captured the enthusiasm and fantasy of entrepreneurs, educators and students. Many e-Education software systems have been franchised. However, few of them have successfully taken advantage of current available online resources and Internet technologies, such as, easy access to a huge and interlinked network of scientific data, advanced graphical tools and computational power enabling educators and students to visualize scientific data and processes in ways that were previously impossible. This study focuses on the technological and pedagogical challenges to science e-Education, based on the lessons learned in designing and implementing an online collaboratory - VISIT Virtual Immersion in Science Inquiry for Teachers, sponsored by a grant from US National Science Foundation Teacher Enhancement Program. The paper examines weak spots of current e-Education software packages. The paper discusses key characteristics of successful e-Education for science educators. The paper presents new designs for enhancing science e-Education, including, vertical (in-depth) exploration of time-series data, horizontal (geographic) exploration of time-series data, user-collected data integration tool, and knowledge database construction tool. The paper also discusses future directions of enhancing science e-Education software design. Key words: e-Education, science inquiry, GIS, online collaboratory, software design

Author

*Software Engineering; Applications Programs (Computers); Data Integration; Internets; Education; Data Bases*

**20050214930** Magenta Development Ltd., UK

**Magenta Multi-Agent Engines For Decision-Making Support**

Andrejev, V.; Batishchev, S.; Iwkushkin, K.; Minakov, I.; Rzevski, G.; Safronov, A.; Skobelev, P.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The article concerns principles of constructing of open multi-agent systems for decision-making support. It describes key differences of the applied approach to constructing of multi-agent systems, their architecture, and main features of constructing and functioning of agents. The article provides a brief description of the developed engine for the development of multi-agent applications for business management and other areas of application.

Author

*Decision Making; Management Methods; Support Systems; Architecture (Computers)*

**20050214931** Tartu Univ., Tartu, Estonia

**Domain-Specific Language Agents**

Meriste, Meriste; Helekivi, Jueri; Kelder, Toenis; Motus, Leo; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Original contains black and white illustrations

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Multi-agent systems are proposing a new design concept for software - the kenetic software design - based on the concept of interactive agents. On the basis of this conceptual view, interacting agents appear as an appropriate conceptual tool for the development of domain-specific languages. Domain specific language will be considered as a consensual collection of interrelated autonomous notions and, the language processor as a cluster of interacting agents i.e. a multi-agent representing language notions. This paper suggests an agent-based modeling framework as a possible methodological basis for DSL design and development.

Author

*Software Engineering; Languages*

**20050214932** Warsaw Univ. of Technology, Warsaw, Poland

**Development of Distributed Package of Finite Element Method**

Okulicka, F.; Dluzewski, J. M.; Dluzewski, Janusz; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Original contains color illustrations

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The parallelization of the sequential finite element code is discussed in the paper. HYDRO-GEO - finite element code oriented at hydro-technical and geo-technical engineering problems is considered. The structure of the code and the scope of parallelization are discussed in details. The great number of sequential loops can be done in parallel way. The effort and the obtained results are discussed herein. As an engineering problem the Warsaw underground structure is modeled. The obtained seed up is discussed. Index Terms Parallel and distributed programming, finite element code, geotechnical problems.

Author

*Parallel Programming; Geotechnical Engineering; Finite Element Method*

**20050214941** New Mexico State Univ., Las Cruces, NM, USA

**A Theory of Programming for e-Science and Software Engineering**

Reinfelds, Juris; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Programming needs a theory that can be used to design programs and to reason about programs with concepts that practitioners use every day. A good theory minimizes the complexity of everyday concepts and maximizes their expressive power. Dijkstra introduced a programmer s theory for imperative programming. The kernel language approach of Van Roy and Haridi provides a precise and concise basis for programming in all paradigms (imperative, logical, functional and object-oriented) as well as for parallel, concurrent and distributed multi-thread programming. The netcentric e-Commerce, e-Speak and other e-system applications require multi-language and multi-thread programs. The kernel language approach gives us a simple, concise, yet very powerful and expressive framework in which we can design programs and reason about multi-paradigm, multi-language programs. Index Terms multi-paradigm programming; net-centric programming; programmer s theory of programming; teaching of multi-paradigm, multi-thread programming;

Author

*Electronic Commerce; Software Engineering; Object-Oriented Programming; Kernel Functions; Computer Programming*

**20050214948** University of North Texas, Denton, TX, USA

**SEMPEL: A Software Engineering Milieu for PEer-Learning**

Lakshminarasimhan, V.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

SEMPEL is A Software Engineering Milieu for PEer-Learning aimed at providing an interactive education over both in-situ and distance-based modality of teaching. The objective of this project is to offer a seamless distributed environment for continuous interaction with both peers and instructors. It also facilitates the 'third dimension' in learning and keeps a profile on the learning of an individual so that it can proactively manage the process and offer alternate course of actions where required. The SEMPEL framework includes tools and technologies for cooperation and collaboration. Furthermore, SEMPEL is also populated with a suite of testing and certification tools in order that an individual has a choice of learning procedures. In addition, SEMPEL s value-added services include organizations to have a certified means to meeting their learning objectives. SEMPEL will be actively deployed and used in the near term (first 5 years) as a virtual learning environment, and we expect it to become the primary source for 'Digitally Empowered Learning'. Index Terms- E-ducation, interactive learning, peer-to-peer learning, knowledge-based persistence, virtual learning environment..
Author
*Computer Programming; Software Engineering; Knowledge Based Systems; Education; Certification*

**20050214955** Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
**Measurement Technique for Object Oriented Systems**
Henry, Sallie; Long, Cary; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Software complexity metrics have long been used in the procedural programming paradigm. With the advances in object-oriented technology for e-business applications, there exists a need for more extensive work in the area of metrics for the object-oriented paradigm. Metrics assist the software developer with the evaluation of the quality of the software and prediction of possible weaknesses in that software. In past studies, metrics have been shown to predict the location and the number of faults in production code. Applying software metrics during the software development phase allows the software engineer to better assess the software prior to production. Existing object-oriented metrics do not address how a class' relation to other classes in the inheritance hierarchy affects its future maintenance needs. This research proposes a new object-oriented metric, Hierarchy Corrected Metric (HCM) that does address a class' relation to others in the hierarchy. HCM uses the values of the standard OO metrics for each class plus knowledge of the class inheritance hierarchy to arrive at a revised complexity measurement for each class. That measurement reflects not only internal complexity for the class but also the influence of other classes in the hierarchy to the complexity of the class. Using data from a commercial system HCM was shown to have a high correlation with maintenance. HCM was a better predictor of software quality than the existing OO (MOOSE) metrics.
Author
*Object-Oriented Programming; Software Engineering; Computer Programming; Technology Utilization; Electronic Commerce*

**20050214957** Calgary Univ., Alberta, Canada
**Holarchies on The Internet: Enabling Global Collaboration**
Ulieru, Mihaela; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 1 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The tremendous progress in networking technologies has challenged dramatically the way enterprises do business by replacing traditional off- line information processing methods with on-line real-time connections to the global economy. From E-commerce and marketing intelligence to custom-based product design and ordering, more and more transactions flow over the internet making distances between business partners measurable in network intelligenc e power rather than in thousands of miles. In this talk I will present the concept of Holonic Enterprise as a paradigm shift in global enterprise collaboration that exploits emerging technologies supporting collaborative work in a dynamic distributed environment to create a new kind of infrastructure facilitating strategic partnerships among cyber-highway enabled participants. Embracing several paradigms (among which: the virtual and web-centric enterprise paradigm, the holonics and multi-agent systems models and the novel business perspective of co-opetition) into a versatile, unified business model this new paradigm links the three levels of a global collaborative organization (inter-enterprise; intra-enterprise and basic resource level) to build a web-centric ecosystem partnering in which the workflow is harmoniously managed. Synergistic merging of these paradigms with most recent advances in soft computing result in a dynamic environment that maintains the optimal configuration of an emergent virtual organization by clustering at every level of resolution the best partners for each activity that contributes towards organization

s goal. A look at how the Holonic Enterprise model extends to e-health, e-learning, e- factory and other emerging internet-enabled perspectives concludes the talk.
Author
*Internets; Artificial Intelligence; World Wide Web*

**20050214958** Ajou Univ., Suwon, Korea, Republic of
**Analysis on Utilization and Delay of Memory in a Lossless Packet Processing System**
Kim, Jongsu; Moon, Jongwook; Yim, Kangbin; Jung, Gihyun; Choi, Kyunghee; Jang, Joongsoon; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We propose an embedded system with a distributed multi-processor architecture as one possible solution to help Intrusion Detection System to improve the packet processing capability. Dual port RAM is utilized for transporting packets and synchronization data between the processors connected each other in a loosely coupled manner. To figure out the most sensitive factors to influence the performance and the memory utilization to handle packets incoming in a burst fashion, a performance evaluation model is presented. Comparison is done with simulation result and empirical data gathered in a real network. The discrepancy is negligibly small so that the model is close enough to the real system, indicating that it could be used to evaluate or minimize the implementation cost of other similar multi-processor systems.
Author
*Embedded Computer Systems; Memory (Computers); Architecture (Computers); Computer Systems Programs*

**20050214960** Bagnall (Peter M.), USA
**Solving Scaling Problems with the Modern GUI (July 2002)**
Bagnall, Peter M.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The GUI has changed very little since its invention by Xerox in the mid 70. GUIs are no longer able to present the full range of a typical application's functions in such a way that the user can find and understand them easily. Understanding the objectives a user has in mind while using software can greatly ease this problem, resulting in more appropriate, less complex software with the same power as software we see today. Breaking the application model and using a document or object approach may provide a superior solution.
Author
*Graphical User Interface; Scaling Laws; Computer Programs; Computer Systems Design*

**20050214961** Brigham Young Univ., Provo, UT, USA
**Verifying and Leveraging Software Frameworks**
Larson, Trent; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Small-scale software verification is difficult, and large-scale verification for abstract behavior is typically orders of magnitude more difficult. However, software frameworks are good candidates for formal analysis since they have well-defined APIs and semantics, so we introduce the conditions and approach by which verification can be practical. The framework must be absolutely stable and have interesting formal properties. In addition, the properties should be stated as relationships between methods and not about the state of data. We show that properties of a large program such as an application server can be formally verified, and the results can be easily leveraged by framework users. Finally, we discuss the use of frameworks and other formal methods in modern system architectures.
Author
*Program Verification (Computers); Semantics; Computer Programs*

**20050214962** Autosophy, San Francisco, CA, USA
**The Emerging Autosophy Internet**
Holtz,Klaus; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The next leap forward in Internet performance is expected to come from a combination of better search engines, higher bit-rate channels, and more mobile computing. However, there could also be an easier way to improve the Internet. The Autosophy information theory, first developed in 1974, has the potential to radically transform all Internet communications. Autosophy techniques are already widely used on the Internet; for example, in the GIF and TIF standards for lossless still-image compression and in the V.42bis data compression standard found in virtually all modems. Those early applications are rapidly being superseded by more advanced algorithms. A television system based on the Autosophy information theory has recently been demonstrated. Applications include High Definition Television, movies, and teleconferencing over the Internet. Preliminary software simulations show the way to extremely high lossless video compression. Compression ratios are dependent only on the video content, i.e., motion and complexity within the images. Autosophy communication protocols are especially suited to the packet-switching Internet environment, being highly immune to the Internet s current Quality of Service (QoS) problems. Packet latencies, dropped packets, unpredictable bitrates, and insecure networks may all cease to be significant issues. The practical transmission of video and synchronized sound over unpredictable channels like the Internet may even require the use of Autosophy protocols. The new techniques also yield a hardware-independent protocol that can mix all different data types (including video, still images, sound, text, and random bit files) in the same packet stream. Other applications of the Autosophy information theory include self-learning databases with the potential to replace the programmed data processing computer.

Author

*Data Compression; Information Theory; Internets; Protocol (Computers)*

**20050214963** Cabrillo Coll., Aptos, CA, USA

**Visualizing Molecules Helps Students 'See' Chemistry in a New Light**

Ungar, Harry; Baucom, Albion; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Original contains color and black and white illustrations

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Because molecules have properties which are dependent on their complete 3D structures, chemistry students need to develop the ability to think in 3D. Molecular model kits can now be valuably augmented or surpassed by having students closely observe and manipulate molecular models on a computer screen. Our students use both hand-held and computer models to solve assigned problems, writing their answers in the form of conventional 2D structures on ordinary paper. This combination of multiple formats has produced highly effective results with students at many different levels of chemical education. The C4 Project (Computers in Chemistry at Cabrillo College) designs, builds, uses, evaluates and distributes free educational software featuring molecular visualizations. The software is WWW based and is available at http://c4.cabrillo.cc.ca.us. In addition to student exercises and tutorials, our software is effectively used by teachers as a lecture aid. Also, our advanced Java-based applets can be incorporated by developers into their own web pages. Because it requires only a computer connected to the Internet, a standard WWW browser and the free Chime plug-in, our software can be used anywhere in the world without any added costs.

Author

*Molecules; Students; Chemistry; Education; Scientific Visualization; Computers*

**20050214964** Massachusetts Inst. of Tech., MA, USA

**Using the Quick Look Methodology to Plan and Implement Complex Information Technology Transformations**

Staats, Rich; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Much has been written in the literature about program management and technical requirements for implementing Information Technology (IT) transformations, but in practice these factors are necessary, but not sufficient to guarantee success changes. The MITRE Corporation in coordination with the US Department of Defense developed the Quick Look (QL) methodology to provide better oversight on complex problems related to the military transformation in general and IT changes in particular. The QL model captures otherwise intangible factors such as: consistent stakeholder support; sufficient, stable, and synchronized resources; effective management structures; and, realistic, well-defined and appropriate requirements and objectives. The paper contains several hundred questions that enable the practitioner to the model has been extended into an automated tool in both MS Word and Windows executable formats for ease of use and application. The QL methodology is

currently being applied in the Offices of the Secretary of Defense for IT system design, procurement, and fielding.
Author
*Information Systems; Project Management; Systems Engineering; Methodology*

**20050214965** Catena Corp., Japan
**The Mathematical Structure Model of a Word-unit-based Program**
Arai, Osamu; Fujita, Hamid; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The new software world is moving and moving a head but not yet in the status of its needed expectation. We think that such needed expectation should be represented by the new challenge needed for new software generation needs. This paper presents one part of our innovation in Lyee technology, Lyee was established by Mr. Negoro and has already produced industrial achievements. This paper is aimed to provide a mathematical ground for the Lyee methodology. By introducing a concept of Word that is provided with a domain, an address (name and pointer) and a 'state,' we could define a structure of a program. The 'state' has three conditions, i.e. truth, falsehood, and the undecided. This idea has consistency with the intuition-based logic. This enables us to handle an issue of the execution of control, that is, the sequential order of program execution, as an independent issue from others. Having constructed such a structure, we are thus allowed to focus on which value should be put in a domain of the Word under some defined conditions in the applications. These are some of the characteristics of the Lyee related to system construction methodology . Index Terms Program control structures, Computer science, System construction methodology, Intuition-based logic.
Author
*Computer Programs; Mathematical Models; Words (Language); Mathematical Logic*

**20050214966** Oldenburg Univ., Germany
**World-wide interaction with 3D-data**
Kaupp, Gerd; Stepanenko, Svetlana; Herrmann, Andreas; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 11 pp.; In English; See also 20050214876; Original contains color illustrations
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Recent developments in interactive imaging/animation and present habits in the treatment of 3D-data in publication media are summarized. Even VRML or X3D standards do not provide numeric capabilities that are available at every site of 3D-data production. However, original 3D-data should be urgently published and conserved for the numeric/statistic analysis of 3D-objects by interaction with these data on a worldwide basis. VRML is the generally accepted exchange format that should be used for publication and archiving, presently. In the absence of a generally available 3D-viewer with numeric capabilities these (unsegmentated) VRML data must be adapted and imported to the proprietary software of the different vendors for interactive analysis and further imaging/viewing. Several data-sets of five different vendors (softwares) in supermicroscopy were converted and exchanged via VRML. The wealth of numeric/statistic 3D-analysis is demonstrated. 3D-objects from all sciences and daily life can be similarly treated. This is exemplified with geographic objects. All imaging-based 3D-acquisition devices should at least keep the original data for recourse to them.
Author
*Imaging Techniques; Data Links; Data Acquisition; Data Transfer (Computers)*

**20050214970** Loughborough Univ., Leicesterschire, UK
**CAL-Visual, an E-Education Tool for the Management of Digital Resources**
Bouchlaghem, Dino; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 14 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper reports on a project which aimed at implementing the use of computer imagery and visualization to support the teaching and learning of subject areas where visualisation of objects and processes play an important role. The work involved the development of a framework for the management of digital resources in teaching and learning using web technologies. The project built on Communication and Information Technologies (C&IT) and Computer Assisted Learning

(CAL) techniques being widely exploited in higher education to improve the teaching and learning experience in built environment education. In architecture and building engineering, computer based visualization can play an important role in enhancing students learning with the use of practical case studies of building sites and finished buildings in a classroom environment. The work investigated the use of digital repositories as an aid to teaching and learning and proposed a WEB based system for the management of digital archives containing images, video footages and animations of construction projects and buildings. This facilitates the visualisation of construction materials, components and building defects, and simulates construction processes; hence bringing the learning benefits gained form construction sites to classroom environments. After reviewing relevant work and presenting the main aim and objectives of the project, the paper describes the architecture of the system and prototype, discusses some of the issues encountered during the design and implementation and then and presents some preliminary evaluation results.
Author
*Computer Techniques; Resources Management; Imagery*

**20050214971** Florida Agricultural and Mechanical Univ., Tallahassee, FL, USA
**Casual Databases**
Riggs, K. R.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 12 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A software system, called a casual database is considered. Its value is suggested. Its feasibility is related to schema integration and heterogeneous retrieval. Baseline results regarding feasibility of these in XML is produced and constraints and opportunities enumerated.
Author
*Data Bases; Document Markup Languages*

**20050214972** MedSMART, Inc., Ann Arbor, MI, USA
**EMERGENCY! Medicine and Modern Education Technology.**
vonLubitz, Dag K. J. E.; Carrasco, Benjamin; Gabbrielli, Francesco; Patricelli, Frederic; Pletcher, Tymoty; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Increasingly rapid progress of medical science and the continuous development of new methods of clinical treatment demand that every practitioner at any level of medical practice continues to update the essential knowledge acquired during professional education. Only a few years after medical school, new facts will have emerged, new treatments devised and approved, and new tools will have become available. In order to stay 'current,'continuous exposure to training ceased to belong to the realm of commendable intellectual curiosity, instead becoming a frequently quite costly and time-consuming 'must.' For those living and working in close proximity to medical training centers such as universities or teaching hospitals, maintenance of adequate knowledge and skills level is significantly less burdensome than for those operating in rural or remote regions. Hence, it is the lesser group of medical practitioners for whom the advent of modern medical education technology is one of the most important developments in medicine.
Derived from text
*Medical Equipment; Medical Science; Remote Regions; Biotechnology*

**20050214977** Fern Univ., Hagen, Germany
**E-Learning Content Creation with MPEG-4**
Stepping, Michael; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

MPEG-4 is an object oriented system for multimedia representation (streams, images, etc.) and it is more than 'yet another' approach to audio and video coding. The potential of MPEG-4 systems lies in the standardised format of the MPEG-4 content which is based on VRML. Current authoring systems store the content in proprietary formats which are not compatible with each other. This paper provides an overview of the MPEG-4 system model and its advantages. Additionally, it gives an

example of how complex the MPEG-4 content creation process currently is. Index Terms Multimedia communication, multimedia systems, authoring systems, authoring languages.
Author
*Telecommunication; Languages; Learning*

**20050214978** Technische Univ., Munich, Germany
**Differentiated Multilayer Resilience in IP over Optical Networks**
Autenrieth, Achim; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 10 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The infrastructure of the future Internet will be based on a multilayer transport network, most likely using Multi- Protocol Label Switching (MPLS) running on top of a Optical Transport Network (OTN). Even though the reliability of a service is an important attribute of the service quality, resilience is considered to be separated from the service quality as a transport network property. However, using a differentiated resilience and protecting only those services which require a high level of resilience can result in significantly better resource usage. In this paper the use of differentiated resilience in multilayer IP over optical networks is discussed. Several options to offer a tailored resilience using recovery mechanisms available in MPLS and optical layers are presented and evaluated.
Author
*Internets; Protocol (Computers); Security; Transport Properties*

**20050214979** eCare A.B., Stockholm, Sweden
**Implementation of Feedback(TradeMark): An Application for Quality Assurance, Learning and e-Communication of Diagnosis of Medical Images**
Hedlin, J.; Bergquist, M.; Gater, H.; Flodmark, O.; Hedin, S.; Hellstrom, M.; Jacobson, B.; Johansson, B.; Lundberg, N.; Maere, K., et al.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 11 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Studies illustrate that clinically significant errors in radiological diagnosis range from 2-20 %. For the patient this may imply wrong or no treatment. In order to deal with these errors the Feedback(TradeMark) application has been developed in close collaboration between the company e-Care AB and some of the leading radiology departments in Sweden. Within the application, physicians will be notified about discrepancies in the diagnosis of medical images that have been interpreted more than once. The web-based interface of Feedback(Trademark) application then enables physicians to communicate and discuss any issues surrounding the case, resolving any errors that have been made, and enables learning from one s mistakes. Nationwide communication and compilation of statistics coupled with high security requirements, implies a solution including dynamic directory service, XML/MOM based communication, multi-layer authentication, SSL sockets and certificates signed by own CA.
Author
*Document Markup Languages; Applications Programs (Computers); Quality Control; Diagnosis; Medical Services; Radiology*

**20050214987** Tallinn Technical Univ., Tallinn, Estonia
**Some Remarks on Time Modelling in Interactive Computing Systems**
Motus, Leo; Meriste, Merik; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations
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Majority of new computer applications and emerging software technologies are based on interactive computations. A remarkable share of those applications are truly time sensitive meaning that it is essential to reason about time correctness of system s behaviour, and interactions between components in particular. The conventional software timing analysis is run-time scheduling centered, well-developed and pretty proficient. However, rate monotonic analysis (RMA) is applicable only in

physical design and implementation stages of product development. Software production would be more economical provided that some obvious and/or subtle (e.g. timing correctness of interactions) time-related inconsistencies could be detected and eliminated earlier in product life cycle. Unfortunately the evolution of computer science has abstracted away time, except as used for trivial ordering of events, enabling thus only reasoning about performance-type time properties. This paper suggests that for reasoning about software behaviour in time (i.e. not just about performance-type properties), one needs to merge a non-trivial time model with a model of computations. The paper suggests a sufficiently sophisticated time model and discusses what timing properties need to be readily verified at the early stages of software development. It is suggested that each component has its own time system that comprises fully reversible time, strictly increasing time, and a set of relative times for reasoning about interactions. Index Terms: model of interactive computation, timing constraints, time model, discrete time, three time concepts

Author

*Applications Programs (Computers); Computer Programs; Computer Techniques; Scheduling; Software Engineering; Time Measurement; Product Development*

**20050214988** Okayama Univ., Japan

**A Contradiction-Free Proof Procedure with Visualization for Extended Logic Programs**

Yamasaki, Susumu; Sasakura, Mariko; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 12 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To have a visualization of proof procedures for extended logic programs involving both explicit negation and negation as failure, we provide a method to remove contradictions caused by a pair of some positive predicate and its explicit negation, and to implement negation as failure, such that some visualization routine could be evoked. For the contradiction removal, we need some auxiliary means to keep predicates as evidences to be proved. The proof procedure and visualization is sound with respect to some semantics related to the program with exceptions attached for the originally given program, while negations of the proved evidences are to be virtually used as exceptions. The application of the procedure with a visualization is expected on the basis of the infrastructure of e-education, e-business, or e-science.

Author

*Logic Programming; Theorem Proving*

**20050214990** GoldAvenue, Geneva, Switzerland

**An Approach for Implementing Object Persistence in C++ using Broker**

Sarma, T. Kulathu; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Object and relational technology have conflicting architectural and design principles. Storing objects in a relational database takes considerable amount of time and effort in an overall project development schedule. One approach to implement object-relational mapping is to use a persistence framework. Smalltalk and Java have in built runtime features like Reflection and Introspection to assist in building such a framework. C++ runtime support does not go beyond type identification and its strong type checking imposes additional complexity in implementing a persistence framework. This paper demonstrates an approach for implementing a persistence framework (O-R Link) in C++.

Author

*C++ (Programming Language); Design Analysis; Architecture (Computers)*

**20050214991** National Center for Toxicological Research, Jefferson, AR, USA

**Symbolic Computation in Research**

Zheng, Qi; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper discusses the uses of symbolic computation in scientific research. Three examples drawn from the author's work are presented to show the possibilities that symbolic computation can be effectively used as a tool for making discoveries or as a tool for making tools that facilitate scientific research.

Author

*Computation; Symbolic Programming*

**20050214993** Politecnico di Turin, Turin, Italy

**An Eye-gaze Input Device for People with Severe Motor Disabilities**

Corno, Fulvio; Farinetti, Laura; Signorile, Isabella; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Information and communication technologies can have a key role in helping people with special educational needs, considering both physical and cognitive disabilities. The paper describes an input device, based on eye tracking techniques, that allows people with severe motor disabilities to use gaze for selecting specific areas on a computer screen. Compared to other existing solutions, the strong points of this approach are the simplicity and the consequent affordability of costs. Index Terms human-computer interaction, accessibility, input devices, eye-tracking.

Author

*Education; Eye (Anatomy); Human-Computer Interface*

**20050214998** Belgrade Univ., Yugoslavia

**Computer Simulation Of Combustion in Particulate 2-Phase Flow**

Saljnikov, Aleksandar; Oka, Simeon; Karbozova, Elmira; Sijercic, Miroslav; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 10 pp.; In English; See also 20050214876

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General-purpose methods for coordinating synchronous computer-mediated activities (e.g., shared virtual whiteboards or textual chats) in themselves are not sufficient for many real world applications without additional analysis and development. This paper will discuss an approach to developing collaborative groupware that is tailor-made to improve same time / different place coordination. A key idea is the notion of a coordinating representation, which is a representation shared among a community of users that is introduced to fix a recurrent problem of coordination in an existing computer-mediated practice. The paper describes a methodology for introducing coordinating representations into collaborative computer-mediated activities and briefly discusses the technology we are building to support our methodology. It also provides a detailed example of a groupware system that was constructed using this methodology and experimental evidence for the utility of coordinating representations as a method for tailoring collaborative systems. Index terms collaboration, coordinating representation, groupware, tailor-made

Author

*Computerized SIMulation; Combustion; Mathematical Models; Coal*

**20050215005** Minnesota State Univ., Mankato, MN, USA

**Data Mining from a Web Browser**

Haglin, David J.; Roiger, Richard J.; Hakkila, Jon; Giblin, Timothy W.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Original contains color and black and white illustrations

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An implementation of a web application capable of storing and retrieving data and conducting data mining expeditions is presented. The ToolSHED (SHell for Expeditions using Data mining) supports at least two different architectures: as a centralized data and data mining server allowing access to these services over the web, and as an installable application on a user's system. A prototype is presented for an astronomical data application; the prototype will be used by research astronomers located throughout the web. The ToolSHED is independent of the data stored in the repository, and can provide a wide range of users access to not only the data but methods to selectively filter and analyze the data. Keywords|Data Mining, e-Science, Gamma-Ray Bursts

Author

*Data Mining; Websites; Architecture (Computers); Astronomy*

**20050215006** Hong Kong Univ., Hong Kong

**Cryptographic Schemes in Secure e-Course eXchange (eCX) for e-Course Workflow**

Yau, Joe C. K.; Hui, Lucas C. K.; Cheung, Bruce S. N.; Yiu, S. M.; Cheung, Venus L. S.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Researchers worldwide have been spending lots of effort in researching and developing online education systems. Serious research work on different areas of online education have been done over the years, such as online course delivery systems, pedagogy of online education, online course authoring systems, intelligent tutoring systems, etc. Among all these areas, not many people have looked into the problem of copyright protection of online course material. Since pirating of digital material is very easy and many e-Education institutes rely on registration fees of students to maintain and further develop their courses, e-Course piracy greatly jeopardize the financial support for these institutes. To combat the piracy of online course material, we designed and developed the 'Secure e-Course eXchange' (eCX) for protecting the copyright of online course material. eCX is a complete solution for protecting the online course material right from the hand of the course developer, to the online course server, then to the students. One special feature of eCX is that it allows students to completely download the course material of a course, but at the same time prohibit the students from making illegal copies of the material. In this paper, we will present the design of eCX, and discuss the details of the Environment Encryption Key Retrieval Scheme used in eCX for hiding an encryption key. Index Terms--e-Education, e-Learning, security, infrastructure

Author

*Cryptography; On-Line Systems; Education; Visual Aids*

**20050215043** Ghent Univ., Belgium

**A Taxonomy of Execution Replay Systems**

Cornelis, Frank; Georges, Andy; Christiaens, Mark; Ronsse, Michiel; Ghesquiere, Tom; DeBosschere, Koen; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 10 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Debugging a faulty program can be very hard and time-consuming. The programmer usually reexecutes his program, while zooming in on the root cause of the bug. However, sometimes bugs seem to appear only intermittently, making it even harder for the programmer to solve them. The main reason for this is that when executing a program, there are numerous non-deterministic events taking place within the computer, which can wreck even a very carefully crafted debugging session. To deal with these ghostly bugs, one needs to remove the non-determinism from the execution and its environment. Therefore various socalled execution replay systems have been devised, each with their merits and limitations. We give an overview of the terminology used when discussing execution replay, of the causes of nondeterminism within a computer, and of the current state of the art in execution replay systems.

Author

*Taxonomy; Program Verification (Computers); Intrusion; Computer Programming*

**20050215051** Belgrade Univ., Yugoslavia

**Software Project Management in .NET Environment**

Despotovic, Marijana S.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 7 pp.; In English; See also 20050215042; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The subject of this paper is the analysis and application of methods and standards for software development management. A short review of international standards used in the field of information systems is given with emphasis on software development management. Special attention will be paid to software project management within the Microsoft Solution Framework (MSF) comprising the collection of models and principles which should enable efficient creation of software packages for solving business problems. Index Terms Software Project Management,

Author

*Project Management; Software Engineering; Computer Systems Programs; Applications Programs (Computers); Computer Programming; Computer Programs*

**20050215070** Dalhousie Univ., Halifax, Nova Scotia, Canada

**QoS Architecture for Caching in Middleware**

Bodorik, Peter; Jutla, Dawn; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 8 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

When accessing DBs, caching is used extensively particularly if data is stored in remote DBs. Caching data locally reduces access to remote DBs and thus reduces costs and delays. There are many parameters that affect the choice of the caching method and its efficiency. There are many different caching algorithms that are targeted for different circumstances and requirements. For instance, a cache may support transactional access to data. In the middleware environment, in which heterogeneous DBs are accessed by various applications that have different requirements, there are many different circumstance that do not avail themselves to be supported by one particular caching method. Consequently, different caching methods need to be supported and need to co-exist in such environment. This paper presents an architecture to support soft QoS when many applications use different caches to store data from a number of DB systems. Caches may provide different caching algorithms, while the choice of which algorithm is used is determined by the application s requirements and the cache s and the DB server s capabilities in relation to the different caching algorithms. The proposed architecture introduces a Global Cache Manager (GCM) that interacts with the caches and DB servers and determines which caching algorithm is to be used. Furthermore, the GCM also monitors parameters that characterize caching and the environment and selects appropriate caching algorithm dynamically. The GCM also reduces the DB server s overhead due to caching. This reduction is achieved by the DB server communicating overhead information dealing with consistency, concurrency control, and cache eviction only to the GCM and not to individual caches. It is the responsibility of the GCM to communicate such information to the individual caches.

Author

*Architecture (Computers); Applications Programs (Computers); Data Storage; Communicating; Algorithms*

**20050215073** Trinity Coll., Dublin, Ireland

**Programming Languages Features for some Global Computer**

Ferreira, Ulisses; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 14 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper introduces a number of programming languages concepts that are useful for mobile agents and for the Internet. In particular, we explore the ability to program with the unknown value, called uu, by giving examples of constructs which can be combined sequentially. Although the present characteristics are not necessarily for mobile-code languages, the underlying and unified global environment is a single one.

Author

*Programming Languages; Fault Tolerance; Internets*

**20050215074** Rome Univ., Rome, Italy

**REDACLE: A Flexible Database for Workflow Management**

Barone, Luciano M.; Costantini, Silvia; Organtini, Giovanni; Paramatti, Riccardo; Cavallari, Francesca; Dafinei, Ioan; Diemoz, Marcella; Pellegrino, Fabio; Moro, Remo; Cau, Simone; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 8 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The REDACLE Project was started having in mind the realization of a simple, flexible and fast workflow management system to assist the construction of a high energy physics detector: CMS. It turned out that its database was designed to be flexible enough to be used for the construction of virtually any kind of product. One of the key element of the project was the complete decoupling between the database structure and the workflow process software as well as the separation between objects and their description.

Author

*Data Base Management Systems; Management Systems; Data Bases; High Energy Interactions; Detectors*

**20050215078** Panthesis, Inc., Bellevue, WA, USA

**Swan: Small-world Wide Area Networking**

Bourassa, Virgil; Holt, Fred B.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 7 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As an alternative to client-server architectures, we have developed the Swan technology to support real-time interactive applications. Providing a balanced multicast capability for ad hoc communities, Swan weaves computer processes into a fabric of TCP/IP connections. Using only local knowledge, these Swan fabrics weave in new arrivals and repair around departures. Our Swan solution for ad hoc networks is near-optimal. Swan retains high reliability and logarithmic latency. Latencies scale better than log-base-2 in the number of participants. Swan handles multiple simultaneous arrivals and departures. Swan enforces strong authentication but also provides other opportunities for security. This patented technology is currently used for collaborative design reviews, meetings, multiplayer games and public safety networks.

Author

*Architecture (Computers); Protocol (Computers); Design Analysis; Computer Information Security; Data Bases; Internets*

**20050215081** Electronics and Telecommunications Research Inst., Daejon, Korea, Republic of

**A Study on Efficient Transmission Method Using Space-Time Block Code**

Lee, EunHee; Park, Tae-joon; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 6 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Space-Time Code is able to obtain coding gain without the presence of an additional bandwidth, resulting in an enormous improvement of channel capacity. Conditions for a superior ST(Space-Time) code are the full rank of diversity gain and in the coding gain design point of view a large determinant sum. Researches so far have been conducted in the viewpoint of the full rank. In this paper, a simple explanation of the system model is given and the results of performance simulations discussed .We considered a simulation environment where the transmitter and the receiver has 4 antennas and the receiver has 4,respectively. As a result, we obtained the simulation result using BPSK,QPSK ,8PSK modulation.

Author

*Space-Time Functions; Transmitter Receivers; Determinants; Modulation; Bandwidth; Channel Capacity; Coding*

**20050215083** Technical Research Centre of Finland, Oulu, Finland

**Using Parallel Slackness for Extracting ILP from Sequential Threads**

Forsell, Martti J.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 8 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Abstract Exploiting available instructionlevel parallelism in efficient thread-level parallel machines is difficult and gives only modest results because techniques for doing that are complex, possible performance gains are severely limited by the interthread dependencies and the known exploitation techniques fail if instructions are excessively dependent on each other. In this paper we attack this problem by using parallel slackness to reschedule execution of instructions so that a lot of instruction-level parallelism can be found even if there seems not to exist one, e.g. threads are strictly sequential. This instructionlevel parallelism can be extracted in the forms of hazard-free superpipelining and chained execution. We will describe and evaluate a novel algorithm and an architecture for doing this kind of rescheduling efficiently. According to the evaluation, the proposed algorithm gives the average speedup of almost 500% compared to the unscheduled code, while an ordinary parallel organization of functional units gives 175% speedup only.

Author

*Architecture (Computers); Exploitation; Parallel Processing (Computers); Microprocessors; Education; Algorithms*

**20050215088** Telenor Networks, Snaroyveien, Norway

**A Carrier-centric Assessment of Network Architectures for Providing Optical Transport Services to IP Client Networks**

Bhatnagar, Anjali; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 10 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The focus of the EURESCOM (http://www.eurescom.de) project SCORPION has been on the optimum combination of the functionality of the Internet Protocol (IP), the Generalised Multi- Protocol Label Switching (GMPLS) technology and the emerging Optical Transport Network (OTN) to attain an effective and globally scalable transport network designed and optimised for carrying IP traffic. Here some of the results from the project are presented with main emphasis on the assessment of the network models proposed in the Internet Engineering Task Force (IETF) for a combined IP over OTN network studied within the framework of the project. The project considers a scenario, where an Optical Transport Network (OTN) provider offers a certain set of transport services to its IP client networks. A thorough IP carrier-centric analysis of the available network models within the framework of a given topology, business and technology requirements, and offered services profile is made. One of the conclusions is that the optical network operator s Service level agreement relation to the networks it needs to interface with will very much determine the choice of network solution. A methodology is presented to assist carriers in short-listing a set of feasible network architectures and for choosing the best architecture out of these for their requirements.
Author
*Protocol (Computers); Internets; Switching Theory; Selection; Commerce*

**20050215096** NASA Glenn Research Center, Cleveland, OH, USA
**Space Act Agreement Maker (SAAM) With Electronic Routing System (ERouter) Developed**
Stauber, Laurel J.; Research and Technology 2002; March 2003; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Members of the Commercial Technology Office at the NASA Glenn Research Center have developed an exciting new tool that greatly reduces the lead time in creating and routing Space Act Agreements. The Space Act Agreement Maker (SAAM) is an e-government Web-based system that automates the initial drafting of Space Act Agreements by technical and program personnel. SAAM also is used for editing and will be used later for maintaining electronic copies of all Space Act Agreements. During the initial drafting, the software prompts NASA personnel proposing an agreement to answer questions regarding the agreement. On the basis of the answers, the software selects from a matrix of NASA standard clauses to produce a first draft of the agreement. The draft agreement and information submitted by the NASA personnel are electronically routed to Glenn s Commercial Technology Office for review and, where necessary, editing. The final version of the agreement, along with any supporting documentation, is then routed for electronic concurrence/approval to the necessary internal review participants using the electronic routing system (e-router). SAAM was developed cooperatively by Glenn s Commercial Technology Office and Glenn s Office of Chief Counsel. Currently, SAAM is being evaluated by the NASA Headquarters General Counsel Office for use at all NASA centers. This system allows for the effective processing of Space Act Agreements for NASA s internal and external customers. Document control is maintained by a database. With SAAM s electronic routing, review times can be reduced significantly, allowing Glenn to more rapidly establish partnerships with industry. Prior to the creation of SAAM, it took several hours to draft a Space Act Agreement. With SAAM in place, the document can be written in about 30 min. Using the e-router also saves time in determining where the agreement is in the routing process. The document can be tracked easily, and delays can be avoided. Important research with industry partners can commence quickly after preliminary discussions have been held. The development of these products is in line with the expanding e-government initiative that is part of the Presidential Management Agenda. By using this product, NASA researchers can secure greater support from industry and academia partners. The Space Act Agreement Maker has been very well received at NASA Headquarters and at some of the other NASA centers as well. We anticipate that the NASA Ames Research Center will have the system in place very soon, and that some of the other centers will use SAAM in the near future. The General Counsel s office at NASA Headquarters has encouraged the Glenn team to develop a similar system for processing patent licenses. Find out more about Glenn's Technology Transfer & Partnership Office http://technology.grc.nasa.gov/.
Author
*Agreements; Data Bases; Technology Transfer; Time Functions; Computer Programs*

**20050215158** NASA Glenn Research Center, Cleveland, OH, USA
**Robust Sliding Window Synchronizer Developed**
Chun, Kue S.; Xiong, Fuqin; Pinchak, Stanley; Research and Technology 2003; May 2004; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The development of an advanced robust timing synchronization scheme is crucial for the support of two NASA programs--Advanced Air Transportation Technologies and Aviation Safety. A mobile aeronautical channel is a dynamic channel where various adverse effects--such as Doppler shift, multipath fading, and shadowing due to precipitation, landscape, foliage, and buildings--cause the loss of symbol timing synchronization.
Derived from text
*Sliding; Windows (Computer Programs); Synchronizers; Doppler Effect*

**20050215261** NASA Glenn Research Center, Cleveland, OH, USA

**Space Network Devices Developed**

Jones, Robert E.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center through a contract with Spectrum Astro, Inc., has been developing space network hardware as an enabling technology using open systems interconnect (OSI) standards for space-based communications applications. The OSI standard is a well-recognized layered reference model that specifies how data should be sent node to node in a communications network. Because of this research and technology development, a space-qualifiable Ethernet-based network interface card (similar to the type found in a networked personal computer) and the associated four-port hub were designed and developed to flight specifications. During this research and development, there also have been many lessons learned for determining approaches for migrating existing spacecraft architectures to an OSI-network-based platform. Industry has recognized the benefits of targeting hardware developed around OSI standards such as Transmission Control Protocol/Internet Protocol (TCP/IP) or similar protocols for use in future generations of space communication systems. Some of these tangible benefits include overall reductions in mission schedule and cost and in system complexity. This development also brings us a step closer to the realization of a principal investigator on a terrestrial Internet site being able to interact with space platform assets in near real time. To develop this hardware, Spectrum Astro first conducted a technology analysis of alternatives study. For this analysis, they looked at the features of three protocol specifications: Ethernet (IEEE 802.3), Firewire (IEEE 1394), and Spacewire (IEEE 1355). A thorough analysis was performed on the basis of criteria such as current protocol performance and suitability for future space applications. Spectrum Astro also projected future influences such as cost, hardware and software availability, throughput performance, and integration procedures for current and transitive space architectures. After a thorough analysis, Ethernet was chosen because it was seen as the best longer term fit because of the prevalent commercial market; the current and projected availability of hardware, software, and development tools; and the ease of architecture integration.

Author

*Space Communication; Software Development Tools; Communication Networks; Computer Programs; Real Time Operation; Software Engineering*

**20050215332** Alabama Agricultural and Mechanical Univ., Normal, AL, USA

**Visualization Methods for Viability Studies of Inspection Modules for the Space Shuttle**

Mobasher, Amir A.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXVII-1 - XXVII-5; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

An effective simulation of an object, process, or task must be similar to that object, process, or task. A simulation could consist of a physical device, a set of mathematical equations, a computer program, a person, or some combination of these. There are many reasons for the use of simulators. Although some of the reasons are unique to a specific situation, there are many general reasons and purposes for using simulators. Some are listed but not limited to (1) Safety, (2) Scarce resources, (3) Teaching/education, (4) Additional capabilities, (5) Flexibility and (6) Cost. Robot simulators are in use for all of these reasons. Virtual environments such as simulators will eliminate physical contact with humans and hence will increase the safety of work environment. Corporations with limited funding and resources may utilize simulators to accomplish their goals while saving manpower and money. A computer simulation is safer than working with a real robot. Robots are typically a scarce resource. Schools typically don t have a large number of robots, if any. Factories don t want the robots not performing useful work unless absolutely necessary. Robot simulators are useful in teaching robotics. A simulator gives a student hands-on experience, if only with a simulator. The simulator is more flexible. A user can quickly change the robot configuration, workcell, or even replace the robot with a different one altogether. In order to be useful, a robot simulator must create a model that accurately performs like the real robot. A powerful simulator is usually thought of as a combination of a CAD package with simulation capabilities. Computer Aided Design (CAD) techniques are used extensively by engineers in virtually all areas of engineering. Parts are designed interactively aided by the graphical display of both wireframe and more realistic shaded renderings. Once a part s dimensions have been specified to the CAD package, designers can view the part from any direction to examine how it will look and perform in relation to other parts. If changes are deemed necessary, the designer can easily make the changes and view the results graphically. However, a complex process of moving parts intended for operation in a complex environment can only be fully understood through the process of animated graphical simulation. A CAD package with simulation capabilities allows the designer to develop geometrical models of the process being designed, as well as the environment in which the process will be used, and then test the process in graphical animation much as the actual physical system would be run . By being able to operate the system of moving and stationary parts, the designer is able to see in simulation how the system will perform under a wide variety of conditions. If, for example, undesired collisions occur between

parts of the system, design changes can be easily made without the expense or potential danger of testing the physical system. Author

*Computer Aided Design; Computer Programs; Computerized SIMulation; Systems Engineering; Robotics; Viability*

**20050215333** Middle Tennessee State Univ., Murfreesboro, TN, USA

**Java-based Graphical User Interface for MAVERIC-II**

Seo, Suk Jai; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXXVIII-1 - XXXVIII-5; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

A computer program entitled 'Marshall Aerospace Vehicle Representation in C II, (MAVERIC-II)' is a vehicle flight simulation program written primarily in the C programming language. It is written by James W. McCarter at NASA/Marshall Space Flight Center. The goal of the MAVERIC-II development effort is to provide a simulation tool that facilitates the rapid development of high-fidelity flight simulations for launch, orbital, and reentry vehicles of any user-defined configuration for all phases of flight. MAVERIC-II has been found invaluable in performing flight simulations for various Space Transportation Systems. The flexibility provided by MAVERIC-II has allowed several different launch vehicles, including the Saturn V, a Space Launch Initiative Two-Stage-to-Orbit concept and a Shuttle-derived launch vehicle, to be simulated during ascent and portions of on-orbit flight in an extremely efficient manner. It was found that MAVERIC-II provided the high fidelity vehicle and flight environment models as well as the program modularity to allow efficient integration, modification and testing of advanced guidance and control algorithms. In addition to serving as an analysis tool for techno logy development, many researchers have found MAVERIC-II to be an efficient, powerful analysis tool that evaluates guidance, navigation, and control designs, vehicle robustness, and requirements. MAVERIC-II is currently designed to execute in a UNIX environment. The input to the program is composed of three segments: 1) the vehicle models such as propulsion, aerodynamics, and guidance, navigation, and control 2) the environment models such as atmosphere and gravity, and 3) a simulation framework which is responsible for executing the vehicle and environment models and propagating the vehicle s states forward in time and handling user input/output. MAVERIC users prepare data files for the above models and run the simulation program. They can see the output on screen and/or store in files and examine the output data later. Users can also view the output stored in output files by calling a plotting program such as gnuplot. A typical scenario of the use of MAVERIC consists of three-steps; editing existing input data files, running MAVERIC, and plotting output results.

Author

*C (Programming Language); Graphical User Interface; Flight SIMulation; Space Transportation System; Java (Programming Language); Computer Programs*

**20050215350** Monash Univ., Victoria, Australia

**User Profiles with Common Modules for Multiple Domains**

Alahakoon, Oshadi; Loke, Seng; Zaslavsky, Arkady; IPSI 2005 Hawaii Proceedings; [2005]; 9 pp.; In English; See also 20050215347; Original contains color illustrations

Contract(s)/Grant(s): ARC-LPO211384; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Personalization using profiles of the users has become an important feature in the fast growing number of e-commerce applications. In current applications, these profiles are usually tailored to the application domains. Therefore separate profiles have to be generated and maintained for each different application domain. Each time a new need arises, users have to reveal their personal details or/and needs to new applications. To overcome this limitation we propose a novel modular user profile, which has layers of information enabling these to be used across multiple application domains. The proposed model consists of three layers where information related to a particular user is separated according to 'domain dependence'

Author

*Electronic Commerce; Electronic Modules; Personnel Selection; Architecture (Computers)*

**20050215353** Putra Malaysia Univ., Serdang, Malaysia

**Modelling Software Metric Data with XML**

Yap, Ng Keng; AbdulGhani, Abdul Azim; Mamat, Ali; Zuzalil, Hazura; IPSI 2005 Hawaii Proceedings; [2005]; 9 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Software measurement is the dimension and/or decision criteria as to what a piece of software can provide. The output of software measurement is in the form of metric data. Metric data are important because it can be used as the input for

software analysis in software engineering. Software engineering relies on these data to investigate many factors in software development such as cost, scheduling, affordability, quality etc., in order to gain better control of the engineering processes. These days, people store data in different data formats, media and database technologies. These heterogeneous formats have posed many problems in data analysis, especially in terms of the integration and reusability of historical data. These problems have prompted efforts to find a data format that is compliant with the concepts of software measurement and which is applicable to any metric data. Keywords: Software Metric Data, Software Measurement Data Model
Author
*Computer Programs; Software Engineering; Document Markup Languages; Data Bases; Computer Programming*

**20050215355** Universita degli Studi di Salerno, Italy
**Building Lightweight Ontologies for E-Learning Environment**
DeSanto, M.; Liguori, C.; Pietrosanto, A.; Vento, M.; IPSI 2005 Hawaii Proceedings; [2005]; 9 pp.; In English; See also 20050215347; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the last decade the term Ontology has become a fashionable word inside the Knowledge Engineering Community. Although there are several methodologies and methods for building ontologies they are not fully mature if we compare them with software and knowledge engineering techniques. In literature the main approaches to solve this problem aim to facilitate manual ontology engineering by providing natural language processing tools or skeleton methods. Other approaches rely on machine learning and automated language processing techniques in order to extract concepts and relations from structured or unstructured data such as databases and text. This second approach is more interesting and fashionable but shows very poor results. On the other hand the concept of ontology is not unique. In this paper we propose a novel approach for building university curricula ontology through analysis of real data: answers of students to final course tests. In this paper the term ontology means Lightweight Ontology: a taxonomy with more semantic value In fact teachers design these tests keeping in mind the main topics of course knowledge domain and their semantic relation. The ontology building is accomplished by means of Bayesian Networks. The proposed method is composed by two steps: the first one uses a structural learning multi-expert system in order to build a Bayesian Network from data analysis. In the second step the obtained Bayesian Network is translated in the course ontology. This approach can be useful for performing subsequent inference and knowledge extraction tasks as for example the updating of lesson s sequencing in e-learning environment or for improving intelligent tutoring systems performance.
Author
*Bayes Theorem; Computer Programming; Data Bases; Expert Systems*

**20050215357** Bahia Univ., Salvador, Brazil
**Mobility and Computation**
Ferreira, U.; IPSI 2005 Hawaii Proceedings; [2005]; 36 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As an example, in 1999, I had an interesting conceptual insight over computation: '...at the moment that I conceive the idea of moving computation from one place to another, I also observe that a general notion of computation transcends pure mathematics and meets the physical world'. This itself requires new, informal and philosophical discussions in the foundations of computer science. Later, in 2001, \and because the universe is on the move, computation is essentially mobile.' The present paper discusses some meaning of computation, provides a different semantics and present a formalized, physical and abstract model after my simplification. The present model makes use of four forms of mobility, namely strong mobility, intentional unity mobility, non-intentional unity mobility, and broadcast mobility. In this paper, I present other arguments for the most general and unified notion of computation, although it is only one among other good proposals. Mobility and global computing form two different classes of argument.
Author
*Mobility; Computation; SIMplification*

**20050215364** Iwate Prefectural Univ., Iwate, Japan
**LYEE Agent System Development Method**
Takeda, Yozo; Fujita, Hamido; IPSI 2005 Hawaii Proceedings; [2005]; 12 pp.; In English; See also 20050215347; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The system, which does not ask a place and time, grows greatly with the development and the spread of Web system in recent years, and the growth has also accomplished various evolutions. However, no big differences and changes are found in the technique of development for such software in the Web system. For example, when reconstructing the complicated workflow system, an upper design process defines strictly subjects, such as the functional contents and a scope of workgroup, and a user, and afterward, very complicated and fixed logic is created as a program by downstream development according to this definition. The more workflow logic becomes complicated, the more term of system development extends and delays away from the original schedule. An organization and business schema changes, which sometimes happens, force to update various system specifications in a short term. It is not so strange that on the complete day workflow system becomes useless with old specification in actual business. Thus, as for the system with complicated specifications, which change to progress of time and conditions, it is becoming general recognition gradually that the conventional or the non-flexible method of software development is not suitable to the actual business fields. Although many researches are made in order to cope with such a problem, the software development methodology of LYEE gives some hints as one of them. In this paper, using a way of thinking LYEE methodology, new type of structure s agent is introduced as a useful device in the workflow agent system. This device is named LYEE Agent. Proposal and consideration are performed using LYEE Agent on the systems development in which it can respond flexibly and promptly to the users' requirements of various types of workflow systems.
Author
*Systems Engineering; Computer Programming; Software Engineering; Commerce*

**20050215374** Bridgeport Univ., CT, USA
**Multi-Population Genetic Algorithm for Protein Folding**
Ratakonda, Veda; Mahmood, ausif; Dichter, Julius; IPSI 2005 Hawaii Proceedings; [2005]; 5 pp.; In English; See also 20050215347; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Predicting the three-dimensional or tertiary structure of a protein through computational means is commonly referred to as the protein folding problem. This problem has been shown to be NP-complete even with many approximations to simplify the underlying model. We develop a multi-population genetic algorithm with small population exchanges after certain generations as a solution to this problem. A distributed implementation of the protein folding problem using web services is also carried out. The approach developed here guarantees enough diversity to prevent premature convergence, thus yielding better (lower energy) conformations at the expense of a (possibly) slower rate of convergence. When we compare our scheme on the sequences published in [UM Unger and Moult], which (by design) have known optimal solutions, our algorithm achieves the optimal result in all the cases, which were sometimes 3 to 4 units lower energy than the best reported solution with other methods [UM, PPG, KLM].
Author
*Genetic Algorithms; Proteins; Folding; Convergence; Sequencing*

**20050215411** NASA Glenn Research Center, Cleveland, OH, USA
**User-Friendly Interface Developed for a Web-Based Service for SpaceCAL Emulations**
Liszka, Kathy J.; Holtz, Allen P.; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

A team at the NASA Glenn Research Center is developing a Space Communications Architecture Laboratory (SpaceCAL) for protocol development activities for coordinated satellite missions. SpaceCAL will provide a multiuser, distributed system to emulate space-based Internet architectures, backbone networks, formation clusters, and constellations. As part of a new effort in 2003, building blocks are being defined for an open distributed system to make the satellite emulation test bed accessible through an Internet connection. The first step in creating a Web-based service to control the emulation remotely is providing a user-friendly interface for encoding the data into a well-formed and complete Extensible Markup Language (XML) document. XML provides coding that allows data to be transferred between dissimilar systems. Scenario specifications include control parameters, network routes, interface bandwidths, delay, and bit error rate. Specifications for all satellite, instruments, and ground stations in a given scenario are also included in the XML document. For the SpaceCAL emulation, the XML document can be created using XForms, a Webbased forms language for data collection. Contrary to older forms technology, the interactive user interface makes the science prevalent, not the data representation. Required versus optional input fields, default values, automatic calculations, data validation, and reuse will help researchers quickly and accurately define missions. XForms can apply any XML schema defined for the test mission to validate data before forwarding it to the emulation facility. New instrument definitions, facilities, and mission types can be added to the existing schema. The first prototype user interface incorporates components for interactive input and form processing. Internet address, data rate, and the

location of the facility are implemented with basic form controls with default values provided for convenience and efficiency using basic XForms operations. Because different emulation scenarios will vary widely in their component structure, more complex operations are used to add and delete facilities.
Author
*Space Communication; Architecture (Computers); Test Stands; Internets; Data Acquisition*

**20050215431** Upper Austria Univ. of Applied Sciences, Austria
**Realisation of Service-Oriented Architecture (SOA) using Enterprise Portal Plattforms taking the Example of Multi-Channel Sales in Banking Domains**
vonAmmon, Rainer; Gebauer, Benjam; Jobst, Daniel; IPSI 2005 Amalfi Proceedings; [2005]; 17 pp.; In English; See also 20050215422; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Multi-channel sales make high demands on IT infrastructures. Service- Oriented Architectures (SOAs) are to enable reusable software-based services and flexible, adaptable business processes. To realize this, the use of enterprise portal platforms is planned. The state of the art has been tested in a relevant project that focused on typical use cases of automotive credit banks in retail banking applications. Initial findings indicate that these platforms are ideal for realizing an SOA. In addition to the technical implementation of an SOA, the planning of suitable services, their level of granularity and reusability is another challenge.
Author
*Architecture (Computers); Domains; Commerce; Computer Programs*

**20050215434** Ecole Polytechnique, Montreal, Quebec, Canada
**The Essence of the Software Engineering Process**
Robillard, Pierre N.; IPSI 2005 Amalfi Proceedings; [2005]; 13 pp.; In English; See also 20050215422; Original contains color illustrations
Contract(s)/Grant(s): NRC-A-0141; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Software development is a complex endeavor that is mainly cognitive. What is specific about software engineering relative to other engineering disciplines, and how can we measure what can be improved? Many concepts, such as life cycle, project management, problem solving and opportunistic design, are common to all engineering disciplines. These concepts are reviewed from a software engineering perspective in order to highlight their links to the software process. Software engineering process activities are composed of cognitive actions performed by human beings. For many years, researchers and developers have contributed to the improvement of the practice of creating software by suggesting various intuitive approaches, proposing modeling techniques and presenting case studies of successful projects. Real and durable improvements are likely to emerge from a scientific approach based on observation and measurement of real behaviors.
Author
*Computer Programming; Software Engineering; Problem Solving; Product Development; Project Management*

**20050215610** NASA Glenn Research Center, Cleveland, OH, USA
**OTIS 3.2 Software Released**
Riehl, John P.; Sjauw, Waldy K.; Research and Technology 2003; May 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Trajectory, mission, and vehicle engineers concern themselves with finding the best way for an object to get from one place to another. These engineers rely upon special software to assist them in this. For a number of years, many engineers have used the OTIS program for this assistance. With OTIS, an engineer can fully optimize trajectories for airplanes, launch vehicles like the space shuttle, interplanetary spacecraft, and orbital transfer vehicles. OTIS provides four modes of operation, with each mode providing successively stronger optimization capability. The most powerful mode uses a mathematical method called implicit integration to solve what engineers and mathematicians call the optimal control problem. OTIS 3.2, which was developed at the NASA Glenn Research Center, is the latest release of this industry workhorse and features new capabilities for parameter optimization and mission design. OTIS stands for Optimal Control by Implicit Simulation, and it is implicit integration that makes OTIS so powerful at solving trajectory optimization problems. Why is this so important? The optimization process not only determines how to get from point A to point B, but it can also determine how to do this with the least amount of propellant, with the lightest starting weight, or in the fastest time possible while avoiding certain obstacles

along the way. There are numerous conditions that engineers can use to define optimal, or best. OTIS provides a framework for defining the starting and ending points of the trajectory (point A and point B), the constraints on the trajectory (requirements like 'avoid these regions where obstacles occur'), and what is being optimized (e.g., minimize propellant). The implicit integration method can find solutions to very complicated problems when there is not a lot of information available about what the optimal trajectory might be. The method was first developed for solving two-point boundary value problems and was adapted for use in OTIS. Implicit integration usually allows OTIS to find solutions to problems much faster than programs that use explicit integration and parametric methods. Consequently, OTIS is best suited to solving very complicated and highly constrained problems.
Author
*Trajectory Optimization; Control SIMulation; Orbit Transfer Vehicles; Optimal Control; Computer Programs*

**20050215683** NASA Glenn Research Center, Cleveland, OH, USA
**Flight Hardware Fabricated for Combustion Science in Space**
OMalley, Terence F.; Weiland, Karen J.; Research and Technology 2004; June 2005; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

NASA Glenn Research Center s Telescience Support Center (TSC) allows researchers on Earth to operate experiments onboard the International Space Station (ISS) and the space shuttles. NASA s continuing investment in the required software, systems, and networks provides distributed ISS ground operations that enable payload developers and scientists to monitor and control their experiments from the Glenn TSC. The quality of scientific and engineering data is enhanced while the long-term operational costs of experiments are reduced because principal investigators and engineering teams can operate their payloads from their home institutions.
Derived from text
*Combustion; Communication Networks; Software Engineering; Computers*

**20050216418** Tama Art Univ., Tokyo, Japan
**Collaborative Learning Using PDA Devices**
Yamaguti, Takako; Kaji, Hideki; Kusunoki, Fusako; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 4 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Exhibitions at a scientific museum are usually difficult for ordinary schoolpupils. To improve the issues of current explanation systems, we use Personal Data Assistant (PDA) devices. Recent PDAs have enough functionality for school children to interactively, individually, and easily learn about scientific displays at a museum. In this paper, we describe the design and implementation of visual interfaces for PDAs for such a leaning system. The system aims at letting elementary and junior high schoolchildren learn scientific knowledge without tears, when they walk around the museum displays. Experiments using the prototype system implemented in Flash/MX software toolkit have suggested the effectiveness on the performance and functionality of the proposed method.
Author
*Architecture (Computers); Display Devices; Phonetics; Software Development Tools; Radio Frequencies*

**20050216422** Humboldt Univ., Berlin, German Democratic Republic
**Challenges of Service-oriented Architectures**
Stantchev, Vladimir; Scherz, Marian; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 7 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper evaluates service-oriented architectures (SOA) as an emerging technology that brings new challenges and opportunities to electronic societal interaction. It outlines steps needed to develop a comprehensive scientific model for SOA including: definition of applicable hardware and communication platforms, a service ware framework for service composition and verification, as well as definition of sound economic service models in the areas of electronic business interaction. A key property for such architecture is architectural translucency - the ability to control parameters of the architecture by modifying the layer that will bring the highest improvement of these parameters. The ultimate goal is to provide mobile, adaptive and dependable service environment built using standard-based hardware-software entities for a wide range of interactions in the

area of e-business, e-government and similar technology-oriented relationships.
Author
*Architecture (Computers); Computer Programs; Electronic Commerce; Economics*

**20050216496** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
**Output Analysis and Comparison of Deployment Models with Varying Fidelity**
Gill, Matthew M.; Mar. 28, 2005; 91 pp.; In English; Original contains color illustrations
Report No.(s): AD-A436933; AFIT/GLM/ENS/05-08; No Copyright; Avail.: CASI: A05, Hardcopy

This thesis explores the changes in insights that result from using different types of models to assess the capability of deploying the Stryker Brigade within specific timeline goals. The thesis uses as its primary base a study conducted in 2002 by USTRANSCOM to evaluate the ability of Stryker to meet stated deployment timeline goals. Specifically, the author compares the outputs from four different models as they change over three different deployment scenarios and 10 different routes. The study investigates the relationships among the outputs of spreadsheet models, spreadsheet models with elements of variability added, and low- and high-level discrete-event simulations. The study also explores the implications of applying newly proposed distributions describing the variability in aircraft cargo loads and en-route ground times. The results of the study suggest that the type of model used to assess a deployment has an effect on the insights derived from exploring scenarios. The study also suggests that the newly proposed ground time distributions have a significant effect on the military's ability to move cargo through an en-route system, and what factors have the greatest limiting effect on the ability of Stryker to meet its deployment timeline goals.
DTIC
*Computerized SIMulation; Deployment; Organizations*

**20050216510** Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA
**Training Requirements of Digital System Operators in a Stryker Brigade Combat Team**
Schaab, Brooke B.; Dressei, J. D.; Hayes, Peter B.; Jun. 1, 2005; 37 pp.; In English
Contract(s)/Grant(s): Proj-A792
Report No.(s): AD-A436992; ARI-RR-1837; No Copyright; Avail.: CASI: A03, Hardcopy

Digital technology allows personnel to connect via digital networks rather than face-to-face. Successful information sharing and collaboration in this environment is critical for mission planning and execution. Soldiers operating the U.S. Army's most advanced digital systems responded to questionnaires and interviews to describe: How they were trained to communicate across systems? What types of training were most successful? What were the consequences of successes and failures in communicating across systems? Results from the data collected can be summarized as follows: Most Soldiers had a basic understanding of their digital system, gained through classroom instruction or on-the-job training, but they seek additional field training. Soldiers need to train on their systems to fully understand its capabilities and so that operation becomes automatic. The Soldiers say that the best training is hands-on experience in a variety of exercises. Soldiers want training using the suite of systems that they must operate and communicate with, and it should be done as a single training unit. Soldiers report that planning and preparation is much faster using their digital systems and these systems make it much safer for troop movement in enemy territory.
DTIC
*Combat; Computer Networks; Digital Systems; Education*

**20050216511** Army Research Inst. for the Behavioral and Social Sciences, Fort Benning, GA USA
**Soldier Perceptions of the Rapid Decision Trainer**
Beal, Scott A.; Christ, Richard E.; May 1, 2005; 66 pp.; In English
Contract(s)/Grant(s): Proj-A790
Report No.(s): AD-A436993; ARI-RR-1835; No Copyright; Avail.: CASI: A04, Hardcopy

This report describes the approach and results of a preliminary evaluation of the Rapid Decision Trainer (RDT), a personal computer-based simulation developed for use by the Infantry Officer Basic Course (IOBO) at Fort Benning, Georgia. The objective of the RDT was to provide each lieutenant with the opportunity to serve as platoon leader while executing a simulated attack mission in preparation for a platoon live-fire exercise. Nineteen lieutenants enrolled in the IOBO were assigned to train with the RDT in one large group. Twenty other lieutenants trained in two-man buddy-teams. After executing the RDT mission, lieutenants in both training conditions participated in an after-action review with a senior instructor. A questionnaire administered to the lieutenants documented their perceptions and opinions of RDT training value, their

motivations for training with the RDT, their sense of personal involvement in the simulated mission, and the adequacy of the realism portrayed in the simulation. Following the RDT training, the lieutenants participated in a live-fire exercise. A second questionnaire was administered subsequent to the live-fire exercise after-action review. Regardless of which RDT training condition the lieutenants were in, they endorsed the use of the RDT for the IOBO. They indicated the RDT had training value, they were motivated and involved during the simulated mission, and the realism of simulated battlefield events and actions was adequate for training. The results highlighted a number of issues that were described and will be investigated in future training research for desktop simulations and game-based technologies.
DTIC
*Computerized SIMulation; Decision Making; Education; Perception; Training Devices*

**20050216544** Michigan Univ., Ann Arbor, MI USA
**Building Sound Mobility Models for AD HOC Network Simulation**
Liu, Mingyan; Aug. 1, 2005; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-04-1-0114; Proj-Q808
Report No.(s): AD-A437092; AFRL-IF-RS-TR-2005-280; No Copyright; Avail.: CASI: A03, Hardcopy

The design and evaluation of mobile ad hoc network research often heavily relies on simulations of the system. Underlying the simulation is the mobility model that generates the movement of the constituents of the network. In order to obtain accurate and reliable performance results, we need these mobility models to be suitable for simulation studies. In order to apply simulation results to practice, we also need these mobility models to be reasonably realistic in representing the actual movement of human or vehicles. Motivated by these requirements, in addressing the first need in this project we derive a general framework within which we construct stationary random mobility models that are suitable for simulation studies in that no warm-up is needed as the mobility models start in steady state. In doing so we also illustrate the flaws with existing mobility models, as well as ways in which they are typically used. In addressing the second need we construct realistic mobility models from real data traces collected over a college campus. Such models combine mobility data with geographical data (campus map, road/building information, etc.), and more closely capture real movement than random mobility models that are commonly used. Technical approaches used in this project include stochastic modeling, renewal theory and computer simulation.
DTIC
*Computerized SIMulation; Mobility; Models; Networks; SIMulation*

**20050216694** Okayama Univ., Japan
**Procedural Correctness for Distributed Knowledge Processing**
Yamasaki, Susumu; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 8 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The procedural issues for knowledge processing have been more significant in distributed environments. The more knowledge there is by means of distributed systems, the better, where procedural correctness is required for knowledge processing. In this paper, procedural correctness for distributed knowledge processing is discussed from semantics views on knowledge in logical form.
Author
*Distributed Processing; Semantics; Mathematical Models*

**20050216700** Wayne State Univ., Detroit, MI, USA
**Some Potential But Avoidable Negative Impacts of the Internet Technology on Education and Medical Practice**
Hong, Felix T.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 11 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Positive impacts of applications of the Internet technology on education and medical practice have been amply documented. However, potential negative impacts have seldom been discussed. A potential adverse impact may be its inhibitory effect on visual thinking. Although visual thinking has long been documented by scientific geniuses as an effective way of creative problem solving, mainstream psychologists tended to dismiss the evidence as anecdotal and unreliable. Our new insights into human creativity suggested the contrary. In the age of information technology it is vital for humans to be able to integrate digital and analog information. Such integration requires parallel processing and random access of

information, and is crucial to both learning and decision making (e.g., differential diagnosis in medical practice). Despite a plethora of graphic information, current Internet applications tend to fragment and 'sequentialize' information in a dogmatically predetermined fashion, thus hindering parallel processing and random access of information, and discouraging visual thinking of the users. This paper explains how the pitfalls can be avoided in future applications. Index Terms evidence-based medicine, computer-based education, creativity, education, health care
Author
*Computer Techniques; Data Processing; Diagnosis; Problem Solving; Random Access*

**20050216706** Fachhochschule, Merseburg, Germany
**Multiagent System for Decision Support in Urban Systems**
Seder, Ivan; Weinkauf, Ronny; Neumann, Tobias; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 5 pp.; In English; See also 20050216686; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For the purpose of general planning and management activities in urban administration a multiagent system is developed. The multiagent system takes into account different users like planners, investors, managers and citizens as future habitants and tourists and also the administration actors. The services of the system are provided by collaboration of intelligent agents in a multiagent system. In the framework of general architecture different categories of agents are proposed. User agents act on behalf of their particular users and initiate the collaboration with other agents in order to fulfil their requirements. Presentation agents prepare the visualization of the resulting non-spatial and spatial information determined through collaboration between the involved agents. Optimization agents implement different algorithms for spatial location optimization depending on different criteria for specific region. Data retrieval agents can retrieve spatial and non-spatial data from their corresponding databases according to specified criteria. The work focuses on applying agent technology, together with spatial optimisation algorithms and spatial software components to automate the decision procedures in urban administration. The further focus is on applying web services technology for implementation of multiagent system. The prototype of the multiagent system is partially implemented and successfully tested in our laboratory with available real world data from landscape Geisel- Valley.
Author
*Algorithms; Computer Programs; Data Bases; Decision Support Systems; Systems Management; Topography*

## 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.

**20050214878** Intelliden Corp., Colorado Springs, CO, USA
**A New Paradigm for Network Management: Business Driven Device Management**
Strassner, John; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 11 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Existing network management architectures suffer from a set of architectural and integration problems that prevent business processes from being used to drive the configuration and management of network resources. Business driven device management is a new paradigm that enables business rules to be used to manage the construction and deployment of network configurations. The cornerstone of this approach is a new version of the DEN (Directory Enabled Networks) information model, called DEN-ng (DEN-new generation). DEN-ng represents managed objects, policies, and business rules in one homogeneous model. It provides facilities to translate the business rules and procedures of an organization to the policies that configure and control its networks. This enables the network to be transformed from a cost center to a profit center. Index Terms DEN-ng, information model, data model, network management, configuration management.
Author
*Computer Networks; Management Methods; Information Management*

**20050214882** Universidad La Salle, Mexico City, Mexico

**E-Book, an e-learning tool for Engineering Undergraduates**

Gomez-Ramirez, E.; Ponce-Meza, M.; Farias-Elinos, M.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An e-book for Dynamical Systems (DS) was designed and developed by an interdisciplinary group (Education, and Computer Sciences experts) with the purpose of model development of a tool that can be used in other subjects. This e-book was developed with an intelligent system, called Master System (MS), which integrates the uses of the multimedia and the Internet, performing individualized students exercises, exams, quizzes, and offering the option of students and teachers feedback of their performance. The intelligent assistant for these functions is described. The educational methodology followed is the deep understanding of concepts and development of thinking and professionals skills. The e-book is updated with teachers and students self-developed cases transformed in web pages for the e-book. In this paper are discussed the functions and possibilities of the Master System design and performance, intelligent assistant and the educational methodology followed.

Author

*Systems Engineering; Education; Internets; Dynamical Systems; Feedback*

**20050214887** Network Services SRL, Italy

**A Center for Knowledge Factory Network Services (KoFNet) as a Support to e-business**

Fiore, Piernicola; Visaggio, Giuseppe; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This work presents a knowledge base managed by KoFNet as a support to globally distributed processes between independent teams. After describing the characteristics of the knowledge base the work illustrates how it guides and supports the manager s decisions in globally distributed process management. The primary goal is that a decision must be made rationally and not intuitively in order to reduce risks. Access to the knowledge base is platform and user independent; the knowledge base is public and, thanks to the services provided by KoFNet, Small and Medium Enterprises (SME) can access it either to reuse the subscribers experience and competences or to protect the developed experience. The innovations of the knowledge base presented in this work are: the variety of topics considered; the different types of attributes available for each knowledge package in order to choose the appropriate one for the user; a guide for package description that makes them homogeneous and therefore easily operative. Index Terms Global Software Development, Knowledge Base, Experience Factory, Knowledge Transfer, KoFNet.

Author

*Knowledge Based Systems; Software Engineering; Commerce; Computer Programming*

**20050214894** Demokritos National Centre for Scientific Research, Greece

**Distributed Medical Intelligence via Broadband Communications Networks**

Makropoulos, Constantin; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Telemedicine is a rapidly growing sector that relies on information and telecommunications technology to transfer medical information for diagnosis, therapy and education. Telemedicine applications are as good as their transmission network. Satellite communication technologies allow telemedicine to bring high quality medical services to remote locations, such as the transferring of quality medical images. However, the TCP/IP protocol, which is the base for a large number of telemedicine applications, has revealed a number of weaknesses that do not permit to the applications to work adequately and result in the satellite link working at far below maximum performance. This has been shown to be the case in real-time applications that require fully interactive communication. Consequently satellite channels servicing simultaneously both TCP/IP and UDP/IP in a ‘pay per use’ usability constitute a great aspect of a telemedicine network system.

Author

*Telemedicine; Telecommunication; Technology Transfer; Information Systems; Communication Networks; Protocol (Computers); Real Time Operation*

**20050214895** Ecole Superieure des Sciences et Techniques, Bab Mnara, Tunisia

**Evaluation and Perspectives of an Innovative Tunisian e-learning Experimentation**

Chorfi, Henda; Jemni, Mohamed; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper we will present works realised by the team of e-learning of the Higher College of Sciences and Techniques of Tunis (ESSTT). At first, on the pedagogical plan, we describe the pilot e-learning experience recently done, the evaluation of this experience and our plans for the future. Secondly, on the plan research, we present our reflections around the concept of an intelligent system of e-learning and our conception of the architecture of a such system.

Author

*Architecture (Computers); Education; Prototypes; Universities; Intelligibility*

**20050214900** Pittsburgh Univ., Pittsburgh, PA, USA

**Topological Design of Multiple VPNs over MPLS Network**

Srikitja, Anotai; Tipper, David; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

With the deployment of MPLS over a core IP backbone, it is possible for a service provider to built Virtual Private Networks (VPNs) supporting various classes of services with QoS guarantees. Efficiently mapping the logical layout of multiple VPNs over a service provider network is an important and challenging traffic engineering procedure. The use of sinktree (multipoint-to-point) routing paths in a MPLS network makes the VPN design problem different from traditional design approaches where a full-mesh of point-to-point paths is often the choice. The clear benefits of using sink-tree paths are the reduction in the number of label switch paths and bandwidth saving due to larger granularities of bandwidth aggregation within the network. In this paper, the design of multiple VPNs over MPLS, using sink-tree routing, is formulated as a mixed integer programming problem to simultaneously find VPNs logical topologies and their dimensions to carry multi-service, multi-hour VPNs traffic from various customers. Such a problem formulation yields a NP-hard complexity. Here, we propose a heuristic aiming to scale the VPN design problem by choosing a small-but-good candidate set of feasible sink-tree paths to solve the optimization problem over. Numerical results are given showing the advantages of the proposed approach. I.

Author

*Deployment; Protocol (Computers); Layouts; Design Analysis; Computer Networks*

**20050214901** City Univ., London, UK

**What is Virtual about the Web?**

Karamuftuoglu, Murat; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Bergsonian theory of memory is that perceptions and their affective colouring survive and are preserved in themselves. This state can be termed as pure virtuality, as past images exist as a potential or more accurately undetermined plurality , without necessarily being actualised in psychological states. Images on the World Wide Web when perceived by the user are extended into movement or action. We will call images that are extended to movement as action-images or sensory-motor images. The main thesis of the paper is that interaction on the Web is dominated by action-images. It is argued, from this point of view that the WWW is not a proper virtual environment.

Author

*World Wide Web; Computer Networks*

**20050214903** Technical Research Centre of Finland, Espoo, Finland

**Multidrop Generic Framing Procedure (GFP-MD)**

Seppanen, Kari; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In metropolitan areas there is a diverse set of requirements for a new network concept: it is desired that a single transport network should serve all legacy networks as well as new datacom networks. The former type of networks requires efficient support for low bit-rate real-time connection oriented services while the latter one would benefit from packet based statistical multiplexing at transport layer. These contradictory requirements make it difficult to develop a single integrated (or converged) network concept serving all the services. The sheer capacity is not a problem today as higher and higher bit-rates and more and more wavelengths can be used. The challenging question is how to share the resources and manage the network in a cost-efficient manner if plain over-provisioning is not acceptable. Furthermore, protecting the existing investments is a real concern for the operators that should not be overlooked. In recent years SDH/SONET based transport networks are considered to be too inflexible, inefficient, and over-complex for the needs of data communications. As the importance of data communications has been increasing, it has been quite natural to search for a replacement for SDH. However, it has turned out that developing such replacement is not a very easy and straightforward task. On the contrary, many useful functions provided by the SDH seem to be complicated to reinvent in other ways. Furthermore, the motivation for replacing SDH is eroding: the recent developments in advanced SDH like Virtual concatenation (VC), Link capacity adjustment scheme (LCAS), and Generic framing procedure (GFP) have made SDH much more suitable for today s requirements. In this paper a novel multidrop network scheme based on GFP is proposed. The multidrop GFP (GFP-MD) is targeted for metropolitan area networks serving various access and virtual private networks. It is primarily designed to be used in limited complexity resilient networks such as dual rings. However, it supports arbitrary network topologies as well. The GFP-MD gives an efficient way to share network resources between slow and medium speed data streams at metropolitan area while providing a seamless interconnection into SDH/SONET based core networks. Furthermore, GFP-MD can be used to support efficient multicast and broadcast for distribution services. Keywords Keywords: Network convergence, SDH, LCAS, VC, GFP, MAN
Author
*Computer Networks; Data Flow Analysis; Broadcasting; Real Time Operation; Multiplexing; Data Transmission; Convergence*

**20050214905** Hawaii Univ., HI, USA
**e-Health Utilization: Socio-Cultural Issues**
Bangert, David; Doktor, Robert; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 13 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study discusses organizational design issues of health care systems preparing to implement e-health technologies. The cultural environment of the system proves to be an important determinant of appropriate design to enhance e-health technology utilization.
Author
*Health; Technology Utilization*

**20050214907** Michigan Univ., Mount Pleasant, MI, USA
**Schema Validation Applied to Native XML Databases**
Hu, Gongzhu; Li, Qinglan; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Native XML database is the database that stores and manipulates XML data in a 'native' form, generally either as indexed text or as some variant of the Document Object Model (DOM) mapped to an underlying data store. It and its surrounding technologies constitute a database management system (DBMS), in some sense. It can insert/delete XML document, support document-level transactions, and query database in an XML query language. With more and more applications about XML been developed, schema (Document Type Definition, XML schema language) is introduced to satisfy the requirement of data integrity for native XML databases. Schema validation is a component to verify the data type, content model, attribute, or occurrence according to an XML schema grammar. It is performed when a new XML document to be added into the database or an update to be executed. In this paper, we describe the design of schema validation in a native XML database, and implement it in an API.
Author
*Data Base Management Systems; Application Programming Interface; Query Languages; Data Storage; Data Bases*

**20050214908** Czech Technical Univ., Prague, Czechoslovakia

**Towards to e-transport**

Svitek, Miroslav; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876

Contract(s)/Grant(s): MOTT-802/210/108; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The goal of this paper is to present new research subject called transport telematics, which can be found in wide spectrum user areas, from an individual transport and travel information provision to intelligent use and management of large-scale transport networks. Advanced telematics provides intelligent environment for knowledge society establishment and allows expert knowledge description of complex transport systems. The main effort in presented paper will be given to electronic clearing for using the transport infrastructure (EFC - Electronic Fee Collection) in individual transport.

Author

*Complex Systems; Spectra; Transportation Networks; Information Systems*

**20050214909** Universitiare Manouba, Tunisia

**A Reuse-Oriented Approach for the Construction of Hypermedia Apllications**

Selmi, Semia Sonia; Kraiem, Naoufel; Ghezala, Henda Ben; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the last few years, we have witnessed a growing interest in the Internet in various life domains and consequently, an increasing number of hypermedia applications covering a very large spectrum of topologies. However, the development of hypermedia applications is still largely ad-hoc and poorly managed. A variety of hypermedia design methodologies have been proposed to try to improve web sites quality and solve, with minimal cost, some maintenance problems. Mainly disadvantages of these methods are : the requirements analysis phase is not usually considered in their life cycle, The second point is that these methods can be adopted for the design of different applications with different requirements. In this paper, we propose to construct system development methods by using reusing and assembling different existing a hypermedia design methods..

Author

*Systems Engineering; Topology; Websites; Internets*

**20050214913** Louisiana Univ., Lafayette, LA, USA

**Does Attentional Load Affect Discourse Management in On-Line Communication?**

Eech, Claude G.; Condon, Sherri L.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 13 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Several experiments are reported that follow up earlier research on how size of the text window affects computer-mediated communication. These studies vary attentional load by manipulating both text window size and the ability to scroll back to text no longer in the text window. The long-turn versus short-turn strategies and differential disfluencies reported in Cech & Condon (1998) were associated with an interface that constrained the maximum size of a single message to the window size. Current studies extend this paradigm to virtual messages that can be much larger than the viewable composition area. Index Terms computer-mediated communication, discourse management, message transmission.

Author

*On-Line Systems; Interprocessor Communication; Messages; Loads (Forces)*

**20050214915** Patras Univ., Greece

**Enhanced Security Watermarking and Authentication based on Watermark Semantics**

Koukopoulos, D. K.; Stamatiou, Y. C.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this work, we present for the first time, to the best of our knowledge, a way to enhance audio watermarking of mpeg layer 3 audio files with the use of semantically secure keys. The strength of our scheme relies on the fact that it allows the

users to prove ownership of the audio file not, simply, by detecting the bit pattern that comprises the watermark itself, but by demonstrating that they know a hard to compute property of the watermarking key when it is viewed as an instance of a computationally intractable problem. This feature allows our scheme to be used successfully for both authentication and copyright protection purposes. The existence of hard to compute properties and the construction of keys that possess them are explained in detail in our paper. Furthermore, we present for the first time, to the extend that we are able to know, a realtime audio watermarking scheme that does not need the original signal to detect the watermarking key and operates directly in the compressed data domain, while manipulating the time and subband/channel domain. This scheme also overcomes the disadvantage of algorithms operating in the PCM-Data domain to be vulnerable to compression/recompression attacks, as it places the watermark in the scale factors domain and not in the digitized sound audio data. Moreover, our scheme does not need to specially encode the sound data into an mp3 file as it is done by MP3Stego. The basic difference between our scheme and other audio watermarking schemes with similar characteristics is that our scheme was implemented taking special care for the efficient exploitation of the two limited resources of computer systems: time and space. For this purpose, some new engineering considerations and solutions are proposed for the parts of the algorithm that mainly contribute to the algorithm s time delay and space consumption, thus making the algorithm s execution real time and independent of the watermark key s length.
Author
*Computer Information Security; Audio Data; Protection; Data Compression; Semantics; Embedding*

**20050214919** Queens Univ., Belfast, UK
**Infrastructure, Requirements and Applications for eScience: A European Perspective**
Perrott, R.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Abstract Recent developments in the international arena has meant the technology is now mature enough to bring together those required for the implementation of a grid computing facility. This paper examines the requirements and applications for an eScience infrastructure with particular reference to developments in Europe.
Author
*Parallel Processing (Computers); Grid Computing (Computer Networks); World Wide Web*

**20050214924** Humboldt Univ., Berlin, German Democratic Republic
**Medical e-Learning, e-Training and Interactive Telemedicine via Satellite in the Operating Room of the Future**
Graschew, Georgi; Roelofs, Theo A.; Rakowsky, Stefan; Schlag, Peter M.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Using off-the-shelf hardware components and a specially developed high-end software communication system (WinVicos) satellite networks for interactive telemedicine have been designed and developed. These networks allow for various telemedical applications, like teleteaching, telementoring, intraoperative teleconsultation, second opinioning, etc.. Based on the successful GALENOS network, several projects are currently being realized: MEDASHIP (Medical Assistance for Ships); DELTASS (Disaster Emergency Logistic Telemedicine Advanced Satellites Systems) and EMISPHER (Euro-Mediterranean Internet-Satellite Platform for Health, medical Education and Research).
Author
*Internets; Medical Science; Education; Satellite Networks; Telemedicine*

**20050214926** Wollongong Univ., Australia
**Privacy Issues Arising from a Smart_ID Application in eHealth**
Fulcher, John A.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876
Contract(s)/Grant(s): Proj. C00001904; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Privacy issues arising from a project investigating the use of smart devices to access patient records from a doctor s surgery are discussed. Issues concerning ownership, access, confidentiality and security are raised. Unique Patient Identifiers

- UPIs - are necessary in developing a Smart_ID system for use in General Practice. Wider issues concerning privacy legislation and agreed formats for both Electronic Health Records and UPIs are addressed. It is suggested that rather than use randomly assigned digital signatures, a person s biometric 'signature' be stored on a smartcard or similar device, and user ID verified prior to accessing confidential health records during a normal medical consultation.
Author
*Health; Privacy; Biometrics; Security*

**20050214929** Cornell Univ., NY, USA
**Learning and Networking Concepts and Components of the Global Seminar**
Sutphin, Dean; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 9 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The rapid growth of the world s population and technological developments make it desirable and possible for experts from diverse cultures to collaborate on global issues. The College of Agriculture and Life Sciences at Cornell University has pioneered a model Global Seminar on Sustainable Food Systems and the Environment. This course is the result of a unique collaboration of university and community leaders, international businesses, and governments and their agencies. These partners have pooled their skills, expertise, and funds to create a course that shares a vision for a safe, nutritious food supply and a sustainable environment. We have created a model for course delivery that is sustainable across countries, from developing to developed countries. Low-cost, low technology audio conferencing and power point presentations mixed with high-end video conferencing provides a distributed cost alternative that matches institutional capacity in a collaborative educational consortium. The educational model is first targeted to sustainable food systems and the environment, but has broad application to a wide range of disciplines and subject matter. The course is presented through case studies that focus on key policy issues that require cooperation and shared vision to optimize food and environmental resources worldwide. By engaging students and faculty in international problem-solving teams, we are preparing future community and academic leaders with the knowledge, skills and breadth of vision necessary to understand and solve complex problems.
Author
*Network Analysis; Video Communication; Teleconferencing; Problem Solving; Life Sciences; Agriculture*

**20050214942** Chalmers Univ. of Technology, Goeteborg, Sweden
**Adding Security to Quality of Service Architectures**
Lindskog, Stefan; Jonsson, Erland; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In a Quality of Service (QoS) aware communication system, a user is able to choose between various service classes, each with different reliability, predictability, and efficiency degrees. However, until now security has not been recognized as a parameter in QoS architectures and no security-related service classes have been defined. This implies that end-users have no chance of configuring their level of security, which is remarkable. This paper contains a survey of QoS architectures as seen from a security point of view and gives some initial ideas on how QoS architectures can be extended with a security dimension.
Author
*Predictions; Architecture (Computers); Reliability; Security*

**20050214946** Nonogaki Corp., Tokyo, Japan
**Object Oriented Communication Design Tool Usable for Everyone**
Nonogaki, H.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002], pp. 100105; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Current eLearning systems require that learners take responsibility for building and maintaining motivation and choosing and optimizing their learning strategies. These functions were formerly provided by teachers in traditional learning scenarios. In self-directed learning scenarios learners need to plan, structure, control, optimize, evaluate and assess their learning process and their learning success. Tools for supporting control and evaluation of the learning process must be incorporated into innovative learning systems. On top of organizing the learning process new strategies for self-driven learning must be acquired (meta-learning). The paper discusses these issues against the background of cognitivist and constructivist learning theory and

defines new requirements for a learning system architecture which must be met by future eLearning systems.
Author
*Object-Oriented Programming; Communication; World Wide Web; Learning Theory*

**20050214949** Florida Atlantic Univ., Boca Raton, FL, USA
**Internet Privacy Concerns and Trade-off Factors - Empirical Study and Business Implications**
Dinev, T.; Hart, P.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The research presented focuses on identifying and analyzing antecedents to privacy concerns of Internet users. The model developed assesses the relationship between the privacy concerns as dependent variables and trust, personal interest, ability to control, and perceptions of vulnerability as antecedents. Measures for assessing these constructs were developed and tested. Confirmatory Factor Analysis Measurement and Structural Equation Modeling with LISREL were used for statistical analysis of the data. Results show statistically significant correlations between the measured factors. In particular, it is found that the perceived vulnerability is an important antecedent to privacy concerns related to abuse of personal information and information availability; that trust and interest are related to privacy concerns; and that trust and personal interest may play the role of compensating factors that counterbalance the perceptions of vulnerability in determining one s level of privacy concerns. Business implications are discussed. Index Terms Privacy concerns, Internet privacy, Confirmatory Factor Analysis, LISREL.
Author
*Internets; Privacy; Tradeoffs; Commerce; Correlation; Statistical Analysis; Factor Analysis*

**20050214951** Ritsumeikan Univ., Shiga, Japan
**Navigation Support System for Live e-CRM**
Ikeda, Hideto; Vogiatzis, Nikolaos; Shibuya, Aki; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Customer relationship management (CRM) is the key to e-commerce. In real-time e-commerce, customer satisfaction is primarily dependent on the skill of the personnel who support them, their general knowledge and their knowledge of their customer. This paper proposes a flexible navigation system to solve problems. The navigation system includes a knowledge base and an instantiation capability for customer database systems. The system can be used in a variety of different fields by developing the appropriate knowledge bases and linkages into customer information repositories.
Author
*Telephony; Navigation; Support Systems; Electronic Commerce; Knowledge Based Systems*

**20050214959** Seagate Technology, Shakopee, MN, USA
**Storage Infrastructures for e-Business**
Rege, Satish L.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 15 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Storage is center stage for e-Businesses trying to gain control of exploding data growth. E-Business is increasingly reliant on the importance and criticality of its data. To store, share, and manage these data, as well as to secure them, make them persistent, and ensure they are always available are the greatest expenses of the e-Infrastructure. Efficient storage is a vital part of cost considerations facing e- Business. This paper discusses a framework to analyze storage architectures in an e-Infrastructure, taking into consideration various Internet-based business practices. It uses the concepts of creation, consumption, and containers. It identifies present storage architectures, and it shares insights into how these architectures will evolve to meet the demands of e-Business over the Internet. Index Terms Business, Internet, Storage, Storage Networks
Author
*Electronic Commerce; Internets; Data Storage; Architecture (Computers); Data Management*

**20050214973** Ben Gurion Univ. of the Negev, Beersheva, Israel

**Observations and Prescriptions for Web Standards**

Bodoff, David; Ben-Menachem, Mordechai; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Frames and cases, together with symbolic inference methods, were used in the past in artificial intelligence. The limitations of those technologies led the AI community to limit their use to narrow domains rather than large scale, general purpose applications. But similar technologies are enjoying a renaissance as the foundation for a very wide range of standards for Semantic Web and Web Services. In this paper we explore a number of issues relating to the promise and the limitations of these technologies as the basis for Web standards. Our view is that the various Web standards efforts should pay closer attention to the limitations of their underlying symbolic frame-oriented technologies, and should use these technologies according to their recognized strengths and limitations.

Author

*Artificial Intelligence; Domains; World Wide Web*

**20050214982** Hewlett-Packard France, Grenoble, France

**Federated Profile Information Architecture**

Jia, G.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

User profile information is the key to the success of personalization. As the number of storage devices increases, and a diversity of services become available over the Internet, profile information is becoming widely distributed and fragmented, highly heterogeneous, and with local autonomy. It is difficult to ensure profile information consistency, availability, and overall privacy and efficiency. This paper presents a federated architecture for integrating and managing various profile data repositories. The architecture provides a federated view and controlled sharing of the profile data from heterogeneous, distributed profile information stores. The solution is generic, and a prototype is being developed in the profiling team at Hewlett-Packard Laboratories Grenoble.

Author

*Architecture (Computers); Data Bases; Data Storage; Privacy; Internets*

**20050214994** University of Science of Malaysia, Penang, Malaysia

**Computer-Mediated Communication (CMC): A Shift Towards E-Education Systems In Malaysia**

Idrus, Rozhan M.; Atan, Hanafi; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The quest for an industrialized nation has propelled Malaysia to embark on a knowledge-based society with the embodiment via the numerous information and communication technologies (ICT) manifested through significant endeavours such as the smart school, virtual university, Open University and the information superhighway. The computer has undoubtedly made its mark as a major tool in the mechanism, playing a wizardry role in the teacher learner interactivity in the educational transaction process. However, the technology variables in the communication puzzle include the availability of computers and their accessibility to the Internet. This paper will elucidate a case presentation of the readiness of distance learners at the University Sains Malaysia from the standpoint of paradigm shift and the relationship between the current need and future projection of accessibility, usability as well as the status of the infrastructure of the country towards this vision of a knowledge and information-rich society.

Author

*Computers; Interprocessor Communication; Knowledge Based Systems*

**20050214996** Tin-ifa Ghana Ltd., Ghana

**DEC (Decision Making in Business Environments)Computer Age of Business (Admiration or Admission?)**

Owusu-Prempeh, Nanayaaa; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education,

e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 2 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The importance of ICT in Africa leaves me to wonder if we are actually admiring the Computer Age of Business (CAB) or that if we are ready to admit this paradigm into the daily operations of our Public and Private affairs. Globalization gives us no choice but to leapfrog into the world of information and communications technology. ICT is now a global reality which is increasingly being embraced in every region of the world in every country and in most communities. Ghana and we its citizens are no exception to this trend, a most welcome trend. In deed, we are aware of the colossal divide among nations and even within countries as they allude to ICT The issue of transacting business in this age of computers is not a luxury but an expedient way to work and study. Obviously countries like USA, Japan Italy, to name a few, have been able to admit and implement so well the use of computers and digital technologies and are even deploying beyond 3G whereas countries like Ghana, Sierra Leone and many others which have not consumed the analogue technology and are still struggling with very low telephone densities of.05% and lower.

Derived from text

*Analogs; Computers; Decision Making; Information Systems*

**20050214997** Brandeis Univ., Waltham, MA, USA

**Coordinating Representations for Collaborative Systems**

Alterman, Richard; Feinman, Alex; Landsman, Seth; Introne, Josh; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color and black and white illustrations

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General-purpose methods for coordinating synchronous computer-mediated activities (e.g., shared virtual whiteboards or textual chats) in themselves are not sufficient for many real world applications without additional analysis and development. This paper will discuss an approach to developing collaborative groupware that is tailor-made to improve same time / different place coordination. A key idea is the notion of a coordinating representation, which is a representation shared among a community of users that is introduced to fix a recurrent problem of coordination in an existing computer-mediated practice. The paper describes a methodology for introducing coordinating representations into collaborative computer-mediated activities and briefly discusses the technology we are building to support our methodology. It also provides a detailed example of a groupware system that was constructed using this methodology and experimental evidence for the utility of coordinating representations as a method for tailoring collaborative systems. Index terms collaboration, coordinating representation, groupware, tailor-made

Author

*Coordination; Computer Programs*

**20050215000** Belgrade Univ., Yugoslavia

**e-Business Management and Workflow Technologies**

Ilic, Natasa; Djurcic, Zeljko; Milutinovic, Veljko; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 10 pp.; In English; See also 20050214876; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This tutorial consists of two parts that briefly cover the most essential issues in the areas of e-business management and workflow technologies. The most important subject in the first part are the management solutions - software products that are used in e-business management. The second part of this tutorial describes the terms used in workflow terminology, and helps to understand workflow point of view on work processing.

Author

*Electronic Commerce; Computer Systems Programs; Information Management; Management Methods; Computer Programs*

**20050215045** City Univ. of Hong Kong, Kowloon, Hong Kong

**An Intelligent Proxy Server (IPS) for Mobile Communication System**

Yeung, K. H.; HuiS. Y.; Wong, K. Y.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Previous research on prefetching mostly studies statistical prefetching. In this paper, we point out that deterministic prefetching is actually more suitable for mobile applications. A deterministic prefetching scheme for mobile communication systems is therefore presented. The scheme reduces the user experienced delay in accessing the Internet. A User Profile Database (UPD) and an Intelligent Proxy Server (IPS) are the key components of the prefetching scheme. The UPD keeps all the user profiles containing their favorite URLs. These profiles will be accessed by the IPS when the users register to the mobile network. The accessed information is then used by the prefetching process to retrieve the objects. Simulation results show that this prefetching scheme can significantly reduce the mean request delay and give a lower utilization of the link connecting to the Internet.
Author
*Mobile Communication Systems; Internets; Data Bases; Communication Networks; Connectors*

**20050215046** Ecole Nationale Superieure des Telecommunications, Paris, France
**Group Mobility Models for Mobile Ad hoc Networks**
Labiod, H.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 4 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper focuses on mobility models used in ad hoc networks simulations. Typically, to analyze the performance of an ad hoc routing protocol, we have to fix realistic traffic models and radio transmission parameters as well as node mobility models. In the context of some specific nomadic applications, group mobility models are more adapted. For this purpose, in this paper, we give a performance analysis of two group mobility models called Pursue model and Reference Point Group Mobility (RPGM) model. We compare the results of these models with the Random Waypoint Mobility model and illustrate how the performance criteria of the reactive routing Dynamic Source Routing (DSR) protocol can be highghly affected by the the mobility model s features.
Author
*Models; SIMulation; Computer Networks; Wireless Communication*

**20050215047** Saint Petersburg Univ., Saint Petersburg, Russia
**Evolution of Mobile IP**
Yanovsky, Gennady G.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Mobile Information Society is fast becoming a reality. Internet-oriented mechanisms are selected as a main transport mechanism for the majority of information, whether it carries voice, data and video, for fixed and mobile users. Two concepts are considered in this article evolution of Internet Protocol (IP) and evolution of mobile communications toward to broadband. Finally, main challenges on mobile Internet in the future networks are discussed.
Author
*Mobile Communication Systems; Convergence; Internets; Protocol (Computers)*

**20050215048** Tufts Univ., Medford, MA, USA
**An Effective Query Control Scheme for Dynamic Source Routing**
Epperson, Clint; Chang, Chorng H.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 11 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the most robust and scalable Mobile Ad Hoc Network (MANET) routing algorithms today is the Dynamic Source Routing (DSR) algorithm. DSR is a reactive routing algorithm which discovers routes from a source node to a destination node on an on demand basis. When a route to a destination is needed, DSR performs a global search by flooding a query packet known as a Route Request throughout the network. While effective at finding a route to the destination, this global search can produce a large amount of routing control traffic which consumes a significant amount of network bandwidth. In this paper, we present a simple query control scheme for the DSR protocol to reduce the amount of routing control traffic generated during the global search process. A simple method to reduce the number of Route Requests that are rebroadcast is to let nodes randomly select whether or not they will rebroadcast a Route Request. A simulation study was performed in order to evaluate

the effectiveness of such a query control scheme in reducing the amount of routing control traffic generated during the global search process. The results of this simulation study show that the query control scheme limits the amount of routing control traffic generated by as much as 4% to 17%, depending on the rate of topological change in the network and the offered traffic load.
Author
*Algorithms; Protocol (Computers); SIMulation*

**20050215050** Technical Research Centre of Finland, Espoo, Finland
**Designing Efficient Address Lookup Algorithms for IPv6**
Seppaenen, Kari; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 6 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The number of Internet users is still growing despite of the current datacom regression. Furthermore, the need for semipermanently unique addresses is also increasing due to always-on type of access services. Thus the todays 32-bit address space in the Internet provided by IPv4 is running out quite soon. The new Internet Protocol version, IPv6, increases the length of IP address to 128 bits. Such address space should be more than adequate for all future needs. Using such long addresses have created worries concerning the impact of IPv6 to the performance of the IP routers. This has lead to efforts to show the scalability of existing IPv4 address lookup algorithms and, if the scalability is lacking, efforts to modify them to better suit for 128 bit addresses. However, those efforts can be vain as the addressing in IPv6 is done in a quite different way compared to IPv4. This means that the address lookup operation can be done in a totally new way. The new methods can utilise simple table lookup operations instead of laborious longest match operation. Thus they can easily exceed the speed of existing IPv4 address lookup algorithms. The most important change in the addressing is that the unicast addresses are hierarchical and thus aggregatable. The hierarchical address format make it possible to utilise simple and efficient address match operations as the operation can be divided into multiple steps. The address aggregation enables the reduction of sizes of routing tables and number of route updates. No more it is necessary for each router to have knowledge of each subnet. Furthermore, IPv6 addressing provides an opportunity to design highly optimised routers to different tasks, e.g., core and metro network routers. I propose a generic multistage algorithm for IPv6 address lookup and provide task optimised versions for different layers of network hierarchy. These algorithms can be implemented in hardware using pipelining and the performance of such implementation can exceed 100 Gbit/s linespeeds.
Author
*Protocol (Computers); Pipelining (Computers); Internets; Hierarchies; Algorithms*

**20050215052** Cisco Systems, Inc., Madrid, Spain
**Advances in Handling DoS Attacks on the Internet**
Behringer, Michael H.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the past years Denial-of-Service (DoS) Attacks have become an every-day occurrence on Internet backbones, with some attacks demonstrating a grand potential to cause damage. Due to the potentially huge business impact Internet Service Providers and Enterprises have been forced to investigate ways to counter-act these attacks. This paper gives a brief overview of the anatomy and a classification of current DoS attacks, and an outlook on how DoS attacks are likely to be in the future. It then outlines countermeasures which are in operation today, the current work at the IETF, as well as the directions of research in handling the attacks.
Author
*Internets; Intrusion Detection (Computers); Computer Networks; Classifications*

**20050215053** Abo Akademi, Turku, Finland
**Mobility Impact on Energy Conservation of Ad Hoc Routing Protocols**
Anckar, Bill; Eriksson. Niklas; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 11 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Drawing on an analytical framework that can be used to assess the extent to which different mobile services are likely

to offer customer value in comparison to stationary electronic channels, this paper offers both theoretical and empirical contributions relating to customer value creation in mobile commerce, and especially the role of mobility as a driver for consumer adoption of mobile commerce. Based on the findings from a survey conducted with a convenience sample of 113 Finnish students, we offer some early insights relating to the main reasons for consumers interest in different mobile services, and the primary settings in which mobile services will be used. In addition, the consumers interest in a number of commonly proposed mobile success applications is explored. The findings indicate that consumers indeed perceive mobility to be at the core of the value proposition of mobile commerce, although some mobile services clearly stood out as highly attractive even in a fixed setting.
Author
*Energy Conservation; Protocol (Computers); Mobile Communication Systems*

**20050215054** Belgrade Univ., Yugoslavia
**Security Architecture of the Distributed System Layered Approach**
Cvetanovic, M. M.; Radivojevic, Z. R.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 4 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Architecture of a security subsystem is a very important aspect of any computing infrastructure, so, it is not unusual practice to dedicate special attention to problem addressed in this paper. Modern attack techniques require new theoretical model for their elimination. Layered approach incorporated with metadata promises easy extensibility, flexibility and above all reliable security.
Author
*Architecture (Computers); Distributed Processing; Metadata; Computer Information Security; Computer Systems Design*

**20050215055** Udine Univ., Italy
**Towards Effective Intrusion Prevention: Developing an Open Framework for Integrated Network Security**
Montessoro, Pier L.; Pierattoni, Davide; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 7 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper addresses an innovative architecture for effective intrusion prevention in IP networks. Facing security design with a distributed approach, it is possible to perform flow admission, intrusion detection and advanced firewall techniques in an integrated fashion. This way both traffic shaping and application layer protection are natively achieved, together with enterprise-specific security policies. Models and methodologies presented here are currently being implemented in an open framework for distributed intrusion prevention architecture.
Author
*Computer Security; Intrusion; Protection; Warning Systems; Detection*

**20050215057** Calgary Univ., Alberta, Canada
**World Wide Web Database Integration via Mobile Agents**
Trinh, Quang M.; Barker, Ken; Alhajj, Reda; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 12 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents an architecture that utilizes of dynamic deployment of mobile agents to support the integration of heterogeneous and autonomous databases on the World Wide Web (or web). Our integration technique uses a multi-agent system of mobile agents by dispatching the agents to the autonomous component database hosts and returns data to the central server. Our system uses an integrated schema to utilize agents in remote locations and HyperText Markup Language (HTML - usable even with minimal bandwidth) as the client interface. Using HTML reduces overhead and therefore gives the architecture performance advantages over other existing mobile agent systems. Furthermore, the system also supports the addition and removal of component databases dynamically. The exchange language used by the system is XML (eXtensible Markup Language), a standard and extensible format with supports in almost all programming languages, which can be read and understood by almost any application. Using rich document structures like XML supports data transport by agents using

the web and can be used for Business To Business (B2B) data exchange between existing and/or future applications. The proposed system is shown to be better than existing techniques when higher volumes of data are to be exchanged such as those found in B2B applications. The improvements are consistently significant and are magnified substantially as the amount of data exchanged increases.
Author
*World Wide Web; Data Bases; Document Markup Languages; Programming Languages; Deployment; Heterogeneity*

**20050215060** Paderborn Univ., Germany
**Storage Management as Means to Cope with Exponential Information Growth**
Brinkmann, A.; MeyeraufderHeide, F.; Scheidler, C.; Vodisek, M.; Ruekert, U.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 6 pp.; In English; See also 20050215042; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The advances in Internet technology have led to tremendous improvements in business, education, and science and have changed the way we think, live, and communicate. Information exchange has become ubiquitous by the possibilities offered through modern technologies. We are able to offer information 24 hours a day through our web sites and can leave messages every time and from anywhere in the world. This change in communication has led to new challenges. Enterprises have to deal with an information amount that doubles every year. The technological foundation to cope with this information explosion is given by Storage Area Networks (SANs), which are able to connect a great number of storage systems over a fast interconnection network. However, to be able to use the benefits of a SAN, an easy-to-use and efficient management support has to be given to the storage administrator. In this paper, we will suggest new storage management concepts and we will introduce a new management environment that is able to significantly reduce management costs and increases the performance and resource utilization of the given SAN infrastructure.
Author
*Data Storage; Internets; Information Management; Management Planning; Information Systems*

**20050215062** Storage Technology Corp., Louisville, CO, USA
**Knowledge Management via Information Relationship Modeling**
Milligan, Charles A.; Halladay, Steven M.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Data management approaches to content management build the necessary metadata to describe the perceived information content of the data and then organizes the data according to that metadata. Such organizations establish the most effective means to access the data from the standpoint of performance or of reliability. File systems and database systems are geared toward managing this organization. Unfortunately, information technologists also often extend this paradigm to the domain of digital knowledge management. This approach considers knowledge to be just another sort of metadata that needs to be managed much like information. Businesses survive in direct measure with how well they manage their business data which is primarily created in order to provide input for business processes. These business processes allow responsible people to make informed decisions. Information is metadata; data about the data that identifies content, context, organizational structure, and a host of other things that allow the ready access to the proper data elements when needed for preprocessing in preparation for making a decision. However, knowledge differs from data or information. Knowledge is an understanding of the business that gives context to the decisions being made. As such, knowledge management is not about the data but about the processes. Knowledge, therefore, identifies the relationship linkage that allows the appropriate subset of information (and attendant data) to be called on for reaching a particular conclusion. As a consequence, this paper suggests a new definition for knowledge management that is far different from that used for information management. Information management requires the creation of metadata (data about data). Knowledge management requires the creation of meta-processes. Another term for metaprocess is relationship model. Knowledge management is concerned with developing models of processes within businesses, abstracting the processes, and furthermore, linking them to information available in the enterprise information systems. The relationship model expressions then become the critical technology for accomplishing effective knowledge management. The body of this paper explains the need for relationship modeling and how this modeling relates to conventional data management approaches and describes what relationship modeling is.
Author
*Data Management; Models; Metadata; Knowledge Representation*

**20050215064** Instituto Superior de Engenharia do Porto, Porto, Portugal

**A Distributed System for the Dissemination of DGPS Data through the Internet**

Soares, Manuel G.; Malheiro, Benedita; Restivo, Francisco J.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 7 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The accuracy of the Navigation Satellite Timing and Ranging (NAVSTAR) Global Positioning System (GPS) measurements is insufficient for many outdoor navigation tasks. As a result, in the late nineties, a new methodology the Differential GPS (DGPS) was developed. The differential approach is based on the calculation and dissemination of the range errors of the GPS satellites received. GPS/DGPS receivers correlate the broadcasted GPS data with the DGPS corrections, granting users increased accuracy. DGPS data can be disseminated using terrestrial radio beacons, satellites and, more recently, the Internet. Our goal is to provide mobile platforms within our campus with DGPS data for precise outdoor navigation. To achieve this objective, we designed and implemented a distributed system that establishes Internet links to remote DGPS sources and performs campus-wide dissemination of the obtained data. The Internet links are provided by a client/server distributed application where the server is connected to a DGPS source and the client is a component (input module) of the campus-wide DGPS data provider. The campus DGPS data provider allows the establishment of both Intranet and wireless links within the campus. Whereas the wireless broadcast is intended for DGPS/GPS portable receivers equipped with a wireless interface, the Intranet links are provided for DGPS/GPS receivers with a RS232 interface. This distributed system is expected to provide adequate support for accurate (submetric) outdoor navigation tasks.

Author

*Global Positioning System; Internets; Navstar Satellites; Information Dissemination; Distributed Processing; Data Transmission*

**20050215066** Maine Univ., ME, USA

**Biometrics Security Applications: A New Way to Insure Security**

Hossain, Babu Mustahid; Chowdhury, Evan; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fingerprint based applications hold a promising future in terms of resolving numerous security hazards. In order to offer efficient security systems for the households, we investigate prototypes, technologies, and frameworks that will transcend the current state of practice in household security application systems. In this paper, we first discuss the current practices and trends in the regular doorlocks. Then, we investigate a number of research issues and future directions in fingerprint based development for door-locks.

Author

*Biometrics; Warning Systems; Security; Procedures; Information Systems*

**20050215067** Hawaii Univ., Honolulu, HI, USA

**Pods: Issues in the Design of Practical Ad-Hoc Wireless Sensor Networks**

Biagioni, Edoardo; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 6 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Pods ad-hoc wireless sensor network has been designed to study the environment of endangered species of plants. This paper presents the overall design of this network, focusing on the design of the network nodes and of the algorithms we use. In designing and building the Pods network, several issues have become apparent that are more widely applicable to sensor networks in general. Of these issues, the two most fundamental are scaling and energy efficiency. In the foreseeable future large sensor networks can and will be built, and any algorithms used must scale to many thousands of nodes and to networks with diameters of hundreds or thousands of hops. As such networks are built, energy efficiency becomes an essential element of both the overall cost and the ease of deployment. These two elements can therefore significantly affect the viability of a wireless sensor network design. Algorithms developed as part of the Pods project, particularly the MOR routing protocol, provide good performance on both of these measures.

Author

*Wireless Communication; Sensors; Communication Networks; Algorithms; Computer Systems Design*

**20050215076** Electronics and Telecommunications Research Inst., Daejon, Korea, Republic of

**Management Method of Transport Connection in Diameter-Based Authentication, Authorization and Accounting System**

Kim, Marie; Kim, Hyungon; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Diameter-Based AAA (Authentication, Authorization and Accounting) System manages transport connection using two finite state machines, which are Peer State Machine defined in Diameter Base Protocol [1] and Failover State Machine defined in AAA Transport Profile [2]. To realize them, two state machines should be synchronized harmonically. In this paper, we design a co-operating scenario between two state machines. To work designed scenario, we enhance failover state machine, which could not be applied to Diameter-Based AAA by itself, and define 3 interfaces between two state machines. Using the designed failover state machine and interfaces, transport connection management, which supports failover process, can be implemented successfully in Diameter-Based AAA System.

Author

*Accounting; Computer Information Security; Management Methods; Protocol (Computers)*

**20050215077** Caspian Networks, San Jose, CA, USA

**The Next Generation of IP: Flow Routing**

Roberts, Lawrence G.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 13 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For the last 33 years IP routers have not changed, they still support only 'best effort' traffic. However, the bandwidth available to people has been increasing rapidly with the advent of broadband access. The result is that many new services are now desired that require far better QoS than 'best effort' IP can support. Also, with broadband, the problem of controlling the total usage and carrier expense has become important. Thus, it has become critical to improve both the delay performance and the control of bandwidth for IP service, much as was accomplished in ATM. Also, call rejection for high bandwidth streaming services like video is required instead of random discards if quality is to be maintained. All these problems can be solved with no change to TCP/IP by routing flows rather than packets. This requires keeping some state information for the duration of the flow, but this information can be captured on the fly as the first packet goes by. This permits an IP flow router to achieve all the capabilities of an ATM switch plus some, but without the call setup delay and at a lower cost than a conventional IP router.

Author

*Asynchronous Transfer Mode; Internets; Protocol (Computers); Bandwidth*

**20050215079** International Business Machines Corp., Haifa, Israel

**Out of Order Incremental CRC Computation**

Satran, Julian; Sheinwald, Dafna; Shimony, Ilan; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 11 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We consider a communication protocol where the sender takes an information message, appends a CRC, breaks the resulting message into small segments, and transmits them separately, possibly via different routes, to the receiver. Traditionally, reversing the sender operations, the receiver first assembles all the segments that make up the message, then computes a CRC for the message and verifies it against the arriving CRC, and finally delivers the information message to the upper layer protocol (ULP). We present an incremental CRC computation, to be carried out by the receiver, whereby each arriving segment contributes its share to the message's CRC without waiting for all the other segments to arrive in advance. This allows immediate delivery of the arriving segment to the ULP. We impose no constraint on the order by which the segments arrive, nor on their sizes. Yet, our scheme does not increase time complexity with respect to the traditional computation, which assembles all the segments rst, and it uses only a fixed and very small amount of extra memory. Our scheme is beneficial when the ULP can process the individual segments without rst reading the entire message. We assume, to this end, that once all the segments arrive and the receiver compares the CRC it computed against the arriving message's CRC, it can, upon detecting an error, revert to the state it and the ULP had prior to the arrival of any segment of that message.

A practical application is the evolving protocol for Remote Direct Memory Access (RDMA) over TCP, where an overall CRC is added to a concatenation of data segments. However, our scheme also applies to a much wider set of network protocols. Author

*Protocol (Computers); Computer Programs; Transmitters; Receivers; Detection; Messages; Computation*

**20050215082** Consiglio Nazionale delle Ricerche, Italy

**Managing Wide Area Network with GPL Products**

Furnari, Mario Mango; Pezzullo, Gennaro; Vitobello, Francesco; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 7 pp.; In English; See also 20050215042; Original contains color and black and white illustrations

Contract(s)/Grant(s): C29/P/12/M03; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper the design criteria and the experience gained on implementing a network monitoring system for the Museo Virtuale di Napoli: Rete dei Musei Napoletani (ReMuNa1) WAN infrastructure are described. ReMuNa is a fully distributed content and delivering management system composed of 19 nodes interconnected through a Virtual Private Network. To guarantee the full time accessibility on the web of the whole ReMuNa contents and to secure the implemented Multimedia Distributed Document Information System (MDDIS), it was necessary to plan the use of a network monitoring system. After analysing different network monitoring architectures, it was decided to implement a distributed monitoring system, with a centralized Network Operating Center (NOC). In order to pursue this goal, different network monitoring tools, all available under GPL license, were considered and analyzed. The chosen architecture, together with the corresponding components, is described; finally, the experience gained is summarized.

Author

*Wide Area Networks; Management Systems; Design Analysis; Architecture (Computers); Internets*

**20050215085** Belgrade Univ., Yugoslavia

**Semantic Web**

Neuhold, Erich; Frankhauser, Peter; Milutinovic, Veljko; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Semantic Web is a concept that enables better machine processing of information on the Web, by structuring documents written for the Web in such a way that they become understandable by machines. This can be used for creating more complex applications (intelligent browsers, more advanced Web agents), global databases with the data from the Web, reuse of information, etc. Semantic modeling languages like the Resource Description Framework (RDF) and topic maps employ XML syntax to achieve this objective. New tools exploit cross domain vocabularies to automatically extract and relate the meta information in a new context. Web Ontology languages like DAML+OIL extend RDF with richer modeling primitives and provide a technological basis to enable the Semantic Web.

Author

*Semantics; World Wide Web; Data Processing; Document Markup Languages; Internets; Extraction; Data Bases*

**20050215118** NASA Glenn Research Center, Cleveland, OH, USA

**Location Management in a Transport Layer Mobility Architecture**

Eddy, Wesley M.; Ishac, Joseph; August 2005; 15 pp.; In English

Contract(s)/Grant(s): WBS 22-184-10-06

Report No.(s): NASA/TM-2005-213844; E-15218; No Copyright; Avail.: CASI: A03, Hardcopy

Mobility architectures that place complexity in end nodes rather than in the network interior have many advantageous properties and are becoming popular research topics. Such architectures typically push mobility support into higher layers of the protocol stack than network layer approaches like Mobile IP. The literature is ripe with proposals to provide mobility services in the transport, session, and application layers. In this paper, we focus on a mobility architecture that makes the most significant changes to the transport layer. A common problem amongst all mobility protocols at various layers is location management, which entails translating some form of static identifier into a mobile node's dynamic location. Location management is required for mobile nodes to be able to provide globally-reachable services on-demand to other hosts. In this paper, we describe the challenges of location management in a transport layer mobility architecture, and discuss the advantages

and disadvantages of various solutions proposed in the literature. Our conclusion is that, in principle, secure dynamic DNS is most desirable, although it may have current operational limitations. We note that this topic has room for further exploration, and we present this paper largely as a starting point for comparing possible solutions.
Author
*Computer Networks; Direct Numerical SIMulation; Protocol (Computers); Mobility*

**20050215162** NASA Glenn Research Center, Cleveland, OH, USA
**ThermoBuild: Online Method Made Available for Accessing NASA Glenn Thermodynamic Data**
McBride, Bonnie; Zehe, Michael J.; Research and Technology 2003; March 2004; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The new Web site program 'ThermoBuild' allows users to easily access and use the NASA Glenn Thermodynamic Database of over 2000 solid, liquid, and gaseous species. A convenient periodic table allows users to 'build' the molecules of interest and designate the temperature range over which thermodynamic functions are to be displayed. ThermoBuild also allows users to build custom databases for use with NASA's Chemical Equilibrium with Applications (CEA) program or other programs that require the NASA format for thermodynamic properties. The NASA Glenn Research Center has long been a leader in the compilation and dissemination of up-to-date thermodynamic data, primarily for use with the NASA CEA program, but increasingly for use with other computer programs.
Derived from text
*Data Bases; Thermodynamic Properties; Websites*

**20050215342** Memphis Univ., Memphis, TN, USA
**An Open Source Simulation System**
Slack, Thomas; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XLI-1 - XLI-6; In English; See also 20050215300; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

An investigation into the current state of the art of open source real time programming practices. This document includes what technologies are available, how easy is it to obtain, configure, and use them, and some performance measures done on the different systems. A matrix of vendors and their products is included as part of this investigation, but this is not an exhaustive list, and represents only a snapshot of time in a field that is changing rapidly. Specifically, there are three approaches investigated: 1. Completely open source on generic hardware, downloaded from the net. 2. Open source packaged by a vender and provided as free evaluation copy. 3. Proprietary hardware with pre-loaded proprietary source available software provided by the vender as for our evaluation.
Derived from text
*SIMulation; Real Time Operation*

**20050215358** HRL Labs., LLC, Malibu, CA, USA
**Protocols for Enhancing Gateway Dependability in Hybrid Mobile Ad Hoc Networks**
Ahmed, Mohiuddin; IPSI 2005 Hawaii Proceedings; [2005]; 3 pp.; In English; See also 20050215347; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One standard method to enable connectivity amongst groups of isolated mobile nodes is to use gateways that can communicate across platforms, and thus form a hybrid network of ad hoc networks. However, such a hierarchical network is particularly vulnerable to single points of failure (at the gateways). This article describes techniques that enable such gateways to incorporate a measure of security and distributed fault tolerance. Algorithms are designed to employ redundant gateways in each ad hoc domain that, along with node signaling schemes, ensure continued operation and graceful degradation of the network performance in the face of node/gateway failures. Preliminary simulation study shows that the proposed algorithms are tractable, implementable, and have relatively modest computational and network overhead. isolated groups due to radio access technology mismatch or terrain blockages.
Author
*Protocol (Computers); SIMulation; Fault Tolerance; Degradation; Algorithms; Failure*

**20050215360** Norwegian Univ. of Science and Technology, Norway
**Modeling System Integrity of a Security Critical System using Coloured Petri Nets**
Houmb, Siv Hilde; Sallhammar, Karin; IPSI 2005 Hawaii Proceedings; [2005]; 15 pp.; In English; See also 20050215347; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There exist several standards targeting assessment and certi.cation of security. However, these standards focus on qualitative evaluation according to prede.ned security levels, rather than providing quantitative assessment of operational security. Quantitative evaluation, such as probabilistic analysis, is frequently used within the dependability domain. Recently, the need for techniques for quantification of security attributes has been raised. This relates both to security requirements in Quality of Service architectures and input requirements to trade-o. decisions regarding the design and choice of security mechanisms to comply with an established security policy. A security critical system is a system that contains data or information that should be protected against unauthorized reading, change or deletion in accordance to a security policy. In this paper, we present an approach for quantitative evaluation of security critical systems using a higher level formalism for stochastic modeling, analysis, and simulation. We present a generic hierarchic Coloured Petri Nets (CPN) model to quantify operational system integrity of a security critical system. In our modeling framework, we consider security breaches along with hardware, operating system, and application/services failures, regardless of cause. To demonstrate the use of the hierarchical and generic CPN model, operational security aspects of a real-world web service is modeled and analyzed.
Author
*Stochastic Processes; SIMulation; Petri Nets; Computer Security; Warning Systems; Color*

**20050215361** Boras Univ., Sweden
**An Ethical Perspective on Internet Commerce**
Lind, Ann; IPSI 2005 Hawaii Proceedings; [2005]; 14 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Electronic commerce on the Internet has increased rapidly during the last few years. In Europe as well as in for example the USA there are an increasing number of companies that use Internet as a channel for commerce. Electronic commerce stands for all paperless exchange of business information. There are generally two different types of electronic commerce: business-to-consumer (B2C) and business-to business (B2B). This paper has a focus on B2C with Internet as media. The purpose of the paper is to illuminate some ethical aspects that are important to consider during such electronic commerce. Electronic commerce can be regarded from different perspectives: a communicative perspective, a business process perspective, a service perspective and an online perspective. The analysis presented in this paper considers all these perspectives. Companies use different techniques to come into contact with prospective customers, such as store-front, auctions, dynamic price, portals, financial services and casinos. This kind of commerce has had a great impact on individuals, companies and society. There are many advantages such as reduced costs and shorter lead times that give the customer lower prices for products bought on the Internet. For the customer Internet commerce also gives increased choice and the possibility to shop 24 hours per day 7 days a week. The customer may also interact with other customers to discuss product quality and the service level of a specific company. Internet commerce will also bring benefits for society as a whole. When people do not have to go to a shop the traffic on the roads will decrease as well as pollution. Cheaper products will also give poorer people the possibility of increasing their standard of living. But electronic commerce will also bring some disadvantages. Rationalisations may cause unemployment and less profitable branches may be closed. The people in the affected society were earlier used to a service that they no longer have access to if they cannot use the new information technology. Electronic commerce also means a more complicated environment which can have a negative impact on individuals as well as on companies. People who cannot adapt to the new technique will become unemployed and the company that cannot or will not be part of it may suffer from competition. Companies that have been in the business for a long time may have old business systems that are necessary to integrate with an electronic commerce system. That can be complicated as well as costly. Electronic commerce suffers from less flexibility compared to traditional commerce and has an impact on the social environment. Many customers may prefer the personal contact. In this paper some ethical theories are presented. They are used for evaluating ethical implications of electronic commerce. The teleological (for example the utilitarian perspective) and deontological (for example Kantianism) theories are the main basis for this evaluation. If our basis is a utilitarian perspective there may be problems since it is difficult to grasp the consequences that a specific action may cause. There are definitely positive as well as negative consequences to consider. It is very hard to estimate how many people will suffer from negative consequences and how many will benefit from positive consequences and it is also difficult to estimate what the emerging of electronic commerce will mean for the society as a whole. From a deontological point of view we may conclude that it is not acceptable that a certain group of people are not given the same advantages as others and that their social environment suffers. Ethical relativism will probably accept electronic commerce since it is normal in our culture.
Author
*Consumers; Information Systems; Internets; Electronic Commerce*

**20050215363** Washington Univ., Tacoma, WA, USA

**Toward Next Generation Business Information Systems: Four Inherent Capabilities of Service Oriented Computing**

Chung, Sam; Tang, Lai Hong; Davalos, Sergio; Park, Saechul; IPSI 2005 Hawaii Proceedings; [2005]; 6 pp.; In English; See also 20050215347; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The research conducted examines how the emerging Service Oriented Computing (SOC) paradigm will influence the development of the distributed Business Information Systems (BIS). For this purpose, a Service Oriented Architecture (SOA) that can be implemented by currently available SOC technologies, which we call a basic SOA, is described. The basic SOA is applied to the development of distributed BISs for retail Supply Chain Management (SCM). To analyze the effects of the SOC paradigm on the development of distributed BISs, the following four inherent capabilities of SOC are proposed: interoperability, reusability, adaptability, and interdependability. Then, we investigate how the proposed capabilities are naturally provided by the SOC paradigm through the development of the BISs for retail SCM. Based upon the inherent capabilities of the SOC paradigm, the SOC paradigm is very effective for not only Enterprise Application Integration within an organization, but also for B2B Application Integration between organizations. The capabilities cannot be easily obtained through other distributed object computing paradigms. which is called web services [1, 2, 3]. A web service uses standard interface definitions and general interaction protocols to integrate the applications based upon eXtensible Markup Language (XML). Software developers have accepted the emerging computing paradigm using web services, which we call SOC with their belief that the SOC paradigm can overcome the implementation complexity of the current distributed object computing paradigms [1, 2]. For this purpose, a basic Service Oriented Architecture (SOA) is first described with currently available SOC technologies. The basic SOA is applied to the development of distributed Business Information Systems (BIS) in retail Supply Chain Management (SCM) [4]. Two heterogeneous BISs are developed for a retailer and a supplier, respectively. The business logic layer of each BIS is implemented with web services. The web services are published to public service registries. The two BISs are integrated with the published web services for Business-to-Business (B2B) transactions between
Author

*Protocol (Computers); Information Systems; Document Markup Languages; Heterogeneity; Interoperability*

**20050215365** Kyunghee Univ., Taejon, Korea, Republic of

**Service Quality Improvement Using Quality Function Deployment in the Application Service Provider Industry**

Ki, Dohoon; IPSI 2005 Hawaii Proceedings; [2005]; 8 pp.; In English; See also 20050215347; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The ASP (Application Service Provider) industry provides essential infrastructure for the Internet-based e-business transactions, thereby accelerating corporate e-transformation. First introduced is the QFD (Quality Function Development) framework which provides a great tool not only to arrange and evaluate VoC (Voice of Customers) and VoE (Voice of Engineers), but also to link and combine VoC and VoE, thereby presenting explicit directions for service quality improvement. There have been, however, few researches on QFD for the telecommunication service industries. The case study discussed here serves an illustration of the applicability and usefulness of the QFD approach to the ASP industry. The proposed QFD framework shows great potentials since customers needs are explicitly considered in the framework, and it helps service operators develop better IT outsourcing by providing guidelines for redesigning or reengineering the service delivery process. Author

*Electronic Commerce; Telecommunication; Quality Control; Internets; Engineers*

**20050215366** Faculty of Economics Split, Croatia

**The Role of the Internet in Developing Business Strategies of Knowledge-Intensive Enterprises in South-East Europe (SEE): The Case of Croatia**

Alfirevi, Niksa; Omazi, Mislav ante; Hruska, Domago; IPSI 2005 Hawaii Proceedings; [2005]; 11 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The information system has been crucial part of business more than half a century but not a prime determinant of enterprise strategy, until early- or mid- 1990s. Then the emergence of the Internet changed everything, virtually overnight. In this paper, the authors discuss the role of the Internet in formulating, implementing and controlling the strategic management process of business organizations in Republic of Croatia, as well as its influence to the development of the ‘knowledge sector’ in the national economy. First, the theoretical findings regarding the influence of the Internet into the formulation and implementation of the strategy are presented, while the issue of the existence of the ‘e-Business strategy"/e-Strategy as

a separate theoretical construct is discussed. Special attention is given to the specific features of the knowledge-intensive companies in the South- East European (SEE) context, with the knowledge as a strategic resource being analyzed as a (potential) source of competitive advantage for the large enterprises in the region. Subsequently, on the basis of experience from the successful and globally recognized dot.com enterprises, based in the Republic of Croatia, we assess and make specific recommendations for developing feasible knowledge-based business strategies, which should assist the enterprises from the other countries in the region to successfully integrate into the global knowledge economy.
Author
*Information Systems; Knowledge Based Systems; Internets; Electronic Commerce; Organizations*

**20050215372** Industrial Technology Research Inst., Taiwan, Province of China
**Design of Advanced Guidance Law against Hypersonic Attacking Targets: Robust Adaptive Neural Network Approach**
Chen, Yung-Yue; Liu, Pai-Chuan; IPSI 2005 Hawaii Proceedings; [2005]; 6 pp.; In English; See also 20050215347
Contract(s)/Grant(s): NSC89-2213-E-007-039; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An advanced guidance law for three-dimensional engagement is developed against very high-speed and maneuverable targets. In practical situation, three-dimensional missile-target dynamics are not always exactly known. Therefore, one method that can approach the unknown missile-target system needed to be used. It is famous that unknown systems can be approximated by the neural network systems to any desired accuracy; hence the unknown three-dimensional (3-D) pursuit dynamics of missile and target is able to be approximated by neural network systems with adjustable parameters. Furthermore, by the combination of feedback linearization, neural network approximation, and H control, an robust adaptive neural network guidance law can be successfully develop to treat the robust tracking of uncertain missile-target systems. By this arrangement, the effects of approximation errors between the true models of missile-target systems and neural network approach model and exogenous disturbance (targets accelerations) on tracking errors are attenuated below a prescribed level via a robust H tracking technique.
Author
*Hypersonics; Neural Nets; Uncertain Systems; Accuracy; Feedback; Network Control*

**20050215689** Verizon Federal Network Systems, Inc., Cleveland, OH, USA
**Adapting End Host Congestion Control for Mobility**
Eddy, Wesley M.; Swami, Yogesh P.; September 2005; 19 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS3-03100; WBS 22-184-10-06
Report No.(s): NASA/CR-2005-213838; E-15208; No Copyright; Avail.: CASI: A03, Hardcopy

Network layer mobility allows transport protocols to maintain connection state, despite changes in a node's physical location and point of network connectivity. However, some congestion-controlled transport protocols are not designed to deal with these rapid and potentially significant path changes. In this paper we demonstrate several distinct problems that mobility-induced path changes can create for TCP performance. Our premise is that mobility events indicate path changes that require re-initialization of congestion control state at both connection end points. We present the application of this idea to TCP in the form of a simple solution (the Lightweight Mobility Detection and Response algorithm, that has been proposed in the IETF), and examine its effectiveness. In general, we find that the deficiencies presented are both relatively easily and painlessly fixed using this solution. We also find that this solution has the counter-intuitive property of being both more friendly to competing traffic, and simultaneously more aggressive in utilizing newly available capacity than unmodified TCP.
Author
*Computer Networks; Algorithms; Detection; Mobility*

**20050216402** Lausanne Univ., Switzerland
**E-Privacy Solutions for Efficient Enterprises and Organizations**
Ghernaouti-Helie, Solange; Sfaxi, Mohamed Ali; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 13 pp.; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI

Privacy is a real concern for e-services users. Cyber crime, as the increased justice and police investigations needs affect effective e-privacy solutions. Internet privacy challenges, issues and threats are presented. Benefits and limits of existing

privacy solutions and the P3P project (W3C) are analyzed. Recommendations are proposed to preserve privacy and satisfy security objectives for small and medium size enterprise.
Author
*Internets; Privacy; Computer Security*

**20050216403** Technische Hochschule, Aachen, Germany
**A Scalable and Flexible Infrastructure Framework for Addressing Spam**
Schryen, Guido; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 4 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Spam as unsolicited e-mail to a large number of recipients is known to become an increasingly disturbing and costly issue of electronic business and Internet traffic. Mainly technical-oriented approaches are applied with a focus on blocking, filtering, and authentication mechanisms based on the domain name system. They come along with different drawbacks and have all low effectiveness in common. The article proposes a new SMTP-based infrastructure framework that features a more controlled handling of email accounts and involves restricting the number of emails per account and day by introducing a new organizational unit called counter managing authority.
Author
*Electronic Mail; Internets; Computer Information Security*

**20050216408** Multimedia Univ., Cyberjaya, Malaysia
**VHDL Modeling of Partial Encryption of Compressed Images for Hardware Prototyping**
Reaz, M. B. I.; Mohd-Yasin, F.; Tan, S. L.; Tan. H. Y.; Sulaiman, M. S.; Ibrahimy, M. I.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 4 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes the VHDL modeling of a partial encryption of compressed images algorithm that allows for efficient hardware implementation. The compression algorithm decomposes images into several different parts. A secure encryption algorithm is then used to encrypt only the crucial parts, which are considerably smaller than the original image. This will result in significant reduction in processing time and computational requirement for encryption and decryption. The breadth-first traversal linear lossless quadtree decomposition method is used for the partial compression and RSA is used for the encryption. Functional simulations are carried out to verify the functionality of the individual modules and the system on four different images. Comparisons, verification and analysis made validate the advantage of this approach. This work also has the potential of being extended to use other kind of compression algorithm such as lossy quadtree and SPIHT.
Author
*Hardware Description Languages; Mathematical Models; Cryptography; Prototypes; Data Compression; Images*

**20050216410** Simon Fraser Univ., Burnaby, British Columbia, Canada
**The Virtual Silk Highway: A Project to Bridge the Digital Divide**
Atkins, M. Stella; Janz, Robert F.; Kaffenberger, Walter; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 5 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In June 2001 NATO agreed to fund a non-military project to bring Internet connectivity to the countries in the Southern Caucasus and Central Asia, using satellite dishes located at key academic institutions in each country. The Internet connection is hosted by a research facility DESY, based in Hamburg. The last connections were made to Ashgabat in Turkmenistan in August 2003. This 'Virtual Silk Highway' project is ambitious, innovative and exciting, both technically and sociologically. We present the story of some of the issues, unexpected problems encountered, and some of the surprise successes of this project to bridge the digital divide. .
Author
*Internets; Satellite Communication; Parabolic Reflectors; Research Facilities*

**20050216412** Huazhong Univ. of Science and Technology, Wuhan, China

**Honeynet-based Adaptive Network Forensics System**

Ren, Wei; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 5 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Two new fields in network security have grown in importance in the Internet era: Network Forensics and Honeynet systems. These two fields share the objective of collecting information about computer mischief, but with dramatically contrasting desired outcomes. Network forensics system can analysis and reconstruct the attack behavior, investigate and trace back the malicious source. Meanwhile the honeynet system can lure attackers and gain information about new type intrusions. These two system integrated together can enhance the ability of incident response and forensics investigation. In this paper, we detail a method to utilize honeynet technology to enhance network forensic capabilities. We at first time give the design of a honeynet-based adaptive network forensics system.

Author

*Internets; Computer Networks; Computer Security; Intrusion*

**20050216414** ProseFlow, USA

**How Up-to-Date Are Corporate Web Practices?**

Moen, Deirdre Saoirse; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 6 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Worldwide Web Consortium (W3C) has spent extensive time developing web standards so that there can be common agreement about the representation of content by the viewers user agent. Many skilled web designers constantly complain about the poor quality, from a standards compliance perspective, of even the highest-profile web sites. This paper examines and quanties some of the common problems seen on highprofile web sites.

Author

*World Wide Web; Websites; Organizations*

**20050216417** Royal Inst. of Tech., Stockholm, Sweden

**Fault Management System in IP-over-WDM Networks**

Mukherjee, Amitava; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 9 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The today s telecommunication networks can provide fast and high quality services to end users with the integration of computer and communication technologies and the fast maturation of fiber optic communication techniques. In the backbone networks, optical communication network will play a key role to provide diverse array of services to end users. As more and more mission-critical business users are involved, the 99.99% uptime of services for those users is a must. As such, how to provide uninterrupted services to these users, and reduce the loss of service to a minimum if interruption is inevitable, becomes a critical design issue. That is, survivability must be considered in designing optical communication network to provide uninterrupted continuous service to users in the presence of node/link failures. In order to design a fault-management system in a distributed network architecture, there are three different components namely (a) fault detection, (b) fault recovery that involves protection and restoration mechanism and (c) fairness service provision for different needs. This article would briefly focus on this design methodology for IP-over-WDM networks in an integrated manner.

Author

*Telecommunication; Fault Detection; Fiber Optics; Interprocessor Communication; Management Systems; Optical Communication; Communication Networks*

**20050216434** Manchester Metropolitan Univ., UK

**'Web-Weaving': Creating Competitive Advantage for Online Fashion Retailers**

Ashworth, Catherine J.; Hallsworth, Alan; Schmidt, Ruth A.; Pioch, Elke A.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 17 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Despite apparel sales playing a key role in the European economy and online fashion and lingerie sales overtaking

established Internet products, such as electrical goods and CDs, the Internet and marketing literature to date has largely neglected small and medium-sized (SME) fashion e-retailers (SMEFEs). Initial exploratory critical case-research has led to conceptualisation of the 'Web-Weaving' model for achieving profitable and potentially sustainable e-retail for a 'pure-play' e-retailer in the fashion sector. This strategic approach identifies a multi-niche opportunity for e-retail, which spreads risk, maximizes revenue streams, utilizes knowledge economies/synergies across multiple web sites, promotes customer added value and offers potential for competitive advantage.
Author
*Marketing; Websites; Internets; Revenue*

**20050216437** Tsukuba Univ., Japan
**Shopping Mall Navigation with Smart RFID Tags**
Murakami, Eiji; Terano, Takao; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 4 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes Fairy Wing: a distributed information service system, which utilizes Radio Frequency Identification (RFID) tags as portable media for user-computer interaction with naive users. The characteristics of the proposed system are summarized as follows: (1) The system is quipped on small PCs with a reasonable RFID reader/writers and works with/without computer networks; (2) It is effective in distributed computer environments even for small number of users; and (3) It gradually accumulates users' profiles from the individual behaviors of them then generates the recommendation and advices for each user. A prototype system has been implemented and validated in user navigation in a shopping mall.
Author
*Information Systems; Radio Frequencies; Computer Networks; Human-Computer Interface; Navigation*

**20050216439** Maryland Univ., MD, USA
**Student Satisfaction and Delivering Technical Higher Education over the Internet**
Abdul-Hamid, Husein; Howard, James A.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 28 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Research into student satisfaction with the delivery of higher education has primarily focused on the effect of class size. While a majority of such studies over the past thirty years identify a class size effect, the strength of this effect, in most instances, is small. Published research is most heavily concentrated in the undergraduate live classroom area where class sizes sometimes reach 600 students for introductory courses. Quantitative/statistical research examining the relationship between class size and outcome variables for accredited undergraduate and graduate courses delivered over the Internet is virtually non-existent. The same is true when comparing student satisfaction levels for technical versus non technical courses. The present effort, we hope, will contribute to the body of knowledge about the effects of teaching technical and non technical content in the virtual environment of the Internet.
Derived from text
*Education; Internets*

**20050216441** Japan Advanced Inst. of Science and Technology, Ishikawa, Japan
**Adaptive Task Scheduling by Dynamic Priority**
Tanaka, Kiyofumi; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 9 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In a real-time OS that should provide reliability, it is an important objective to achieve scheduling where each execution of given tasks is finished by its deadline without fail. In this paper, we describe a method of estimating execution time of a task based on the time which priority of a task is dynamically updated according to the period and the time properties dependent on the estimate of execution time, Moreover, we show the preliminary evaluation by simulation.
Author
*Real Time Operation; Time Dependence; Scheduling*

**20050216443** Saint Joseph's Univ., Philadelphia, PA, USA

**Bringing Food Supply Chain Stakeholders Together: A Case Study of a Table Top Agroterrorism Simulation Exercise**

Tavantzis, Thomas .; Clapano, Kevin; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 6 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Table-top exercises (TTE) have been increasingly employed as a way to train emergency responders to act in a coordinated fashion in the face of potential terrorist threats. TTE s are much less expensive than full-scale stimulation exercises and they are effective in bringing stakeholders together to build alliances while identifying future training needs. This case-study discussion focuses on the key issues in developing a TTE including methods to create powerful and realistic multimedia images, the facilitation skills needed to lead a TTE, and the direct and indirect benefits to the stakeholders. A discussion of web-enabled TTEs will also be included.

Author

*Education; Emergencies; Food Chain; Physical Exercise*

**20050216450** National Bureau of Standards, Washington, DC USA

**Security Analysis and Enhancements of Computer Operating Systems**

Abbott, R. P.; Chin, J. S.; Donnelley, J. E.; Konigsford, W. L.; Tokubo, S.; Webb, D. A.; Apr. 1, 1976; 70 pp.; In English

Contract(s)/Grant(s): Proj-640.1112

Report No.(s): AD-A436876; NBSIR-76-1041; No Copyright; Avail.: CASI: A04, Hardcopy

This is one of a series of documents prepared as part of a project on computer security and privacy at the Institute for Computer Sciences and Technology of the National Bureau of Standards. This document is intended primarily for use by those who are responsible for managing and operating government data processing installations. It provides an understanding of the types of security problems that arise in current computer operating systems, and it suggests ways in which the security of these operating systems can be enhanced. The document may also be of use to: (1) those engaged in the development of computer security techniques; (2) the manufacturers of computer systems and software; and (3) those responsible for managing and operating computer systems in the private sector. This document concerns the security problems that arise in computer operating systems. In order to develop a balanced set of security safeguards, one should use it in conjunction with documents that treat other specific aspects of the security problem.

DTIC

*Augmentation; Computer Information Security; Operating Systems (Computers); Security*

**20050216489** Villanova Univ., PA USA

**High Rate Multiuser Cooperative Diversity Systems**

Zhang, Yimin; Amin, Moeness; Wang, Genyuan; Watson, Morgan; Kurti, Gjergji; Aug. 1, 2005; 112 pp.; In English

Contract(s)/Grant(s): N00014-04-1-0617

Report No.(s): AD-A436924; No Copyright; Avail.: CASI: A06, Hardcopy

The fundamental objective of this research project is to develop novel cooperative wireless network schemes and practical coding designs that provide unmanned surface vehicle (USV) swarms reliable wireless links, with the overall data throughput and the communication quality significantly exceeding those of existing non-cooperative systems. Towards this end, we have made contributions in three areas: (1) We have developed a cooperation protocol that effectively constructs distributed space-time codes for cooperative diversity systems. Depending on application environments, the proposed protocol can be used to construct different distributed space-time codes. For example, high data rate distributed codes can be used to improve the communication efficiency when the channel state information (CSI) is available at the receivers, whereas differential distributed space-time codes can be used to avoid channel estimations in the absence of CSI; (2) We have developed full-rate, large diversity product space-time codes with non-vanishing minimum determinant. The proposed space-time codes are an important component in high-efficiency distributed space-time code construction; (3) We have studied the channel modeling and spatial correlation between different antennas in sea surface environments. The results are important in assessing the performance of cooperative diversity systems in sea surface environments as well as in designing array antenna configurations.

DTIC

*Coding; Communication Networks; Multiple Access; Surface Vehicles; Wireless Communication*

**20050216525** Raytheon Co., Tucson, AZ USA

**Integrated Sensing and Processing (ISP) Phase II: Demonstration and Evaluation for Distributed Sensor Networks and Missile Seeker Systems**

Schmitt, Harry A.; Waagen, Donald E.; Bellofiore, Sal; Cramer, Robert; Savage, Craig; Morrell, Darryl; Barbano, Paolo; Anderson, David; LaScala, Barbara; Hero, Al; Sep. 1, 2005; 26 pp.; In English

Contract(s)/Grant(s): N00014-04-C-0437

Report No.(s): AD-A437038; No Copyright; Avail.: CASI: A03, Hardcopy

The primary goal of this effort is to bring to maturity a select set of basic algorithms, hardware, and approaches developed under the Integrated Sensing and Processing (ISP) Phase I program, implement them on representative hardware, and demonstrate their performance in a realistic field environment. We have identified a few promising research thrusts investigated in ISP Phase I where field demonstrations are cost prohibitive but collected data sets are available. Here, we will conduct a thorough performance evaluation.

DTIC

*Detection; Distributed Processing; Homing Devices; Missile Systems; Missile Tracking; Networks; Target Acquisition; Wireless Communication*

**20050216687** Oslo Univ., Norway

**Values, Brand and Aesthetics in e-business, from Information Design Point of View**

Karabeg, Almira; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 7 pp.; In English; See also 20050216686; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The purpose of this article is to view the interplay between technology, concept of value and the role of aesthetics in the Internet-based business through the lens of information design. More concretely, we propose application of methodology called polyscopic modeling to structuring of existing information, as well as designing new knowledge related to the creation of value in e-business

Author

*Commerce; Internets; Lens Design*

**20050216691** Technische Hochschule, Aachen, Germany

**Appropriateness of Lightweight MTA Authentication Protocols for Fighting Spam**

Schryen, Guido; Hoven, Reimar; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 6 pp.; In English; See also 20050216686; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Spam is known to become an increasingly disturbing and costly issue of electronic business and Internet traffic. In 2003, it even surpassed legitimate e-mail. Fighting the spam problem, the IETF Anti-Spam Research Group currently discusses several Lightweight MTA Authentication Protocols (LMAP) basing on DNS entries. The article presents the most important approaches (RMX, DMP, SPF, and CallerID), its similarities and differences, and discusses the benefits and limitations as well.

Author

*Computer Information Security; Direct Numerical SIMulation; Internets; Electronic Mail*

**20050216699** Putra Malaysia Univ., Serdang, Malaysia

**Data Mining and Knowledge Discovery on Malaysian's Ethno-pharmacology**

Jais, Abdul Manan Mat; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 7 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Malaysia is one of the 12 mega-biodiversity country in the world, but despite all the bounties, there is yet a conclusive documentation as a portal to describe details on Malaysian s ethno-pharmacology, to be in tandem with other conventional pharmaceutical and natural products chemistry. As such, Malaysia is to produce details biological scientific information into bio-informatic, involving intelligent data analysis, data mining and knowledge discovery on biodiversity, DNA biochemical profiling and biomedical evident. This strategic planning on first selected few species is wiser and at this forum, we would highlight the importance of collaborative efforts and working together towards building up a unique mystical Malaysian s ethno-pharmacology. INTRODUCTION

**20050216702** Erlangen-Nuernberg Univ., Erlangen, Germany

**Molecular Processes as a Basis for Autonomous Networking**

Krueger, Bettina; Dressler, Falko; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 6 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Autonomous networking has become the buzzword for attempts of building high-scalable network architectures, which are self-organizing, self-maintaining and self-healing. Few of these approaches were successful and none has shown to provide all the promised functions. We try to study the processes in computer networks using molecular processes as the paradigm. This novel approach shows many similarities between computer networking and cellular mechanisms. In this paper, we focus on the area of network security as one research area with high demand for high-scalable mechanisms providing the needed functionality. After identifying similarities between nature and technology, we discuss potential research domains, which are high potentials for learning directly from biology at the example of security attacks in networks. We see the proposed mechanism as a generic approach for autonomous networking. The countermeasures against attacks in computer networks are only a special example to introduce the mechanisms. Keywords Autonomous Networking, Bio-Inspired Computing, Network Modeling, Next Generation Networks

Author

*Molecular Properties; Autonomy; Computer Networks; Cytology; Network Analysis*

**20050216704** Belgrade Univ., Yugoslavia

**A Comparison of Product Searching Across Four Search and Evaluation Shopping Facilities**

Riquelme, Hernan; Bartlett, Ivonne; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 32 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Consumers are faced with an array of search and evaluation facilities in connecting with products and companies nowadays. These take the form of shopping agents such as shopping robots, shopping directories, e-malls, or individual e-tailers. An understanding of consumer behaviour, especially the first stage of the buying decision process, namely the information search, is critical to the development of new facilities on line. This article reports a study that compares four different on-line retailing formats or search and evaluation facilities: a directory, a shopping bot, an e-mall, and an e-tailer along perceived satisfaction, cognitive effort, confidence, perceived savings and credibility. The results of the study show that there are significant differences among the four formats in terms of the above dimensions. Keywords: Internet search, search evaluation, online retailing, customer satisfaction.

Author

*On-Line Systems; Internets; Information Retrieval; Directories; Consumers*

## 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*.

**20050214945** Paedagogische Hochschule, Ludwigsburg, Germany

**Meta-Learning Functionality in eLearning Systems**

Schroeder, Ulrik; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Current eLearning systems require that learners take responsibility for building and maintaining motivation and choosing and optimizing their learning strategies. These functions were formerly provided by teachers in traditional learning scenarios. In self-directed learning scenarios learners need to plan, structure, control, optimize, evaluate and assess their learning process and their learning success. Tools for supporting control and evaluation of the learning process must be incorporated into innovative learning systems. On top of organizing the learning process new strategies for self-driven learning must be acquired (meta-learning). The paper discusses these issues against the background of cognitivist and constructivist learning theory and defines new requirements for a learning system architecture which must be met by future eLearning systems.

Author

*Learning Theory; Computer Assisted Instruction; Optimization*

**20050214956** University of Northern Arizona, Flagstaff, AZ, USA

**The Brave New World of the Cyber Speech and Hearing Clinic: Treatment Possibilities**

Culbertson, William R.; Tanner, Dennis C.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 12 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper follows our presentation at the 6th Annual Multiconference on Systemics, Cybernetics and Informatics, wherein we discussed the concepts of diagnosis in communication disorders via computer mediated links from a central hub to remote sites. The present paper addresses treatment aspects that will follow the original diagnostic procedures and program development. Although there will always be situations where face-to-face patient-clinician contact will be necessary, Internet linkages can provide many services more conveniently for patients. This will be especially useful in remote places, such as the Indian Reservations of the American Southwest, where access to specialized service is difficult and, in some cases, impossible. Patients will log onto cyber speech and hearing clinics from the comfort of their homes or from convenient hub locations. Three-dimensional and holographic imaging will continue to improve, replacing face-to- face treatment sessions. In this paper, we discuss how surrounding ceiling-to- floor screens will be constructed with keyboard or voice recognition capabilities, embedded digital cameras, bio-assessment and feedback devices to be used in treatment sessions wherein the computer facilitates the patient s self-paced progress. Virtual reality headsets will provide further options for interaction and give the patient more freedom and mobility. Speech and hearing professionals will be able to provide synchronous and asynchronous treatment services, including care plan development and progress monitoring, from their home cyber centers. In the future, long automobile journeys to distant speech and hearing clinics will be the exception, and not the rule.
Author

*Clinical Medicine; Cybernetics; Hearing; Articulation (Speech)*

**20050215556** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Transition Report for Dr. Ken Fernandez, NASA Marshall Space Flight Center**

Fernandez, Ken R.; [2005]; 1 pp.; In English; NASA Administrator's Fellowship Program 2005 Symposium, 25 Jul. 2005, San Jose, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The primary objective proposed during my tenure with the NASA Administrator's Fellowship Program (NAFP) was the use of ROBOSIM, a NASA developed robot simulation software package, to introduce the first robotics class to the School of Engineering at Alabama A&M University. The students participating in the spring of 2004 chose as their class project a simulation of the Shuttle, the Shuttle Remote Manipulator System, and the inspection boom which may be used to inspect the Shuttle's tiles on-orbit. In addition to meeting this primary objective and fulfilling other activities that were required by NAFP participants, several other accomplishments are reported. Participation with the faculty of Alabama A&M in the planning and execution of the First and Second Annual Michael P. Anderson Memorial Summer Programs for minority high school students was completed. This program, funded by NASA, provided supervised 'hands- on' group activities in various engineering disciplines, including robotics. A third major accomplishment during the NAFP tenure was the granting of a U.S. patent for the NASA 3-D Luggage Scanning System. International patents are also pending on this device. The device uses stereographic imaging similar to that used by NASA on the Mars Rover to enhance the contents of luggage and other items being inspected. It is believed that this device can greatly improve the efficiency and accuracy of security checkpoint screening.
Author

*Robotics; Computer Programs; Computerized SIMulation; Remote Manipulator System*

**20050216531** Space and Naval Warfare Systems Center, San Diego, CA USA

**SSC San Diego Biennial Review 2003. Vol 3: Intelligence, Surveillance, and Reconnaissance**

Olds, Robert B., Jr.; Everett, H. R.; Lapota, David; DiCristofaro, Vivian D.; Glover, Mark V.; McDonald, Vincent; Morin, David; Owen, Mark W.; Rice, Joseph A.; Roy, Thomas N.; Jan. 1, 2003; 58 pp.; In English; Original contains color illustrations

Report No.(s): AD-A437061; No Copyright; Avail.: CASI: A04, Hardcopy

Volume 3 of this Biennial Review features ten (10) technical papers describing and discussing innovative technologies being developed at the Spawar Systems Center in San Diego.
DTIC

*Adaptation; Autonomous Navigation; Image Processing; Intelligence; Reconnaissance; Surveillance*

**20050216554** Columbia Univ., New York, NY USA

**Application-Level Anomaly Detection for the Master Caution Panel**

Stolfo, Salvatore J.; Jul. 1, 2005; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-02-2-0209; DARPA ORDER-P093; Proj-P093

Report No.(s): AD-A437103; AFRL-IF-RS-TR-2005-278; No Copyright; Avail.: CASI: A03, Hardcopy

The goal of this work was to study how to monitor a large distributed system and apply machine learning methods to, and generate models of, its normal operation. With this done, the generated model(s) may be used to actively detect abnormal executions at run-time which may indicate improper use, attacks, or internal faults of the monitored system in question. We used the data collected by Master Caution Panel (MCP) software for the Theater Battle Management Core System (TBMCS) as sample data to test our machine learning methods. The MCP system has been under development for some time. It shares the same goal, but is based upon carefully designed and crafted 'logic modules' that issue alerts when conditions warrant. The goal here is to use the existing monitoring and alert functions of MCP as a baseline to determine whether automated learning systems can achieve comparable performance in an automated fashion. A positive outcome of this study could suggest general principles of use in a wide range of mission critical systems.

DTIC

*Algorithms; Anomalies; Detection; Panels*

## 64
## NUMERICAL ANALYSIS

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

**20050214869** NASA Glenn Research Center, Cleveland, OH, USA, Toledo Univ., OH, USA

**Probabilistic Aeroelastic Analysis Developed for Turbomachinery Components**

Reddy, T. S. R.; Mital, Subodh K.; Stefko, George L.; Pai, Shantaram S.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Aeroelastic analyses for advanced turbomachines are being developed for use at the NASA Glenn Research Center and industry. However, these analyses at present are used for turbomachinery design with uncertainties accounted for by using safety factors. This approach may lead to overly conservative designs, thereby reducing the potential of designing higher efficiency engines. An integration of the deterministic aeroelastic analysis methods with probabilistic analysis methods offers the potential to design efficient engines with fewer aeroelastic problems and to make a quantum leap toward designing safe reliable engines. In this research, probabilistic analysis is integrated with aeroelastic analysis: (1) to determine the parameters that most affect the aeroelastic characteristics (forced response and stability) of a turbomachine component such as a fan, compressor, or turbine and (2) to give the acceptable standard deviation on the design parameters for an aeroelastically stable system. The approach taken is to combine the aeroelastic analysis of the MISER (MIStuned Engine Response) code with the FPI (fast probability integration) code. The role of MISER is to provide the functional relationships that tie the structural and aerodynamic parameters (the primitive variables) to the forced response amplitudes and stability eigenvalues (the response properties). The role of FPI is to perform probabilistic analyses by utilizing the response properties generated by MISER. The results are a probability density function for the response properties. The probabilistic sensitivities of the response variables to uncertainty in primitive variables are obtained as a byproduct of the FPI technique. The combined analysis of aeroelastic and probabilistic analysis is applied to a 12-bladed cascade vibrating in bending and torsion. Out of the total 11 design parameters, 6 are considered as having probabilistic variation. The six parameters are space-to-chord ratio (SBYC), stagger angle (GAMA), elastic axis (ELAXS), Mach number (MACH), mass ratio (MASSR), and frequency ratio (WHWB). The cascade is considered to be in subsonic flow with Mach 0.7. The results of the probabilistic aeroelastic analysis are the probability density function of predicted aerodynamic damping and frequency for flutter and the response amplitudes for forced response.

Author

*Aeroelasticity; Probability Theory; Turbomachinery; Mass Ratios; Mach Number; Structural Design; Subsonic Flow*

**20050214871** Toledo Univ., OH, USA

**Fast-Running Aeroelastic Code Based on Unsteady Linearized Aerodynamic Solver Developed**

Reddy, T. S. R.; Bakhle, Milind A.; Keith, T., Jr.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center has been developing aeroelastic analyses for turbomachines for use by NASA and

industry. An aeroelastic analysis consists of a structural dynamic model, an unsteady aerodynamic model, and a procedure to couple the two models. The structural models are well developed. Hence, most of the development for the aeroelastic analysis of turbomachines has involved adapting and using unsteady aerodynamic models. Two methods are used in developing unsteady aerodynamic analysis procedures for the flutter and forced response of turbomachines: (1) the time domain method and (2) the frequency domain method. Codes based on time domain methods require considerable computational time and, hence, cannot be used during the design process. Frequency domain methods eliminate the time dependence by assuming harmonic motion and, hence, require less computational time. Early frequency domain analyses methods neglected the important physics of steady loading on the analyses for simplicity. A fast-running unsteady aerodynamic code, LINFLUX, which includes steady loading and is based on the frequency domain method, has been modified for flutter and response calculations. LINFLUX, solves unsteady linearized Euler equations for calculating the unsteady aerodynamic forces on the blades, starting from a steady nonlinear aerodynamic solution. First, we obtained a steady aerodynamic solution for a given flow condition using the nonlinear unsteady aerodynamic code TURBO. A blade vibration analysis was done to determine the frequencies and mode shapes of the vibrating blades, and an interface code was used to convert the steady aerodynamic solution to a form required by LINFLUX. A preprocessor was used to interpolate the mode shapes from the structural dynamic mesh onto the computational dynamics mesh. Then, we used LINFLUX to calculate the unsteady aerodynamic forces for a given mode, frequency, and phase angle. A postprocessor read these unsteady pressures and calculated the generalized aerodynamic forces, eigenvalues, and response amplitudes. The eigenvalues determine the flutter frequency and damping. As a test case, the flutter of a helical fan was calculated with LINFLUX and compared with calculations from TURBO-AE, a nonlinear time domain code, and from ASTROP2, a code based on linear unsteady aerodynamics.
Author
*Design Analysis; Aeroelasticity; Unsteady Aerodynamics; Unsteady Flow; Dynamic Structural Analysis; Vibration Mode; Euler Equations of Motion; Dynamic Models*

**20050214872** NASA Glenn Research Center, Cleveland, OH, USA, Toledo Univ., OH, USA
**Forward-Swept Fan Flutter Calculated Using TURBO Code**
Srivastava, Rakesh; Bakhle, Milind A.; Stefko, George L.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Flutter, a self-excited dynamic instability arising because of fluid structure interaction, can be a significant design problem for rotor blades in gas turbines. Blade shapes influenced by noise-reduction requirements increase the likelihood of flutter in modern blade designs. Validated numerical methods provide designers an invaluable tool to calculate and avoid the flutter instability during the design phase. Toward this objective, a flutter analysis code, TURBO, was developed and validated by researchers from the NASA Glenn Research Center and other researchers working under grants and contracts with Glenn. The TURBO code, which is based on unsteady three-dimensional Reynolds-averaged Navier-Stokes equations was used to calculate the observed flutter of a forward-swept fan. The forward-swept experimental fan, designed to reduce noise, showed flutter at part-speed conditions during wind tunnel tests.
Author
*Flutter Analysis; Numerical Analysis; Design Analysis; Flutter; Gas Turbines*

**20050214952** Ecole Nationale Superieure des Telecommunications, France
**Practical Traffic Grooming Formulation for SONET/WDM Rings**
Ghobril, Paul S.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We consider the problem of minimizing the cost of SONET/WDM rings by appropriate wavelength assignment and traffic grooming. The whole problem of reducing the number of SONET add-drop multiplexers turns out to be an NP-complete integer linear programming. Heuristics are often used and the problem is usually separated into wavelength assignment and traffic grooming. These algorithms can be deterministic or stochastic (Metropolis). We present a comprehensive definition of the problem and we propose a size controllable formulation of the integer linear program ILP for a grooming factor g=2 based on the separation between traffic grooming and wavelength assignment. Then, using simulation results, we extend the algorithm for g=4,8,16, etc. This algorithm does not rely on random numbers as the stochastic algorithm and gives optimized results for g=2. We focus on non-uniform traffic and bidirectional four-fiber self healing rings. .
Author
*Algorithms; Heuristic Methods; Stochastic Processes*

**20050214967** Technische Univ., Berlin, Germany

**A Generic Approach to the Design of Linear Output Feedback Controllers**

Bavafa-Toosi, Yazdan; Khaki-Sedigh, Ali; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

New necessary and sufficient conditions for multivariable pole placement (MVPP) and entire eigenstructure assignment (EEA) through linear multivariable output feedback are established. It is shown that the resultant matrix is of full rank and all design freedoms are retained. A generic problem on linear multivariable output feedback control law design is then defended. Based on the EEA concept and sufficiency of the regional pole placement, the design is (re)formulated in terms of a constrained nonlinear optimization problem. To this end, some decoupling indices for non-interactive performance are defined, their necessary and sufficient conditions are derived, and tracker design is addressed. The problem formulation well suits the application of global optimization techniques. By way of this approach, optimal robust stability/performance, non-interactive performance, reliability, actuator limitations and low sensitivity in the face of structured or unstructured plant uncertainties are achieved. The effectiveness of the proposed methodology is demonstrated by simulation results using genetic algorithm.

Author

*Actuators; Control Theory; Feedback Control; Multivariable Control; Sensitivity*

**20050214968** National Inst. of Telecommunications, Wroclaw, Poland

**Advanced Optical Infrastructure for the Emerging Optical Internet Services**

Marciniak, Marian; Klinkowski, Miroslaw; Kowalewski, Marian; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Abstract The Internet is leading to the convergence of networking developments for the future with dominant role of transparent and/or all-optical transmission and signal processing. The fixed network (PSTN, ISDN, Frame Relay, ATM networks) and mobile networks (GSM, GPRS, 3G/UMTS networks) are being converged, with IP as the common transport protocol. The converged network is supposed to deliver end-to-end seamless services with high bandwidth in real time, security and QoS built-in. In ongoing optical network evolution it is essential to recognize that 'transparent network' and 'alloptical network' are not synonyms. Indeed, the optical transparency has to be sacrificed in optical logic elements, signal processing, packet switching, etc. As a consequence, the traditional 'electronic opacity' meets its 'optical' equivalent in all-optical packet switched network. The paper presents author s original view on future (all) optical packet-switched network which is based on a clear distinction within dual nature of optical signals: analogue and transparent features of the signal in optical frequency domain from one side, and digital characteristics of temporal signals and opaque solutions for all-optical logics from the other one. The state-of-the art of transparent optical telecommunication technology is reviewed and possible directions of the future developments are outlined. The imminence of breakdown of the 'transparency paradigm' in the all-optical packet switched network for a variety of networking functions will be pointed out. Index Terms Optical Fiber Communications, Transparent Networks, All-Optical Networks, Optical Internet, Quality of Service.

Author

*Optical Data Processing; Internets; Asynchronous Transfer Mode; Communication Networks; Optical Fibers*

**20050214989** Hiroshima Univ., Japan

**An Efficient and Adaptive Method for Reservation of Multiple Multicast Trees**

Inoue, Shinji; Amamiya, Makoto; Kakuda, Yoshiaki; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 10 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many centralized methods for reservation of a single multicast tree in multicast communication have been proposed recently, however, there are neither decentralized nor multiagent-based methods for reservation of multiple multicast trees so far. Along with spread of multicast communication, reservation of multiple multicast trees are required, in which some links are shared among them. In the previous paper we proposed a decentralized reservation method for multicast communication based on the multiagent system. This paper presents an improved method and evaluates its potentially good properties of

efficiency and adaptability. Keywords|multicast communication, multicast tree, multiagent, efficiency, adaptability
Author
*Communication; Network Analysis; Trees (Mathematics)*

**20050214992** Sydney Univ., Australia
**Australian and Asia-Pacific Grid Developments and Information Spaces**
Pailthorpe, Bernard A.; Bordes, Nicole; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 9 pp.; In English; See also 20050214876; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent evolution of computers and networks have led to the idea of the computational Grid: a global collection of computing, data and software resources all connected by powerful networks. These developments leverage prior initiatives to support High Performance Computing infrastructure and programs. The extent and power of this infrastructure enables new grand challenges to be attempted, as with CERN s DataGrid project, stimulated science and technology policies and programs, and in 2001 led to the emergence of the Asia-Pacific Grid Forum. We will describe Australia s role in these developments, from advanced computing and networking initiatives, middleware projects, Access Grid developments, to visualisation environments. Recent research will be presented, describing a local 'information space' (iSpace), with interoperable devices, scientific software applications and datasets, linked to a range of computer displays and other input and output devices. It is a prototype for a new kind of scientific laboratory and portal to the Grid.
Author
*Grid Computing (Computer Networks); Display Devices; Data Acquisition; Applications Programs (Computers)*

**20050214995** Sogang Univ., Seoul, Korea, Republic of
**Automatic Determination of Cluster Size Using Machine Learning Algorithm**
Jun, Sung-Hae; Yang, Jihoon; Oh, Kyung-Whan; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 6 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There have been introduced lots of clustering algorithms. Among them, K-means and hierarchical clustering methods especially require an initial number of clusters to be determined. But this determination of cluster size is subjective and the accuracy of the clustering results may depend on the initial cluster size. In this paper, we'll determine the optimal cluster size using machine learning algorithm like unsupervised neural networks, Bayesian learning and fuzzy set logic. In this paper, unlike the general fuzzy logic approach, the membership function of fuzzy set is determined heuristically not subjective but objective by Bayesian machine learning algorithm from given training data. This approach contributes to the selection of optimal cluster size. In our experiment, we showed results of automatic determination of cluster size using machine learning algorithm give training data. Index Terms Optimal Cluster Size, Bayesian Learning, Fuzzy Set, Self Organizing Maps.
Author
*Cluster Analysis; Algorithms; Machine Learning; Neural Nets*

**20050215289** NASA Glenn Research Center, Cleveland, OH, USA, Ohio Aerospace Inst., OH, USA
**adwTools Developed: New Bulk Alloy and Surface Analysis Software for the Alloy Design Workbench**
Bozzolo, Guillermo; Morse, Jeffrey A.; Noebe, Ronald D.; Abel, Phillip B.; Research and Technology 2003; May 2004; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A suite of atomistic modeling software, called the Alloy Design Workbench, has been developed by the Computational Materials Group at the NASA Glenn Research Center and the Ohio Aerospace Institute (OAI). The main goal of this software is to guide and augment experimental materials research and development efforts by creating powerful, yet intuitive, software that combines a graphical user interface with an operating code suitable for real-time atomistic simulations of multicomponent alloy systems. Targeted for experimentalists, the interface is straightforward and requires minimum knowledge of the underlying theory, allowing researchers to focus on the scientific aspects of the work. The centerpiece of the Alloy Design Workbench suite is the adwTools module, which concentrates on the atomistic analysis of surfaces and bulk alloys containing an arbitrary number of elements. An additional module, adwParams, handles ab initio input for the parameterization used in adwTools. Future modules planned for the suite include adwSeg, which will provide numerical predictions for segregation profiles to alloy surfaces and interfaces, and adwReport, which will serve as a window into the database, providing public

access to the parameterization data and a repository where users can submit their own findings from the rest of the suite. The entire suite is designed to run on desktop-scale computers. The adwTools module incorporates a custom OAI/Glenn-developed Fortran code based on the BFS (Bozzolo- Ferrante-Smith) method for alloys, ref. 1). The heart of the suite, this code is used to calculate the energetics of different compositions and configurations of atoms.
Author
*Software Engineering; Computerized SIMulation; Metal Surfaces; Numerical Analysis; Graphical User Interface*

**20050215438** Sao Paulo Univ., Brazil
**Mobility and Computation**
Ferreira, U.; IPSI 2005 Amalfi Proceedings; [2005]; 36 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mobile agents and the Internet have brought new ideas to theoretical foundations of computer science in the last few years. As an example, in 1999, I had an interesting conceptual insight over computation: \...at the moment that I conceive the idea of moving computation from one place to another, I also observe that a general notion of computation transcends pure mathematics and meets the physical world\. This itself requires new, informal and philosophical discussions in the foundations of computer science. Later, in 2001, \and because the universe is on the move, computation is essentially mobile.' The present paper discusses some meaning of computation, provides a different semantics and present a formalized, physical and abstract model after my simplification. The present model makes use of four forms of mobility, namely strong mobility, intentional unity mobility, non-intentional unity mobility, and broadcast mobility. In this paper, I present other arguments for the most general and unified notion of computation, although it is only one among other good proposals. Mobility and global computing form two different classes of argument.
Author
*Computation; Internets; Semantics; Broadcasting; Mobility*

**20050215560** NASA Langley Research Center, Hampton, VA, USA
**Numerical Evaluation of P-Multigrid Method for the Solution of Discontinuous Galerkin Discretizations of Diffusive Equations**
Atkins, H. L.; Helenbrook, B. T.; [2005]; 11 pp.; In English; 17th AIAA Computational Fluid Dynamics Conference, 6-9 Jun. 2005, Toronto, Ontario, Canada
Contract(s)/Grant(s): 23-065-21; Copyright; Avail.: CASI: A03, Hardcopy

This paper describes numerical experiments with P-multigrid to corroborate analysis, validate the present implementation, and to examine issues that arise in the implementations of the various combinations of relaxation schemes, discretizations and P-multigrid methods. The two approaches to implement P-multigrid presented here are equivalent for most high-order discretization methods such as spectral element, SUPG, and discontinuous Galerkin applied to advection; however it is discovered that the approach that mimics the common geometric multigrid implementation is less robust, and frequently unstable when applied to discontinuous Galerkin discretizations of di usion. Gauss-Seidel relaxation converges 40% faster than block Jacobi, as predicted by analysis; however, the implementation of Gauss-Seidel is considerably more expensive that one would expect because gradients in most neighboring elements must be updated. A compromise quasi Gauss-Seidel relaxation method that evaluates the gradient in each element twice per iteration converges at rates similar to those predicted for true Gauss-Seidel.
Author
*Diffusivity; Galerkin Method; Multigrid Methods; Discretization (Mathematics); Mathematical Models; Numerical Analysis*

**20050215565** Ohio State Univ., Columbus, OH, USA
**Modeling for Ultrasonic Health Monitoring of Foams with Embedded Sensors**
Wang, L.; Rokhlin, S. I.; Rokhlin, Stanislav, I.; [2005]; 62 pp.; In English
Contract(s)/Grant(s): DTFA03-98-D-00008; NAG1-0266; No Copyright; Avail.: CASI: A04, Hardcopy

In this report analytical and numerical methods are proposed to estimate the effective elastic properties of regular and random open-cell foams. The methods are based on the principle of minimum energy and on structural beam models. The analytical solutions are obtained using symbolic processing software. The microstructure of the random foam is simulated using Voronoi tessellation together with a rate-dependent random close-packing algorithm. The statistics of the geometrical properties of random foams corresponding to different packing fractions have been studied. The effects of the packing fraction on elastic properties of the foams have been investigated by decomposing the compliance into bending and axial compliance

components. It is shown that the bending compliance increases and the axial compliance decreases when the packing fraction increases. Keywords: Foam; Elastic properties; Finite element; Randomness
Author
*Foams; Algorithms; Elastic Properties; Numerical Analysis; Beams (Supports); Microstructure*

**20050215649** Massachusetts Inst. of Tech., Cambridge, MA, USA
**Multi-Resolution Planning in Large Uncertain Domains**
Kaelbling, Leslie Pack; September 03, 2005; 84 pp.; In English
Contract(s)/Grant(s): NCC2-1237; No Copyright; Avail.: CASI: A05, Hardcopy

This project spanned three and one half years of research. This report covers three major lines of work that were done most recently and reported on in a talk given by the PI at NASA Ames on March 23, 2004. There are have been additional publications related to this work (Lane & Kaelbling, 2001a, 2001b, 2002; Zettlemoyer, Pasula, & Kaelbling, 2003; Gardiol & Kaelbling, 2003; Pasula, Zettlemoyer, & Kaelbling, 2004).
Author
*Domains; Planning; Algorithms; Mathematical Models; Uncertain Systems*

**20050216404** Hallym Univ., Korea, Republic of
**An Analysis of Queueing System with Service Scheduling Function and its Applications to Telecommunication Networks**
Choi, Doo Il; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 10 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We analyze a finite queueing system with general service scheduling function. There are two type customers with different service requirements. The service order for customers of each type is determined by the service scheduling function alpha(sub k)(i,j) where alpha(sub k)(i,j) is probability for type-k customer to be selected when there are i type-1 and j type-2 customers. This model is motivated by traffic control to support traffics with different traffic characteristics in telecommunication networks (in particular, ATM networks). By using the embedded Markov chain and the supplementary variable method, we obtain the queue length distribution, and the loss probability and the mean waiting time of each customer. We also apply our model to traffic control to support diverse traffics in telecommunication networks.
Author
*Queueing Theory; Probability Theory; Scheduling; Telecommunication; Asynchronous Transfer Mode*

**20050216406** Waseda Univ., Tokyo, Japan
**Kneser Type Theorem for Functional Integral Equation in Population Problem**
Yanagiya, Akira; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 4 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper we will investigate the existence theorems and Kneser type theorem for functional integral equation occurred in the theory of populational models. These theorems will be proved by two types of fixed point theorems. Those are Banach contraction and Shauder type theorem. Key-word: functional integral equation, Kneser type theorem, Banach contraction principle, Shauder fixed point theorem.
Author
*Populations; Integral Equations; Theorems; Existence Theorems*

**20050216689** Royal Inst. of Tech., Stockholm, Sweden
**Experiments on Clustering using Swarm Intelligence and Collective Behaviour**
Alenius, Emma; Eide, Age J.; Johansson, Jan; Johansson, Jimmy; Land, Johan; Lindblad, Thomas; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 8 pp.; In English; See also 20050216686; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The paper presents an experiment on clustering using collective behaviour of very simple agents. The clustering is

controlled by the limit on number of steps the agents are forced to move, if a cluster is not reached in the meantime.
Author
*Experimentation; Clusters; Mathematical Models*

**20050217053** Army Engineer Research and Development Center, Vicksburg, MS USA
**SOF Tactical Repeater**
Pokrefke, Thomas J., Jr; Jul. 1, 2005; 104 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437071; ERDC/CHL-TR-05-3; No Copyright; Avail.: CASI: A06, Hardcopy

In the 1930s, 1940s, and 1950s, the U.S. Army Engineer Waterways Experiment Station (WES) conducted several series of studies to investigate the effects of distortion, differing horizontal and vertical scales, on physical model results. This report presents the portion of those investigation conducted from 1954 to 1961. The results had not been previously published; however, the two WES researchers, the late Messrs. John J. Franco and the late James E. (Ed) Glover, had prepared various unpublished documents of these investigations. Therefore, this report is a compilation of those writings and supporting data, as well as this author s conclusions and applicability of the effects of distortion investigations to physical, movable-bed models using lightweight bed materials. The investigations conducted by Franco and Glover involved two specific series of tests. Those series were: a. Plan A, Series 1. These tests were conducted using distortions of 0, 2, 4, 6, 8, and 10. The horizontal scale used was 1:200 with subsequent vertical scales of 1:200, 1:100, 1:50, 1:33.33, 1:25, and 1:20, respectively. The tests were conducted following the Froude criteria to determine the appropriate velocity and discharge scales for these tests. b. Plan A, Series 2. These tests were conducted using distortion ratios of 0, 2, 3, and 4. The horizontal scale used was 1:400. This series of tests was conducted somewhat different than Series 1, with the velocity held constant at the 0-distortion value and the depth varied from the 0-distortion to the 4-distortion value. The depth was then held at the 4-distortion value and the velocity varied from the 0-distortion to the 4-distortion value. Some of these tests were conducted with the Froudian scale relationships not followed to isolate either velocity or depth of flow impacts.
DTIC
*Distortion; Horizontal Orientation; Vertical Orientation; System Effectiveness*

## 65
## STATISTICS AND PROBABILITY

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

**20050216423** Tokyo Inst. of Tech., Tokyo, Japan
**Proposal of Improving Model for Default Probability Prediction With Logit Model on Non-Compensatory Rule**
Sakamaki, Yoshikazu; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 8 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Financial statement analysis is widely used for credit risk analysis. This method was developed at the end of 19 s for the purpose of surveying credit reliability of credit customers. However, the result of analysis with financial statements is likely to be controlled by the work experience of analysts. As the result, it is difficult to maintain consistency of risk measurement, and moreover, it is expensive and time consuming to perform the vast amount of precise evaluations required in a short time. Many researchers have studied financial statement analysis scientifically applying mathematical and statistical methods, especially with use of multivariate statistical analysis. This report presents the history of preceding risk control studies and considers issues of the preceding default forecasting model based mainly on the binominal logit model on compensatory rule. Moreover we propose the improving scoring model on the non-compensatory rule and verify that our model is superior to the binominal logit model, and is useful in business using based on actual financial data.
Author
*Probability Theory; Multivariate Statistical Analysis; Reliability; Forecasting; Mathematical Models*

**20050216425** Puerto Rico Univ., Mayaguez, Puerto Rico
**On Detection of Outliers and their Effect in Supervised Classification**
Acuna, Edgar; Rodriquez, Caroline; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 14 pp.; In English; See also 20050216400; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0360; EIA-99-77071; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An outlier is an observation that deviates so much from other observations as to arouse suspicion that it was generated by a different mechanism (Hawkins, 1980). Outlier detection has many applications, such as data cleaning, fraud detection and network intrusion. The existence of outliers can indicate individuals or groups that have behavior very different from the most of the individuals of the dataset. Frequently, outliers are removed to improve accuracy of the estimators. But sometimes the presence of an outlier has a certain meaning, which explanation can be lost if the outlier is deleted. In this paper we compare detection outlier techniques based on statistical measures, clustering methods and data mining methods. In particular we compare detection of outliers using robust estimators of the center and the covariance matrix for the Mahalanobis distance, detection of outliers using partitioning around medoids (PAM), and two data mining techniques to detect outliers: Bay s algorithm for distance-based outliers (Bay and Schwabacher, 2003) and the LOF a density-based local outlier algorithm (Breuning et al., 2000). The effect of the presence of outliers on the performance of three well-known classifiers is discussed. of the estimators.
Author
*Classifications; Detection; Multivariate Statistical Analysis; Matrices (Mathematics); Selection; Classifiers; Data Mining*

**20050216521** Naval Undersea Warfare Center, Newport, RI USA
**Development of a Class-Specific Module for Hyperbolic, Frequency-Modulated Signals**
Harrison, Brian F.; Jun. 7, 2005; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437031; NUWC-NPT-TR-11681; No Copyright; Avail.: CASI: A03, Hardcopy

The class-specific method (CSM) is a novel technique for signal classification. CSM operates by computing low-dimensional feature sets, each tailored to a given signal class. In this manner, CSM avoids the difficulties inherent with classical Bayesian signal classification methods that attempt to estimate probability distributions in high-dimensional feature space. The fundamental building block of a CSM classifier is the feature extraction module. Each module is designed for a specific signal class. This report presents the development of a module for hyperbolic, frequency-modulated signals. This development also serves to acquaint the CSM novice with the general considerations in module design.
DTIC
*Classifications; Command Service Modules; Frequency Modulation; Signal Processing*

**20050216696** Miami Univ., Oxford, OH, USA
**REU (Research Experience for Undergraduates) in Statistics at Miami University**
Waikar, Vasant B.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 12 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper I will describe the working of this REU named Summer Undergraduate Mathematical Sciences Research Institute or SUMSRI that I have directed for the last six summers at Miami University. SUMSRI is funded by National Security Agency (NSA) and National Science Foundation (NSF). I will also discuss the nature and content of the research papers written by the undergraduates at this REU under my supervision. Some of these papers have won awards in the student paper competition sponsored by the American Statistical Association (ASA).
Author
*Research and Development; Statistics; Students; Personnel Management*

## 66
## SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

**20050214886** Tokyo Inst. of Tech., Tokyo, Japan
**Toward Logical-probabilistic Modeling of Complex Systems**
Sato, Taisuke; Motonmura, Yoichi; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We have been developing a symbolic knowledge representation language called PRISM that combines logical inference with statistical parameter learning. In this paper, we discuss various aspects of PRISM applied to statistical modeling with

complex combinatorial structures such as natural language modeling, and show how to exploit expressive power (first-order logic) and learning power (fast EM learning) of PRISM.
Author
*Statistical Analysis; Combinatorial Analysis; Complex Systems*

**20050214891** Stellenbosch Univ., South Africa
**A Knowledge Management Framework for Integrated design**
DuPreez, Niek; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Quality and price was a major discriminator in the 1980 s. Partial Integration of Innovation became relevant in the 1990 s. Thereafter Time to market dictated. Global Competitiveness in manufacturing is currently characterized by an increasing rate of change of product requirements and user frills. Complex dynamic networks of value chains and product and service delivery mechanisms are constantly being modified to match these growing specifications and requirements. More and diversified innovation teams are tasked to face these innovation challenges as primary part of their job descriptions. Facilitating and supporting these teams have become extremely important. Sustainability of competitiveness requires a full life cycle approach to innovation. This paper presents a framework, which combines and integrates different lifecycles in a predefined hierarchical structure to support different teams in the process of innovating products, processes and enterprises in the globally competitive manufacturing environment. This framework is providing flexibility within a structure at the same time it guides the different teams using a predefined or of the shelf-selected methodology. Implementation of such a framework within The Windows-based software environment EDEN(TM) is discussed briefly in conclusion. KEYWORDS: Collaborative Concurrent design, integrated innovation
Author
*Management Systems; Integral Transformations; Flexibility*

**20050214899** Loughborough Univ. of Technology, UK
**Structured Metadata Analysis**
Probets, Steve; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 9 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

With the proliferation of metadata and metadata schemes there are an increasing number of XML schemas available that describe the logical structure of metadata. In addition, there are metadata harvesting protocols, such as that from the Open Archives Initiative, that enable this metadata to be collected. However, although the metadata can be harvested, it can only be effectively collated and presented to users if the structure of the metadata is understood. This paper will describe the possibilities of analysing metadata schemas with the intention of dynamically creating a query and presentation interface based on the information contained in individual schemas. The analysis could be used to initially query and subsequently display the metadata in manner suitable to its structure. This approach is possible as the metadata schemas are specified in valid XML documents (that conform to their own XML or RDF schema), thereby allowing associated XML technologies to analyse the schemas. Index Terms Metadata, Open Archives Initiative, XML Schema Analysis, XSLT, XQuery.
Author
*Metadata; Query Languages; Document Markup Languages; Protocol (Computers); Interfaces*

**20050215003** Wien Univ., Austria
**Evaluating the Quality of Service for a Satellite Based Content Delivery Network**
Hlavacs, Helmut; Aschenbrenner, Guido; Hotop, Ewald; Baijal, Aadarsh; Garg, Ashish; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 11 pp.; In English; See also 20050214876; Original contains black and white illustrations
Contract(s)/Grant(s): CEC-IST-2000-30066; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the past years content delivery networks (CDNs) have become increasingly popular as they bypass the contended Internet and deliver content to their paying customers with higher quality of service (QoS). Satellite based CDNs additionally

exploit the advantage of satellite multicast and broadcast, being able to deliver the same content to an arbitrary number of points of presence (PoPs) in its footprint. Although many future CDNs will use satellites, little is known about the QoS as perceived by end users of such a network and how to measure it. In this paper we present a methodology for evaluating the QoS of a satellite based CDN for the European IST project CODIS. Designed as a professional CDN transporting MPEG-2 and MPEG-4 based multimedia presentations for content providers, broadcasters, and ISPs, the network will use the satellite STENTOR, containing an onboard MPEG-TS multiplexer. The methodology is centered around the QoS perceived by network end users.
Author
*Satellite Networks; Protocol (Computers); Multiplexing; Internets; Multimedia*

**20050215163** NASA Glenn Research Center, Cleveland, OH, USA
**Low-Cost, User-Friendly, Rapid Analysis of Dynamic Data System Established**
Arend, David J.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

An issue of primary importance to the development of new jet and certain other airbreathing combined-cycle powered aircraft is the advancement of airframe-integrated propulsion technologies. Namely, engine inlets and their systems and subsystems are required to capture, convert, and deliver the atmospheric airflow demanded by such engines across their operating envelope in a form that can be used to provide efficient, stable thrust. This must be done while also minimizing aircraft drag and weight. Revolutionary inlet designs aided by new technologies are needed to enable new missions. An unwanted byproduct of pursuing these inlet technologies is increased time-variant airflow distortion. Such distortions reduce propulsion system stability, performance, operability, and life. To countermand these limitations and fully evaluate the resulting configurations, best practices dictate that this distortion be experimentally measured at large scale and analyzed. The required measurements consist of those made by an array of high-response pressure transducers located in the flow field at the aerodynamic interface plane (AIP) between the inlet and engine. Although the acquisition of the necessary pitot-pressure time histories is relatively straight-forward, until recent years, the analysis has proved to be very time-consuming, tedious, and expensive. To transform the analysis of these data into a tractable and timely proposition, researchers at the NASA Glenn Research Center created and established the Rapid Analysis of Dynamic Data (RADD) system. The system provides complete, near real-time analysis of time-varying inlet airflow distortion datasets with report quality output. This fully digital approach employs Institute of Electrical and Electronics Engineers (IEEE) binary data file format standardization to establish data-acquisition-system-independent processing on low cost personal computers. Features include invalid instrumentation code-out, logging, and multiple replacement schemes as needed for each channel of instrumentation. The AIP pressure distribution can be interpolated to simulate measurements by alternate AIP probe arrays, if desired. In addition, the RADD system provides for the application of filters that can be used to focus the analysis on the frequency range of interest.
Author
*Air Breathing Engines; Air Flow; Airframes; Data Systems; Frequency Ranges; Propulsion System Performance; Pressure Sensors; Data Acquisition; Engine Inlets*

**20050215263** NASA Glenn Research Center, Cleveland, OH, USA
**Method Developed for Noninterference Measurement of Blade Damping**
Kurkov, Anatole P.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Although noninterference optical instrumentation has been previously used to monitor and measure rotor blade vibrations, it has not been used at the NASA Glenn Research Center for the determination of damping. This article describes such a measurement in Glenn's Spin Rig facility. The optical system was chosen because installation of the slip rig for this particular configuration was not feasible, ruling out strain gauge instrumentation. The shaft in this facility was suspended with two radial magnetic bearings, and the excitation was supplied to the bearings by a signal generator. For the first mode, the direction of excitation force was always perpendicular to the blade as described by Morrison. The preceding graph shows blade displacements, as measured by an optical probe during a frequency sweep designed to locate the first mode resonance. The resonance determines the frequency at which the shaft is excited. Because the sampling rate was fixed to only once per revolution with these transducers, and the first mode frequency was much larger than the rotational frequency, the data in this figure were undersampled with an apparent frequency that was only 1 Hz at the beginning of the sweep, about 14 Hz at the maximum amplitude, and about 20 Hz at the end of the sweep. The true excitation frequency varied during the sweep from 320 to 340 Hz, and the resonance occurred at 334 Hz. Damping is determined by applying a frequency burst to the shaft. Upon cessation of the burst, the blade undergoes free decay. The apparent damping is then obtained by a least squares fit of the

theoretical cosine decay function through the experimental points. The following graph illustrates this procedure. Because of frequency aliasing, the apparent measured damping must be divided by the ratio of the true resonant frequency to the apparent measured frequency to obtain the true damping. Note that the contribution of the shaft vibration to the blade vibration could be neglected because it was shown that it is an order of magnitude smaller and that its decay is an order of magnitude faster. Author

*Damping; Shafts (Machine Elements); Magnetic Bearings; Transducers; Vibration; Rotor Blades; Resonant Frequencies*

**20050215460** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Template for Systems Engineering Tools Trade Study**

Bailey, Michelle D.; [2005]; 1 pp.; In English; 1st International Conference on Innovation and Integration in Aerospace Sciences, 4-5 Aug. 2005, Ireland; No Copyright; Avail.: Other Sources; Abstract Only

A discussion of Systems Engineering tools brings out numerous preferences and reactions regarding tools of choice as well as the functions those tools are to perform. A recent study of Systems Engineering Tools for a new Program illustrated the need for a generic template for use by new Programs or Projects to determine the toolset appropriate for their use. This paper will provide the guidelines new initiatives can follow and tailor to their specific needs, to enable them to make their choice of tools in an efficient and informed manner. Clearly, those who perform purely technical functions will need different tools than those who perform purely systems engineering functions. And, everyone has tools they are comfortable with. That degree of comfort is frequently the deciding factor in tools choice rather than an objective study of all criteria and weighting factors. This paper strives to produce a comprehensive list of criteria for selection with suggestions for weighting factors based on a number of assumptions regarding the given Program or Project. In addition, any given Program will begin with assumptions for its toolset based on Program size, tool cost, user base and technical needs. In providing a template for tool selection, this paper will guide the reader through assumptions based on Program need; decision criteria; potential weighting factors; the need for a compilation of available tools; the importance of tool demonstrations; and finally a down selection of tools. While specific vendors cannot be mentioned in this work, it is expected that this template could serve other Programs in the formulation phase by alleviating the trade study process of some of its subjectivity.

Author

*Systems Engineering; Templates*

**20050215490** Boeing Co., Canoga Park, CA, USA

**Advanced Health Management Algorithms for Crew Exploration Applications**

Davidson, Matt; Stephens, John; Jones, Judit; [2005]; 1 pp.; In English; Air Force Research Lab Integrated Systems Health Management Conference, 8 Aug. 2005, Cincinnati, OH, USA

Contract(s)/Grant(s): NAS8-54000; NAS8-01140; No Copyright; Avail.: Other Sources; Abstract Only

Achieving the goals of the President's Vision for Exploration will require new and innovative ways to achieve reliability increases of key systems and sub-systems. The most prominent approach used in current systems is to maintain hardware redundancy. This imposes constraints to the system and utilizes weight that could be used for payload for extended lunar, Martian, or other deep space missions. A technique to improve reliability while reducing the system weight and constraints is through the use of an Advanced Health Management System (AHMS). This system contains diagnostic algorithms and decision logic to mitigate or minimize the impact of system anomalies on propulsion system performance throughout the powered flight regime. The purposes of the AHMS are to increase the probability of successfully placing the vehicle into the intended orbit (Earth, Lunar, or Martian escape trajectory), increase the probability of being able to safely execute an abort after it has developed anomalous performance during launch or ascent phases of the mission, and to minimize or mitigate anomalies during the cruise portion of the mission. This is accomplished by improving the knowledge of the state of the propulsion system operation at any given turbomachinery vibration protection logic and an overall system analysis algorithm that utilizes an underlying physical model and a wide array of engine system operational parameters to detect and mitigate predefined engine anomalies. These algorithms are generic enough to be utilized on any propulsion system yet can be easily tailored to each application by changing input data and engine specific parameters. The key to the advancement of such a system is the verification of the algorithms. These algorithms will be validated through the use of a database of nominal and anomalous performance from a large propulsion system where data exists for catastrophic and noncatastrophic propulsion sytem failures.

Author

*Algorithms; Spacecrews; Space Exploration; Systems Health Monitoring; Systems Analysis*

**20050216407** Saint Joseph's Univ., Philadelphia, PA, USA

**Researching, Designing and Deploying Scenario-based WBT for Early Responders to Terrorist Incidents**

DeVito, Paul L.; Scillia, Giuseppe; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 4 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Early Responder Distance Learning Center (ERDLC) creates and administers accredited Advanced Distributed Learning courses for the Emergency Response Community with a focus on psychological consequences. These courses are based on psychological research translated into instructional design and realized in multimodal scenarios, each of which is followed by an assessment. The courses produced by the ERDLC have served as test cases for SCORM and are now being delivered on a highly scalable platform that includes sophisticated and detailed response tracking capabilities. This presentation emphasizes the process of starting with an immediate problem and creating an instructional design based on research.

Author

*Deployment; Transponders; Education; Satellite Networks; Embedding; Appropriations*

**20050216427** Electronics and Telecommunications Research Inst., Korea, Republic of

**A DRM System with the Certificate of Fingerprinting through the Internet**

Lee, Junseok; Seo, Yongseok; Suh, Youngho; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 6 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes our design of a contents distribution framework that can trace the distributor of illegal contents using fingerprinting technology. The paper assumes that the system of contents distribution exists to protect copyright using a packaging mechanism, a license mechanism, watermarking technology etc. The paper explains the coverage to protect copyright with the technologies and fingerprinting. we describes how to apply the fingerprinting technology to the system of contest distribution together with the technologies. The most important point is that the paper suggests the certificate for fingerprinting code to overcome embeddable size of fingerprinting code in image, audio, video contents.

Author

*Distributors; Internets; Packaging; Telecommunication*

**20050216517** Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA

**The Influence of Trainee Gaming Experience and Computer Self-Efficacy on Learner Outcomes of Videogame-Based Learning Environments**

Orvis, Karin A.; Orvis, Kara L.; Belanich, James; Mullin, Laura N.; Jun. 1, 2005; 43 pp.; In English

Contract(s)/Grant(s): Proj-A792

Report No.(s): AD-A437016; TR-1164; No Copyright; Avail.: CASI: A03, Hardcopy

Videogame-based environments are an increasingly popular choice to facilitate training. The purpose of the current research was to investigate the influence of two trainee characteristics, prior videogame experience and computer self-efficacy, on learner outcomes of a videogame-based training environment. In this research, 413 participants played a first-person-perspective videogame that began with a single-player section to introduce game-specific tasks, followed by a multi-player section where participants formed small teams to conduct several collaborative missions. Results indicated that computer self-efficacy and prior videogame experience were predictive of several learner outcomes such that trainees with greater computer self-efficacy and prior videogame experience reported less difficulty using the game interface and greater team cohesion, training satisfaction, and training motivation. Further, a videogame genre-specific effect was demonstrated in that only specific prior game experiences that share similar characteristics with the current training game were significantly predictive of the learner outcomes. These findings have implications for training game developers and instructors utilizing such games.

DTIC

*Education; Game Theory; Games; Learning; Students*

## 67
## THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

**20050214944** Central Bank of Portugal, Portugal
**Mapping Object Oriented Models into Relational Models: A Formal Approach**
Rio, Luis; Ramos, Pedro; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 8 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since Object Databases are yet rather immature, Relational Databases are still an inevitable solution to store data. The fact that the two underlying models are based on different paradigms makes the process of mapping objects to relational databases an area in which work has to be done. In this paper we propose a formal framework based on predicate calculus that maps object models into relational ones. By adopting a logical approach we obtain a solid but flexible framework in where a designer can easily include non-standard rules that can help him to obtain a relational model more adequate to the target domain. The automatic generation guarantees a third normal form relational model.
Author
*Relational Data Bases; Formalism; Mathematical Logic; Mathematical Models*

**20050216695** Technological Educational Inst. of Larissa, Greece
**Reasoning about Actions and Agent Capabilities**
Hartonas, C.; Kodokostas, D.; Nikolaidis, Ch.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 25 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This report is an attempt to integrate approaches that appear as a variant of dynamic logic combined with a logic of knowledge, with approaches focusing on logics of information flow. The general semantic framework is similar where we study information networks, i.e. structures consisting of sites (locations, local worlds) and links between locations. Links can be thought of as actions (programs, processes) performed at some site and transforming it to some other site. Sites, themselves, may be thought of as local environments inhabited by objects and agents acting on these objects, modifying their attributes. Agents may act in isolation, or in teams, exercising their distinct capabilities.
Author (revised)
*Information Flow; Mathematical Logic; Recursive Functions*

## 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*.

**20050215075** Tennessee Univ., Chattanooga, TN, USA
**Space and Time of Non Inertial Systems**
Wang, Ling Jun; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 6 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The transformation of space and time between non inertial reference frames has been discussed based on the Principle of Uniformity. It has been shown that the Lorentz transformation must hold good instantaneously for non inertial systems, and that the time dilation of an accelerating system can be calculated by integration. The implication of the uniformity of space and time in the clock paradox is also discussed.
Author
*Relativistic Effects; Lorentz Transformations; Time Signals*

**20050215341** Wisconsin Univ., Stoughton, WI, USA

**Lightning Detection Efficiency Analysis Process: Modeling Based on Empirical Data**

Rompala, John T.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXXVI-1 - XXXVI-5; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

A ground based lightning detection system employs a grid of sensors, which record and evaluate the electromagnetic signal produced by a lightning strike. Several detectors gather information on that signal s strength, time of arrival, and behavior over time. By coordinating the information from several detectors, an event solution can be generated. That solution includes the signal s point of origin, strength and polarity. Determination of the location of the lightning strike uses algorithms based on long used techniques of triangulation. Determination of the event s original signal strength relies on the behavior of the generated magnetic field over distance and time. In general the signal from the event undergoes geometric dispersion and environmental attenuation as it progresses. Our knowledge of that radial behavior together with the strength of the signal received by detecting sites permits an extrapolation and evaluation of the original strength of the lightning strike. It also limits the detection efficiency (DE) of the network. For expansive grids and with a sparse density of detectors, the DE varies widely over the area served. This limits the utility of the network in gathering information on regional lightning strike density and applying it to meteorological studies. A network of this type is a grid of four detectors in the Rondonian region of Brazil. The service area extends over a million square kilometers. Much of that area is covered by rain forests. Thus knowledge of lightning strike characteristics over the expanse is of particular value. I have been developing a process that determines the DE over the region [3]. In turn, this provides a way to produce lightning strike density maps, corrected for DE, over the entire region of interest. This report offers a survey of that development to date and a record of present activity.

Author

*Lightning; Signal Detection; Magnetic Fields; Polarity*

**20050216514** Air Force Research Lab., Edwards AFB, CA USA

**Ion Velocity Measurements in a Linear Hall Thruster**

Gascon, Nicolas; Cappelli, Mark A.; Hargus, William A., Jr; Jun. 1, 2005; 7 pp.; In English

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

Report No.(s): AD-A437001; AIAA-2005-4401; No Copyright; Avail.: CASI: A02, Hardcopy

This work presents the general operation and the near exit plane velocity field of the Stanford Linear Hall thruster in a high vacuum environment. The ionized propellant velocities were measured using laser induced fluorescence of the excited state xenon ionic transition at 834.7 nm. Ion velocities were interrogated from the channel exit plane to a distance 30 mm from it. Both axial and transverse (along the electron Hall current direction) velocities were measured. These results presented here, combined with those of previous works, highlight the high sensitivity of electron mobility inside and outside the channel, depending on the background gas density, type of wall material, or magnetic field intensity. When operated with a low background pressure, the particular Hall discharge studied here creates an ion accelerating electrostatic field mainly outside of the channel, in a narrow zone located 5-20 mm away from the exit plane.

DTIC

*Hall Thrusters; High Vacuum; Ions; Magnetic Fields; Velocity Measurement*

**20050216542** Army Engineer Research and Development Center, Vicksburg, MS USA

**Folsom Dam Outlet Works Modification Project; Simplified Three-Dimensional Stress Analysis of Monolith 12**

Matheu, Enrique E.; Garner, Sharon B.; Jun. 1, 2005; 77 pp.; In English; Original contains color illustrations

Report No.(s): AD-A437088; ERDC/GSL-TR-05-14; No Copyright; Avail.: CASI: A05, Hardcopy

This report presents a finite-element stress analysis of monolith 12 conducted to assess any potential adverse effects caused by the proposed dimensions of the air vent near the base of the spillway pier wall. A simplified three-dimensional finite-element model was developed to simplify the analysis while preserving the main characteristics of the section. The numerical model included fixed boundary conditions along the base and appropriate boundary conditions along the two lateral planes representative of the vertical contraction joints. The analyses included static (self-weight and hydrostatic) and dynamic (inertial and hydrodynamic) effects. The dynamic effects were accounted for using equivalent lateral loads and following Chopra's simplified procedure for seismic analysis of concrete gravity sections. The results provide an estimate of the stress field around the air manifold opening along the downstream face, and they provide a quantitative basis to evaluate its impact at the proposed location and to complete the design of any necessary reinforcement to be placed around the conduit.

DTIC

*Concretes; Dams; Dynamic Loads; Stress Analysis; Stress Distribution; Vents*

**20050217071** Global Solar Energy LLC, Tucson, AZ USA

**SOF Tactical Repeater**

Albright, Scot P.; Jul. 11, 2005; 22 pp.; In English

Contract(s)/Grant(s): DAAD19-00-C-0118

Report No.(s): AD-A437015; FIN1; ARO-41877.11-CH; No Copyright; Avail.: CASI: A03, Hardcopy

Between 2000 and 2003 Transportable AC Systems (TACS) and Hybrids (HTACS) were developed and demonstrated to support the electrical requirements of Command Centers in the field. Primary power was provided by unbreakable, lightweight, flexible solar modules. Systems included battery bank, AC inverter, and backup generator. The HTACS added Windpower and higher-efficiency solar arrays, and a more ruggedized, modularized, and productionized power control center. Demonstrated were held at six different Military bases in the U.S. and Europe. The primary benefits of a TACS or HTACS system for the Military are driven by the Lightweight, Portable, nature of the Solar Energy Products with most advantageous features noted below: * High Power-to-Weight ratios * Minimized Battery/ Fuel Transport * High Field Survivability (Silent, Camouflaged, Low angular or Thermal Signature) * Solves Targeted Energy Needs (Battery Recharging, Water Purification, Personal Electronics, PCs, Radios, Tools, Lighting, Transportable energy for command centers, medical, etc., survival kits) * Provides BOTH Cost-savings and Improved Logistics The result of these efforts is intended to provide the demonstrated, data-supported, basis for larger scale implementation of with solar powered tactical AC systems. Shown as economically superior to existing stand-alone Diesel generators.

DTIC

*Alternating Current; AC Generators; Electric Batteries; Electrical Properties*

**20050217200** NASA Glenn Research Center, Cleveland, OH, USA

**Testing Done for Lorentz Force Accelerators and Electrodeless Propulsion Technology Development**

Pencil, Eric J.; Gilland, James H.; Arrington, Lynn A.; Kamhawi, Hani; Research and Technology 2004; June 2004; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

The NASA Glenn Research Center is developing Lorentz force accelerators and electrodeless plasma propulsion for a wide variety of space applications. These applications range from precision control of formation-flying spacecraft to primary propulsion for very high power interplanetary spacecraft. The specific thruster technologies being addressed are pulsed plasma thrusters, magnetoplasmadynamic thrusters, and helicon-electron cyclotron resonance acceleration thrusters. The pulsed plasma thruster mounted on the Earth Observing-1 spacecraft was operated successfully in orbit in 2002. The two-axis thruster system is fully incorporated in the attitude determination and control system and is being used to automatically counteract disturbances in the pitch axis of the spacecraft. Recent on-orbit operations have focused on extended operations to add flight operation time to the total accumulated thruster life. The results of the experiments pave the way for electric propulsion applications on future Earth-imaging satellites.

Derived from text

*Performance Tests; Acceleration (Physics); Plasma Propulsion; Technology Utilization; Spacecraft Propulsion*

## 71
## ACOUSTICS

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

**20050215037** NASA Langley Research Center, Hampton, VA, USA

**Impact of Fluidic Chevrons on Jet Noise**

Henderson, Brenda S.; Kinzie, Kevin W.; Whitmire, Julia; Abeysinghe, Amal; [2005]; 13 pp.; In English; 11th AIAA/CEAS Aeroacoustics Conference, 23-25 May 2005, Monterey, CA, USA

Contract(s)/Grant(s): 23-781-30-12

Report No.(s): AIAA Paper 2005-2888; No Copyright; Avail.: CASI: A03, Hardcopy

The impact of alternating fluidic core chevrons on the production of jet noise is investigated. Core nozzles for a representative 1/9th scale, bypass ratio 5 model system were manufactured with slots cut near the trailing edges to allow for air injection into the core and fan streams. The injectors followed an alternating pattern around the nozzle perimeter so that the injection alternated between injection into the core stream and injection into the fan stream. For the takeoff condition and a forward flight Mach number of 0.10, the overall sound pressure levels at the peak jet noise angle decrease with increasing injection pressure. Sound pressure levels increase for observation angles less than 110o at higher injection pressures due to

increases in high frequency noise. Greater increases in high frequency noise are observed when the number of injectors increases from 8 to 12. When the forward flight Mach number is increased to 0.28, jet noise reduction (relative to the baseline) is observed at aft angles for increasing injection pressure while significant increases in jet noise are observed at forward observation angles due to substantial acoustic radiation at high frequencies. A comparison between inflow and alternating injectors shows that, for equal mass injection rates, the inflow nozzle produces greater low frequency noise reduction (relative to the baseline) than the alternating injectors at 90o and aft observation angles and a forward flight Mach number of 0.28. Preliminary computational fluid dynamic simulations indicate that the spatial decay rate of the hot potential core flow is less for the inflow nozzle than for the alternating nozzles which indicates that gentle mixing may be preferred over sever mixing when fluidic chevrons are used for jet noise reduction.
Author
*Jet Aircraft Noise; Injectors; Core Flow; Bypass Ratio; Sound Pressure; Noise Reduction; Mach Number; Computational Fluid Dynamics*

**20050215059** National Taiwan Univ., Taipei, Taiwan, Province of China
**Calculation of Spatial Impulse Response for Array Transducer**
Sungis, Chia-Chi; Author, S. B., Jr.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 8 pp.; In English; See also 20050215042; Original contains color illustrations
Contract(s)/Grant(s): Proj. NSC 87-2213-E-002-075; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Unlike the conventional method of obtaining the spatial impulse response (SIR) for a transducer, this paper proposes a new approach to calculate the acoustic field for a rectangular focusing array transducer either in transmitting, receiving, or transmitting-receiving (pulse-echo) mode. The SIR spectrum corresponding to each single frequency is derived by superposing the sound fields that generated by the subdivided rectangular sources. The time domain pressure variation is obtained by taking inverse Fourier transform from the combination of each SIR spectrum for the array. The results for a single rectangular transducer in transmitting and receiving modes match well with those from previous researches. The SIR spectrum for a focusing linear array transducer with multiple field scatterers is also developed. The present approach dramatically reduces the number of sampling points and thus highly increases the computation efficiency. Taking advantage of this, the SIR for finite number of scatterers distributed on the surface of a half sphere is superimposed to estimate the reasonable physical size of a point scatterer. It can be a suggestion when conducting experiment. For arbitrary shape of radiator, the present method can also be employed as long as the radiator is subdivided into small rectangles.
Author
*Transducers; Acoustics; Linear Arrays; Impulses*

**20050215451** Danube Univ., Austria
**Synchronicity in Random Signals**
Bratengeyer, Erwin; Mueller, Hartmut; IPSI 2005 Amalfi Proceedings; [2005]; 6 pp.; In English; See also 20050215422; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

On the basis of both, theoretical analysis and evidence gained from research conducted by the authors it has been shown that two separate random signals contain identical patterns when measured synchronously in different locations. Empirical analyses of histograms obtained from different electronic noise signals revealed frequency spectra displaying similar logarithmic-hyperbolic distributions. The occurrence of synchronicity in random signals at two remote locations provides the basis for a completely new way of communication methods. The theoretical concept, the experimental setup and measurement data will be presented. The idea of this method is fundamentally different from the common transmitter-receiver model usually applied today. A good analogy for this method of transmission is the principle of quantum teleportation. Our findings could have most important implications on current concepts of information technology and physics.
Author
*Random Signals; Synchronism; Electronics; Noise (Sound)*

**20050215486** NASA Glenn Research Center, Cleveland, OH, USA
**New Acoustic Arena Qualified at NASA Glenn's Aero-Acoustic Propulsion Laboratory**
Wnuk, Stephen P.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

A new acoustic arena has been qualified in the Aero-Acoustic Propulsion Laboratory (AAPL) at the NASA Glenn Research Center. This arena is outfitted specifically for conducting fan noise research with the Advanced Noise Control Fan (ANCF) test rig. It features moveable walls with large acoustic wedges (2 by 2 by 1 ft) that create an acoustic environment usable at frequencies as low as 250 Hz. The arena currently uses two dedicated microphone arrays to acquire fan inlet and exhaust far-field acoustic data. It was used successfully in fiscal year 2003 to complete three ANCF tests. It also allowed Glenn to improve the operational efficiency of the four test rigs at AAPL and provided greater flexibility to schedule testing. There were a number of technical challenges to overcome in bringing the new arena to fruition. The foremost challenge was conflicting acoustic requirements of four different rigs. It was simply impossible to construct a static arena anywhere in the facility without intolerably compromising the acoustic test environment of at least one of the test rigs. This problem was overcome by making the wall sections of the new arena movable. Thus, the arena can be reconfigured to meet the operational requirements of any particular rig under test. Other design challenges that were encountered and overcome included structural loads of the large wedges, personnel access requirements, equipment maintenance requirements, and typical time and budget constraints. The new acoustic arena improves operations at the AAPL facility in several significant ways. First, it improves productivity by allowing multiple rigs to operate simultaneously. Second, it improves research data quality by providing a unique test area within the facility that is optimal for conducting fan noise research. Lastly, it reduces labor and equipment costs by eliminating the periodic need to transport the ANCF into and out of the primary AAPL acoustic arena. The investment to design, fabricate, and install the new compact arena in fiscal year 2002 has paid dividends in fiscal year 2003 and will for many years to come. It has provided a dedicated, high-quality acoustic arena to support low-speed fan testing for ANCF while minimizing scheduling impacts and improving operational productivity in the AAPL facility.
Author
*Acoustic Properties; Aeroacoustics; Aerodynamic Noise; Environmental Tests; Noise Reduction; Fan Blades*

**20050215542** NASA Glenn Research Center, Cleveland, OH, USA
**Fluids and Combustion Facility Acoustic Emissions Controlled by Aggressive Low-Noise Design Process**
Cooper, Beth A.; Young, Judith A.; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The Fluids and Combustion Facility (FCF) is a dual-rack microgravity research facility that is being developed by Northrop Grumman Information Technology (NGIT) for the International Space Station (ISS) at the NASA Glenn Research Center. As an on-orbit test bed, FCF will host a succession of experiments in fluid and combustion physics. The Fluids Integrated Rack (FIR) and the Combustion Integrated Rack (CIR) must meet ISS acoustic emission requirements (ref. 1), which support speech communication and hearing-loss-prevention goals for ISS crew. To meet these requirements, the NGIT acoustics team implemented an aggressive low-noise design effort that incorporated frequent acoustic emission testing for all internal noise sources, larger-scale systems, and fully integrated racks (ref. 2). Glenn's Acoustical Testing Laboratory (ref. 3) provided acoustical testing services (see the following photograph) as well as specialized acoustical engineering support as part of the low-noise design process (ref. 4).
Author
*Combustion Physics; Fluid Dynamics; Low Noise; Acoustic Emission; Acoustics; Auditory Defects; Combustion*

**20050215626** NASA Glenn Research Center, Cleveland, OH, USA
**NASA Glenn's Acoustical Testing Laboratory Awarded Accreditation by the National Voluntary Laboratory Accreditation Program**
Akers, James C.; Cooper, Beth A.; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

NASA Glenn Research Center's Acoustical Testing Laboratory (ATL) provides a comprehensive array of acoustical testing services, including sound pressure level, sound intensity level, and sound-power-level testing per International Standards Organization (ISO)1 3744. Since its establishment in September 2000, the ATL has provided acoustic emission testing and noise control services for a variety of customers, particularly microgravity space flight hardware that must meet International Space Station acoustic emission requirements. The ATL consists of a 23- by 27- by 20-ft (height) convertible hemi/anechoic test chamber and a separate sound-attenuating test support enclosure. The ATL employs a personal-computer-based data acquisition system that provides up to 26 channels of simultaneous data acquisition with real-time analysis (ref. 4). Specialized diagnostic tools, including a scanning sound-intensity system, allow the ATL's technical staff to support its clients' aggressive low-noise design efforts to meet the space station's acoustic emission requirement. From its inception, the ATL has pursued the goal of developing a comprehensive ISO 17025-compliant quality program that would incorporate Glenn's existing ISO 9000 quality system policies as well as ATL-specific technical policies and procedures. In March 2003,

the ATL quality program was awarded accreditation by the National Voluntary Laboratory Accreditation Program (NVLAP) for sound-power-level testing in accordance with ISO 3744. The NVLAP program is administered by the National Institutes of Standards and Technology (NIST) of the U.S. Department of Commerce and provides third-party accreditation for testing and calibration laboratories. There are currently 24 NVLAP-accredited acoustical testing laboratories in the USA. NVLAP accreditation covering one or more specific testing procedures conducted in accordance with established test standards is awarded upon successful completion of an intensive onsite assessment that includes proficiency testing and documentation review. The ATL NVLAP accreditation currently applies specifically to its ISO 3744 soundpower- level determination procedure (see the photograph) and supporting ISO 17025 quality system, although all ATL operations are conducted in accordance with its quality system. The ATL staff is currently developing additional procedures to adapt this quality system to the testing of space flight hardware in accordance with International Space Station acoustic emission requirements.\h
Author
*Research Facilities; Acoustic Emission; Elastic Properties; Noise Reduction; Sound Intensity; Sound Pressure; Test Chambers*

**20050216516** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
**Doppler Aliasing Reduction in Wide-Angle Synthetic Aperture Radar Using a Linear Frequency Modulated Random Stepped-Frequency Waveform**
McMahon, Jason; Mar. 1, 2005; 99 pp.; In English
Report No.(s): AD-A437013; AFIT/GE/ENG/05-11; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research examines the theory, application, and results of using Random Stepped-Frequency (RSF) waveforms to mitigate Doppler aliasing in a wide-angle Synthetic Aperture Radar (SAR) imaging scenario. Severe Doppler aliasing typically occurs in this scenario since range extent requirements force the pulse repetition frequency to a value violating the lower bound for Doppler aliasing. Building on previous research, this work expands upon RSF waveform analysis using a Linear Frequency Modulated RSF (LFM-RSF) waveform. The RSF waveform suppresses Doppler aliasing by positioning nulls at the aliased scatterer location. Applying LFM with RSF processing theoretically provides greater frequency coverage and aliased scatterer cancellation improvement when compared to fixed frequency values. Results using the LFM-RSF waveform show images with alias mitigation performance consistent with previous non-LFM RSF results. Given a 45 dB image dynamic range and satisfying a time-bandwidth product criterion, the LFM-RSF waveform produces an image with aliased energy reduced by 99.6%. Slightly more energy reduction is possible by violating the time-bandwidth product criterion with an associated frequency overlap between subpulses. This violation leads to additional frequency coverage which enhances aliased energy reduction to 99.9%.
DTIC
*Doppler Effect; Frequencies; Frequency Modulation; Synthetic Aperture Radar; Waveforms*

**20050216534** Illinois Univ. at Urbana-Champaign, Urbana, IL USA
**Sound Wave Mitigation Through the Design of Surface Impedance**
Chew, Weng C.; Wang, Gong L.; Aug. 1, 2005; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437068; ERDC/CERL-CR-05-1; No Copyright; Avail.: CASI: A03, Hardcopy

An artificial soft surface is proposed to reduce and attenuate the propagation of acoustic waves along the surface of hard ground. An infinitesimal pressure line source is used as the excitation. Instead of an ideal periodic structure, a quasi-periodic structure is used where a finite number of grooves are incorporated to model exactly the realistic situation. Two boundary integral equation methods are proposed, one is based on the free space Green's function. The multilevel fast multiple algorithm is used to speed up the matrix-vector product necessitated by iterative methods used in solving the final linear system. The second method is more efficient in that two half space Green's function are employed rather than the free space Green's function so that the edge effect is removed, which results from boundary truncation, and the size of the linear system is greatly reduced. They are then used to analyze the behavior of acoustic wave propagation above textured surfaces, the impedance of which is, as expected, altered. The effects of the number and the geometry of grooves, and the effect of source height are also investigated. The conclusions drawn can be used for reference in a practical problem of mitigating gun blast noise.
DTIC
*Electrical Impedance; Impedance; Noise Reduction; Sound Waves; Surface Properties*

**20050217012** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada
**Computer-aided Classification for a Database of Images of Minelike Objects**
Fawcett, John A.; Myers, Vincent L.; Mar. 1, 2005; 61 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437000; DRDC-ATLANTIC-TM-2004-272; No Copyright; Avail.: CASI: A04, Hardcopy

In this report we describe some computer classification experiments with a database of sidescan sonar images. This database consists of 383 swaths of sidescan sonar data extracted by the authors from sea trial data collected over the last few years by DRDC Atlantic. The effects of the filtering and image segmentation processes on the resultant classification rates are considered. A number of kernel-based and nearest-neighbor classification schemes are examined. It is found that despite the complexities of the database considered in this report that high classification/low false alarm rates can be achieved.
DTIC
*Classifications; Computer Techniques; Data Bases; Image Classification; Sonar; Targets*

## 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*.

**20050215420** BAE Systems, Huntsville, AL, USA
**Calculated X-ray Intensities Using Monte Carlo Algorithms: A Comparison to Experimental EPMA Data**
Carpenter, P. K.; [2005]; 2 pp.; In English; 2005 Microscopy and Microanalysis Meeting, 31 Jul. - 4 Aug. 2005, Honolulu, HI, USA
Contract(s)/Grant(s): NAS8-02096; No Copyright; Avail.: CASI: A01, Hardcopy

Monte Carlo (MC) modeling has been used extensively to simulate electron scattering and x-ray emission from complex geometries. Here are presented comparisons between MC results and experimental electron-probe microanalysis (EPMA) measurements as well as phi(rhoz) correction algorithms. Experimental EPMA measurements made on NIST SRM 481 (AgAu) and 482 (CuAu) alloys, at a range of accelerating potential and instrument take-off angles, represent a formal microanalysis data set that has been widely used to develop phi(rhoz) correction algorithms. X-ray intensity data produced by MC simulations represents an independent test of both experimental and phi(rhoz) correction algorithms. The alpha-factor method has previously been used to evaluate systematic errors in the analysis of semiconductor and silicate minerals, and is used here to compare the accuracy of experimental and MC-calculated x-ray data. X-ray intensities calculated by MC are used to generate a-factors using the certificated compositions in the CuAu binary relative to pure Cu and Au standards. MC simulations are obtained using the NIST, WinCasino, and WinXray algorithms; derived x-ray intensities have a built-in atomic number correction, and are further corrected for absorption and characteristic fluorescence using the PAP phi(rhoz) correction algorithm. The Penelope code additionally simulates both characteristic and continuum x-ray fluorescence and thus requires no further correction for use in calculating alpha-factors.
Derived from text
*Algorithms; Electron Probes; Microanalysis; Monte Carlo Method; X Rays; Mathematical Models*

**20050216438** Universidad de Guadalajara, Guadalajara, Jalisco, Mexico, Universidad de Guadalajara, Guadalajara, Jalisco, Mexico
**Numerical Study of the Quantum Controlled-Not (CN) Gate Implemented on Four-Spins Molecules with Spin-Spin Interaction and at Room Temperature**
Lopez, G. V.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 11 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We study numerically the non-resonant effects on four-spins molecules at room temperature with the implemented quantum Controlled-Not (CN) gate. The interaction among the spins within a molecule is considered of the form spin-spin, where the four nuclear spins in each molecules represent a four-qubit register, and the spin-spin interaction among the qubits is characterized by the coupling constants J(sup x, sub alpha,beta), J(sup y, sub alpha,beta), and J(sup z, sub alpha, beta) (alpha, beta = 0, 1, 2, 3). We calculate the errors on the reduced density matrix elements at the end of pi-pulse as a function of the Rabi's frequency, Omega(sub alpha) and the above coupling constants.
Author
*Numerical Analysis; Resonance; Molecules; Quantum Computation*

## 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*.

**20050215459** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Energy Spectra of H and He from the ATIC-2 Experiment**
Wefel, J. P.; Adams, J. H.; Ahn, H. S.; Bashindzhagyan, G. L.; Batkov, K. E.; Chang, J.; Christl, M.; Fazely, A. R.; Ganel, O.; Gunasingha, R. M., et al.; 29th International Cosmic Ray Conference; 2005, pp. 101-104; In English; 29th International Cosmic Ray Conference, 3-10 Aug. 2005, Pune, India; Copyright; Avail.: Other Sources; Abstract Only

The Advanced Thin Ionization Calorimeter (ATIC) experiment measures the energy spectra of individual elements, from H to Fe, in the energy region from about 100 GeV to tens of TeV. The ATIC instrument was flown twice in long-duration balloon flights around the South Pole in 2000-2001 (ATIC-1) and 2002-2003 (ATIC-2). ATIC-2 gathered about 18 days of data at an altitude of 36 km. In this paper we discuss the separation of protons from helium and present preliminary energy spectrum of each component, including deconvolution of the measured energy deposit spectra. The results are compared to previous data and to different cosmic ray propagation models, including a diffusion model with weak re-acceleration.
Author
*Calorimeters; Ionization; Energy Spectra; Helium; Cosmic Rays; Diffusion*

**20050215607** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Dynamic Response Testing in an Electrically Heated Reactor Test Facility**
Bragg-Sitton, Shannon M.; [2006]; 1 pp.; In English; STAIF-2006 Conference, 12-16 Feb. 2006, Albuquerque, NM, USA; No Copyright; Avail.: Other Sources; Abstract Only

Non-nuclear testing can be a valuable tool in development of a space nuclear power or propulsion system. In a non-nuclear test bed, electric heaters are used to simulate the heat from nuclear fuel. Standard testing allows one to fully assess thermal, heat transfer, and stress related attributes of a given system, but fails to demonstrate the dynamic response that would be present in an integrated, fueled reactor system. The integration of thermal hydraulic hardware tests with simulated neutronic response provides a bridge between electrically heated testing and full nuclear testing. By implementing a neutronic response model to simulate the dynamic response that would be expected in a fueled reactor system, one can better understand system integration issues, characterize integrated system response times and response characteristics, and assess potential design improvements at a relatively small fiscal investment. Initial system dynamic response testing was demonstrated on the integrated SAFE-100a heat pipe cooled, electrically heated reactor and heat exchanger hardware, utilizing a one-group solution to the point kinetics equations to simulate the expected neutronic response of the system (Bragg-Sitton, 2005). The current paper applies the same testing methodology to a direct drive gas cooled reactor system, demonstrating the applicability of the testing methodology to any reactor type and demonstrating the variation in system response characteristics in different reactor concepts. In each testing application, core power transients were controlled by a point kinetics model with reactivity feedback based on core average temperature; the neutron generation time and the temperature feedback coefficient are provided as model inputs. Although both system designs utilize a fast spectrum reactor, the method of cooling the reactor differs significantly, leading to a variable system response that can be demonstrated and assessed in a non-nuclear test facility.
Author
*Dynamic Response; Fast Nuclear Reactors; Thermal Stresses; Nuclear Fuels; Nuclear Propulsion; Solar Cells; Solar Generators; Test Facilities*

## 74
## OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

**20050215020** National Center for Microgravity Research on Fluids and Combustion, Cleveland, OH, USA
**Diffusivity Measured as a Function of Concentration**
Rashidnia, Nasser; Balasubramaniam, Ramaswamy; Research and Technology 2002; March 2003; 5 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Optical diagnostic techniques have become an integral part of many measurements in industrial and research laboratories. Many types of interferometers and their phase-shifted versions have been used to measure optical wave fronts for lens testing and combustion and fluid flow diagnostics. One such instrument is the point diffraction interferometer (PDI), which is considered to be robust because it has a common-path design. However, the PDI is difficult to align and has limited measurement range for liquid phase applications. Interferometry and schlieren techniques have been widely used for many years for gas flow visualization.
Derived from text
*Combustible Flow; Diagnosis; Flow Visualization; Interferometers; Lenses*

**20050215049** Ecole Nationale Superieure des Telecommunications, Paris, France
**Dynamic Multi-Stage Traffic Grooming in Optical Networks**
Ghobril, Paul; Tohme, Samir; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 4 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The migration from static to dynamic optical networking and from interconnected rings to arbitrary mesh topology gives rise to new challenges in the design and operation of optical networks. In this context, we study the problem of multi-stage traffic grooming to minimize the cost and complexity of optical networks. This hierarchical packing of connections, from fine to coarse granularity, reduces the hardware complexity at the expense of increasing the blocking probability. Node design and wavelength assignment methods are proposed. Numerical results are given to show the complexity reduction with a limited blocking probability in different conditions.
Author
*Wavelength Division Multiplexing; Computational Grids; Probability Theory; Multiplexing*

**20050215160** NASA Glenn Research Center, Cleveland, OH, USA
**Light Microscopy Module Fan Disturbance Characterized Through Microgravity Emissions Laboratory Testing**
McNelis, Anne M.; Motil, Susan M.; Research and Technology 2002; March 2003; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

A Light Microscopy Module (LMM) is being engineered, designed, and developed at the NASA Glenn Research Center. The LMM is planned as a remotely controllable on-orbit microscope subrack facility, allowing flexible scheduling and control of physical science and biological science experiments within Glenn s Fluids Integrated Rack on the International Space Station. The LMM concept is a modified commercial research imaging light microscope with powerful laser-diagnostic hardware and interfaces, creating a one-of-a-kind, state-of-the-art microscopic research facility. The microscope will house several different objectives, corresponding to magnifications of 10, 40, 50, 63, and 100. Features of the LMM include high-resolution color video microscopy, brightfield, darkfield, phase contrast, differential interference contrast, spectrophotometry, and confocal microscopy combined in a single configuration. Also, laser tweezers are integrated with the diagnostics as a sample manipulation technique. As part of the development phase of the LMM, it was necessary to quantify the microgravity disturbances generated by the control box fan. Isolating the fan was deemed necessary to reduce the fan speed harmonic amplitudes and to eliminate any broadband disturbances across the 60- to 70-Hz and 160- to 170-Hz frequency ranges. The accelerations generated by a control box fan component of the LMM were measured in the Microgravity Emissions Laboratory (MEL). The MEL is a low-frequency measurement system developed to simulate and verify the on-orbit International Space Station (ISS) microgravity environment. The accelerations generated by various operating components of the ISS, if too large, could hinder the science performed onboard by disturbing the microgravity environment. The MEL facility gives customers a test-verified way of measuring their compliance with ISS limitations on vibratory disturbance levels. The facility is unique in that inertial forces in 6 degrees of freedom can be characterized simultaneously for an operating test article. Vibratory disturbance levels are measured for engineering or flight-level hardware following development from component to subassembly through the rack-level configuration. The MEL can measure accelerations as small as 10-7g, the accuracy needed to confirm compliance with ISS requirements.
Author
*Microscopy; Optical Microscopes; Fans; Spectrophotometry; Imaging Techniques; Hardware*

**20050215329** Austin Peay State Univ., Clarksville, TN, USA
**Electroformed Nickel-Graphite Composite**
Xiong-Skiba, Pei; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XLVI-1 - XLVI-5; In English; See also 20050215300; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

Future x-ray astronomy will demand larger optics than Chandra, currently in orbit. Ways must be devised to produce cheaper and lighter x-ray mirrors to save the cost of manufacturing and launching this future telescope. One technique, being developed at Marshall Space Flight Center and elsewhere, is electroformed nickel replication technique, wherein mirror shells are electroformed (using pure nickel or a nickel alloy) onto super-polished and figured aluminum mandrels and are subsequently released by cooling. This technique can produce relatively inexpensive mirrors, but is hampered by the high density of nickel (8.9 g / cm3). An alternative is to develop a composite, with lower mass density and compatible mechanical properties to the nickel cobalt alloy, as the mirror shell material.
Derived from text
*Nickel Alloys; Graphite; Mechanical Properties; Electroforming; Optical Equipment*

**20050215492** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Sub-pixel Spatial Resolution Micro-roughness Measurements with Interlaced Stitching**
Mooney, James T.; Stahl, H. Philip; [2005]; 1 pp.; In English; SPIE Optics and Photonics 2005 Conference, 31 Jul. - 2 Aug. 2005, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

In this paper we describe a method to increase the spatial resolution of surface micro-roughness measurements. As the surface specifications for precision optics become more demanding, the metrology instruments must cover a broad spatial frequency range. Generally, multiple instruments are used to cover the full range of the specifications. For example, a Fizeau interferometer would be used to test low spatial frequency surface errors, a white light interferometer would be used for mid spatial frequency errors, and an AFM would be used for high spatial frequency errors. For some precision optics, three instruments would be necessary. However, in many applications, an increase in the spatial resolution of a metrology instrument could negate the need for multiple instruments. A solution to increase the spatial resolution of micro-roughness measurements obtained using white light interferometry with 'interlaced stitching' will be presented. In 'interlaced stitching', multiple interferometric measurements are made as the optic under test (or the CCD array) is laterally shifted at sub-pixel increments. The measurements are then combined to construct a measurement with higher spatial resolution. Initial results obtained while implementing a similar process used to increase the spatial resolution of measurements made with a commercially available Fizeau interferometer will be presented.
Author
*Charge Coupled Devices; Surface Roughness; Spatial Resolution; Pixels; Frequency Ranges*

**20050215499** NASA Marshall Space Flight Center, Huntsville, AL, USA
**NASA's Challenges in Optics for Future Space-Based Science Missions**
Stahl, H. Phil; [2005]; 1 pp.; In English; SPIE 20th Congress of the International Commission for Optics Challenging Optics in Science and Technology, 21-26 Aug. 2005, Changchun, China; No Copyright; Avail.: Other Sources; Abstract Only

NASA's mission is: 'To understand and project our home planet, To explore the universe and search for life, To inspire the next generation of explorers . . . as only NASA can.' I These mission concepts are further defined in our recently pub1ished'Strategic Objectives for 2005 and Beyond' , which include conducting advanced telescope searches for Earth-like planets and habitable environments around the stars, as well as exploring the universe to understand its origin, structure, evolution, and destiny. This presentation will summarize several future space-based missions currently in formulation to meet these objectives, and will outline some of the principal challenges in the field of optics to their success.
Author
*Mission Planning; Planets; Telescopes; Space Missions; Optics*

**20050215544** Alabama Univ., Huntsville, AL, USA
**Sub-pixel phase-measuring interferometry with interlace stitching**
Mooney, James T.; [2005]; 1 pp.; In English; Mirror Technology Days 2005, 16-18 Aug. 2005, Huntsville, AL, USA; No Copyright; Avail.: Other Sources; Abstract Only

Measurement of mid spatial frequency figure error is critical to large precision optics for missions such as TPF-C. This presentation introduces a technique for increasing the spatial sampling resolution to meet these requirements using conventional video resolution phase-measuring interferometer. Technique involves sub-pixel data shifts, interlaced stitching and PSF deconvolution.
Author
*Spatial Resolution; Errors; Frequency Measurement; Interferometers; Optics*

**20050215581** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Metrology for the Development of High Energy X-Ray Optics**

Gubarev, Mikhail; Ramsey, Brian; Engelhaupt, Darell; Dpeegle, Chet; [2005]; 1 pp.; In English; SPIE Optics and Photonics Conference, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources

We are developing grazing incidence x-ray optics for a balloon-borne hard-x-ray telescope (HERO). The instrument will have 200 sq cm effective collecting area at 40 keV and an angular resolution goal of 15 arcsec. The HERO mirror shells are fabricated using electroform-nickel replication off super-polished cylindrical mandrels. The angular resolution goal puts stringent requirements on the quality of x-ray mirrors and, hence, on mandrel quality. We used metrology in an iterative approach to monitor and refine the x- ray mirror fabrication process. Comparison of surface figure and microroughness measurements of the mandrel and the shells will be presented together with results from x-ray tests.

Author

*X Ray Optics; Metrology; Electroforming; Nickel; X Ray Telescopes*

**20050215599** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Poco Graphite Mirror Metrology Report**

Kester, Thomas J.; [2005]; 1 pp.; In English; Mirror Technology Days, 16-18 Aug. 2005, Huntsville, AL, USA; No Copyright; Avail.: Other Sources; Abstract Only

Recently a lightweight mirror technology was tested at Marshall Space Flight Center's Space Optic Manufacturing Technology Center (MSFC, SOMTC). The mirror is a Poco Graphite CVD Si clad SiC substrate. It was tested for cryogenic (cryo) survivability to 20deg Kelvin in SOMTC's X-ray Calibration and Cryogenic Test Facility. The surface figure of the mirror was measured before and after cry0 cycling. The test technique and results are discussed.

Author

*Cryogenics; Mirrors; Graphite; Calibrating*

**20050215600** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Cryogenic Performance of a Lightweight Silicon Carbide Mirror**

Eng, Ron; Carpenter, James; Haight, Harlan; Hogue, William; Kegley, Jeff; Stahl, H. Philip; Wright, Ernie; Kane, Dave; Hadaway, James; [2005]; 1 pp.; In English; SPIE Optics and Photonics Annual Meeting: Optical Materials and Structure Technology, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Low cost, high performance lightweight Silicon Carbide (SiC) mirrors provide an alternative to Beryllium mirrors. A Trex Enterprises 0.25m diameter lightweight SiC mirror using its patented Chemical Vapor Composites (CVC) technology was evaluated for its optical performance. CVC SiC is chemically pure, thermally stable, and mechanically stiff. CVC technology yields higher growth rate than that of CVD SiC. NASA has funded lightweight optical materials technology development efforts involving SiC mirrors for future space based telescope programs. As part of these efforts, a Trex SiC was measured interferometrically from room temperature to 30 degrees Kelvin. This paper will discuss the test goals, the test instrumentation, test results, and lessons learned.

Author

*Cryogenics; Mirrors; Silicon Carbides; Optical Materials*

**20050215602** Alabama Univ., Huntsville, AL, USA, Poco Graphite, Inc., Decatur, TX, USA, Trex Enterprises Corp., San Diego, CA, USA

**Cryogenic Performance of Trex SiC Mirror**

Foss, Colby; Kane, Dave; Bray, Donald; Hadaway, James; [2005]; 1 pp.; In English; Mirror Technology Days, 16-18 Aug. 2005, Huntsville, AL, USA; Copyright; Avail.: Other Sources; Abstract Only

Low cost, high performance lightweight Silicon Carbide (Sic) mirrors provide an alternative to Beryllium mirrors. A Trex Enterprises 0.25m diameter lightweight Sic mirror using its patented Chemical Vapor Composites (CVC) technology was evaluated for its optical performance. CVC Sic is chemically pure, thermally stable, and mechanically stiff. CVC technology yields higher growth rate than that of CVD Sic. NASA has funded lightweight optical materials technology development efforts involving Sic mirrors for future space based telescope programs. As part of these efforts, a Trex Sic was measured interferometrically from room temperature to 30 degrees Kelvin. This paper will discuss the test goals, the test instrumentation, test results, and lessons learned.

Author

*Cryogenics; Low Cost; Optical Materials; Mirrors; Silicon Carbides; Telescopes; Thermal Stability*

**20050216532** Space and Naval Warfare Systems Center, San Diego, CA USA

**SSC San Diego Biennial Review 2003. Vol 2: Communication and Information Systems**

Stewart, Stephen E.; Lieberman, Stephen; Carter, Brad; Nuzen, Ahn; Brininstool, Michael; Anderson, Kenneth D.; Cunningham, Daniel E.; Hepner, Thomas A.; Rogers, L. T.; Shum, Allen; Jan. 1, 2003; 50 pp.; In English; Original contains color illustrations

Report No.(s): AD-A437062; No Copyright; Avail.: CASI: A03, Hardcopy

Volume 2 of this Biennial Review features nine (9) technical papers describing and discussing innovative technologies being developed at the Spawar Systems Center in San Diego.

DTIC

*Commercialization; Information Systems; Optical Communication; Technology Transfer; Telecommunication; Wide Area Networks*

**20050216537** Minnesota Univ., Minneapolis, MN USA

**Lightfield Completion**

Yatziv, Liron; Sapiro, Guillermo; Levoy, Marc; Feb. 1, 2004; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A437080; IMA-PREPRINT-SER-1957; No Copyright; Avail.: CASI: A02, Hardcopy

A light field is a 4D function representing radiance as a function of ray position and direction in 3D space. In this paper, we describe a method for recovering gaps in light fields of scenes that contain significant occluders. In these situations, although a large fraction of the scene may be blocked in any one view, most scene points are visible in at least some views. As a consequence, although too much information is missing to employ 2D completion methods that operate within a single view, it may be possible to recover the lost information by completion in 4D - the full dimensionality of the light field. The proposed light field completion method has three main steps: Registration, initial estimation, and high dimensional texture synthesis and/or inpainting. At the registration stage, the set of images are shifted and re-projected so that the corresponding pixels from different images are aligned in the reconstructed light field. Following this, the estimation step uses a naive technique to fill-in parts of gaps using the available information from the multiple images. This serves as the initial condition for the next and last step, where the missing information is recovered via high dimensional texture synthesis and/or inpainting. These two steps of initial condition and completion are iterated. The algorithm is illustrated with real examples.

DTIC

*Images; Radiance; Scene Generation*

**20050217020** NASA Glenn Research Center, Cleveland, OH, USA

**Optical Tweezers and Optical Trapping Improved for Future Automated Micromanipulation and Characterization**

Wrbanek, Susan Y.; Decker, Arthur J.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Optical trap arrays are being developed at the NASA Glenn Research Center for holding, manipulating, and optically interrogating arrays of nanotube sensors. The trap arrays, for example, might be used to arrange arrays of chemical sensors for insertion onto a chip in liquid, air, and vacuum environments. Neural-network-controlled spatial light modulators (SLMs) are to generate and control the trap positions and trap profiles in three dimensions.

Derived from text

*Optical Equipment; Trapping; Light Modulators*

**20050217096** NASA Glenn Research Center, Cleveland, OH, USA

**Nanorod Material Developed for Use as an Optical Sensor Platform**

Bencic, Timothy J.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Optical sensors are becoming increasingly important in the development of new nonintrusive or embedded sensors. The use of light and material optical properties helps us measure unknown parameters such as temperature, pressure, flow, or chemical species. The focus of this work is to develop new nanostructure platforms upon which optical sensors can be constructed. These nanorods are synthesized oxides that form a base structure to which luminescent sensing dyes or dopants can be attached or embedded. The nanorod structure allows for a much greater open area than closed or polymer-based sensors do, enabling a much faster contact of the measured species with the luminescent sensor and, thus, a potentially faster measurement.

Derived from text

*Optical Properties; Optical Measuring Instruments*

**20050217159** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Alignment, Assembly and Testing of High Energy X-Ray Optics**

Gubarev, Mikhail; Ramsey, Brian; [2005]; 1 pp.; In English; SPIE Optics and Photonics, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

We are developing grazing-incidence x-ray imaging optics for a balloon-borne hard x-ray telescope (HERO). The HERO payload, scheduled for launch in May 2005, currently consists of 8 mirror modules each containing 12 mirror shells fabricated using electroform-nickel replication off super-polished cylindrical mandrels. An optical system developed for aligning and assembling the shells in the modules will be described. Sources for systematic errors associated with this process will be discussed and results from on-ground x-ray testing of each module will be presented.

Author

*Alignment; Fabrication; X Ray Optics; X Ray Astronomy; Balloon-Borne Instruments*

**20050217191** NASA Johnson Space Center, Houston, TX, USA

**FAR and NEAR Target Dynamic Visual Acuity: A Functional Assessment of Canal and Otolith Performance**

Peters, Brian T.; Brady, Rachel A.; Landsness, Eric C.; Black, F. Owen; Bloomberg, Jacob J.; [2004]; 1 pp.; In English; Barany Society XXII International Congress, 7-9 Jul. 2004, Paris, France; No Copyright; Avail.: CASI: A01, Hardcopy

Upon their return to earth, astronauts experience the effects of vestibular adaptation to microgravity. The postflight changes in vestibular information processing can affect postural and locomotor stability and may lead to oscillopsia during activities of daily living. However, it is likely that time spent in microgravity affects canal and otolith function differently. As a result, the isolated rotational stimuli used in traditional tests of canal function may fail to identify vestibular deficits after spaceflight. Also, the functional consequences of deficits that are identified often remain unknown. In a gaze control task, the relative contributions of the canal and otolith organs are modulated with viewing distance. The ability to stabilize gaze during a perturbation, on visual targets placed at different distances from the head may therefore provide independent insight into the function of this systems. Our goal was to develop a functional measure of gaze control that can also offer independent information about the function of the canal and otolith organs.

Derived from text

*Targets; Viewing; Distance; Astronauts; Adaptation; Microgravity; Otolith Organs*

## 76
## SOLID-STATE PHYSICS

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

**20050215326** Pennsylvania State Univ., PA, USA

**Fabrication of 3-D Photonic Band Gap Crystals Via Colloidal Self-Assembly**

Subramaniam, Girija; Blank, Shannon; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XLII-1 - XLII-10; In English; See also 20050215300; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

The behavior of photons in a Photonic Crystals, PCs, is like that of electrons in a semiconductor in that, it prohibits light propagation over a band of frequencies, called Photonic Band Gap, PBG. Photons cannot exist in these band gaps like the forbidden bands of electrons. Thus, PCs lend themselves as potential candidates for devices based on the gap phenomenon. The popular research on PCs stem from their ability to confine light with minimal losses. Large scale 3-D PCs with a PBG in the visible or near infra red region will make optical transistors and sharp bent optical fibers. Efforts are directed to use PCs for information processing and it is not long before we can have optical integrated circuits in the place of electronic ones.

Derived from text

*Colloids; Crystals; Energy Gaps (Solid State); Fabrication; Self Assembly; Three Dimensional Models; Photonics*

**20050215421** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Stability of Magnetically-Suppressed Solutal Convection In Protein Crystal Growth**

Leslie, F. W.; Ramachandran, N.; [2005]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

The effect of convection during the crystallization of proteins is not very well understood. In a gravitational field, convection is caused by crystal sedimentation and by solutal buoyancy induced flow and these can lead to crystal imperfections. While crystallization in microgravity can approach diffusion limited growth conditions (no convection),

terrestrially strong magnetic fields can be used to control fluid flow and sedimentation effects. In this work, a theory is presented on the stability of solutal convection of a magnetized fluid in the presence of a magnetic field. The requirements for stability are developed and compared to experiments performed within the bore of a superconducting magnet. The theoretical predictions are in good agreement with the experiments and show solutal convection can be stabilized if the surrounding fluid has larger magnetic susceptibility and the magnetic field has a specific structure. Discussion on the application of the technique to protein crystallization is also provided.
Author
*Convection; Protein Crystal Growth; Stability; Solutes; Microgravity; Retarding; Magnetization*

**20050217026** NASA Glenn Research Center, Cleveland, OH, USA
**High-Temperature, Thin-Film Ceramic Thermocouples Developed**
Sayir, Ali; Blaha, Charles A.; Gonzalez, Jose M.; Research and Technology 2004; June 2005; 4 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

To enable long-duration, more distant human and robotic missions for the Vision for Space Exploration, as well as safer, lighter, quieter, and more fuel efficient vehicles for aeronautics and space transportation, NASA is developing instrumentation and material technologies. The high-temperature capabilities of thin-film ceramic thermocouples are being explored at the NASA Glenn Research Center by the Sensors and Electronics Branch and the Ceramics Branch in partnership with Case Western Reserve University (CWRU). Glenn s Sensors and Electronics Branch is developing thin-film sensors for surface measurement of strain, temperature, heat flux, and surface flow in propulsion system research. Glenn s Ceramics Branch, in conjunction with CWRU, is developing structural and functional ceramic technology for aeropropulsion and space propulsion. Derived from text
*High Temperature; Thin Films; Ceramics; Thermocouples; Heat Flux; Computer Vision*

## 80
## SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

**20050214879** Purdue Univ., West Lafayette, IN, USA
**Purdue's Center for Technology Roadmapping: A Resource for Research and Education in Technology Roadmapping**
Duckles, Jonah M.; Coyle, Edward J.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Strategic thinking has moved from developing strategies for fixed environments to creating strategies that enable organizations to adapt to and benefit from change. This trend is a reaction to the increasingly dynamic nature of a global economy driven by rapid advances in technology. In response to this trend, Purdue University has created the Center for Technology Roadmapping (CTR). The Center s goal is to enhance strategic planning by advancing the art and science of technology planning. A key feature of the center is a website at which industry associations, research organizations, and individuals can develop roadmaps that are stored in a common data format and posted for public access. As this archive of roadmaps grows, many unique opportunities will arise. In the area of roadmapping research, these include: data-mining across roadmaps from different industries; development of an ontology for technology roadmapping; and analyzing the dynamics of roadmaps over time. In the area of education, these opportunities include: new tools and topics for courses in technology planning and management; the use of roadmapping tools and techniques in undergraduate design courses; an Executive Masters program in technology roadmapping; and broader dissemination of technology information throughout society. Index Terms-Strategic Planning, Technology Planning, Technological Innovation, Technology Forecasting
Author
*Data Mining; Technological Forecasting; Technology Utilization; Management Planning; Research and Development; Information Dissemination*

**20050214914** Stellenbosch Univ., South Africa

**e-infrastructure in a Complex Environment**

Smith, Julian; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 16 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A university environment is an extremely complex one. Planning, implementing and maintaining an effective e-infrastructure represent particular challenges in such an environment. Competing priorities may have a substantial impact on the quality and extent of the infrastructure which may be established. Taking into account that an e- infrastructure is of little value unless it contributes to make the business processes more efficient and effective, the paper will focus on the dynamics in a university environment in general and refer to the University of Stellenbosch, South Africa, in particular.

Author

*Knowledge Based Systems; Universities; Education; Priorities*

**20050214922** Recon Healthcare Ltd., Bangalore, India

**Internet: A Powerful Tool in Disseminating Medical Knowledge in Urban and Rural India**

Sridhar, C. B.; Suresh, Deena; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 4 pp.; In English; See also 20050214876; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

During July 01, 1998 to July 08, 2002, Internet facility at Recon Healthcare, Bangalore India, for procuring medical information free of cost was informed to doctors through company s e-mail. The doctors responded either through this or regular mail. 412 requests were received. Of this 58% from south, 18% from west, 13% from north and 11% from east. 15% of requests were from rural India with major requests from Tumkur, Karnataka. With the availability of Internet, medical knowledge has been enhanced quickly to doctors in rural India. They will use this in enhancing their knowledge and improving patient care.

Author

*Medical Services; Electronic Mail; Internets; Physicians; Patients*

**20050215069** Technological Educational Inst. of Larissa, Greece

**Towards Team-Orientation in Agent Design: Social Plan Execution**

Hartonas, C.; Gerogiannis, V.; Savvas, E.; Kakarontzas, G.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 12 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present a process-algebraic approach for the specification of agent systems where agents participate in joint activities, extending previous work by the first author in [8, 9]. While related to existing work on teamwork, such as [15, 16, 17, 19, 20, 21], our focus here is not on discussing notions bearing on joint intentions or abilities. Rather, we focus on providing a specification language for agent systems and behaviors of agents. The language of behaviors we propose can also serve as a coordination language for specifying the ow of control in joint agent activity. We then provide an operational semantics for the language of social agents that we present, based on a notion of social structure that simplifies the semantics of social plan execution. The formation of the required social structure is part of the process of social plan formation. In this report we assume social plans are already available (pre-compiled or already formed) and focus on providing semantics for their execution.

Author

*Algebra; Coordination; Teams*

**20050215328** Alabama Agricultural and Mechanical Univ., Normal, AL, USA

**A Summary of NASA Summer Faculty Fellowship Work in the E.O. Office and in the Educator Resources Center**

Thompson, H. Wendell, Sr.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XLV-1 - XLV-5; In English; See also 20050215300; No Copyright; Avail.: CASI: A01, Hardcopy

The Office of Equal Opportunity supports a number of summer programs which are designed to: 1.) Increase the number of elementary and secondary students and teachers who are involved in NASA-related education opportunities; and 2.) Support higher education research capability and opportunities that attract and prepare increasing numbers of students and

faculty for NASA-related careers. A part of my work in the E.O. office involved the evaluation of several of the programs in order to determine their level of success and to make recommendations for the improvement of those programs where necessary. As a part of the involvement with one of the programs, the PSTI, I had the great opportunity to interact with the students in a number of their sessions which involved problem-based learning in science, mathematics and technology. A summary of the evaluation of those programs is included in this report. The second part of my work involved assisting the coordinator of the Educator Resource Center at the Space and Rocket Center. I participated in space science workshops for in-service and pre-service teachers. There educational resources were made available to the participants including many hands-on activities that hey could take back to their classes. I participated in the three hour workshops that were offered on Tuesdays and Thursdays of each week, although there were workshops on other days. On Mondays, Wednesdays, and Fridays, I worked in the E.O. office. As a result of my work in the ERC, I developed a Directed Reading PowerPoint Lesson Plan Guide involving remote sensing entitled, Echo the Bat. This was based on a NASA published children's book entitled Echo The Bat, written by Ginger Butcher. I have included a description of the lesson in this report. A summary of the evaluations of several of the summer programs supported by the Equal Opportunity office are included in this report.
Derived from text
*Educational Resources; NASA Programs; Mathematics; Aerospace Sciences*

**20050215356** Northern Illinois Univ., De Kalb, IL, USA
**Aviation Maintenance Online: Multimedia and Multidimensional Approaches to Engineering Technology**
Song, Xueshu; Billman, Charles L.; Pilcher, Phil; Wilson, Kristin; IPSI 2005 Hawaii Proceedings; [2005]; 10 pp.; In English; See also 20050215347
Contract(s)/Grant(s): NSF DUE 99-50088; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Three aviation training modules included aircraft systems simulations under normal and faulty conditions, animated cartoon movies of scientific concepts; measurements of aircraft systems in simulated team-based, trouble shooting exercises, and time and labor costs for component replacement. Significant differences between test and control groups were found for students attitude, knowledge, learning time, and instructional resources. The authors are currently creating a network of practitioners to assess, implement, demonstrate the transportability of the modules, and assess student learning. Live demonstrations will be at IPSI-2005 HAWAII.
Author
*Aircraft Maintenance; Education; Operating Costs; SIMulation*

**20050215367** Zagreb Univ., Zagreb, Croatia
**Internet as a Marketing Communications Media of Nonprofit Organizations: The Case of Croatia**
Pavicic, Jurica; Vlasic, Goran; Podrug, Najla; IPSI 2005 Hawaii Proceedings; [2005]; 13 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The modern nonprofit organizations in Croatia have been developing only since the early 1990's - after significant changes caused by the radical social/economic/political transition. At first they were mostly humanitarian (mostly due to a fact that, in ex-Yugoslavia, the war and post-war problems caused many sufferings for thousands of refugees and displaced persons). Since 1995 - after the war, many other NGOs were started. Due to the Government budget problems and relatively low interest of companies in community issues, large number of NGOs cannot find sufficient funds to develop their programs adequately and communicate to their target audience through traditional media (TV, radio, newspapers, ...). That is why, besides some PR activity, Internet has become the main communication media for NGOs with their donors, general publics, and target users. Computer science NGO Sabirnica is one of the few modern NGOs in Croatia founded before 1990's (it was founded in 1984) which is still active. By using the case of Sabirnica and the practical evidence of using the modern marketing communication the authors will emphasize the importance of Internet as an inexpensive way of communication with the target audience, but also making it easier to get new people interested as volunteers or donators. The importance is even greater when the possibility of finding international donators as well as cooperation with other NGOs throughout the world is analyzed.
Author
*Croatia; Economics; Organizations; Warfare*

**20050215428** Hong Kong Univ., Hong Kong, National Central Univ., Taiwan

**Calligraphy in the Cyber-age: Beyond Aesthetics and Penmanship**

Kao, Henry S. R.; IPSI 2005 Amalfi Proceedings; [2005]; 15 pp.; In English; See also 20050215422; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Calligraphy is defined as beautiful writing in all cultures. It has served for ages the functions of learning, communication and artistic expression. Recent scientific evidence has widened its traditional role beyond aesthetics and penmanship. This paper will: (1) analyze and contrast Chinese and English calligraphies from a visual-geometric perspective; (2) identify their commonalities in character construction; (3) discuss a general system of calligraphic handwriting; (4) review research on Chinese calligraphic handwriting (CCH) confirming its positive contributions to health and behavioural therapy; and (5) highlight the development of this new cyber-age role of calligraphy for the benefit of man.

Author

*Handwriting; Health; Therapy*

**20050215430** State Univ. of New York, NY, USA

**Focused Mathematical Problem-Solving Resulting in Heightened Awareness and Linguistic Agility**

Klein, Ana Maria; IPSI 2005 Amalfi Proceedings; [2005]; 5 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper discusses a mental state called problem space (isolated by Newell & Simon in 1972) and how it manifests itself during focused problem solving activity. My research findings elicit two other key features present while problem-solvers derive problem-solving strategies. These features are: (1) invented language as a place-holder for big ideas and, (2) a need for physical models to represent ideas while strategizing out loud. Problem space is a mental state that is reached during moments of highly focused mental activity. It is an instantaneous trance-like heightened sense of awareness that occurs in the brain in a matter of seconds. Participants in my research study on focused mathematical problem solving (Klein, 2003) have bounced in and out of this trance-like state while solving intricate mathematical problems within an extended period of time. Findings from my study also point out that such intense brain activity elicits creative, intelligent, linguistically agile, and effective problem solving strategies, which can be generalized to any problem-solving situation. Two important phenomena have ensued from the data collected during focused mathematical problem solving (1) invented language as a linguistic placeholder and (2) problem space as a highly efficient/focused learning zone.

Derived from text

*Linguistics; Mental Health; Problem Solving; Mathematics*

**20050215432** Compiegne Univ., Compiegne, France

**Robustness of the Actor's Collaboration in Multidisciplinary Teams to Improve the Productivity of the Innovation Projects**

Lepage, Alain; IPSI 2005 Amalfi Proceedings; [2005]; 17 pp.; In English; See also 20050215422; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Which perception keys of multidisciplinary team member s collaboration could help engineers leading their project in order to decrease it s innovation s performance variability? The study of the leadership and the psycho-sociological tools in labour knowledge area makes it possible to determine a synthetic typology of the actor's profiles adapted to the team's design aid depending on the stake, the role and the crisis condition in the organization. To model the effectiveness of the creativity of the team, the methods of idea production ('focus group', 'interview one on one' and 'Triz') are linked to the profiles of the actors according to the context of the project. The research analyses the performance of the model applied to product and service innovation in companies.

Author

*Psychology; Sociology; Multidisciplinary Research; Productivity*

**20050215435** Sydney Univ., Australia

**Supporting Multiple Narratives: A Virtual Museum Application**

Hiller, John; IPSI 2005 Amalfi Proceedings; [2005]; 16 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The fine art museum includes the work of local artists and collectors. Special exhibitions follow trends and assemble items

from afar for the local population to see. Collections of natural history museums are rich with objects describing country development. Immigration waves are well represented. Material is collected for individual cultural groups. Agricultural implements and manufacturing processes are on show. Current projects have their displays. These real museums are limited in the initiatives they can support. Multiple uses of objects at any one time are not possible. Only a small fraction of the collection is on display. When virtual objects are formed from museum objects, reuse becomes practical and object classes can define multiple contexts. Several stories can be told with the one set of objects; several viewpoints of the one major issue can be presented; there can be multiple narratives. This paper illustrates support for multiple viewpoints in a multi-modal linking process. Issues discussed include an object definition structure and layered organization of material. The paper also traverses some political and cultural aspects that are limiting. In its educational applications it sees support for multiple narratives as promoting an understanding of others and thus fostering an attitude of tolerance.
Author
*Museums; Virtual Reality*

**20050215441** University of Technology, Sydney, Australia
**Defining Agent Requirements for Constructivist Learning**
Hawryszkiewycz, Igor T.; IPSI 2005 Amalfi Proceedings; [2005]; 9 pp.; In English; See also 20050215422; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Constructivist learning has been proposed as a way to both personalize learning and develop competencies in a context. This paper proposes a general support system for personalized learning to assist users to setup learning spaces that match the learning process. It combines collaborative systems, agent systems and learning models into an integrated environment to facilitate personalized learning. It describes software agents that can be used to provide such support. It first defines the various ways for supporting personalized learning. It t hen defines leaning spaces that must be set up to support these ways and how agents can be used to do so. Keywords Learning Systems, Constructivist learning, Software Agents, Collaborative Systems
Author
*Learning; Computer Systems Programs; Software Engineering; Support Systems*

**20050215443** Akita Univ., Japan
**'A New International University for the Global Age: Akita International University, Japan, A Case Study**
Movrich, Ronald F.; IPSI 2005 Amalfi Proceedings; [2005]; 9 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The phenomenon of globalization has produced well known, if controversial, effects on various aspects of life. It is a process that has increased interdependence in both political and economic spheres. It also has geographic, cultural and social dimensions. The process of globalization, moreover, affects not only economies, societies and political systems but also higher education. Globalization, as Harvard Professor David E. Bloom has written, has turned a piercing spotlight onto each country's higher education systems and institutions. By this he means that globalization exerts increased pressures for educational change and reform in schools, colleges, and universities. These transforming forces are felt both in the developing and the developed world. This paper examines one such attempt at university reform in the global era in Japan. It is a case study of Akita International University (AIU). The publicly funded university opened its doors in April, 2004, to some 150 Japanese students and about 50 international students. Located in Akita Prefecture, some 400 miles North of Tokyo, it is a small, liberal arts college with just two majors: Global Business and Global Studies. This paper first looks briefly at the atmosphere of higher education in Japan at the beginning of the 21st century and assesses the need for change. It then examines how AIU came into being, its role and philosophy, and some unique features of the university and especially its Global Studies Program.
Author
*Japan; Universities; Education; Economics*

**20050215444** Laske (M.), Meersburg, Germany
**Why They Win or Lose (the Issue of Leadership in Virtual Project Teams)**
Laske, M.; Neunteufel, H.; IPSI 2005 Amalfi Proceedings; [2005]; 9 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Starting in the 70s of the twentieth century the term team has become virtually indispensable as an ingredient of project organizations. Teamwork has been successfully applied to projects of increasing complexity, where the direct (autocratic) style of leadership proved inefficient. Virtual project teams appear in projects conducted by several independent individuals

(companies of people), mainly held together by their common goal and communication interfaces, without having to leave their home organization or even their work place. This paper will investigate the main differences between virtual and non-virtual project teams, possible measures and methods to lead virtual project teams as efficiently as co-located teams, and the probability of virtual teams to foster the emergence of problems such as social loafing, free riding, moral hazard, diffusion of responsibility. The paper will propose measures such as emphasis on the task at hand, formalization and reduction in volume of work packages, improved structure of project support tools, and will discuss additional possibilities in this area. Terms like virtual organization and virtual team will be discussed. By comparing leadership tasks in traditional and virtual teams, differences will be made visible and will lead to a modification of the tasks a project manager must fulfill.
Derived from text
*Leadership; Organizations; Virtual Reality*

**20050215449** Megatrend Univ. of Applied Sciences, Belgrade, Serbia
**Development of Generic Virtual University Reference Architecture**
Angelina, Njegus V.; IPSI 2005 Amalfi Proceedings; [2005]; 7 pp.; In English; See also 20050215422; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This work proposes a Generic Virtual University Reference Architecture (GVURA) for the development and maintenance of Models based on this architecture. The potential of communication media, networks and information technologies has provided the means for worldwide communication online and this opportunity can be used in education. In this way education provides effective education process and also improve the cost effectiveness. The primary objective of GVURA was to provide a framework for analyzing the evolving requirements of an virtual university and translating these requirements into a system, which enables and integrates the functions, which match the requirements. The GVURA Reference Architecture contains a limited set of architectural constructs to completely describe the requirements of and the solutions for a particular virtual university. The System User, who is the best able to understand the virtual university needs, uses the requirements building blocks to create the Requirements Definition Model that satisfy its objectives. This model finally will be translated into an Implementation Description Model.
Author
*Virtual Reality; Models; Universities; Architecture (Computers)*

**20050215450** McGill Univ., Montreal, Quebec, Canada
**Interdisciplinary Research Into Learning and Thinking Processes**
Donald, Janet Gail; IPSI 2005 Amalfi Proceedings; [2005]; 21 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Interdisciplinary research into learning and thinking processes has conceptual foundations in the methods of inquiry espoused by different disciplines and the theories of learning promulgated by psychologists and educators. These conceptual models, whether they arise from specific disciplines or from the learning sciences, provide context in our search for ways to improve learning and thinking in our disciplines. In a series of studies, we examined the challenges confronting university instructors in helping students learn to think in different programs and at different stages in their education. We found a set of thinking processes that can be applied and developed across disciplines in a variety of instructional contexts. A fundamental quandary in interdisciplinary research into learning and thinking processes is whether interdisciplinary is a simple or complex phenomenon. Interdisciplinary is described modestly in the dictionary as of or between more than one branch of learning. The complexity arises when we consider what we know about different branches of learning and how they are related. Interdisciplinary research into learning and thinking processes at the postsecondary level must therefore take into account the literatures of different disciplines as well as the higher education research on student learning. A beginning point is faculty and student expectations. One of the first things one learns when attempting to study how learning and thinking occur in different disciplines is that there are many ways of perceiving postsecondary teaching and learning. From the perspective of faculty, learning is a matter of disciplinary knowledge and methods of inquiry, but faculty expectations of students differ across disciplines. Most physics professors expect students to enter their programs with a high degree of logical ability, while English professors expect students to learn to argue logically in their courses (Donald, 1988). In our studies, engineering professors did not expect entering students to be able to think abstractly, but did expect them to be able to think logically and to reason. Law professors expect students to learn to think like a lawyer, to acquire the skills and methods of analysis and procedure (Donald, 2002). Since scholars learn and think within disciplines, an important source for what is to be learned is what our disciplines tell us, particularly the methods of inquiry used and the learning tasks prescribed by these methods. Learning theories have a more general effect, influencing what happens in the classroom and how learning is assessed. The experience

of adapting to university may lead students to view learning from a very different perspective, What do I need to do to survive and succeed? Recognizing this range of perspectives is a first step in responding to the challenge of understanding interdisciplinary research on postsecondary education.
Author
*Cognitive Psychology; Research and Development; Learning Theory*

**20050215452** Lin (Chong-Ming), Sunnyvale, CA, USA
**Some Thoughts About Integration: From Michelangelo, Bada Sanren , James Joyce to SOC, Internet & 'Innernet'**
Lin, Chong-Ming; IPSI 2005 Amalfi Proceedings; [2005]; 16 pp.; In English; See also 20050215422; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

IPSI conference is a unique conference. It s like a Sistine Chapel with internet technology as its focal point, and its wings cover various interdisciplinary fields. Now, the new VIP Scientific Forum formally extends the main conference into other related fields which are also part of the modern civilization but associated closely with the core technology --- Internet. To me, this technology and culture balanced conference had integrated many new ideas into the conference s discussions in the past, even when these ideas were still at their infant stages. As a result, while many technical conferences are becoming dull after years and years in running their narrowly focused technical programs repeatedly on familiar subjects and limited directions, IPSI has raised its vision in addressing and exploring new ideas constantly. It is under that impression, this author likes to present some of his recent thoughts regarding a timeworn word, 'integration', with new views, starting freshly from arts, literature, integrated circuits, then connecting the observations back to the conference s core subject internet, before looking into a future mirror image technology --- 'innernet'. Nearly fifty years ago, an European scientist and literature writer, Sir Charles Percy Snow (1905- 1980), in 1959, followed some other leading intellectuals discussions on communication problems between scientific and liberal art groups, presented his worry through his famous lecture at Cambridge University, with the title of 'The Two Cultures and the Scientific Revolution' . His lecture later was published as a book, with shorter title 'The Two Cultures', which had generated hot debates from scholars around the world in both groups, and the debate is still lingering on today. Ten years ago, another book , 'The Clash of Civilizations?', by Samuel Huntington, had again shocked many intellectual scholars around the world, with even more intensity and heat than 'The Two Cultures' had generated. While both books generated 'shock waves' around the world, but they have different focuses. Snow s book was addressing the existing and widening gap between two culture camps of different knowledge backgrounds; while Huntington s book, was predicting the 8 major civilization groups, will clash with each other, due to their power operations are getting too close to each other s power fields, thus the clashes between major civilizations will be tragically unavoidable, especially between the Arabs and the USA.
Author
*Integrated Circuits; Internets; Words (Language); Predictions; Lectures*

**20050215497** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Common Badging and Access Control System (CBACS)**
Baldridge, Tim; [2005]; 20 pp.; In English; Government Smart Card - Inter Agency Advisory Board Meeting, 10 Aug. 2005, Washington, DC, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

The goals of the project are: Achieve high business value through a common badging and access control system that integrates with smart cards. Provide physical (versus logical) deployment of smart cards initially. Provides a common consistent and reliable environment into which to release the smart card. Gives opportunity to develop agency-wide consistent processes, practices and policies. Enables enterprise data capture and management. Promotes data validation prior to SC issuance.
Derived from text
*Access Control; Data Management; Policies*

**20050216429** CoreTech Consulting Group, Inc., King of Prussia, PA, USA
**Project Management Methodology and Model for an e-learning Implementation**
Ruero, John Peter Abraham Q.; Orcena, Charles Louis L.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 6 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The distinct attribute of deploying an e-Learning Project in Universities and Colleges is that this is not another Information Technology (IT) project for a school. The e-Learning Implementation Project is a project that targets the very core-competency of the academic institution, which is instructional delivery. Implementing an e-Learning project requires understanding of each institution s cultural, organizational (political), pedagogical, financial and infrastructural plans in order to succeed in the project. The paper presents a Project Management Methodology and Model and how it can be effectively utilized in an e-Learning Project Implementation. More importantly, the paper presents the what, why s and how s on managing an e-learning project. Further, it provides practical and useful insights to satisfy and manage stakeholders with varying needs and expectations.
Author
*Information Systems; Education; Project Management; Deployment*

**20050216435** Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
**The Rhetorics of Restructuring in Higher Education: Unpacking the Myths of Network Necessity in Telematic Transformation**
Luke, Timothy W.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 34 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper explores how self-selecting 'experts' in the computing, educational consulting, and telecommunications industries generate the myths of inexorable modernization, often borrowed from the manufacturing sector of the economy, and turn them into a program of radical restructuring for a multi billion dollar service industry in the USA, namely, higher education. Technology by itself does nothing. Yet, the rhetoric of restructuring being pushed by trade groups, like Educause, or commercial firms, like Microsoft, disguises a series of changes in administrative authority, job control rules, and professional practices on college and university campuses as a set of technologically-driven imperatives that, first, should not, and, second, cannot be resisted by anyone who believes in 'progress.' These changes would empower off-campus experts, like software designers and network controllers, over and against on-campus professors and deans allegedly to 'rationalize,' 'streamline,' or 'restructure' the university to better face the challenges of the 21st century. It is not clear, however, that all of these changes are needed, that they would improve the educational process, or that they would save money. Instead, these changes are aimed at cheapening the educational product, disempowering one bloc of professional workers by breaking their jobs into more paraprofessional tasks, or redirecting how, where, and by whom money is spent on education. This paper, then, traces out how these rhetorical strategies are at work in higher education.
Author
*Telecommunication; Education; Procedures; Personnel; Universities*

**20050216440** Michigan State Univ., MI, USA
**Low-income Children's Career Aspirations and Internet use: Findings from the HomeNetToo Project**
Jackson, Linda; vonEye, Alexander; Biocca, Frank; Zhao, Yong; Barbatsis, Gretchen; Fitzgerald, Hiram; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 5 pp.; In English; See also 20050216400
Contract(s)/Grant(s): NSF ITR-08-05348; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

HomeNetToo is a longitudinal field study to examine the antecedents and consequences of home Internet use in low-income families (NSF: Information Technology Research Grant # 085348; http://www.HomeNetToo.org). The project occurred between Fall 2000 and Spring 2002, and included 140 children whose Internet use was automatically and continuously recorded, and who completed surveys at multiple points during the project. Most of the children were 13 year-old African American (83%) males (58%), living in single-parent households (75%) in which the median annual household income was less than $15,000. This report focuses on relationships between their home Internet use and their career aspirations. The following hypothesis was formulated: Children who aspire to careers in the professions (e.g., doctor, lawyer) or computing will use the Internet more than will children who aspire to other careers, regardless of academic performance. Derived from text
*Information Systems; Surveys; Occupation; Internets*

**20050216442** Cisco Systems, Inc., Milpitas, CA, USA

**Designing Scalable E-Learning Environments**

Frezzo, Dennis C.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 8 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

E-learning is transforming the process of education. Important questions surround e-learning. These questions drive investigations in one of the largest e-learning laboratories in the world, the Cisco Networking Academy Program. The Academy Program is a private-public partnership between Cisco Systems, Inc. and public schools, colleges, and universities around the world. This paper describes the teaching and learning principles that have guided the design of e-learning environments that have helped the program grow from one Academy in San Francisco in 1996 to approximately ten-thousand Academies in 150 countries today.

Author

*On-Line Systems; Learning; Education*

**20050216707** Jyvaskyla Univ., Finland

**From Tacit to Explicit: Contextualistic Account of Knowledge and Information Systems**

Pohjola, Pasi; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 12 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This is an investigation of social aspects of knowledge, how these aspects have relation to information systems and how they are relevant for ignorance management. The central claim here is that methods for ignorance management should include methods for explicating tacit presuppositions. It is argued that the lack of such methods (or properties) in contemporary knowledge management systems have foundations in theoretical misconceptions of knowledge. These misconceptions are examined here and an alternative conception of knowledge is suggested for the foundations of development of future information systems. Ignorance management can be seen as a discipline for managing knowledge issues that are in typical cases ignored. These kinds of ignored issues are for example lack of relevant information in decision making and tacit presuppositions in organizational action. The discussion here of knowledge and of ignorance management is targeted especially to the explication of tacit presuppositions. It is suggested that technological development of information systems should target to developing ignorance management methods, especially methods that enable explication of tacit presuppositions. The claim for the explicating ignorance management methods is based on two interrelating issues of knowledge, contextualism and explication of tacit presuppositions. It is shown that these are key features of knowledge, especially in the context of information systems, and that these features have relevance for the technological development of future information systems. In knowledge management literature, future information systems should answer at least these two demands: (i.) these systems ought to be seen as embedded in broader sociotechnical systems and (ii.) these systems ought to enhance knowledge sharing and knowledge transfer1. The list of demands is here expanded by ignorance management, because the analysis of knowledge implies that knowledge can be represented truly only in a relation to its existing context.

Author

*Decision Making; Management Information Systems; Information Systems; Management Methods; Management Systems*

## 81
## ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

**20050215071** Kyushu Inst. of Information Sciences, Kyushu, Japan

**Concept of e-OJT**

Gouda, Kazumasa; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 4 pp.; In English; See also 20050215042; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

These days many corporations need business person who is highly skilled enough to start job immediately. However, most of newcomers or applicants are novice, and far from enterprise's needs. In such situation, education for novices is very

important, and influences greatly success of companies. OJT, or On the Job Training, is one of solutions. This paper introduces concept of e-OJT, and shows its applications.
Author
*Education; Commerce; Personnel Development; Human Resources; Tasks*

**20050215300** Alabama Univ., Huntsville, AL, USA, Alabama Univ., Tuscaloosa, AL, USA, Alabama Agricultural and Mechanical Univ., Normal, AL, USA
**The 2004 NASA Faculty Fellowship Program Research Reports**
Pruitt, J. R.; Karr, G.; Freeman, L. M.; Hassan, R.; Day, J. B., Compiler; January 2005; 360 pp.; In English; See also 20050215301 - 20050215342
Contract(s)/Grant(s): NNM04AA08G
Report No.(s): NASA/CR-2005-213847; M-1137; No Copyright; Avail.: CASI: A16, Hardcopy

This is the administrative report for the 2004 NASA Faculty Fellowship Program (NFFP) held at the George C. Marshall Space Flight Center (MSFC) for the 40th consecutive year. The NFFP offers science and engineering faculty at U.S. colleges and universities hands-on exposure to NASA s research challenges through summer research residencies and extended research opportunities at participating NASA research Centers. During this program, fellows work closely with NASA colleagues on research challenges important to NASA's strategic enterprises that are of mutual interest to the fellow and the Center. The nominal starting and .nishing dates for the 10-week program were June 1 through August 6, 2004. The program was sponsored by NASA Headquarters, Washington, DC, and operated under contract by The University of Alabama, The University of Alabama in Huntsville, and Alabama A&M University. In addition, promotion and applications are managed by the American Society for Engineering Education (ASEE) and assessment is completed by Universities Space Research Association (USRA). The primary objectives of the NFFP are to: Increase the quality and quantity of research collaborations between NASA and the academic community that contribute to the Agency s space aeronautics and space science mission. Engage faculty from colleges, universities, and community colleges in current NASA research and development. Foster a greater public awareness of NASA science and technology, and therefore facilitate academic and workforce literacy in these areas. Strengthen faculty capabilities to enhance the STEM workforce, advance competition, and infuse mission-related research and technology content into classroom teaching. Increase participation of underrepresented and underserved faculty and institutions in NASA science and technology.
Author
*Competition; Education; Space Missions; Technologies*

**20050215308** Clark-Atlanta Univ., GA, USA
**Investigation of Integrated Vehicle Health Management Approaches**
Paris, Deidre; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXXII-1 - XXXII-6; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

This report is to present the work that was performed during the summer in the Advance Computing Application office. The NFFP (NASA Faculty Fellow Program) had ten summer faculty members working on IVHM (Integrated Vehicle Health Management) technologies. The objective of this project was two-fold: 1) to become familiar with IVHM concepts and key demonstrated IVHM technologies; and 2) to integrate the research that has been performed by IVHM faculty members into the MASTLAB (Marshall Avionic Software Test Lab). IVHM is a NASA-wide effort to coordinate, integrate and apply advanced software, sensors and design technologies to increase the level of intelligence, autonomy, and health state of future vehicles. IVHM is an important concept because it is consistent with the current plan for NASA to go to the moon, mars, and beyond. In order for NASA to become more involved in deep exploration, avionic systems will need to be highly adaptable and autonomous.
Derived from text
*Software Engineering; Avionics; Management Planning*

**20050215352** Monash Univ., Australia
**Use of Knowledge Mapping to Elicit Knowledge Flows and Gaps in an Insurance Organization**
Thosar, Mandar; Burstein, Frada; IPSI 2005 Hawaii Proceedings; [2005]; 12 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Knowledge maps are proposed as one of the tools to elicit the knowledge flows and gaps within organization. Different authors have defined knowledge maps differently and there is no common agreement on the way this method can be applied

as part of knowledge management initiative. This paper analyses the advantages, disadvantages and limitations of using knowledge mapping technique for making knowledge artefacts and flows explicit and visible. The authors share the lessons learned, while implementing a knowledge mapping project at a leading health insurance companies in Australia. Index Terms Knowledge management, knowledge mapping, knowledge structures, health insurance, case study
Author
*Health; Insurance (Contracts); Knowledge Based Systems*

**20050215354** San Francisco Univ., CA, USA
**Transferring Critical Path Technology to Financial Planning**
Huxley, Stephen J.; IPSI 2005 Hawaii Proceedings; [2005]; 18 pp.; In English; See also 20050215347; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To scientists and other young professionals under the age of 50, especially those who specialize in technical research, retirement probably seems like a distant, barely visible event, remote on the planning horizon. Even those over the age of 50, when the passing of time can no longer be denied, may pay little attention to their financial futures. Nevertheless, both types of workers are likely to be saving money for that far off day retirement. A question that probably haunts many, at least at the subconscious level, is whether they saving enough (or too much). While they may be well versed in the analytical and engineering methodologies within their own fields, they often have only a hazy idea of how to apply similar quantitative tools to personal financial matters. If they seek help from a financial professional, they may get lucky and find someone who can perform the simple mathematics of projecting the path their retirement account should follow to meet their goals. But many financial planners, especially stockbrokers, are trained more to sell financial products than to perform analysis. Furthermore, even if the planner helps them to correctly determine their ultimate financial goal correctly, the information is seldom presented in an easily understood format. This paper transfers the technology of the critical path concept used in project management theory to personal financial planning theory. The critical path separates the planning horizon over time into a 'safety zone' and a 'danger zone.' If a retirement portfolio drops below the critical path, the probability it will hit its target drops below an acceptable level of chance. This level of chance can be set at any value between 0 and 1. If the median growth rate for an index fund were used, for example, dropping below the critical path would imply a less than 50 probability of reaching the goal. This idea seems so simple that one would think that all financial advisors use the critical path routinely. Unfortunately, such is not the case. Most financial advisors are sufficiently well trained to calculate required growth rates to meet a goal at the end of some span of time. But they generally focus on how well the portfolio did in the prior period without the proper perspective of what it means with regard to meeting the goal at the end of the planning horizon. Their or their clients may then make poor decisions regarding their investments, and permanently damage their chances of meeting their ultimate goal. The critical path provides the proper perspective as to the correct investment actions to take over time. As an example, it will be shown later how investors saving for retirement could have used the critical path concept to avoid the major stock market decline that began in March 2000.
Author
*Project Management; Probability Theory; Retirement*

**20050215601** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Communicating Risk to Program Managers**
Shivers, C. Herbert; [2005]; 17 pp.; In English; 23rd International System Safety Conference, 22-25 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: CASI: A03, Hardcopy

Program Managers (PM) can protect program resources and improve chances of success by anticipating, understanding and managing risks. Understanding the range of potential risks helps one to avoid or manage the risks. A PM must choose which risks to accept to reduce fire fighting, must meet the expectations of stakeholders consistently, and avoid falling into costly 'black holes' that may open. A good risk management process provides the PM more confidence to seize opportunities save money, meet schedule, even improve relationships with people important to the program. Evidence of managing risk and sound internal controls can mean better support from superiors for the program by building a trust and reputation from being on top of issues. Risk managers have an obligation to provide the PM with the best information possible to allow the benefits to be realized (Small Business Consortium, 2004). The Institute for Chartered Accountants in England and Wales sees very important benefits for companies in providing better information about what they do to assess and manage key business risks. Such information will: a) provide practical forward-looking information; b) reduce the cost of capital; c) encourage better risk management; and d) improve accountability for stewardship, investor protection and the usefulness of financial reporting. We are particularly convinced that enhanced risk reporting will help listed companies obtain capital at the lowest possible cost

(The Institute of Chartered Accountants in England &Wales, June 2002). Risk managers can take a significant role in quantifying the success of their department and communicating those figures to executive (program) management levels while pushing for a broader risk management role. Overall, risk managers must show that risk management work matters in the most crucial place-the bottom line- as they prove risk management can be a profit center (Sullivan, 2004).
Author
*Project Management; Risk; Communicating; Commerce; Cost Reduction*

**20050216690** Technical Research Centre of Finland, Finland
**Managing Knowledge - and Ignorance - in Paper Mill Design**
Siltanen, Pekka; Syrjanen, Timo L.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 9 pp.; In English; See also 20050216686; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Today large engineering projects, such as plant design projects, are implemented using concurrent design methodologies. Knowledge sharing within a project organisation is a key element for successful project execution. What we need is a common language to represent knowledge so that it can be shared between designers using different software and performing different design tasks. In many cases we make important project decisions based on incomplete information. Part of the knowledge management in concurrent design projects is to manage not only knowledge that exists, but also to be aware of those decisions, which were based on missing or incomplete information. Today knowledge of the rationale behind the design decisions is mostly not managed adequately. It seems to us that there are methodologies that help sharing this kind of information, but practical implementations require more specific definitions and tools.
Author
*Information Management; Industrial Plants; Plant Design*

**20050217129** Societe Nationale d'Etudes et de Construction de Moteurs Aeronautiques, France
**European Space Propulsion Perspective**
Souchier, Alain; Fifth International Symposium on Liquid Space Propulsion; January 2005; 20 pp.; In English; See also 20050217123; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Contents include the following: Restructuring of the Ariane launcher sector. Qualification of the Ariane 5 ECA launcher. Reorganisation of the Ariane launcher sector. Sustaining guaranteed access to space with Ariane 5. Unblocking of the ISS exploitation programme ( 2002 - 04). Relations between the European Space Agency and the European Union. 2010 perspectives for the European launcher sector. Future launchers preparatory programme ( FLPP) Soyuz at the CSG.
CASI
*Ariane Launch Vehicle; European Space Agency; European Union; Propulsion*

## 82
## DOCUMENTATION AND INFORMATION SCIENCE

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

**20050214918** Ministry of Housing, Spatial Planning and the Environment, Netherlands
**GroupIntelligence: Automated Support for Capitalising On Group Knowledge**
deWaart, Jules; vanGenuchten, Michiel; Schuwer, Robert; Verveen, Stephan; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

GroupIntelligence is a new tool for the support of decision- making and is an extension of a well-known group support system called GroupSystems. GroupIntelligence can create a database out of the results of one or more meetings using GroupSystems and it can generate a website out of this database. Most of the examples that I will show you are slides that come from the website of GroupSupport.com; a young Dutch ICT firm who developed the tool.
Author
*Decision Making; Support Systems; Websites; Knowledge Based Systems*

**20050214943**

**Distributed Information Systems Building Techniques**

International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 10 pp.; In English; See also 20050214876; Original contains color illustrations
Contract(s)/Grant(s): GA102/01/1485; MSM2-62200012; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As all other higher education institutions, Brno University of Technology has been working on its university information system in order to provide its students and faculty with better tools for communication and reporting. Facing the distributed nature of its quite independent schools and departments, the university had to employ new technologies to enable co-operation of various information systems, already in place or being developed, with the central databases held at the top level. The solution seems to be usage of a metasystem to generate a system based on Web services complemented with an object-oriented data access. This paper gives a short overview of the technologies used and discusses the advantages they brought.
Author

*Object-Oriented Programming; Information Systems; Document Markup Languages; Data Bases*

**20050214954** Tokyo Univ., Japan

**Introduction of Information Infrastructure for Medical Academic Activities in Japan - UMIN and MINCS-UH**

Kiuchi, Takahiro; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In Japan, two characteristic information network projects are in progress at the initiative of national university hospitals, fully funded by the Japanese government. One is an Internet-based network service called UMIN (University hospital Medical Information Network) established in 1989, and the other is a satellite-based broadcasting system called MINCS-UH (Medical Information Network by Communications Satellite for University Hospitals) established in 1996. Currently UMIN is available to all Japanese medical researchers and the number of its registered users is about 138,000. It provides various information services including email, mailing list, database, web hosting, on-line data entry system for clinical and epidemiological research, electronic library, etc., and the number of web page views per month is more than 6,000,000. Many useful services of UMIN attract medical researchers and, vice versa, many user accounts attract information service providers such as academic societies, medical schools, etc. I believe that UMIN is one of the most successful examples of public information infrastructure for academic activities. Currently MINCS-UH is available in thirty national university hospitals in Japan. Its characteristics can be summarized as 1) the first state-of-the-art digital HDTV system in the world, 2) bi-directional communications, 3) 128-bit strong digital encryption method, and 4) easy operations. More than one hundred programs are broadcast each year, and staff in each university hospital have learned how to make better use of bi-directional distant communications with high quality moving images. Index Terms Internet services, medical information systems, satellite broadcasting, HDTV, communication system security
Author

*Information Systems; On-Line Systems; Clinical Medicine; High Definition Television; Communication Satellites; Hospitals; Epidemiology; Data Systems*

**20050214980** Bologna Univ., Italy

**Design and Implementation of an Adaptive Learning Management System**

Casadei, Giorgio; Magnani, Matteo; Sirocchi, Fabio; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The paper focuses o an open source intelligent learning system. The innovative aspect of this work is represented by the synergy between three modules: lesson generator, test generator and interaction tool. Te ‘lesson generator’ dynamically assembles customized web pages from a data base of learning resources: the system in time is able to change its behaviour using the student feedback obtained by formative assessment. The ‘test generator’ produces customize tests depending on the student answers. The ’ interaction tool’ allows real-time peer interactions between users. By monitoring these interactions it is possible to obtain qualitative data to update the student models.
Author

*Management Systems; Real Time Operation; Data Bases; Feedback*

**20050214981** California Lutheran Univ., Thousand Oaks, CA, USA

**Extending the Personal Response System (PRS) to Further Enhance Student Learning**

Wines, Joan; Bianchi, Julius; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The EduCue classroom has proven successful at California Lutheran University (CLU) and at other schools across the U.S. (http://www.educue.com/users.htm). In a general climate of sparse instructional assessment data, quantitative studies confirm that the EduCue and other Personal Response Systems (PRS) increase student learning by as much as 50% (http://www.educue.com/links.htm). This startling information has prompted us to explore how successful PRS teaching practices might be integrated with more powerful hand-held PDA devices (Palm(Registered TradeMark), CLIE(Registered TradeMark), Visor(Regitered TradeMark), Blackberries(Registered TradeMark)). The great potential (and responsibility) for further enhancing PRS teaching and learning techniques with the PDA technologies lies not only in Education, but in business and government as well. This proposed PDA configuration deserves a wide-ranging, collaborative, public-domain development, so that all concerned sectors and communities can reach consensus on the standards required for its implementation.

Author

*Education; Students; Schools; Rangefinding; Procedures*

**20050214983** Hong Kong Polytechnic, Kowloon, Hong Kong

**Generating Color Palettes for Compressed Video Sequences**

Cheung, Wan-Fung; Chan, Yuk-Hee; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 5 pp.; In English; See also 20050214876; Original contains color illustrations

Contract(s)/Grant(s): A412; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents a palette generation algorithm which extracts color information from a compressed video stream directly and, based on the extracted information, design colour palettes for displaying the video sequence accordingly. It significantly reduces the complexity of palette generation by effectively reducing the number of training vectors used in the training process without sacrificing the quality. The palette obtained can provide a good display quality even if zooming and panning exist in a shot. Simulation results show that the proposed method can achieve a significant SNR improvement as compared with conventional video colour quantization schemes.

Author

*Color; Video Compression; Algorithms; Sequencing*

**20050214984** California Univ., Berkeley, CA, USA

**The Social Infrastructure of E-Education**

Lyman, Peter; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 15 pp.; In English; See also 20050214876; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The infrastructure for e-education is not only technical, it requires social, economic and political innovation. Innovations cannot be planned, rather they involved unpredictable changes in our institutions. We, in the midst of this innovation, must make the best inferences we can based upon an analysis of this discontinuous process of change. To this end, this paper suggests five hypotheses about the emerging social infrastructure for e-education. They are: 1) Traditional educational institutions are optimized to use print for the transmission of information; it is not enough to replace printed information with software, as fundamental organizational changes are also required; 2) Traditional educational institutions are optimized to serve traditional markets, therefore too constrained to develop innovative e-education infrastructures and programs; 3) The Web is the first and most significant infrastructure for e-education thus far; 4) Information retrieval, not the transmission of information, will be one of the key pedagogical concepts of e-education; and 5) Intellectual property law is the primary inhibitor of the evolution of e-education.

Author

*Education; Information Retrieval; Intellectual Property; Data Transmission; Economics*

**20050214985** Telematica Instituut, Enschede, Netherlands

**Information Publishing on FRIENDS**

Salden, Alfons H.; terDoest, Hugo; Kersemakers, Rob; Slijp, Dion; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 10 pp.; In English; See also 20050214876; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We present an open web service architecture and infrastructure that fully supports information publishing across network, application and business layers. Our information publishing system is built on the Framework for Integrated Engineering and Deployment of Services, FRIENDS. This framework enables us to build a middle-ware platform for development, deployment and usage of distributed applications. It is also based on the Telecommunications Information Networking Architecture, TINA. The added values of FRIENDS are illustrated in the management, distribution and presentation (viewing and/or printing) of documents. Those beneficial features boil down to rapid and easy service life-cycle management of essential information publishing web services. On the one hand these web services support information publishing by providing viewing, printing, subscription and payment services to customers. On the other hand they offer security, digital rights management, accounting, billing and payment services to the publisher. We focus in addition on the ease of integrating financial, security and digital rights management services to sustain the core business processes of subscribing, viewing and printing in our business case. We do so by applying an Application Service Provisioning solution to information publishing in which a number of secondary business processes like accounting and billing are outsourced to third parties (TTP is used in the context of certification). Author

*Information Management; Accounting; Telecommunication; Management Information Systems; Information Systems; Commerce*

**20050214986** Universita degli Studi di Salerno, Italy

**Models for E-Learning Environment Evaluation: A Proposal**

Colace, F.; DeSanto, M.; Vento, M.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Our 'information-oriented' society shows an increasing exigency of life-long learning. In such framework, on-line Learning is becoming an important tool to allow the flexibility and quality requested by such a kind of learning process. In the recent past, a great number of on-line platforms have been introduced on the market showing different characteristics and services. To evaluate them both pedagogical and technological aspects must be carefully evaluated. This paper proposes a model for describing and characterizing online learning platform component. The model is then used to evaluate the most known existing commercial platform. Author

*Education; On-Line Systems; Information Systems*

**20050214999** Bowie State Univ., MD, USA

**Document Ontology: A Statistical Approach**

Srivastava, Sadanand; GildeLamadrid, James; Velvadapu, Chakravarthi S.; International Conference on Advances in Infrastructure for e-Electronic, e-Business, e-Education, e-Science, e-Medicine on the Internet (SSGRR-2002s); [2002]; 7 pp.; In English; See also 20050214876; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes a system, which constructs a domain specific ontology, by reading a collection of related text documents, and extracting ontological information statistically. In particular, the system determines word frequencies, which are formed into a frequency matrix. The well-known Singular Value Decomposition is performed on the matrix, and the resulting matrices are used to determine statistical relationships between document terms. These relationships are then used to build an ontological graph. The ontology graph can be viewed and manipulated with our user interface, or loaded into user code. Our system is designed to allow updates to the ontology by either extending the document base, or limited user intervention. It provides a method of generating richer domain specific knowledge, with minimal user interaction. Keywords: Information Retrieval, Ontology, Latent Semantic Indexing Text documents Textual processing Statistics gathering SVD/LSI Graph construction Ontology Author

*Statistical Analysis; Large Scale Integration; Information Retrieval; Decomposition; Data Processing*

**20050215063** National Security Research Inst., Daejon, Korea, Republic of

**Vulnerability Category by Security Risk Analysis on the Information Communication Infrastructure**

Jung, YoonJung; Lee, NamHoon; Kim, Injung; Oh, Ilsok; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 4 pp.; In English; See also 20050215042; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Management, physical and technological vulnerabilities would be found in the process of the steps of implementing security risk analysis on the Information Communication Infrastructures. Now, it would be urgently needed to analyze these vulnerabilities from a complex point of view of the risk analysis on the Information Communication Infrastructure, not to analyze technological vulnerabilities connected to Server or web, such as The Twenty Most Critical Internet Security Vulnerabilities announced by SANS Institute and FBI, and 10 scariest Web vulnerabilities announced by OWASP etc.. In this paper, we would describe and suggest the each 10 vulnerabilities by sorting out management, physical and technological vulnerabilities through asset, risk, vulnerability, protection countermeasure process in the implementing risk analysis on the Information Communication Infrastructures. I

Author

*Vulnerability; Information Management; Countermeasures; Risk; Internets; Computer Security*

**20050215068** National Polytechnic Inst., Mexico City, Mexico

**Is Word Sense Disambiguation Useful in Information Retrieval?**

Gelbukh, Alexander; Sidorov, Grigori; Chanona-Hernandez, Lilana; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Word sense disambiguation (WSD) is a challenge in the field of computational linguistics. The problem of WSD is related with the fact that the words in a dictionary have several senses (phenomenon of polysemy), but only one sense is actually used in the text. WSD method should choose the correct sense. Is this technique useful in information retrieval (IR)? We present an evaluation of how different the senses of the same word are. The idea is that if the senses are rather similar then WSD is of no use for IR because neither the user will be able to distinguish between them for his/her information need, nor the WSD methods will produce reliable results. On the contrary, if there are sufficient differences between the senses then it is useful to apply WSD in IR. We used an explanatory dictionary of Spanish. The definitions in the dictionary were morphologically normalized. The algorithm of comparison calculates the similarity between word senses on the basis of the literal intersection between word senses and, as well, the intersection of synonyms of words. The dictionary of synonyms was used for obtaining the information about synonyms. The experimental results show that about 90% of word senses are substantially different, which means that WSD is useful for IR, nevertheless, about 10% of senses are rather similar, that means that the dictionary we used should be corrected to be able to distinguish these senses for IR. Index Terms computational linguistics, word sense disambiguation, information retrieval.

Author

*Information Retrieval; Words (Language); Sensory Perception; Natural Language Processing; Analogies; Linguistics*

**20050215072** Abo Akademi, Turku, Finland

**Mobility: The Basis for Value Creation in Mobile Commerce?**

Anckar, Bill; Eriksson, Niklas; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 11 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Drawing on an analytical framework that can be used to assess the extent to which different mobile services are likely to offer customer value in comparison to stationary electronic channels, this paper offers both theoretical and empirical contributions relating to customer value creation in mobile commerce, and especially the role of mobility as a driver for consumer adoption of mobile commerce. Based on the findings from a survey conducted with a convenience sample of 113 Finnish students, we offer some early insights relating to the main reasons for consumers interest in different mobile services, and the primary settings in which mobile services will be used. In addition, the consumers interest in a number of commonly proposed mobile success applications is explored. The findings indicate that consumers indeed perceive mobility to be at the

core of the value proposition of mobile commerce, although some mobile services clearly stood out as highly attractive even in a fixed setting.
Author
*Telecommunication; Mobility; Commerce; Internets*

**20050215084** Karlova Univ., Prague, Czechoslovakia
**Hierarchical Associative Memories for Path Prediction**
Teskova, J.; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 5 pp.; In English; See also 20050215042
Contract(s)/Grant(s): INF/MFF 300/2002/A; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The emerging development in information technologies enables the use of artificial neural networks also in areas like navigation, cartography or telecommunication. These research areas require processing of high-dimensional spatial information about external world which corresponds in this context to spatial (geographical) maps, plans of buildings, etc. Strategies for the path prediction in spatial maps can be based on associative memories. During our mutual cooperation with Iveta Mrazova, we have proposed the model of the so-called Hierarchical Associative Memory (HAM) model which comprises an arbitrary number of associative memories grouped hierarchically in several layers. This model was developed with respect to allow a reliable storage and recall of larger amounts of spatial data and enable storing of mutually highly correlated data. Some analysis and experimental results will be briefly discussed, too.
Author
*Associative Memory; Data Processing; Neural Nets; Telecommunication*

**20050215087** Colombo Univ., Colombo, Sri Lanka
**Digital Publishing**
Gunawardana, Nalaka; Bit, Gration Psh; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; 20 pp.; In English; See also 20050215042; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Though the survey is all about electronic books, in order to produce more practical and meaningful results, the survey concentrates on the topics such as digital publishing ,electronic journals ,internet publishing, electronic publishing and even digital libraries where all the topics relate to one another hence the reader can get a broad picture in all these aspects. It describes the evolution and progress of electronic books starting form early electronic text systems to the more popular Internet based Book publishing systems used nowadays. The flow of the survey (using titles) also imitates the evolution of the electronic books as it is. It also examines various aspects of the past as well as present and future of electronic books. Early design systems, and their design issues and what were the problems encountered earlier were also discussed thoroughly in order user to understand the early environment and problems faced with. Then it examines the necessity of having a common standard and advantages of coming to a particular standard. The survey also analyzes the progress of this common standard as well. How we can get rid of this complex rules. The famous and popular internet based book selling systems and their popularity are discussed here by taking example a real internet based book publishing system and how the internet deals with this electronic books and with their publishing. The survey figure out all the factors that has to be considered before putting a electronic book in to the web as well. Finally the broad term digital library and issues relating to digital library also discussed in detail at the end. Because of the many constrains encountered the survey doesn't examines that much technical side of the relevant topics but it covers all the main topics appropriately by giving real existing examples. Without restricting only to Electronic books it covers many areas as stated above.
Author
*Electronic Publishing; Internets; Texts; Libraries; Images*

**20050215090** Quebec Univ., Montreal, Quebec, Canada
**To Search or not to Search: this is the Question**
DiSciullo, Anna Maria; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; In English; See also 20050215042; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

We identify the main features of search engines based on key word search and show that they are not optimal. Their

limitations are basically due to the fact that they do not analyze information in terms of linguistic relations and that they disregard functional categories (so called stop words ), which constitute the logical relations in natural language. We present the main features of an information retrieval and extraction system based on natural language asymmetric relations. We show that asymmetric relations are crucial in the identification of the sub-parts of words and phrases, and that they must be part of the processing in information retrieval and extraction systems. We show that, together with the identification of functional elements, asymmetric relations contribute to improve the performance of search engines.
Author
*Natural Language (Computers); Information Retrieval; Linguistics; Words (Language)*

**20050215091** Belgrade Univ., Yugoslavia
**Integration of speech and text based search technologies**
Milosavljevic, Milan; Kovacevic, Branko; International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science, e-Medicine and Mobile Technologies on the Internet (SSGRR 2003s); [2003]; In English; See also 20050215042; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Growing Internet and other sources of information produce large archives of stored voice, mostly in non-transcribed form. Modern, reliable and fast access to such types of information imposes need to use of computers to directly search the voice for occurrences of the keywords, phrases or other types of naturally expressed queries. We propose new system architecture based on breaking the search into two stages: preprocessing stage performing computations common to all possible queries, and search stage which uses preprocessor output to quickly find search information. We show how dynamic synapse neural network models can be integrate in the acoustic subsystem level, as well as so called n-grame machine paradigm in the search engine subsystem. Finally, we give an estimate of potential gain obtained from such new synergistic system architecture.
Author
*Information Retrieval; Texts; Internets; Dynamic Models; Architecture (Computers)*

**20050215121** Old Dominion Univ., Norfolk, VA, USA, NASA Langley Research Center, Hampton, VA, USA
**Final Report for the Development of the NASA Technical Report Server (NTRS)**
Nelson, Michael L.; September 2005; 146 pp.; In English
Contract(s)/Grant(s): NAS1-01052; 23-104-05-20-30
Report No.(s): NASA/CR-2005-213515; No Copyright; Avail.: CASI: A07, Hardcopy

The author performed a variety of research, development and consulting tasks for NASA Langley Research Center in the area of digital libraries (DLs) and supporting technologies, such as the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). In particular, the development focused on the NASA Technical Report Server (NTRS) and its transition from a distributed searching model to one that uses the OAI-PMH. The Open Archives Initiative (OAI) is an international consortium focused on furthering the interoperability of DLs through the use of 'metadata harvesting'. The OAI-PMH version of NTRS went into public production on April 28, 2003. Since that time, it has been extremely well received. In addition to providing the NTRS user community with a higher level of service than the previous, distributed searching version of NTRS, it has provided more insight into how the user community uses NTRS in a variety of deployment scenarios. This report details the design, implementation and maintenance of the NTRS. Source code is included in the appendices.
Author
*Metadata; Libraries; Protocol (Computers); Documents; Deployment*

**20050215312** Morehouse Coll., Atlanta, GA, USA
**A Threefold Treatise on HOSC Performance Metrics, Implementing Full Cost Analysis, and a Competition Matrix for Future Business Planning**
Battle, Gregory; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. III-1 - III-26; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

This paper is an analysis and narrative of the qualitative business parameters of the Huntsville Operations and Support Center (HOSC), Building 4663 at the Marshall Space Flight Center (MSFC) in which the NASA faculty researcher was assigned the twofold tasks of analyzing HOSC Operations and Support Metrics (which measure a portion of Mission Systems Operations performances), as well as developing a comprehensive spreadsheet to rank possible future competition which will arise from the 'New Vision' under the new NASA Exploration Program initiative as espoused by NASA Director Sean O Keefe. More information of the future missions of NASA may be found at the website: http://www.nasa.gov/missions/

solarsystem/explore_main.html . The restructuring of MSFC will change to some degree the cost/budgeting strategies of all its bureaucracy by changing over from traditional accounting procedures to full-cost accounting. The context of this research in relations to the daily business flow within FD43, Mission Systems Operations Group under the Flight Projects Directorate, FD01 is explained.
Derived from text
*Budgeting; Cost Analysis; Spreadsheets*

**20050215368** Lapland Univ., Finland
**The MOMENTS Integrated Metamodel: Future Multidisciplinary Teaching-Studying-Learning (TSL) Processes and Knowledge Construction in Network-Based Mobile Education (NBME)**
Ruokamo, Heli; Tella, Seppo; IPSI 2005 Hawaii Proceedings; [2005]; 26 pp.; In English; See also 20050215347; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the principal pedagogical insights of recent years has been the recognition of the teaching studying learning process, whose three components are equally pivotal and essential to understanding the entirety (e.g., Uljens 1997; Tella 2001; Ruokamo et al. 2002). A second innovation, which has developed with advances in information and communication technologies (ICT), is network-based education (NBE). In this paper we argue that (1) it is essential to examine teaching, studying and learning as multidisciplinary and cross-disciplinary processes and to adopt a future orientation in doing so; (2) the concept of network-based education should be extended to include the added value brought by network-based mobile education (NBME); and (3) taking these first two orientations into account allows us to create the theoretical prerequisites for better understanding the mechanisms and regularities underpinning knowledge construction in novel operating environments that make use of technology. These arguments constitute the foundation of the metamodel developed in the MOMENTS project, which is part of the Academy of Finland s Life as Learning research program. The MOMENTS integrated metamodel is a multidisciplinary framework that describes and structures the teaching, studying and learning of the future, knowledge construction, and network-based mobile education. The article presents the integrated metamodel augmented by findings from over ten of the case studies conducted as part of the MOMENTS project. The MOMENTS metamodel is based on four conceptual levels of observation: (1) cultural discourses and practices; (2) pedagogical models and principles; (3) action; and (4) individual acts. Intersecting these four levels are the three main components of the model: culture, interaction and adaptability. Where the levels and the main components intersect lie the model s dimensions. It is where the conceptual levels, components and dimensions meet that new knowledge is created. The central question informing the metamodel is what kinds of interventions different techniques and technologies create, enable and bring about when they are used in connection with teaching, studying or learning, and how teachability, studiability and learnability are then defined. The discussion to follow draws on the concept of affordance (Gibson 1979), which has its basis in ecological theories. Central to the concept is the significance of the relationships which an organism has to the various resources in its environment, an individual using network-based mobile education being an example of such an organism. Affordances can thus be seen as including all of the ICT tools, mobile technologies and mobile and network applications that together form the 'jungle' in which an individual lives and works. According to ecological theories, learning is the discovery of increasingly effective means to negotiate the world and life as a human being by taking advantage of affordances. The development among the main components of the model we term the information work value chain. Its impacts are reflected on the concrete level as the increased meaningfulness of using tools, exploring studying materials and, in turn, as improved efficiency. Value chains are procedural mechanisms that are needed if new knowledge or skills are to be constructed.
Author
*Knowledge Based Systems; Education; Procedures; Adaptation; Organisms*

**20050215369** Monash Univ., Australia
**Managing Project Knowledge: The Contribution of Lessons Learned**
Owen, Jill; Burstein, Frada; Linger, Henry; Mitchell, Steven; IPSI 2005 Hawaii Proceedings; [2005]; 10 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Project-based organizations need to retain their knowledge base as an accumulation of their core intellectual property reserve for use in future projects. This paper analyses the application of knowledge management to project management to facilitate learning. It explores how learning and knowledge can improve project capabilities leading to enhanced project maturity and organizational development. We propose a model that shows how knowledge is embedded within the project management methodology of an organization. The paper presents the model and a case study. Findings from the case study

indicate that informal lessons learned play a crucial role in knowledge re-use and transfer in projects.
Author
*Knowledge Based Systems; Project Management; Intellectual Property; Embedding*

**20050215422** Belgrade Univ., Yugoslavia
**International Conference on Advances in the Internet, Processing, Systems, and Interdisciplinary research**
[2005]; In English; International Conference on Advances in the Internet, Processing, Systems, and Interdisciplinary research, 17-20 Feb. 2005, Amalfi, Italy; See also 20050215423 - 20050215452; Copyright; Avail.: CASI: C01, CD-ROM

Contents include the following: Calligraphy in the Cyber-age: Beyond aesthetics and penmanship. Real-time document cluster analysis for dynamic data sets. Computer based questioning system 'e-anemnesis 2003/4' for the occupational medicine. Development of generic virtual university reference architecture. A proposed method to estimate signal to noise plus interference levels in order to improve the performance. Optimal codes for burst error correction.
CASI
*Cluster Analysis; Error Analysis; Medical Services*

**20050215423** Johann-Wolfgang-Goethe-Univ., Frankfurt am Main, Germany
**Capability-oriented Modeling of the Firm**
Beimborn, Daniel; Martin, Sebastian F.; Homann, Ulrich; IPSI 2005 Amalfi Proceedings; [2005]; 16 pp.; In English; See also 20050215422; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

From the theories of the resource- and competence-based view we derive a capability-based modeling paradigm for representing business functions and processes. This method enables analyses of optimal process cuts within business process outsourcing decisions and gives a valuable complementary view of a firm as a structured network of capabilities. In a case study approach, the derived modeling paradigm is applied to a particular segment of the banking business (credit business) and it is shown that this approach can deliver added value in particular strategic decisions. We identify areas of future research in developing strategic competence and process measures to make the theories named above more applicable to manager's decisions.
Author
*Information Systems; Decision Making; Commerce; Consolidation*

**20050215424** Christopher Newport Univ., Newport News, VA, USA
**2005 High Court Legal Issues With Potential to Affect International Business and Decision Making**
Bardwell, Stephanie Huneycutt; IPSI 2005 Amalfi Proceedings; [2005]; 10 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Each term, the USA Supreme Court grants certiorari to a limited number of cases with significant potential to affect business behavior, decision-making and planning. Large corporations, using in-house counsel, track these selected cases very carefully and advise their large corporate clients accordingly. Significant decisions in (1) employment law, (2) tax law, (3) antitrust, in the Foreign Trade Antitrust Improvements Act [FTAIA], (4) credit and disclosure issues, the Truth in Lending Act [TILA] and (5) sentencing guidelines are some of the issues with landmark potential for next year. This paper highlights selected cases with great potential to change the terrain for small business and observes the key lessons suitable for the small business enterprise. It concludes with caveats and recommendations suitable for optimizing business behavior, decision-making and planning.
Author
*International Trade; Commerce; Decision Making*

**20050215427** Oak Ridge National Lab., TN, USA
**Real-Time Document Cluster Analysis for Dynamic Data Sets**
Elmore, Mark T.; Reed, Joel W.; Potok, Thomas E.; Patton, Robert M.; IPSI 2005 Amalfi Proceedings; [2005]; 11 pp.; In English; See also 20050215422; Original contains black and white illustrations
Contract(s)/Grant(s): DE-AC05-00OR-22725; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the most challenging analysis problems in the data mining and information retrieval domains is organizing large amounts of information. In this paper, we present a fast agglomerative clustering technique used in the Virtual Information

Processing Agent Research (VIPAR) project at the Oak Ridge National Laboratory. This approach extends the Vector Space Model (VSM) to provide near real-time clustering of a moderately large and dynamic set of text documents. In the traditional VSM, each document added or removed from the document set requires a computationally expensive set of operations to be performed before analysis can resume. While this a priori calculation of all of the VSM values is feasible in some problem domains, it is computationally prohibitive for near real-time operation with large, dynamic sets of documents. We present a method to quickly and accurately update the VSM values in an environment where articles are being continuously added and removed. We conducted a series of experiments and based on the results, we implemented a strategy that provides dynamic updates to the VSM values while preserving high accuracy. This approach allows documents to be quickly added and removed from the document set, providing accurate agglomerative clustering and enabling real-time document analysis.
Author
*Data Mining; Information Retrieval; Cluster Analysis; Real Time Operation; Data Processing*

**20050215429** Kyushu Inst. of Information Sciences, Fukuoka, Japan
**Case Study: Computer Literacy and Touch Typing at KIIS**
Gouda, Kazumasa; IPSI 2005 Amalfi Proceedings; [2005]; 5 pp.; In English; See also 20050215422; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

These days, information technology have grown very much, and computer literacy plays important role in such a scene. In this paper we report a case study at our university, KIIS (Kyushu Institute Information Sciences). Section 1 introduces the background of research. Section 2 defines terms, and Section 3 shows figures on touch typing software. Section 4 presents figures of scores of touch typing. Final section gives future works. We hope that the average of computer literacy will be enhanced.
Author
*Education; Information Systems; Reading; Touch*

**20050215436** Calabria Univ., Arcavacta di Rende, Italy
**Optimal Codes for Burst Error Correction**
Iembo, Rosanna; IPSI 2005 Amalfi Proceedings; [2005]; 8 pp.; In English; See also 20050215422; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper we explore the possibility of existence of optimal codes because a code correcting errors may be considered an observable of system when it is used for recovering information gotten spoilt from noise.
Author
*Error Correcting Codes; Information Theory; Random Errors; Decision Making; Error Analysis; Binary Codes; Correction*

**20050215440** Universita degli Studi di Salerno, Italy
**Building Lightweight Ontologies for E-Learning Environment**
Colace, F.; DeSanto, M.; Liguori, C.; Pietrosanto, A.; Vento, M.; IPSI 2005 Amalfi Proceedings; [2005]; 9 pp.; In English; See also 20050215422; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the last decade the term Ontology has become a fashionable word inside the Knowledge Engineering Community. Although there are several methodologies and methods for building ontologies they are not fully mature if we compare them with software and knowledge engineering techniques. In literature the main approaches to solve this problem aim to facilitate manual ontology engineering by providing natural language processing tools or skeleton methods. Other approaches rely on machine learning and automated language processing techniques in order to extract concepts and relations from structured or unstructured data such as databases and text. This second approach is more interesting and fashionable but shows very poor results. On the other hand the concept of ontology is not unique. In this paper we propose a novel approach for building university curricula ontology through analysis of real data: answers of students to final course tests. In this paper the term ontology means Lightweight Ontology: a taxonomy with more semantic value In fact teachers design these tests keeping in mind the main topics of course knowledge domain and their semantic relation. The ontology building is accomplished by means of Bayesian Networks. The proposed method is composed by two steps: the first one uses a structural learning multi-expert system in order to build a Bayesian Network from data analysis. In the second step the obtained Bayesian Network is translated in the course ontology. This approach can be useful for performing subsequent inference and knowledge extraction tasks as for example the updating of lesson s sequencing in e-learning environment or for improving intelligent

tutoring systems performance. Keywords: Bayesian Networks, Ontology, MultiExpert System
Author
*Data Mining; Natural Language Processing; Knowledge Representation; Expert Systems; Network Analysis; Education; Software Engineering*

**20050215446** National Cheng Kung Univ., Tainan, Taiwan, Province of China
**Double-Layered Initial Search Pattern for Fast Motion Estimation**
Tai, S. C.; Yu, C. S.; Lee, C. W.; IPSI 2005 Amalfi Proceedings; [2005]; 10 pp.; In English; See also 20050215422; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Multimedia communication relies on data compression technology to reduce the data bytes of transmission, and motion compensation is the key function to exploit temporal redundancy in most video coding standards. Fixed search pattern motion estimation algorithms such as hexagonal search (HEXBS) usually spend extra search steps to confirm near-zero motion vectors. Divide and conquer methods such as efficient three-step search (E3SS) are often struck on vectors with local minimum distortion. This paper proposes a pair of complementary double-layered (inner layer and outer layer) initial search patterns to reduce computational complexity. The inner layer search retains best image quality when the motion is small. The outer layer serves as a guard line to catch large motion. Experimental results of motion estimation on various CIF/QCIF video sequences show that the proposed algorithm achieves image quality similar to E3SS but with a search point cost as low as hexagonal search.
Author
*Multimedia; Data Compression; Algorithms; Sequencing; Data Reduction; Coding*

**20050216400** Belgrade Univ., Yugoslavia
**International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004)**
[2004]; In English; International Conference on Advances in the Internet, Processing, Systems, and Interdisciplinary research, 11-14 Nov. 2004, Venice, Italy; See also 20050216401 - 20050216443; Copyright; Avail.: CASI: C01, CD-ROM

Topics discussed include: Researching, Designing and Deploying Scenario-based WBT for Early Responders to Terrorist Incidents; Using WBT to Train Food Industry Personnel to Protect and Secure the Global Food Supply Chain; Bringing Food Supply Chain Stakeholders Together: A Case Study of a Table Top; Agroterrorism Simulation Exercise; Designing Scalable E-Learning Environments; Perspectives on Making Learning Objects Useful; An investigation into the roles and competencies of an online facilitator; Shopping Mall Navigation with Smart RFID Tags; Analyzing Asset Management Knowledge from Analyst Reports through Text Mining; Analyzing Passive Investment Strategy In Financial Markets via Agent-Based Models; Collaborative Learning Using PDA Devices; Fault Management System in IP-over-WDM Networks; etc.
Derived from text
*Information Retrieval; Management Systems; Market Research; Internets*

**20050216413** Moen (Deirdre Saoirse), USA
**ProseML and ProseFlow: Toward a Prose Formatting Workflow Methodology**
Moen, Deirdre Saoirse; Eley, Stephen F.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 5 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Using text files for prose instead of word processor formats allows for more flexibility in text editing and version control. However, up-conversion and variant format requirements pose problems for proper submission formatting. ProseFlow helps solve these problem by offering a way for prose-specifically articles, short stories, and novels to be represented in XML with ProseML. We have also developed XSLT stylesheets for XSL-FO transformation and a web application to manage manuscripts and submissions. This paper discusses the approaches we have taken and why we feel that they improve both manuscript and career management.
Author
*Document Markup Languages; Words (Language); Texts; Format; Editing*

**20050216415** Cisco Learning Inst., Phoenix, AZ, USA

**Perspectives on Making Learning Objects Useful**

Mohler, Sherman; Whitiker, Lauren; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 11 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Much debate has taken place with regards to the definitive description of a 'learning object', with too many technologists promoting their perspective and too few educators and instructional designers being able to promote their vision for useful and effective on-line learning content. This paper promotes a learning object definition that supports flexible learning strategies, learner modalities, and pedagogy to heighten e-learning beyond mere 'e-reading'. The paper also clarifies an item that almost all other definitions for learning objects miss; that learning objects must first and foremost be accountable for meeting stated learning objectives regarding knowledge transfer to the learner.

Author

*Education; On-Line Systems; Learning*

**20050216430** Arizona State Univ., Tempe, AZ, USA

**Electronic Reflection in the University Classroom: A Longitudinal Investigation**

Bush, Jeffrey E.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 24 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper is the result of studying the use of electronic journal writing as a reflective practice over a eight-year period in university music education coursework. Investigation included the descriptive analysis of thousands of journal entries from undergraduate and graduate students, including written feedback from the students themselves. Quantitative data includes the results of surveys of students attitudes towards the use of electronic reflection; qualitative findings include the identification of common themes encountered in students reflective journals. Other projects utilizing the Internet in university coursework are also described.

Author

*Education; Internets; Surveys; Music*

**20050216432** Kyushu Inst. of Tech., Japan

**Text Summarization Based on Linguistic Function, Conceptual Relationships and Partial Contextual Constraints**

Nomura, Hirosato; Koga, Hiroyuki; Nagai, Hidetoshi; Nakamura, Teigo; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 6 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents a text summarization system that can generate a high-quality short summary from a long text document. The proposed system, called the TExt Summarization System, or TESS, was developed through the investigation of a variety of original strategies, including 1) characterizing sentence function structurally and semantically, 2) selecting important sentence elements by applying conceptual relationships among both sentences and sentence elements, and 3) smoothing the sentence sequence connection by employing partial contextual relationships between phrases, clauses, and sentences. In addition, in order to remove redundant sentence elements, the process refers to dependency structures. During processing, TESS adopts various kinds of evaluation tasks and then assigns scores to selected candidates. After selecting sentence elements or concepts, the system integrates these into a sequence of sentences, which becomes the summary. Evaluation of the quality of the generated summary is not easy because evaluation is subjective and may differ based on individual knowledge or experience. In the present study, we confirmed that TESS could generate a summary of fairly high quality. The previous version of TESS is now available to the public on the internet.

Author

*Internets; Linguistics; Texts*

**20050216436** Pretoria Univ., South Africa

**An Investigation into the Roles and Competencies of an Online Facilitator**

Adendorff, Debbie; Cronje, Johannes; Eloff, Irma; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 68 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An instrumental case study of an online module about e-Learning was conducted to establish the different roles that an online facilitator played and to identify the competencies needed to function. An analysis of the messages sent by the facilitator, the results of a focus group interview with course participants and an interview with the online facilitator, indicated that an online facilitator, to be visible in the online environment, has to fulfill five roles: administrator, social supporter, instructor, guide and mediator. Further analysis of these roles through a professional Work Profiling System indicated that the facilitator needed a combination of five people competencies (motivating others, developing others, interpersonal sensitivity, teamwork and building and maintaining relationships); five thinking competencies (judgement, information gathering, problem analysis, written communication skills and technical skills and competence), and three energy competencies1 (self-confidence, persuasiveness and oral communication skills).
Author
*Information Analysis; Motivation; Instructors*

**20050216495** Army Command and General Staff Coll., Fort Leavenworth, KS USA
**An Analysis of the Systemic Security Weaknesses of the U.S. Navy Fleet Broadcasting System, 1967-1974, as Exploited by CWO John Walker**
Heath, Laura J.; Jun. 17, 2005; 101 pp.; In English
Report No.(s): AD-A436930; No Copyright; Avail.: CASI: A06, Hardcopy

CWO John Walker led one of the most devastating spy rings ever unmasked in the USA. Along with his brother, son, and friend, he compromised U.S. Navy cryptographic systems and classified information from 1967 to 1985. This research focuses on just one of the systems compromised by John Walker himself: the Fleet Broadcasting System (FBS) during the period 1967-1974, which was used to transmit all U.S. Navy operational orders to ships at sea. Why was the communications security (COMSEC) system so completely defenseless against one rogue sailor acting alone? The evidence shows that FBS was designed in such a way that it was effectively impossible to detect or prevent rogue insiders from compromising the system. Personnel investigations were cursory, frequently delayed, and based more on hunches than hard scientific criteria. Far too many people had access to the keys and sensitive materials, and the auditing methods were incapable, even in theory, of detecting illicit copying of classified materials. Responsibility for the security of the system was distributed among many different organizations, allowing numerous security gaps to develop. This has immediate implications for the design of future classified communications systems.
DTIC
*Broadcasting; Cryptography; Navy; Personnel Management; Security*

**20050216533** Space and Naval Warfare Systems Center, San Diego, CA USA
**SSC San Diego Biennial Review 2003. Command and Control**
Jan. 1, 2003; 68 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437066; No Copyright; Avail.: CASI: A04, Hardcopy

Partial contents Human Factors Engineering: An Enabler for Military Transformation Through Effective Integration of Technology and Personnel, Interactive Multisensor Analysis Training (IMAT),U.S. Central Command Deployable Headquarters,Application of Disciple to Decision Making in Complex and Constrained Environments,Collaboration at SSC San Diego: A Decade (1993-2003) of Research,Task-Managed Watchstanding: A Software Architectural Framework,The REDS Dyamic Decision Support Suite,Providing a Multilevel Secure Solution for the Rapidly Expanding World of C4I,Information Operations Command and Control (IOC(exp 2)) Dynamic Network Defense Experiment Research Findings,The Process for Conducting Operational Risk Assessments on C(exp 4)ISR Technologies, and Database Cluster Hierarchies and Semantic Relationship Discovery in Distributed Database Systems,
DTIC
*Command and Control; Military Technology; Research and Development; Reserves*

**20050216545** Army Engineer Research and Development Center, Vicksburg, MS USA
**Resources, Equipment and Logistics in Support of Long-Term Monitoring at Fort Benning**
Leese, David; Aug. 1, 2005; 16 pp.; In English; Original contains color illustrations
Report No.(s): AD-A437093; ERDC/EL-TN-ECMI-05-2; No Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this technical note is to report the progress, status, and lessons learned during implementation and monitoring of the environmental data acquisition systems in support of the Long Term Monitoring Initiative. The LTMI is sponsored by the Strategic Environmental Research and Development Program (SERDP) study at Ft. Benning, GA. One

purpose of the LTMI at Fort Benning is to develop historical databases for meteorological, surface water, and groundwater stations utilizing these data acquisition systems.
DTIC
*Data Acquisition; Ecosystems; Logistics Management*

**20050216686** Belgrade Univ., Yugoslavia
**International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004)**
[2004]; In English; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary research, 24-26 Sep. 2004, Stockholm, Sweden; See also 20050216687 - 20050216711; Copyright; Avail.: CASI: C01, CD-ROM

Topics discussed include: Data Mining and Knowledge Discovery on Malaysian's Ethno-pharmacology; Measurement and Analysis of Gnutella Signaling Traffic; Values, Brand and Aesthetics in e-business, from Information Design Point of View; Fault Management System in IP-over-WDM Networks; Information design - an informing for the 21st century; Molecular Processes as a Basis for Autonomous Networking; Three Fold 'Ontology + Model + Instance (OMI)' Semantic Unification Process; Some Potential But Avoidable Negative Impacts of the Internet Technology on Education and Medical Practice; Appropriateness of Lightweight MTA Authentication Protocols for fighting spam; Information Extraction on Presupposed Items and/or Presupposed Topics from Text Documents; Multiagent System for Decision Support in Urban Systems; Experiments on Clustering using Swarm Intelligence and Collective Behaviour; New business opportunities in the growing IFC market; From Tacit to Explicit: Contextualistic account of knowledge and information systems; Education Reform Technology Building Global Communities; etc.
Derived from text
*Computer Information Security; Decision Support Systems; Data Mining; Texts; Information Systems; Intelligence; Autonomy; Education*

**20050216688** Oslo Univ., Norway
**Information Design: An Informing for the 21st Century**
Karabeg, Dino; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 21 pp.; In English; See also 20050216686; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Information design, as this term is defined by the author, promises to align the creation and use of information with the contemporary needs of people and society. This article summarizes the results of a decade of work on developing information design and bringing it to academic practice and practical use.
Author
*Information Systems; Technology Utilization; Education*

**20050216693** Savannah State Univ., Savannah, GA, USA
**Education Reform Technology Building Global Communities**
Blood, Peggy; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 10 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In the increasingly digitized world of higher education it is time we rethink the traditional education delivery system. Spurring of technology has contributed to pedagogical delivery, not its structure advancement. Academia moves slowly in adjusting to change. How can technology structure and deliver great learning experiences? Universities should embrace world communities of collaboration and exchange between foreign professors and students. An international reform in the university structure and the instructional academy is needed across the globe in order to prepare students for a world society.
Author
*Education; Students; Universities*

**20050216697** Royal Inst. of Tech., Stockholm, Sweden
**Fault Management System in IP-over-WDM Networks**
Mukherjee, Amitava; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 9 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The today's telecommunication networks can provide fast and high quality services to end users with the integration of

computer and communication technologies and the fast maturation of fiber optic communication techniques. In the backbone networks, optical communication network will play a key role to provide diverse array of services to endusers. As more and more mission-critical business users are involved, the 99.99% uptime of services for those users is a must. As such, how to provide uninterrupted services to these users, and reduce the loss of service to a minimum if interruption is inevitable, becomes a critical design issue. That is, survivability must be considered in designing optical communication network to provide uninterrupted continuous service to users in the presence of node/link failures. In order to design a fault-management system in a distributed network architecture, there are three different components namely (a) fault detection, (b) fault recovery that involves protection and restoration mechanism and (c) fairness service provision for different needs, in particular fair allocation of bandwidth in a minimum cost during survivable period. This article would briefly focus on this design methodology for IP-over-WDM networks in an integrated manner.
Author
*Communication Networks; Fault Detection; Interprocessor Communication; Optical Communication; Telecommunication; Fiber Optics*

**20050216703** Kaiserslautern Univ., Germany
**Three Fold 'Ontology + Model + Instance (OMI)' Semantic Unification Process**
Bendeck, Fawsy; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 7 pp.; In English; See also 20050216686; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the main problems in the Semantic Web is the unification of concepts of different ontologies. This Semantic Unification process as been tried in many ways, but it as proves to be a hard problem. This paper presents a novel approach to use three levels of semantic unification: Instance, Model, and Ontology level. Our hypothesis is that the three levels complement each other and completes the cycle of semantic unification of two different ontologies.
Author
*Hypotheses; Semantics; World Wide Web*

**20050216709** Oulu Univ., Finland
**Ignorance Management by Contextual Templates**
Pohjola, V. J.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 12 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Ignorance management is introduced as an essential element of knowledge management. Starting from the idea that it is possible for an organization (and individual) to externalize and share its ignorance only in the context of its prevailing knowledge, a domain independent methodology is proposed for supporting ignorance management by contextual templates. The methodology is built upon PSSP ontology, which provides a hierarchical framework for all knowledge. The framework is a hierarchy of templates representing universal knowledge into which particular knowledge can be inserted. The lacking particular knowledge appears as holes in the context of what is known. The use of contextual templates as a means of ignorance management is illustrated by elaborating a case of a company s pump selection task in the domain of chemical process design.
Author
*Hierarchies; Templates*

## 83
## ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

**20050215362** University of Central Queensland, Rockhampton, Australia
**Size and Effects in the Use of Best Financial And Cost Accounting Practices (BFCAP)**
Zaman, Monir; IPSI 2005 Hawaii Proceedings; [2005]; 23 pp.; In English; See also 20050215347; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The aim of the study was to investigate the size and effects associated with the size measure of employees in small business in Central Queensland region in the context of a 'best financial and cost accounting practice'. This investigation surveyed a sample of 100 small businesses in Central Queensland region in order to test the interrelationships between

strategic planning and budgetary control, use of internal and external accounting staff, manual versus computerised accounting, costing, recording systems and the composition of debt equity ratio and the effect of size on these variables. We found that until the largest size is reached, there is a distinct trend in the increased use of strategic plans and budgetary control. Clear size effects were also found in the number of internal staff used for finance and accounting functions but size had little effects on the use of external advisors for tax consulting and business advisory services. The paper concluded with some implications for the small businesses wishing to increase growth and employment in the Central Queensland in large and complex organisations. Indeed, Perera (1998) explains the development of budgets as a management tool in concert with the emergence of large corporations during this century. Another common assumption in the accounting and finance literature is that small businesses will rely to a much greater extent on the external provision of accounting and finance services than larger firms (Kotey and Meredith 1997; Cameron and Massey, 1997). In this exploratory research study, I explored the size effects of the use of best practice financial and costing practices and the degree to which these are accompanied by the use of strategic planning, capital investment planning and budgetary controls.
Author
*Accounting; Commerce; Cost Estimates; Management Planning*

**20050216401** Mitsui Asset Trust and Banking, Tokyo, Japan
**Analyzing Asset Management Knowledge from Analyst Reports through Text Mining**
Takahashi, Satoru; Takahashi, Hiroshi; Terano, Takao; Tsuda, Kazuhiko; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 4 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Text mining, one of the emerging fields of data mining, aims at acquiring useful knowledge from textual data. In the asset management in finance task domain, although there exist various textual data like accounting settlement or analysts reports, few research and development have been conducted. In this paper, we will explore the feasibility to extract valuable knowledge for asset management through text mining. From empirical study on the practical data, we have confirmed the effectiveness: (1) the extracted keywords are influential to the stock prices, (2) such information is more effective to the larger scale stocks, and (3) multiple analysts have considered the same information valuable.
Author
*Information Retrieval; Financial Management; Data Mining; Extraction; Accounting*

**20050216416** Mitsui Asset Trust and Banking, Tokyo, Japan
**Analyzing Passive Investment Strategy In Financial Markets via Agent-Based Models**
Takahashi, Hiroshi; Takahashi, Satoru; Tsuda, Kazuhiko; Terano, Takao; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 4 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent progress of computer technology makes it possible to analyze social and economics systems via simulation studies. Among them, agent-based approaches are promising: we are able to make social sciences operational, communicable, and experimental. In this paper, using agent-based models from distributed artificial intelligence, we discuss the effects of passive investment strategies in asset management business. Although Passive investment Strategy is effective way in efficient market, but Behavioral Finance points out that market isn t always efficient. After extensive experiments, we have concluded that (1) Passive investment is valid in a realistic efficient market, (2) however, it could have bad influences such as instability of market and inadequate asset pricing deviating.
Author
*Finance; Market Research; Artificial Intelligence; Commerce; Economics*

**20050216419** Cardiff Univ., UK
**Determinants of Corporate Performance: Evidence from an Emerging Economy**
Naser, Kamal; Mokhtar, Mohd Zulkifli; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 24 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study is set out to investigate the relationship between corporate performance and a number of corporate attributes, namely: size, age, growth, ISO registration and industry type in a sample of 151 Malaysian companies. The result of the

analysis indicated that corporate size, growth and ISO registration are positively associated with corporate performance. Corporate performance, however, appeared to be negatively associated with corporate age. Overall, the findings show that ISO registered companies are more likely to achieve better performance than the non-ISO registered ones.
Author
*Economy; Industrial Management; Commerce*

**20050216420** New South Wales Univ., Canberra, Australia
**Agile and 'Second Best Strategies' are the Best for Uncertain Supply Chains**
Barber, E.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 24 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In recent years demand-based strategies have been touted as the preferred approach to uncertainties experienced in supply chains. With supply uncertainty rising and highly variable lead times occurring, supply-based strategies are also gaining some prominence. Overarching both the demand and supply based uncertainties is the increasing volatility of unexpected events in the global economies. Supply chains need to be more robust to cope with the new economic uncertainties. Due to the higher risks associated with uncertainties the supply chains that exploit these uncertainties will be the market winners. Flexible strategies that tend to be more encompassing and adaptive as well as central to the decoupling points of supply chains may be the answer.
Author
*Risk; Decoupling; Economics*

**20050216424** Saint Joseph's Univ., Philadelphia, PA, USA
**Using WBT to Train Food Industry Personnel to Protect and Secure the Global Food Supply Chain**
Childs, Nancy M.; Lord, John B.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 4 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Certificate Program in Food Protection and Homeland Security at Saint Joseph's University was designed for professionals who are involved in the food industry from 'farm-to-fork'. In addition to providing ADL/SCORM web-based training to federal, state, and local governments in preparation for acts of terrorism aimed at food, this program is also designed train those in the private sector of the food industry to prepare and respond to food terrorist incidents. The certificate program is further applicable to those individuals who scholarly pursue the study of food science and marketing as it applies to terrorism and emergency response.
Author
*Food Chain; Industries; Personnel; Marketing*

**20050216708** Jamia Millia Islamia Univ., New Delhi, India
**Test of Absolute Convergence Hypothesis & Estimating Speed of Convergence for Selected South and East Asian Economies, European Union and Some CIS Countries for 1961-2001**
Mathur, Somesh K.; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 30 pp.; In English; See also 20050216686; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We use cross sectional and time series data of GDP per capita on European countries(EU15 +United Kingdom),South Asian Countries(5), some East Asian(8) and CIS Countries(15) to test for 'absolute convergence' hypothesis for four different periods 1961-2001, 1970-2001, 1980-2001, 1990-2001. Only EU and East Asian countries together have shown uniform evidence of absolute convergence in all periods 1961-2001,1970- 2001,1980-2001 and 1990-2001. While EU as a region has shown significant evidence of absolute convergence in two periods ,1961-2001 and 1970-2001, there is no convincing statistical evidence in favor of absolute convergence in the last two periods : 1980-2001 and 1990-2001.This latter evidence with declining rate of economic growth for EU since 1961 may be challenge for designing EUs regional policies which also have to cope up with many East European and Baltic nations who joined EU on May 1,2004 The speed of absolute convergence in the four periods range between 0.99-2.56 % in an year (2% for the EU as worked out by Barro and Xavier Sala-i-Martin, 1995 for European regions) for EU while it ranges between 0.57-1.16% in an year for the countries in East Asia and EU regions together. However,there is no evidence of convergence among the South Asian countries in all periods and some major CIS republics since 1966.There is however tendency for absolute convergence between countries of South Asia,

East Asia and European Union particularly after the 1980s. Generally, speaking policies that will increase labour productivity,open up the economy to new ideas and help augment technological spillovers, increase share of savings in GDP,reduce corruption and improve governance, increase infrastructure spending, and improve increase human capital (educated and healthy labour force) will help in reducing per capita income differences and growth rates across countries and regions and also help in achieving the basic goal of planning- i.e., improve the living standards of the people .
Author
*Asia; Convergence; Economics; Hypotheses*

## 84
## LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes aviation law; space law and policy; international law; international cooperation; and patent policy.

**20050216433** Utrecht Univ., Utrecht, Netherlands
**Protection of the Weaker Party in Modern Contract law and IT Contracts**
Cherednychenko, Olha; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 13 pp.; In English; See also 20050216400; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The growing complexity of transactions has made it increasingly difficult for nonspecialists to understand the outcomes of the contracts they conclude, and has made them dependent on those who know . This development is especially true for IT sector where, in most cases, a user does not possess sufficient technical knowledge to be able to make an adequately informed choice of an IT product or service. Therefore, the relationship between the user (the weaker party) and the provider (the stronger party) in IT contracts deserves qualification of standard imbalance of power caused by information asymmetry. Modern contract law has responded to this situation by accommodating within itself the principle of the protection of the weaker contractual party. The idea behind this principle is that a party, in different phases of the contract s life, should no longer be guided only by his or her own interests, but also by the justified interests of the other party, especially if this party is weaker in terms of knowledge of the subject matter of the contract. Among the main forms in which the protection of the weaker party takes place is the imposition on professionals of various duties to inform the laymen about the implications of the contract and even the risks involved in its conclusion. In present society of professionals and laymen, pre-contractual duties to inform provide a very suitable and highly necessary instrument for remedying the inequality of bargaining power between the parties without detriment to the interests of the stronger party. It is submitted, however, that the protection of the weaker party cannot successfully be achieved without co-operation on the part of the weaker party himself.
Author
*Contract Negotiation; Qualifications; Risk; Inequalities*

## 85
## TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

**20050216536** Villanova Univ., PA USA
**Signal Processing Techniques for Anti-Jamming Global Positioning System (GPS) Receivers**
Amin, Moeness G.; Aug. 1, 2005; 141 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-1-0515; Proj-4519
Report No.(s): AD-A437077; AFRL-IF-RS-TR-2005-290; No Copyright; Avail.: CASI: A07, Hardcopy

The objective of this multi-year research funding is to devise new and novel methods to suppress interferers impinging on a multi-sensor GPS receiver. The research has considered chirp-like jammers as well as wideband interference. A self-coherence anti-jamming scheme is introduced which relies on the unique structure 0 the coarse/acquisition (C/A) code of the satellite signals. Because of the repetition of the CIA-code within each navigation symbol, the satellite signals exhibit strong self-coherence between chip-rate samples separated by integer multiples of the spreading gain. The proposed scheme utilizes this inherent self-coherence property to excise interferes that have different temporal structures from that of the satellite signals. In addition, new approaches using subspace methods and projection techniques are proposed for effective

cancellation of frequency modulated jammers with minimum distortions of the desired satellite signals. The report also considers and analyzes the effect of non-Gaussian noise on the GPS receiver delay lock loops and discriminator outputs.
DTIC
*Global Positioning System; Jamming; Receivers; Signal Processing*

## 88
## SPACE SCIENCES (GENERAL)

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

**20050215110** Georgia Inst. of Tech., Atlanta, GA, USA
**Micro Blowing Simulations Using a Coupled Finite-Volume Lattice-Boltzman n L ES Approach**
Menon, S.; Feiz, H.; September 20, 1990; 62 pp.; In English
Contract(s)/Grant(s): NAG3-2653
Report No.(s): CCL-2005-009; No Copyright; Avail.: CASI: A04, Hardcopy

Three dimensional large-eddy simulations (LES) of single and multiple jet-in-cross-flow (JICF) are conducted using the 19-bit Lattice Boltzmann Equation (LBE) method coupled with a conventional finite-volume (FV) scheme. In this coupled LBE-FV approach, the LBE-LES is employed to simulate the flow inside the jet nozzles while the FV-LES is used to simulate the crossflow. The key application area is the use of this technique is to study the micro blowing technique (MBT) for drag control similar to the recent experiments at NASA/GRC. It is necessary to resolve the flow inside the micro-blowing and suction holes with high resolution without being restricted by the FV time-step restriction. The coupled LBE-FV-LES approach achieves this objectives in a computationally efficient manner. A single jet in crossflow case is used for validation purpose and the results are compared with experimental data and full LBE-LES simulation. Good agreement with data is obtained. Subsequently, MBT over a flat plate with porosity of 25% is simulated using 9 jets in a compressible cross flow at a Mach number of 0.4. It is shown that MBT suppresses the near-wall vortices and reduces the skin friction by up to 50 percent. This is in good agreement with experimental data.
Author
*Large Eddy SIMulation; Finite Volume Method; Boltzmann Transport Equation; Flat Plates; Dynamic Control; Data SIMulation; Compressible Flow; Cross Flow*

**20050215498** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Threshold Gravity Determination and Artificial Gravity Studies Using Magnetic Levitation**
Ramachandran, N.; Leslie, F.; [2005]; 1 pp.; In English; Interdisciplinary Transport Phenomena in Microgravity and Space Sciences IV, 7-12 Aug. 2005, Tomar, Portugal
Contract(s)/Grant(s): NAS8-02096; No Copyright; Avail.: Other Sources; Abstract Only

What is the threshold gravity (minimum gravity level) required for the nominal functioning of the human system? What dosage is required (magnitude and duration)? Do human cell lines behave differently in microgravity in response to an external stimulus? The critical need for a variable gravity simulator is emphasized by recent experiments on human epithelial cells and lymphocytes on the Space Shuttle clearly showing that cell growth and function are markedly different from those observed terrestrially. Those differences are also dramatic between cells grown in space and those in Rotating Wall Vessels (RWV), or NASA bioreactor often used to simulate microgravity, indicating that although morphological growth patterns (three dimensional growth) can be successfully simulated using RWVs, cell function performance is not reproduced - a critical difference. If cell function is dramatically affected by gravity off-loading, then cell response to stimuli such as radiation, stress, etc. can be very different from terrestrial cell lines. Yet, we have no good gravity simulator for use in study of these phenomena. This represents a profound shortcoming for countermeasures research. We postulate that we can use magnetic levitation of cells and tissue, through the use of strong magnetic fields and field gradients, as a terrestrial microgravity model to study human cells. Specific objectives of the research are: 1. To develop a tried, tested and benchmarked terrestrial microgravity model for cell culture studies; 2. Gravity threshold determination; 3. Dosage (magnitude and duration) of g-level required for nominal functioning of cells; 4. Comparisons of magnetic levitation model to other models such as RWV, hind limb suspension, etc. and 5. Cellular response to reduced gravity levels of Moon and Mars.
Author
*Magnetic Suspension; Artificial Gravity; Gravitation; Microgravity; Cells (Biology); Lymphocytes; Magnetic Fields*

**20050215500** NASA Marshall Space Flight Center, Huntsville, AL, USA
**James Webb Space Telescope - the 'First Light Machine'**
Stahl, H. Phil; [2005]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Scheduled to begin is 10 year mission in 2011, the James Webb Space Telescope (JWST) will search for the first luminous objects of the Universe to help answer fundamental questions about how the Universe came to look like it does today. At 6.5 meters in diameter, JWST will be the world's largest space telescope. This talk will review science objectives for JWST and how they are driving the JWST architecture, e.g. aperture, wavelength range and operating temperature. Additionally, the talk will include an overview of the JWST primary mirror technology development effort.
Author
*James Webb Space Telescope; Spaceborne Telescopes; Apertures; Mirrors*

**20050215569** Stanford Univ., Stanford, CA, USA
**Diode Laser Sensors for Arc-Jet Characterization**
Hanson, Ronald K.; September 2005; 160 pp.; In English
Contract(s)/Grant(s): NCC2-5522; No Copyright; Avail.: CASI: A08, Hardcopy

The development and application of tunable diode laser (TDL) absorption sensors to monitor the health and operating conditions in the large-scale 60 MW arc-heated- plasma wind-tunnel at NASA Ames Research Center is reported. The interactive heating facility (THF) produces re-entry flow conditions by expanding the gas heated in a constricted plasma arc-heater to flow at high velocity over a model located in a test cabin. This facility provides the conditions needed to test thermal protective systems for spacecraft re-entering the earth s atmosphere. TDL sensors are developed to monitor gas flows in both the high-temperature constricted flow and the supersonic expansion flow into test cabin. These sensors utilize wavelength-tuned diode lasers to measure absorption transitions of atomic oxygen near 777.2 nm, atomic nitrogen near 856.8 nm, and atomic copper near 793.3 nm. The oxygen and nitrogen sensors measure the population density in exited electronic states of these atoms. The measurements combined with the assumption of local thermal and chemical equilibrium yield gas temperature (typically near 7,000K). The nitrogen and oxygen population temperatures are redundant, and their close agreement provides an important test of the local thermal equilibrium assumption. These temperature sensors provide time-resolved monitors of the operating conditions of the arc-heater and can be used to verify and control the test conditions. An additional TDL sensor was developed to monitor the copper concentration in the arc-heater flow yielding values as high as 13 ppm. Measurements of copper in the flow can identify flow conditions with unacceptably rapid electrode erosion, and hence this sensor provides valuable information needed to schedule maintenance to avoid costly arc-heater failure. TDL sensors were also developed for measurements in the test cabin, where absorption measurements of the populations of argon and molecular nitrogen in excited metastable electronic states established that the number density of these excited species is much lower than estimated using frozen-chemistry approximations. This key finding suggests that in the post-expansion region there is not a significant energy sequestration in electronically excited species. Finally, TDL measurements of atomic potassium seeded into the test cabin flow were used to directly measure the static temperature of the test gas. The results of this study illustrate the high potential of time-resolved TDL measurements for routine and economical sensing of arc-heater health (gas temperature and electrode erosion) as well as the time-resolved test-cabin-flow conditions in front of the model.
Author
*Tunable Lasers; Diodes; Absorption Spectroscopy; Gas Temperature; Gas Detectors; Semiconductor Lasers; Magnetohydrodynamic Flow*

**20050215582** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Adaptive Control for Microgravity Vibration Isolation System**
Yang, Bong-Jun; Calise, Anthony J.; Craig, James I.; Whorton, Mark S.; [2005]; 18 pp.; In English; 2005 AIAA Guidance, Navigation, and Control Conference, 15-18 Aug. 2005, San Francisco, CA, USA
Contract(s)/Grant(s): NAG8-1912; Copyright; Avail.: CASI: A03, Hardcopy

Most active vibration isolation systems that try to a provide quiescent acceleration environment for space science experiments have utilized linear design methods. In this paper, we address adaptive control augmentation of an existing classical controller that employs a high-gain acceleration feedback together with a low-gain position feedback to center the isolated platform. The control design feature includes parametric and dynamic uncertainties because the hardware of the isolation system is built as a payload-level isolator, and the acceleration Sensor exhibits a significant bias. A neural network is incorporated to adaptively compensate for the system uncertainties, and a high-pass filter is introduced to mitigate the effect of the measurement bias. Simulations show that the adaptive control improves the performance of the existing acceleration

controller and keep the level of the isolated platform deviation to that of the existing control system.
Author
*Adaptive Control; Microgravity; Vibration Isolators; High Gain; Accelerometers; Neural Nets*

**20050215612** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Mission Analysis for LEO Microwave Power-Beaming Station in Orbital Launch of Microwave Lightcraft**
Myrabo, L. N.; Dickenson, T.; [2005]; 1 pp.; In English; 4th International Symposium on Beamed Energy Propulsion (ISBEP4), 15-18 Nov. 2005, Nara, Japan
Contract(s)/Grant(s): NAG8-1290; Copyright; Avail.: Other Sources; Abstract Only

A detailed mission analysis study has been performed for a 1 km diameter, rechargeable satellite solar power station (SPS) designed to boost 20m diameter, 2400 kg Micr,oWave Lightcraft (MWLC) into low earth orbit (LEO) Positioned in a 476 km daily-repeating oi.bit, the 35 GHz microwave power station is configured like a spinning, thin-film bicycle wheel covered by 30% efficient sola cells on one side and billions of solid state microwave transmitter elements on the other, At the rim of this wheel are two superconducting magnets that can stor,e 2000 G.J of energy from the 320 MW, solar array over a period of several orbits. In preparation for launch, the entire station rotates to coarsely point at the Lightcraft, and then phases up using fine-pointing information sent from a beacon on-board the Lightcraft. Upon demand, the station transmits a 10 gigawatt microwave beam to lift the MWLC from the earth surface into LEO in a flight of several minutes duration. The mission analysis study was comprised of two parts: a) Power station assessment; and b) Analysis of MWLC dynamics during the ascent to orbit including the power-beaming relationships. The power station portion addressed eight critical issues: 1) Drag force vs. station orbital altitude; 2) Solar pressure force on the station; 3) Station orbital lifetime; 4) Feasibility of geo-magnetic re-boost; 5) Beta angle (i..e., sola1 alignment) and power station effective area relationship; 6) Power station percent time in sun vs, mission elapsed time; 7) Station beta angle vs.. charge time; 8) Stresses in station structures.. The launch dynamics portion examined four issues: 1) Ascent mission/trajecto1y profile; 2) MWLC/power-station mission geometry; 3) MWLC thrust angle vs. time; 4) Power station pitch rate during power beaming. Results indicate that approximately 0 58 N of drag force acts upon the station when rotated edge-on to project the minimum frontal area of 5000 sq m. An ion engine or perhaps an electrodynamic thruster (i.e., geomagnetic re-boost) station-keeping system can maintain the orbit altitude. The rate at which the power station s superconducting magnetic energy storage system (SMES) is ‘charged’ directly relates to the beta angle since the station is operating in the edge-on attitude. The maximum charge rate occurs when the beta angle is at its maximum because time in the sun and projected area of the station are, too, at their maximums For the maximum charge of 2000 G.J with a maximum beta angle of 52 degrees, approximately 3 hours (2 orbital revolutions) are required to reach the full charge, while about 16 hours (10.3 revolutions) are required when the beta angle is 10 degrees. Overall, the LEO station concept appears to be a viable candidate fo1 the formidable power-beaming infrastructure needed to boost MWLC into low earth orbit.
Author
*Microwave Power Beaming; Satellite Solar Power Stations; Superconducting Magnets; Solar Arrays; Orbit Calculation; Orbital Lifetime; Magnetic Energy Storage; Geomagnetism*

**20050215614** Tennessee Univ., Knoxville, TN, USA
**A Preliminary Investigation of Aerogravity Assist at Triton for Capture into Orbit About Neptune**
Ramsey, Philip; Lyne, James Evans; [2005]; 20 pp.; In English; 3rd International Planetary Proe Workshop (IPPW-3), 27 Jun. - 1 Jul. 2005, Anavyssos, Greece; Original contains black and white illustrations
Contract(s)/Grant(s): NNM05AA17G; No Copyright; Avail.: CASI: A03, Hardcopy

Previous work by our group has shown that an aerogravity assist maneuver at the moon Triton might be used to capture a spacecraft into a closed orbit about Neptune if a nominal atmospheric density profile at Triton is assumed. The present study extends that work and examines the impact of atmospheric dispersions, especially important in light of the very low density and large degree of uncertainty of Triton s atmosphere. Additional variables that are analyzed in the current study include ballute size and cut time and variations in the final target orbit. Results indicate that while blunt-body, rigid aeroshells penetrate too closely to the surface to be practical, ballutes of modest size show promise for this maneuver. Future studies will examine the application of inflatable aeroshells and rigid aeroshells with higher lift-to-drag ratios such as biconics and lifting bodies.
Author
*Aeroassist; Atmospheric Density; Aeroshells; Ballutes; Blunt Bodies*

**20050215615** NASA Marshall Space Flight Center, Huntsville, AL, USA

**MTRAP: The Magnetic Transition Region Probe**

Davis, J. M.; West, E. A.; Moore, R. L.; Gary, G. A.; Kobayashi, K.; Oberright, J. F.; Evans, D. C.; Wood, H. J.; Saba, J. L. R.; Alexander, D.; [2005]; 1 pp.; In English; SPIE Optics and Photonics, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The Magnetic Transition Region Probe is a space telescope designed to measure the magnetic field at several heights and temperatures in the solar atmosphere, providing observations spanning the chromospheric region where the field is expected to become force free. The primary goal is to provide an early warning system (hours to days) for solar energetic particle events that pose a serious hazard to astronauts in deep space and to understand the source regions of these particles. The required magnetic field data consist of simultaneous circular and linear polarization measurements in several spectral lines over the wavelength range from 150 to 855 nm. Because the observations are photon limited an optical telescope with a large (\g18sq m) collecting area is required. To keep the heat dissipation problem manageable we have chosen to implement MTRAP with six separate Gregorian telescopes, each with approx. 3 sq m collecting area, that are brought to a common focus. The large field of view (5 x 5 arcmin(sup 2)) and angular resolution (0.025 arcsec pixels) require large detector arrays and, because of the requirements on signal to noise (10(exp 3)), pixels with large full well depths to reduce the readout time and improve the temporal resolution. The optical and engineering considerations that have gone into the development of a concept that meets MTRAP's requirements are described.

Author

*Magnetic Probes; Spaceborne Telescopes; Magnetic Fields; Solar Atmosphere; Chromosphere; Early Warning Systems; Deep Space*

**20050215623** NASA Marshall Space Flight Center, Huntsville, AL, USA

**The Optomechanical Design and Operation of the Ionospheric Mapping and Geocoronal Experiment**

Kalmanson, Phillip C.; Wilczynski, Janusz; Wood, Kent; Dymond, Kenneth; Thonnard, Stefan; Spann, James; [2005]; 2 pp.; In English; SPIE Optics and Photonics Conference, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The Ionospheric Mapping and Geocoronal Experiment (IMAGER) is a space-based, multispectral, imaging payload, designed at the U.S. Naval Research Laboratory. IMAGER is designed to be at the forefront of space based remote sensing instruments for the study of the ionosphere in regards to the spatial, temporal, and spectral resolutions it will possess. IMAGER S mission is to find, track, and measure ionospheric irregularities as they move across the surface of the Earth and vary with time. IMAGER will observe the ionosphere of the Earth in the extreme and far ultraviolet wavelengths from 83.4 nm to 143.0 nm using the airglow emission from the nighttime and daytime ionosphere. The heart of the instrument consists of a 160mm, F/4.0 telescope which is an off-axial portion of a very fast aplanatic Gregorian. The focal length is 640 mm and the field of view is 2.17 degrees. The modulation transfer function is above 0.90 at 2.8 line pairs/ millimeter over the field corresponding to a 20 km line pair on the Earth. A system of reflective filters is used to select different wavelengths of interest. The telescope will be gimbaled to provide a field of regard encompassing the entire disk and limb of the Earth. The gimbal will also allow the telescope to track the ionospheric irregularities as they move. This paper describes the design of the optical and mechanical systems and their intended performance and includes an overview of the mission and science requirements that defined those aforementioned systems.

Author

*Ionospheric Disturbances; Geocoronal Emissions; Imaging Techniques; Payloads; Satellite-Borne Instruments; Remote Sensing*

## 89
## ASTRONOMY

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

**20050215558** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Observations of Type I X-ray Bursts from GS 1826-238 with RXTE**

Lewin, Walter; Paerels, F.; Miller, J.; Pooley, D.; Wijnands, R.; Kuulkers, E.; VanderKlis, M.; [2005]; 1 pp.; In English Contract(s)/Grant(s): NAG5-13574; No Copyright; Avail.: CASI: A01, Hardcopy

The analysis of the XMM data is complete. Additional RXTE data were used to determine the underlying continuum of

the XMM spectra. A few spectral lines (with low significance) are present in the XMM-Newton data of the Type I bursts of GS 1826-238. In spite of numerous efforts, we cannot identify these lines; perhaps they are not real. The bottom line is that we are unable to determine the gravitational redshift from the surface of the neutron star in GS 1826-238. A gravitational redshift was earlier reported using spectra of Type I bursts observed with XMM-Newton from EX0 0748-676 (Cottam et al., Nature). However, renewed observations by Cottam et al. of EX0 0748-676 with XMM-Newton do not confirm their earlier results. Our adopted Co-I Mario Mendez is presently working on a paper which finalizes our conclusions for GS 1826-238. Author

*Continuous Spectra; Neutron Stars; X Rays; X Ray Timing Explorer; Line Spectra*

**20050215624** NASA Marshall Space Flight Center, Huntsville, AL, USA

**The Optical Afterglow of a Short Gamma-ray Burst**

Hjorth, Jens; Watson, Darach; Flynbo, Johan P.U.; Price, Paul A.; Jensen, Brian L.; Jorgensen, Uffe G.; Kubas, Daniel; Gorosabel, Javier; Jakobssonk, Pall; Sollerman, Jesper, et al.; [2005]; 2 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

It has long been known that there are two classes of gamma-ray bursts (GRBs), principally distinguished by their durations. The breakthrough in our understanding of long-duration GRBs (greater than 2 seconds in duration), that ultimately linked them with energetic Type Ic supernovae, came about from the discovery of their long-lived X-ray and optical 'afterglow', when precise and rapid localizations of the sources could finally be obtained. Recently, X-ray localizations have become available for short (less than 2 seconds in duration) GRBs, a hitherto elusive GRB population, that has evaded optical detection for more than thirty years. Here we report the discovery of transient optical emission (R approximately 23 mag) associated with a short GRB. This first short GRB afterglow is localized with sub-arcsecond accuracy onto the outskirts of a blue dwarf galaxy. Unless the optical and X-ray afterglow arise from different mechanisms our observations 33 h after the GRB suggest that, analogously to long GRBs, we observe synchrotron emission from ultrarelativistic ejecta (ZZZ CAN WE LIMIT GAMMA?). In contrast, we did not detect a bright supernova, as found in most nearby long GRB afterglows, which suggests a different origidstrongly constrain the nature of the short GRB progenitors.
Author

*Afterglows; Gamma Ray Bursts; Light Emission; Optical Measurement*

**20050215633** National Space Science and Technology Center, Huntsville, AL, USA

**The locations of cosmic explosions**

Fruchter, A. S.; Levan, A. J.; Strolger, L.; Vreeswijk, P. M.; Bersier, D.; Burud, I.; Castro-Ceron, J. M.; Consclice, C.; Dahlen, T.; Strolger, L., et al.; [2005]; 2 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

When massive stars exhaust their fuel they collapse and often produce the extraordinarily bright explosions known as core-collapse supernovae. Recently, it has become apparent that stellar collapse can power the even more brilliant relativistic explosions known as long-duration gamma-ray bursts. In some cases, a gamma-ray burst and a supernova have been observed from the same event. One would thus expect that gamma-ray bursts and supernovae should be found in similar environments. Here we show that this expectation is wrong. Using Hubble Space Telescope imaging of the host galaxies of long-duration gamma-ray bursts and core-collapse supernovae, we demonstrate that while the distribution of the supernovae in their hosts traces the blue light of young stars, the gamma-ray bursts are much more concentrated on the very brightest regions of their hosts. Furthermore, the host galaxies of the gamma-ray bursts are significantly fainter and more irregular than the hosts of the supernovae. Together these results suggest that long-duration gamma-ray bursts are associated with the very most massive stars and may be restricted to galaxies of limited chemical evolution. Our results directly imply that long-duration gamma-ray bursts are relatively rare in galaxies such as our own Milky Way.
Author

*Supernovae; Massive Stars; Hubble Space Telescope; Explosions; Chemical Evolution; Gamma Ray Bursts; Collapse*

**20050215636** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Elemental Spectra from the First ATIC Flight**

Ahn, H. S.; Adams, J. H.; Bashindzhagyan, G.; Batkov, K. E.; Changv, J.; Christl, M.; Fazely, A. R.; Ganel, O.; Gunasingha, R. M.; Guzik, T. G., et al.; [2005]; 1 pp.; In English; 29th International Cosmic Ray Conference, 3-10 Aug. 2005, Pune, India; Copyright; Avail.: Other Sources; Abstract Only

The Advanced Thin Ionization Calorimeter (ATIC) instrument is a balloon-borne experiment designed to measure the composition and energy spectra of Z = l to 26 cosmic rays over the energy range from approx. 10(exp 11) to approx. 10(exp

14) eV. The instrument consists of a silicon matrix charge detector, plastic scintillator strip hodoscopes interleaved with graphite interaction targets, and a fully active Bismuth Germanate (BGO) calorimeter. ATIC had two successful Long Duration Balloon flights launched from McMurdo Station, Antarctica in 2000 and 2002. In this paper, spectra of various elements measured during the first 16 day flight are presented.
Author
*Energy Spectra; Balloon Flight; Cosmic Rays; Calorimeters; Ionization; Hodoscopes; Bismuth; Germanates*

**20050215638** NASA Marshall Space Flight Center, Huntsville, AL, USA
**XMM-Newton Observations of Four Millisecond Pulsars**
Zavlin, Vyacheslav E.; [2005]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

I present an analysis of the XMM-Newton observations of four millisecond pulsars, J0437-4715, J2124-3358, J1024-0719, and J0034-0534. The new data provide strong evidence of thermal emission in the X-ray flux detected from the first three objects. This thermal component is best interpreted as radiation from pulsar polar caps covered with a nonmagnetic hydrogen atmosphere. A nonthermal power-law component, dominating at energies E greater than or equal to 3 keV, can also be present in the detected X-ray emission. For PSR J0437-4715, the timing analysis reveals that the shape and pulsed fraction of the pulsar light curves are energy dependent. This, together with the results obtained from the phase-resolved spectroscopy, supports the two-component (thermal plus nonthermal) interpretation of the pulsar's X-ray radiation. Highly significant pulsations have been found in the X-ray flux of PSRs 52124-3358 and 51024-0719. For PSR 50034-0534, a possible X-ray counterpart of the radio pulsar has been suggested. The inferred properties of the detected thermal emission are compared with predictions of radio pulsar models.
Author
*Pulsars; X Rays; Stellar Models; Spectral Counterparts (Astronomy); Unsteady Flow; Thermal Emission; Spectroscopy*

**20050215639** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Discovery of an Afterglow Extension of the Prompt Phase of Two Gamma Ray Bursts Observed by Swift**
Barthelmy, S. D.; Cannizzo, J. K.; Gehrels, N.; Cusumano, G.; O'Brien, P.; Vaughan, S.; Zhang, B.; Burrows, D. N.; Campana, S.; Chincarini, G.; January 2005; 3 pp.; In English; Copyright; Avail.: Other Sources

Contemporaneous BAT and XRT observations of two recent well-covered GRBs observed by Swift, GRB 050315 and GRB 050319, show clearly a prompt component of the afterglow emission. The rapid slewing capability of the spacecraft enables X-ray observations immediately after the burst, typically approximately 100 s following the initiation of the prompt gamma-ray phase. By fitting a power law form to the gamma-ray spectrum, we extrapolate the time dependent fluxes measured by the BAT, in the energy band 15 - 350 keV, into the spectral regime observed by the XRT, 0.2 - 10 keV, and examine the functional form of the rate of decay of the two light curves. We find that the BAT and XRT light curves merge to form a unified curve. There is a period of steep decay up to approximately 300 s, followed by a flatter decay. The duration of the steep decay, approximately 100 s in the source frame after correcting for cosmological time dilation, agrees with a theoretical estimate for the deceleration time of the relativistic ejecta as it interacts with circumstellar material. For GRB 050315, the steep decay can be characterized by an exponential form, where T(sub e),(BAT)approximately equal to 24 plus or minus 2 s, and T(sub e)(XRT) approximately equal to 35 plus or minus 2 s. For GRB 050319 a power law decay -d lnf/d lnt = n, where n approximately equal to 3, provides a reasonable fit. The early time X-ray fluxes are consistent with representing the lower energy tail of the prompt emission, and provide our first quantitative measure of the decay of the prompt gamma-ray emission over a large dynamic range. The initial steep decay is expected from the high latitude emission from a curved shell of relativistic plasma illuminated only for a short interval. The overall conclusion is that the prompt phase of GRBs lasts for hundreds of seconds longer than previously thought.
Author
*Afterglows; Gamma Ray Bursts; Swift Observatory; Cosmology*

**20050215643** NASA Marshall Space Flight Center, Huntsville, AL, USA, National Space Science and Technology Center, Huntsville, AL, USA
**Structure in the radio counterpart to SGR 1806-20**
Fender, R. P.; Muxlow, T. W. B.; Garrett, M.; Kouveliotou, C.; Gaensler, B. M.; Garrington, S. T.; Paragi, Z.; Tudose, V.; Miller-Jones, J. C. A.; Spencer, R. E., et al.; [2005]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

On Dec 27, 2004, the magnetar SGR 1806-20 underwent an enormous outburst which has resulted in the formation of an expanding, moving, radio source. We report observations of this radio source with the Multi-Element Radio-Linked

Interferometer Network (MERLIN) and the Very Long Baseline Array (VLBA). The observations confirm the elongation and expansion already reported based on observations at lower angular resolutions, but suggest that at early epochs the structure is not consistent with the very simplest models such as Gaussian flux distributions. In particular there appears to be significant non-Gaussian structure on small angular scales, which may correspond to localised sites of particle acceleration during the early phases of expansion and interaction with the ambient medium.
Author
*Radio Interferometers; Spectral Counterparts (Astronomy); Normal Density Functions; Angular Resolution; Elongation; Very Long Baseline Array (VLBA)*

**20050215645** NASA Marshall Space Flight Center, Huntsville, AL, USA, National Space Science and Technology Center, Huntsville, AL, USA
**Unraveling the Origin of Short Gamma-ray Bursts**
Barthelmy, S. D.; Chincarini, G.; Burrows, D. N.; Gehrels, N.; Covino, S.; Moretti, A.; Romano, P.; OBrien, P. T.; Sarazin, C. L.; Kouveliotou, C., et al.; [2005]; 4 pp.; In English; Copyright; Avail.: CASI: A01, Hardcopy

The origin of the short (\h2 s) class of gamma-ray bursts (GRBs) is finally becoming clear after decades of search. The first one localized to a few arcseconds accuracy, GRB 050509B, was found to have a highly probable association with a nearby (z = 0.225) elliptical galaxy. A second one with arcsecond localization, GRB 050709, was also associated with a low redshift (z = 0.16) galaxy. We report here the detection of short GRB 050724 with remarkable properties; in particular, it has low energy gamma-ray emission that lasts for 100 s after the main short pulse, strong early X-ray afterglow, and an unusual lightcurve that rebrightens at 3x10(exp 4) s. A position on the sky accurate to 9 arcsec was determined and provided as a GCN alert to ground-based telescopes within 80 s. A subsequent high-resolution X-ray image provided a sub-arcsec position coincident with ground-based optical and radio observations of the afterglow. Like GRB 050509B, this burst is located off-center in an elliptical galaxy. The energy output of the GRB at the host distance of z = 0.258 is 2-3 orders of magnitude less than for long bursts. The low level of star formation in such galaxies is strong evidence against a collapsar or hypernova origin like that associated with long GRBs. Based on these new data, it is highly probable that short GRBs are produced by the coalescence of orbiting neutron stars (NSs) or black holes (BHs), with some evidence for a NS-BH merger in this burst.
Author
*Gamma Ray Bursts; Star Formation; Gamma Rays; Elliptical Galaxies; Red Shift; Radio Observation; Neutron Stars*

**20050217102** Hawaii Univ., Honolulu, HI, USA
**Observations of a Filament in the North Ecliptic Pole Supercluster**
Henry, Joseph Henry; March 28, 2005; 1 pp.; In English
Contract(s)/Grant(s): NAG5-13204; No Copyright; Avail.: CASI: A01, Hardcopy

Our work on the ROSAT All-Sky Survey at the North Ecliptic Pole has increased from 7 to 21 the group and cluster membership of a previously known supercluster there, revealing a particularly striking example of a filament. We obtained observations of two clusters in this filament to elucidate its dynamics. However, these observations were severely compromised by flares: less than 20% of the requested time survived screening. Consequently the data were inadequate for the project.
Author
*Ecliptic; Galactic Clusters; Rosat Mission; Filaments*

## 90
## ASTROPHYSICS

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

**20050215458** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Introduction to Particle Acceleration in the Cosmos**
Gallagher, D. L.; Horwitz, J. L.; Perez, J.; Quenby, J.; [2005]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Accelerated charged particles have been used on Earth since 1930 to explore the very essence of matter, for industrial applications, and for medical treatments. Throughout the universe nature employs a dizzying array of acceleration processes to produce particles spanning twenty orders of magnitude in energy range, while shaping our cosmic environment. Here, we introduce and review the basic physical processes causing particle acceleration, in astrophysical plasmas from geospace to the

outer reaches of the cosmos. These processes are chiefly divided into four categories: adiabatic and other forms of non-stochastic acceleration, magnetic energy storage and stochastic acceleration, shock acceleration, and plasma wave and turbulent acceleration. The purpose of this introduction is to set the stage and context for the individual papers comprising this monograph.
Author
*Particle Acceleration; Cosmos; Astrophysics; Charged Particles*

**20050215463** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Modeling contamination migration on the Chandra X-Ray Observatory**
O'Dell, Stephen L.; Swartz, Douglas A.; Anderson, Scot K.; Chen, Kenny C.; Giordano, Rino J.; Knollenberg, Perry J.; Morris, Peter A.; Plucinsky, Paul P.; Tice, Neil W.; Tran, Hien; [2005]; 1 pp.; In English; 2005 SPIE Meeting, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

During its first 5 years of operation, the cold (-60 C) optical blocking filter of the Advanced CCD Imaging Spectrometer (ACIS), on board the Chandra X-ray Observatory, has accumulated a contaminating layer that attenuates the low-energy x rays. To assist in assessing the likelihood of successfully baking off the contaminant, members of the Chandra Team developed contamination-migration simulation software. The simulation follows deposition onto and (temperature-dependent) vaporization from surfaces comprising a geometrical model of the Observatory. A separate thermal analysis, augmented by on-board temperature monitoring, provides temperatures for each surface of the same geometrical model. This paper describes the physical basis for the simulations, the methodologies, and the predicted migration of the contaminant for various bake-out scenarios and assumptions.
Author
*Contamination; Migration; X Ray Astrophysics Facility; Models*

**20050215464** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Managing radiation degradation of CCDs on the Chandra X-ray Observatory II**
O'Dell, Stephen L.; Aldcroft, Thomas L.; Bissell, Bradley A.; Blackwell, William C.; Cameron, Robert A.; Chappell, Jon II.; DePasquale, Joseph M.; Gage, Kenneth R.; Grant, Catherine E.; Harbison, Christine F., et al.; [2005]; 1 pp.; In English; 2005 SPIE Meeting, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The CCDs on the Chandra X-ray Observatory are vulnerable to radiation damage from low-energy protons scattered off the telescope's mirrors onto the focal plane. Following unexpected damage incurred early in the mission, the Chandra Team developed, implemented, and maintains a radiation-protection program. This program - involving scheduled radiation safing during radiation-belt passes, intervention based upon real-time space-weather conditions and radiation-environment modeling, and on-board radiation monitoring with autonomous radiation safing - has successfully managed the radiation damage to the CCDs. Since implementing the program, the charge-transfer inefficiency (CTI) has increased at an average annual rate of only 2.9x10^-6 (2.3%) for the front- illuminated CCDs and 0.95x10^-6 (6.5%) for the back-illuminated CCDs. This paper describes the current status of Chandra radiation-management program.
Author
*Degradation; X Ray Astrophysics Facility; Charge Coupled Devices; Radiation Protection; Telescopes*

**20050215494** NASA Marshall Space Flight Center, Huntsville, AL, USA, Universities Space Research Association, Huntsville, AL, USA, Brookhaven National Lab., Upton, NY, USA, Michigan Univ., MI, USA
**X-Ray Probes of Jupiter's Auroral Zones, Galilean Moons, and the Io Plasma Torus**
Elsner, R. F.; Ramsey, B. D.; Swartz, D. A.; Rehak, P.; Waite, J. H., Jr.; Cooper, J. F.; Johnson, R. E.; May 04, 2005; 1 pp.; In English; 2005 SPIE Optics and Photonics Conference, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Remote observations from the Earth orbiting Chandra X-ray Observatory and the XMM-Newton Observatory have shown the the Jovian system is a rich and complex source of x-ray emission. The planet's auroral zones and its disk are powerful sources of x-ray emission, though with different origins. Chandra observations discovered x-ray emission from the Io plasma torus and from the Galilean moons Io, Europa, and possibly Ganymede. The emission from the moons is due to bombardment of their surfaces by highly energetic magnetospheric protons, and oxygen and sulfur ions, producing fluorescent x-ray emission lines from the elements in their surfaces against an intense background continuum. Although very faint when observed from Earth orbit, an imaging x-ray spectrometer in orbit around the icy Galilean moons would provide a detail mapping of the elemental composition in their surfaces. Here we review the results of Chandra and XMM-Newton

observations of the Jovian system and describe the characteristics of X-MIME, an imaging x-ray spectrometer undergoing study for possible application to future missions to Jupiter such as JIMO. X-MIME has the ultimate goal of providing detailed high-resolution maps of the elemental abundances of the surfaces of Jupiter's icy moons and Io, as well as detailed study of the x-ray mission from the Io plasma torus, Jupiter's auroral zones, and the planetary disk.
Author
*Auroral Zones; X Ray Spectrometers; Earth Orbits; X Ray Astrophysics Facility; Emission Spectra; Imaging Spectrometers; Toroidal Plasmas*

**20050215501** NASA Marshall Space Flight Center, Huntsville, AL, USA
**The Electron Spectrum above 20 GeV Measured by ATIC-2**
Chang, J.; Schmidt, W. K. H.; Adams, James H.; Ahn, H. S.; Bashindzhagyan, G.; Batkov, K. E.; Christl, M.; Fazely, A. R.; Ganel, O.; Gunasigha, R. M., et al.; [2005]; 1 pp.; In English; 29th International Cosmic Ray Conference, 3-10 Aug. 2005, Pune, India; Copyright; Avail.: Other Sources; Abstract Only

The Advanced Thin Ionization Calorimeter (ATIC) Balloon Experiment has been flown from McMurdo, Antarctica in 2000-01 (test flight) and 2002-03 (science flight). ATIC is composed of a segmented BGO calorimeter following a carbon target with scintillator tracking layers and a Silicon matrix detector at the entrance. ATIC measures the composition and energy spectra of the nuclei plus electrons. We present the electron spectrum derived from the ATIC-2 science flight, from 20 GeV to 1.5 TeV, and compare it to existing very high energy measurements from emulsion chambers and to the results of galactic propagation calculations. The good energy resolution and high statistics in the ATIC data allow detailed astrophysical interpretation of the results.
Author
*Calorimeters; Ionization; Electron Spectroscopy; Emulsions; Energy Spectra; Astrophysics; Carbon*

**20050215557** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Coherence Effects in Ring Laser Gyros**
Smith, David D.; Chang, Hongrok; Diels, Jean-Claude; [2005]; 1 pp.; In English; International Society for Optical Engineering Optics and Photonics Conference, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

We predict the propagation of slow and fast light in two co-resonant coupled optical resonators. In coupled resonators, slow light can propagate without attenuation by a cancellation of absorption as a result of mode splitting and destructive interference, whereas transparent fast light propagation can be achieved by the assistance of gain and splitting of the intracavity resonances, which consequently change the dispersion from normal to anomalous. The effective steady-state response of coupled- resonators is derived using the temporal coupled-mode formalism, and the absorptive and dispersive responses are described. Specifically, the occurrence of slow light via coupled-resonator-induced transparency and gain-assisted fast light are discussed. Keywords: whispering gallery modes, optical resonators, slow light, fast light, superluminal pulse propagation, coupled optical resonators.
Author
*Laser Gyroscopes; Ring Lasers; Optical Resonators; Coupled Modes; Whispering Gallery Modes*

**20050215571** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Search for Polarization from the Prompt Gamma-Ray Emission of GRB 041219 with SPI on INTEGRAL**
Kalemci, E.; Boggs, S. E.; Kouvelitou, C.; Finger, M., et al.; [2005]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Measuring the polarization of the prompt gamma-ray emission from GRBs can significantly improve our understanding of both the GRB emission mechanisms, as well as the underlying engine driving the explosion. We searched for polarization in the prompt gamma-ray emission of GRB 041219 with the SPI instrument on INTEGRAL. Using multiple-detector coincidence events in the 100-500 keV energy band, our analysis yields a polarization fraction from this GRB of 66 f 21%. While statistically this measurement suggests a non-zero polarization, we cannot strongly rule out the possibility that the measured modulation is dominated by instrumental systematics. Therefore, SPI observations of GRB 041219 do not significantly constrain GRB models. However, this measurement demonstrates the capability of SPI to measure polarization, and the techniques developed for this analysis.
Author
*Gamma Rays; Polarization; Gamma Ray Bursts; Polarimeters; Energy Bands*

**20050215576** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Deconvolution of Energy Spectra in the ATIC Experiment**

Batkov, K. E.; Panov, A. D.; Adams, J. H.; Ahn, H. S.; Bashindzhagyan, G. L.; Chang, J.; Christl, M.; Fazley, A. R.; Ganel, O.; Gunasigha, R. M.; Guzik, T. G., et al.; 2005; 1 pp.; In English; 29th International Cosmic Ray Conference, 3-10 Aug. 2005, Pune, India; Copyright; Avail.: Other Sources; Abstract Only

The Advanced Thin Ionization Calorimeter (ATIC) balloon-borne experiment is designed to perform cosmic- ray elemental spectra measurements from below 100 GeV up to tens TeV for nuclei from hydrogen to iron. The instrument is composed of a silicon matrix detector followed by a carbon target, interleaved with scintillator tracking layers, and a segmented BGO calorimeter composed of 320 individual crystals totalling 18 radiation lengths, used to determine the particle energy. The technique for deconvolution of the energy spectra measured in the thin calorimeter is based on detailed simulations of the response of the ATIC instrument to different cosmic ray nuclei over a wide energy range. The method of deconvolution is described and energy spectrum of carbon obtained by this technique is presented.

Author

*Calorimeters; Particle Energy; Ionization; Cosmic Rays; Energy Spectra*

**20050217027** NASA Glenn Research Center, Cleveland, OH, USA

**Sonoluminescence: A Galaxy of Nanostars Created in a Beaker**

Wrbanek, John D.; Fralick, Gustave C.; Wrbanek, Susan Y.; Weiland, Kenneth E.; Research and Technology 2004; June 2005; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

As part of basic and applied research on advanced instrumentation technologies, the NASA Glenn Research Center is examining applications for sonoluminescence: ultrasonically produced glowing bubbles that are hotter than the Sun. In the last decade, those outside of the ultrasonic community have become interested in understanding sonoluminescence and in using some of its more interesting properties. First discovered in the 1930s as a byproduct of early work on sonar, the phenomenon is defined as the generation of light energy from sound waves. This glow, which was originally thought to be a form of static electricity, was found to be generated in flashes of much less than a billionth of a second that result when microscopic bubbles of air collapse. The temperature generated in the collapsing bubbles is at least 4 times that of the surface of the Sun.

Derived from text

*Galaxies; Sonoluminescence; Sound Waves; Static Electricity*

**20050217030** Smithsonian Astrophysical Observatory, Cambridge, MA, USA

**Coronal Activity in the R CrA T Association**

Patten, Brian M.; Oliversen, Ronald J., Technical Monitor; September 2005; 3 pp.; In English

Contract(s)/Grant(s): NAG5-11321

Report No.(s): AR-4; No Copyright; Avail.: CASI: A01, Hardcopy

Brian Patten is the Principal Investigator of the NASA ROSS-ADP project Coronal Activity in the R CrA T Association. For this project we have extracted net counts and variability information for all of the X-ray sources found in 23 archival ROSAT PSPC and HRI images in the region of the R CrA T association. These data have been merged with an extensive database of optical and near-infrared photometry, optical spectroscopy, and parallax data. These data have been used to (1) identify new association members and clarify the membership status of a number of previously suspected members of the association, and (2) derive, for the first time, an accurate coronal luminosity function for the T Tauri members of this T association and make direct comparisons between the coronal luminosity functions for other T associations and those of large clusters. We have used our survey data to assess (a) the importance of the star-formation environment in initial coronal activity levels, (b) the effects of PMS evolution on dynamo activity as a function of mass and age, and (c) the level of contamination by field post-T Tauri stars on association membership surveys.

Derived from text

*Coronas; T Tauri Stars; Photometry; Astrophysics*

**20050217031** Smithsonian Astrophysical Observatory, Cambridge, MA, USA

**The NASA Education Forum at SAO on the Structure and Evolution of the Universe**

Gould, Roy; Cooper, Larry, Technical Monitor; July 2005; 9 pp.; In English

Contract(s)/Grant(s): NCC5-706

Report No.(s): AR-2; No Copyright; Avail.: CASI: A02, Hardcopy

The past year for the SEU Forum has been a highly productive one and has moved us forward on three major objectives:

1) Using the Einstein Centennial to involve the public in the Universe Exploration theme, with emphasis on exciting discoveries about dark energy, cosmology, and black holes; 2) Further implementing the recommendations of the Knappenberger Report, in order to strengthen the educational coherence of our collective activities and our collaborations within NASA; and 3) Developing strategic partnerships with underserved communities and other key customers. Among our activities for the past year are the following: 1) Serving the Informal Science Education Communities; 2) Serving the Formal Education (Pre-college) Community; and 3) Serving Minority and Underserved Communities. A summary of goals, plans and activities for the year 9/15/05 through 9/14/06 are also presented.
Derived from text
*Universe; Astrophysics; Education; Galactic Evolution; Galactic Structure; Cosmology*

**20050217097** Smithsonian Astrophysical Observatory, Cambridge, MA, USA
**A Program to Detect and Characterize Extra-Solar Giant Planets**
Noyes, Robert W.; September 2005; 11 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-10854; No Copyright; Avail.: CASI: A03, Hardcopy

This is the final report for this NASA grant. Work under the first three years of the Grant (from May 1 2001 through April 30 2004) has been described in previous annual reports. Here we briefly summarize that work, and then focus on activities between May 1 2004 (the start of a 1-year no-cost extension period) and April 30 2005, the end of the Grant period.
Derived from text
*Extrasolar Planets; Detection; Imagery; Astrophysics*

**20050217099** Smithsonian Astrophysical Observatory, Cambridge, MA, USA
**GALEX Study of the UV Variability of Nearby Galaxies and a Deep Probe of the UV Luminosity Function**
Schlegel, Eric; September 2005; 2 pp.; In English
Contract(s)/Grant(s): NNG05GE09G; No Copyright; Avail.: CASI: A01, Hardcopy

The proposal has two aims - a deep exposure of NGC 300, about a factor of 10 deeper than the GALEX all-sky survey; and an examination of the UV variability. The data were received just prior to a series of proposal deadlines in early spring. A subsequent analysis delay includes a move from SAO to the University of Texas - San Antonio. Nevertheless, we have merged the data into a single deep exposure as well as undertaking a preliminary examination of the variability. No UV halo is present as detected in the GALEX observation of M83. No UV bursts are visible; however a more stringent limit will only be obtained through a differencing of the sub-images. Papers: we expect 2 papers at about 12 pages/paper to flow from this project. The first paper will report on the time variability while the second will focus on the deep UV image obtained from stacking the individual observations.
Author
*Galaxies; Luminosity; Variability; Sky Surveys (Astronomy); Ultraviolet Radiation*

## 91
## LUNAR AND PLANETARY SCIENCE AND EXPLORATION

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

**20050215331** Mercer Univ., Macon, GA, USA
**In Situ Resource Utilization (ISRU) Experiments for Mars Exploration**
Marone, Matt; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXV-1 - XXV-13; In English; See also 20050215300; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

In situ resource utilization can best be described as living off the land. In our case the land is the planet Mars. ISRU is based on the idea that some fraction of the consumables, life support and propellant materials do not have to be flown from earth. Rather, they can be manufactured or extracted from resources already present on Mars. The primary resources on Mars are the atmosphere, polar caps and regolith. The atmosphere of Mars is mostly carbon dioxide as shown in the table below. The proportion of oxygen on the other hand is quite small. Still, there is quite a bit of oxygen in the Martian atmosphere, but it is unfortunately tied up with carbon. Thus, one of the goals of ISRU is the separation of breathable oxygen from the carbon dioxide. Several means of separation have been proposed. We have begun experiments on another approach for production of oxygen with carbon monoxide as a useful by product. Our work on a CO2 separator is described later in this report. Regolith melting is another means of obtaining materials. Two materials of interest are iron and silicon. Iron oxide is plentiful on Mars

and is of obvious importance for structural components. Silicon is the foundation of solid state devices. Power generation on Mars may be accomplished using silicon solar cells. There is discussion of the feasibility of in situ production of solar cells. This would require a means of extracting silicon from the regolith. We have conducted several experiments concerning melting and glassification of the Mars soil simulant. Other summer faculty fellows have tried various means of processing the stimulant material. These include furnace melting, microwave melting and laser ablation. We have conducted several furnace melting experiments in both air and carbon dioxide environments. We have also carried out experiments to test spark melting in a carbon dioxide atmosphere. These experiments suggest the possibility of using arc melting in a reducing atmosphere. It is important to keep in mind that we are working with a soil stimulant. Any simulant, no matter how chemically similar it is to Martian regolith, may differ in mineralogy. The underlying assumption in this work is that once a glass is formed, any differences between simulant and regolith are unimportant. The exact means of forming the glass do, however, depend on the mineralogy of the regolith. A sample return mission is required to help answer these questions.
Author
*In Situ Resource Utilization; Carbon Dioxide; Mars Exploration; Planetary Geology; Mars Surface; Mars Atmosphere; Life Support Systems; Melting; Regolith*

**20050215339** Middle Tennessee State Univ., Murfreesboro, TN, USA
**Elemental Analysis of the JSC Mars-1 Soil Simulant using Laser Ablation and Magnetic Separation**
Nasab, Ahab S.; The 2004 NASA Faculty Fellowship Program Research Reports; January 2005, pp. XXIX-1 - XXIX-12; In English; See also 20050215300; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Future long-duration missions to Mars require capabilities in terms of manufacture of structures and chemical compounds essential for human habitat and exploratory activities. Currently, it is not feasible to import all the required raw and finished materials from Earth. In fact, essential items such as structural members as well as various gases for human consumption and material processing need to be largely extracted from the available planetary resources. The resources on Mars include its soil and rocks, its atmosphere and the polar caps. Mars atmosphere consists of 95% carbon dioxide and the balance contains small percentages of oxygen, nitrogen, and argon. The Mars regolith contains many metal oxides in various mineralogical forms. Presently, Martian soil samples are not available. However, a closely matched Martian soil simulant developed by the Johnson Space Center has been available for scientific research and engineering studies. The chemical makeup of this simulant is compared with the data from Viking Lander and Path Finder missions are shown..
Derived from text
*Carbon Dioxide; Chemical Composition; Chemical Elements; Mars Surface; Planetary Geology*

**20050215625** NASA Marshall Space Flight Center, Huntsville, AL, USA
**The Hollow Spheres of the Orgueil Meteorite: A Re-Examination**
Hoover, Richard B.; Jerman, Gregory; Rossignold-Strick, Maritine; [2005]; 3 pp.; In English; International Symposium of Optical Science and Technology 50th Annual Meeting: Instruments, Methods, and Missions for Astrobiology IX, 31 Jul. - 4 aug. 2005, San Diego, CA, USA; Copyright; Avail.: CASI: A01, Hardcopy

In 1971, Rossignol-Strick and Barghoorn provided images and a description of a number of spherical hollow microstructures showing well-defined walls in acid macerated extract of the Orgueil CI carbonaceous meteorite. Other forms such as membranes and spiral shaped structures were also reported. The carbon-rich (kerogen) hollow spheres were found to be in a narrowly constrained distribution of sizes (mainly 7 to 10 microns in diameter). Electron microprobe analysis revealed that these spheres contained Carbon, possibly P, N, and K. It was established that these forms could not be attributed to pollen or other recent terrestrial contaminants. It was concluded that they most probably represented organic coatings on globules of glass, olivine or magnetite in the meteorite. However, recent studies of the Orgueil meteorite have been carried out at the NASA/Marshall Space Flight Center with the S-4000 Hitachi Field Emission Scanning Electron Microscope (FESEM). These investigations have revealed the presence of numerous carbon encrusted spherical magnetite platelets and spherical and ovoidal bodies of elemental iron in-situ in freshly fractured interior surfaces of the meteorite. Their size range is also very narrowly constrained (typically approximately 6 to 12 microns) in diameter. High resolution images reveal that these bodies are also encrusted with a thin carbonaceous sheath and are surrounded by short nanofibrils that are shown to be composed of high purity iron by EDAX elemental analysis. We present Secondary and Backscatter Electron FESEM images and associated EDAX elemental analyses and 2D X-ray maps of these forms as we re-examine the hollow spheres of Orgueil and attempt to determine if they are representatives of the same population of indigenous microstructures.
Author
*Orgueil Meteorite; Spheres; Hollow; Microstructure; Meteoritic Composition*

**20050215629** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Mineralized Remains of Morphotypes of Filamentous Cyanobacteria in Carbonaceous Meteorites**

Hoover, Richard B.; [2005]; 2 pp.; In English; International Symposium of Optical Science and Technology 50th Annual Meeting: Instruments, Methods, and Missions for Astrobiology IX, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The quest for conclusive evidence of microfossils in meteorites has been elusive. One difficulty arises from the fact than many abiotic or inorganic microstructures, mineral grains, and coating artifacts can mimic the smaller representatives of the microbial world that possess very simple morphologies (unicellular cocci or bacilli). However, there exist a wide variety of large, filamentous trichomic prokaryotic microorganisms (cyanobacteria and sulfur bacteria) with sufficiently well known and complex morphologies that they can be recognized and are known to be of unquestionable biogenic origin. The taphonomic modes of fossilization and their of their life habits and processes frequently result in distinctive chemical biosignatures associated with carbonization, silicification, calcification, phosphatization and metal-binding properties of their cell-walls, trichomes, sheaths and extracellular polymeric substances (EPS). Strong differences of mineral concentrations in closely associated and visibly differentiated cellular microstructures provide strong evidence of biogenicity. This evidence is further enhanced by the detection of recognizable and distinct microstructures (e.g., uniseriate or multiseriate filaments, trichomes, sheaths, cells of proper sizes and size distributions) and growth characteristics (e.g., basal or apical cells, true or false branching of trichomes, tapered or uniform filaments, robust or thin sheaths) and reproductive and nitrogen fixation habits (e.g., baeocytes, hormogonia, akinetes and heterocysts), Microfossils of cyanobacteria and cyanobacterial mats and stromatolites have been recognized a described from many of the most ancient rocks on Earth. The crucial problem lies in developing valid protocols and methodologies for establishing that the putative microfossils are truly indigenous and not merely recent microbial contaminants. During the past several years, we have conducted Field Emission Scanning Electron Microscopy (FESEM) investigations of freshly fractured interior surfaces of carbonaceous meteorites, terrestrial rocks, and recent microbial extremophiles and filamentous cyanobacteria. These studies have resulted in the detection in a several carbonaceous meteorites of the mineralized remains of a wide variety of complex filamentous trichomic microorganisms. These embedded forms are consistent in size and microstructure with well-preserved morphotypes of mat- forming filamentous trichomic cyanobacteria and the degraded remains of microfibrils of cyanobacterial sheaths. We present the results of comparative imaging studies and EDAX elemental analyses of recent cyanobacteria (e.g. Calothrix, Oscillatoria, and Lyngbya) that are similar in size, morphology and microstructure to morphotypes found embedded in meteorites. EDAX elemental studies reveal that forms found in carbonaceous meteorites often have highly carbonized sheaths in close association with permineralized filaments, trichomes and microbial cells. Ratios of critical bioelements (C:O, C:N, C:P, and C:S) reveal dramatic differences between microfossils in Earth rocks and meteorites and in filaments, trichomes, hormogonia, and cells of recent cyanobacteria.

Author

*Bacteria; Carbonaceous Meteorites; Minerals; Filaments*

**20050215637** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Evidence for Liquid Water on Comets**

Sheldon, Robert; Hoover, Richard; [2005]; 1 pp.; In English; International Symposium of Optical Sciences and Technology 50th Annual Meeting: Instruments, Methods, and Missions for Astrobiology IX, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

We have reexamined the arguments for the existence of liquid water on comets, and believe that recent cometary flybys along with pre-Giotto data support its presence on short-period comets. Liquid water would affect cometary dynamics, leaving distinct signatures in precession, orbital dynamics, and potential splitting of comets. Liquid water geysers would affect cometary atmosphere, dust evolution, and non-gravitational forces that perturb the orbit. Liquid water would affect the composition of both the interior and exterior of the comet, producing geologic effects consistent with recent flyby photographs. And most importantly, liquid water suppork the growth of lifeforms, which would make a comet a biofriendly incubator for interplanetary transport. The major objection against liquid water is the necessity of a pressure vessel to prevent sublimation into space. We discuss how such a pressure vessel could naturally evolve as a pristine comet makes its first journey inside the orbit of Mars, and suggest that this type of vessel was observed by Giotto, Deep Space I, and Stardust.

Author

*Comets; Geysers; Water; Mars Surface*

**20050217091** NASA Langley Research Center, Hampton, VA, USA

**Mars Tumbleweed: FY2003 Conceptual Design Assessment**

Antol, Jeffrey; Calhoun, Philip C.; Flick, John J.; Hajos, Gregory a.; Keys, Jennifer P.; Stillwagen, Frederic H.; Krizan, Shawn A.; Strickland, Christopher V.; Owens, Rachel; Wisniewski, Michael; August 08, 2005; 61 pp.; In English

Contract(s)/Grant(s): WBS 23-090-20-15

Report No.(s): NASA/TM-2005-213527; L-19067; No Copyright; Avail.: CASI: A04, Hardcopy

NASA LaRC is studying concepts for a new type of Mars exploration vehicle that would be propelled by the wind. Known as the Mars Tumbleweed, it would derive mobility through use of the Martian surface winds. Tumbleweeds could conceivably travel greater distances, cover larger areas of the surface, and provide access to areas inaccessible by conventional vehicles. They would be lightweight and relatively inexpensive, allowing a multiple vehicle network to be deployed on a single mission. Tumbleweeds would be equipped with sensors for conducting science and serve as scouts searching broad areas to identify specific locations for follow-on investigation by other explorers. An extensive assessment of LaRC Tumbleweed concepts was conducted in FY03, including refinement of science mission scenarios, definition of supporting subsystems (structures, power, communications), testing in wind tunnels, and development of a dynamic simulation capability.

Author

*Mars Surface; Mars Roving Vehicles; Wind Tunnel Tests; Ground Wind; Structural Design*

**20050217103** Teledyne Brown Engineering, USA

**In Situ Fabrication Technologies: Meeting the Challenge for Exploration**

Howard, Richard W.; [2005]; 76 pp.; In English; National Space and Missile Materials Symposium, 27 Jun. - 1 Jul. 2005, Las Vegas, NV, USA; Original contains color illustrations

Contract(s)/Grant(s): NAS8-02060; No Copyright; Avail.: CASI: A05, Hardcopy

A viewgraph presentation on Lunar and Martian in situ fabrication technologies meeting the challenges for exploration is shown. The topics include: 1) Exploration Vision; 2) Vision Requirements Early in the Program; 3) Vision Requirements Today; 4) Why is ISFR Technology Needed? 5) ISFR and In Situ Resource Utilization (ISRU); 6) Fabrication Feedstock Considerations; 7) Planetary Resource Primer; 8) Average Chemical Element Abundances in Lunar Soil; 9) Chemical Elements in Aerospace Engineering Materials; 10) Schematic of Raw Regolith Processing into Constituent Components; 11) Iron, Aluminum, and Basalt Processing from Separated Elements and Compounds; 12) Space Power Systems; 13) Power Source Applicability; 14) Fabrication Systems Technologies; 15) Repair and Nondestructive Evaluation (NDE); and 16) Habitat Structures. A development overview of Lunar and Martian repair and nondestructive evaluation is also presented.

CASI

*Fabrication; In Situ Resource Utilization; Mars Exploration; Lunar Exploration; Technology Utilization*

**20050217106** International Space Univ., Inc., France

**Human Missions to Europa and Titan - Why Not?**

FROM; April 2004; 141 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NNG04GP14G; Copyright; Avail.: CASI: A07, Hardcopy

This report describes a long-term development plan to enable human exploration of the outer solar system, with a focus on Europa and Titan. These are two of the most interesting moons of Jupiter and Saturn, respectively, because they are the places in the solar system with the greatest potential for harboring extraterrestrial life. Since human expeditions to these worlds are considered impossible with current capabilities, the proposal of a well-organized sequence of steps towards making this a reality was formulated. The proposed Development Plan, entitled Theseus, is the outcome of a recent multinational study by a group of students in the framework of the Master of Space Studies (MSS) 2004 course at the International Space University (ISU). The Theseus Program includes the necessary development strategies in key scientific and technological areas that are essential for identifying the requirements for the exploration of the outer planetary moons. Some of the topics that are analysed throughout the plan include: scientific observations at Europa and Titan, advanced propulsion and nuclear power systems, in-situ resource utilization, radiation mitigation techniques, closed life support systems, habitation for long-term spaceflight, and artificial gravity. In addition to the scientific and technological aspects of the Theseus Program, it was recognized that before any research and development work may begin, some level of program management must be established. Within this chapter, legal issues, national and international policy, motivation, organization and management, economic considerations, outreach, education, ethics, and social implications are all considered with respect to four possible future scenarios which enable human missions to the outer solar system. The final chapter of the report builds upon the foundations set by Theseus through a case study. This study illustrates how such accomplishments could influence a mission to Europa to search for evidence of life in its subsurface oceans. The future remains unpredictable, as does the realization of

any of these possibilities. However, projects such as this remind us that the final frontier for humans is truly outer space, and only our imagination will determine where the frontier stops. We can dream of visiting other planetary systems and perhaps even galaxies, but we must begin closer, and considering the scope of our known universe, Europa and Titan are very close indeed.
Author
*Europa; Titan; Manned Space Flight; Gas Giant Planets; NASA Space Programs*

**20050217156** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Human Exploration of the Moon and Mars: Space Radiation Data, Modeling and Instrumentation Needs**
Adams, James H.; Barghouty, A. F.; Bhattacharya, M.; Lin, Zi-Wei; [2005]; 1 pp.; In English; 29th International Cosmic Ray Conference, 3-10 Aug. 2005, Pune, India; No Copyright; Avail.: CASI: A01, Hardcopy

On January 14, 2004 President Bush announced the Vision for Space Exploration, a program for long-term human and robotic exploration of the solar system which will include a return of humans to the moon not later than 2020, followed by human missions to Mars. Since this announcement, NASA has been developing plans and mission architectures for these human missions as well as robotic precursor missions. Among the critical needs for research and development in support of this Vision are investigations on the ionizing radiation environment and development of instrumentation to guide NASA in managing the radiation exposure of the crew during the manned missions. For mission planning, models are needed for a reference worst-case solar energetic particle event and a reference worst-case galactic cosmic ray environment. During Lunar missions it will be necessary to carefully manage the radiation exposure of the crew in real time because of the variability of the radiation environment due to solar activity. In particular, prompt warnings will be needed when large solar energetic particle events occur. Accurate predictions will also be needed of the particle flux and flux history at the moon to support critical mission management decisions. A new generation of dosimeters and radiation monitors will also be needed to accompany the crew. These instruments must return data in real time so that they can be used in the critical decisions that must be made if a large solar energetic particle event occurs. This is especially true if it occurs during a lunar excursion. A substantial radiation exposure on extended lunar missions and Mars missions comes from galactic cosmic rays. This exposure must be mitigated by radiation shielding and other measures. During Mars missions the galactic cosmic ray exposure occurs primarily during the cruse phase between the Earth and Mars. This is especially true for opposition class missions. These missions would typically last -430 days with only 30-90 days on Mars. Solar energetic particle events are less of a concern on Mars because of its greater distance from the Sun (approximately 1.5 AU) and the partial protection afforded by its atmosphere (approximately 20 grams per square centimeter). The talk will describe the current plans for future human missions to Earth orbit, the Moon and Mars. The needs for data and models of the radiation environment and radiation detectors to support these missions will be discussed.
Author
*Extraterrestrial Radiation; Manned Space Flight; Mars Missions; Moon; Models; Earth Orbits; Measuring Instruments*

**20050217176** NASA Glenn Research Center, Cleveland, OH, USA
**Proton-Exchange-Membrane Fuel Cell Powerplants Developed and Tested for Exploration Missions**
Hoberecht, Mark A.; Pham, Nang T.; Research and Technology 2004; June 2005; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy

Proton-exchange-membrane fuel cell (PEMFC) technology has received major attention for terrestrial applications, such as the automotive and residential markets, for the past 20 years. This attention has significantly advanced the maturity of the technology, resulting in ever more compact, efficient, reliable, and inexpensive PEMFC designs. In comparison to the terrestrial operating environment, the space operating environment is much more demanding. Microgravity to high-gravity loads and the need to use pure oxygen (rather than air) as the fuel cell oxidizer place more stringent demands on PEMFC technology. NASA and its partners from industry are leveraging terrestrial PEMFC advancements by conducting parallel space technology development for future exploration missions. A team from the NASA Glenn Research Center, NASA Johnson Space Center, and NASA Kennedy Space Center recently completed the first phase of a PEMFC powerplant development effort for exploration missions. The industry partners for this phase of the development effort were ElectroChem, Inc., and Teledyne Energy Systems, Inc. Under contract to Glenn, both of these industry partners successfully designed, fabricated, and tested a breadboard PEMFC powerplant in the 1- to 5-kW power range. These powerplants were based on existing company-proprietary fuel cell stack designs, combined with off-the-shelf components, which formed the balance of the powerplant design. Subsequent to the contractor development efforts, both powerplants were independently tested at Johnson to verify operational and performance characteristics, and to determine suitability for further technology development in the second phase of the NASA-led effort. Following the independent NASA testing, Teledyne Energy Systems, Inc., was selected

to develop an engineering model PEMFC powerplant. This effort was initiated by the 2nd Generation Reusable Launch Vehicle (RLV) Program Office in 2001; it transitioned to the Next Generation Launch Technologies (NGLT) Program Office in 2003. The effort is now being funded by the Exploration Program Office. We plan to summarize the results from the ongoing engineering model PEMFC powerplant development in a future Research & Technology article.
Author
*Membranes; Protons; Fuel Cells; Power Plants; Fabrication; Technology Utilization; Space Missions*

**20050217177** International Space Univ., Inc., Arlington, VA, USA
**Human Mission to Europa and Titan - Why Not? Executive Summary**
Finarelli, Margaret G.; [2005]; 10 pp.; In English
Contract(s)/Grant(s): NNG04GP23G; No Copyright; Avail.: CASI: C01, CD-ROM: A02, Hardcopy

Outline a step-by-step Development Plan of the key barriers and their solutions to enable human exploration of the outer solar system. Secondary: Perform a case study which supports and emphasizes the key elements of the Development Plan.
Author
*Space Exploration; Gas Giant Planets; Solar System*

## 92
## SOLAR PHYSICS

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

**20050215555** NASA Marshall Space Flight Center, Huntsville, AL, USA
**End-to-End Study of the Transfer of Energy from Magnetosheath Ion Precipitation to the Cusp**
Coffey, V. N.; Chandler, M. O.; Singh, Nagendra; Avanov, Levon; [2005]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

This paper describes a study of the effects of unstable magnetosheath distributions on the cusp ionosphere. An end-to-end numerical model was used to study, first, the evolved distributions from precipitation due to reconnection and, secondly, the energy transfer into the high latitude ionosphere based on these solar wind/magnetosheath inputs. Using inputs of several representative examples of magnetosheath injections, waves were generated at the lower hybrid frequency and energy transferred to the ionospheric electrons and ions. The resulting wave spectra and ion and electron particle heating was analyzed. Keywords: Ion heating: Magnetosheath/Ionosphere coupling: Particle/Wave Interactions. Simulations
Author
*Magnetosheath; Energy Transfer; Solar Wind; Plasma Heating; Ionospheres*

**20050215608** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Simulation of the ATIC-2 Silicon Matrix for Protons and Helium GCR Primaries at 0.3, 10, and 25 TeV/Nucleon**
Watts, J.; Adams, J. H.; Bashindzhagyan, G.; Batkov, K. E.; Chang, J.; Christl, M.; Fazely, A. R.; Ganel, O.; Gunasingha R. M.; Guzik, T. G., et al.; [2005]; 1 pp.; In English; 29th International Cosmic Ray Conference, 3-10 Aug. 2005, Pune, India; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The energy deposition distribution for protons and helium galactic cosmic ray primaries at 0.3, 10, and 25 TeV/nucleon in the ATIC-2 silicon matrix detector are simulated with GEANT4. The GEANT3 geometrical model of ATIC developed by the University of Maryland was combined with a GEANT4 application developed for the Deep Space Test Bed (DSTB) detector package. The new code included relatively minor modifications to completely describe the ATIC materials and a more detailed model of the Silicon Matrix detector. For this analysis all particles were started as a unidirectional beam at a single point near the center of the Silicon Matrix front surface. The point was selected such that each primary passed through at least two of the overlapping silicon pixels.
Derived from text
*Galactic Cosmic Rays; Nucleons; SIMulation; Helium; Protons; Silicon*

**20050215616** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Large Field-of-View KD*P Modulator for Solar Polarization Measurements**
West, E. A.; Noble, M.; Choudhary, D.; [2005]; 1 pp.; In English; SPIE Optics and Photonics, 31 Jul. 4 - Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

This paper will describe the evolution of the Marshall Space Flight Center electro-optical polarimeter with emphasis on the field of view characteristics of the its KD*P modulator. Understanding the field of view characteristics was essential to the success of the MSFC vector magnetograph. The paper will show how the field of view errors of KD*P look similar to the polarization patterns seen in simple sunspots and why the placement of the KD*P in a collimated beam was essential in separating the instrumental polarization from the solar signal. Finally, this paper will describe a modulator design which minimizes those field-of- view errors.
Author
*Electro-Optics; Field of View; Magnetic Signatures; Polarimeters*

**20050215617** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Polarization Measurements in the Vacuum Ultraviolet**
West, E. A.; Kobayashi, K.; Noble, M.; [2005]; 1 pp.; No Copyright; Avail.: Other Sources; Abstract Only

This paper will describe the VUV polarization testing of the NSSTC Solar Ultraviolet Magnetograph (SUMI) optics. SUMI is being developed for a sounding rocket payload to prove the feasibility of making magnetic field measurements in the transition region. This paper will cover the polarization properties of the VUV calibration polarizers, the instrumental polarization of the VUV chamber, SUMI's toroidal varied-line-space gratings and the SUMI polarimeter.
Author
*Sounding Rockets; Magnetometers; Magnetic Fields; Solar Instruments; Polarimeters*

**20050215621** NASA Marshall Space Flight Center, Huntsville, AL, USA
**The Solar Ultraviolet Magnetograph Investigation: Polarization Properties**
West, E. A.; Porter, J. G.; Davis, J. M.; Gary, G. A.; Kobayashi, K.; Noble, M.; [2005]; 1 pp.; In English; SPIE Optics and Photonics, 31 Jul. - 4 Aug. 2005, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

This paper will describe the objectives of the Marshall Space Flight Center (MSFC) Solar Ultraviolet Magnetograph Investigation (SUMI) and the optical components that have been developed to meet those objectives. A sounding rocket payload is being developed to test the feasibility of magnetic field measurements in the Sun s transition region. This paper will review the scientific measurements that will be made by the SUMI sounding rocket program, and the optics have been optimized for simultaneous measurements of two magnetic lines formed in the transition region (CIV at 1550 A and MgII at 2800 A). Finally, this paper will concentrate on the polarization properties of the SUM1 polarimeter and toroidal varied-line-space gratings.
Author
*Magnetometers; Polarization; Optical Equipment; Magnetic Fields; Solar Instruments; Polarimeters*

**20050217172** Florida Inst. of Tech., Melbourne, FL, USA
**Studies of Cosmic Ray Modulation and Energetic Particle Propagation in Time-Dependent 3-Dimensional Heliospheric Magnetic Fields**
Zhang, Ming; [2005]; 5 pp.; In English
Contract(s)/Grant(s): NAG5-11036; No Copyright; Avail.: CASI: A01, Hardcopy

The primary goal of this project was to perform theoretical calculations of propagation of cosmic rays and energetic particles in 3-dimensional heliospheric magnetic fields. We used Markov stochastic process simulation to achieve to this goal. We developed computation software that can be used to study particle propagation in, as two examples of heliospheric magnetic fields that have to be treated in 3 dimensions, a heliospheric magnetic field suggested by Fisk (1996) and a global heliosphere including the region beyond the termination shock. The results from our model calculations were compared with particle measurements from Ulysses, Earth-based spacecraft such as IMP-8, WIND and ACE, Voyagers and Pioneers in outer heliosphere for tests of the magnetic field models. We particularly looked for features of particle variations that can allow us to significantly distinguish the Fisk magnetic field from the conventional Parker spiral field. The computer code will eventually lead to a new generation of integrated software for solving complicated problems of particle acceleration, propagation and modulation in realistic 3-dimensional heliosphere of realistic magnetic fields and the solar wind with a single computation approach.
Author
*Cosmic Rays; Modulation; Energetic Particles; Heliosphere; Magnetic Fields; Time Dependence; Particle Acceleration*

## 93
## SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

**20050215119** Michigan Univ., Ann Arbor, MI, USA
**XMM-Newton X-Ray Observation of Jupiter**
Waite, J. Hunter; May 09, 2005; 29 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04GE64G
Report No.(s): UM-F010232/047577; No Copyright; Avail.: CASI: A03, Hardcopy

Soft X-ray emission has been observed from the disk of both Jupiter and Saturn as well as from the auroral regions of these planets. The low-latitude disk emission as observed by ROSAT, the Chandra X-Ray Observatory, and XMM-Newton appears to be uniformly distributed across the disk and to be correlated with solar activity. These characteristics suggest that the disk x-rays are produced by: (1) the elastic scattering of solar X-rays by atmospheric neutrals and (2) the absorption of solar X-rays in the carbon K-shell followed by fluorescent emission. The carbon atoms are found in methane molecules located below the homopause. In this paper we present the results of calculations of the scattering albedo for soft x-rays. We also show the calculated x-ray intensity for a range of atmospheric abundances for Jupiter and Saturn and for a number of solar irradiance spectra. The model calculations are compared with recent x-ray observations of Jupiter and Saturn. We conclude that the emission of soft x-rays from the disks of Jupiter and Saturn can be largely explained by the scattering and fluorescence of soft x-rays. We suggest that measured x-ray intensities from the disk regions of Jupiter
Author
*Solar X-Rays; Albedo; X Ray Fluorescence; Solar Activity; Emission; Solar Radiation*

**20050215609** National Space Science and Technology Center, Huntsville, AL, USA
**How Space Radiation Risk from Galactic Cosmic Rays at the International Space Station Relates to Nuclear Cross Sections**
Lin, Zi-Wei; Adams, J. H., Jr.; 29th International Cosmic Ray Conference; 2005, pp. 101-106; In English; 29th International Cosmic Ray Conference, 3-10 Aug. 2005, Pune, India; No Copyright; Avail.: CASI: A01, Hardcopy

Space radiation risk to astronauts is a major obstacle for long term human space explorations. Space radiation transport codes have thus been developed to evaluate radiation effects at the International Space Station (ISS) and in missions to the Moon or Mars. We study how nuclear fragmentation processes in such radiation transport affect predictions on the radiation risk from galactic cosmic rays. Taking into account effects of the geomagnetic field on the cosmic ray spectra, we investigate the effects of fragmentation cross sections at different energies on the radiation risk (represented by dose-equivalent) from galactic cosmic rays behind typical spacecraft materials. These results tell us how the radiation risk at the ISS is related to nuclear cross sections at different energies, and consequently how to most efficiently reduce the physical uncertainty in our predictions on the radiation risk at the ISS.
Author
*Radiation Effects; Radiation Transport; Galactic Cosmic Rays; Nuclear Radiation; Extraterrestrial Radiation; Risk*

**20050217170** NASA Marshall Space Flight Center, Huntsville, AL, USA
**Evidence for a Canonical GRB Afterglow Light Curve in the Swift/XRT Data**
Nousek, J. A.; Kouveliotou, C.; Grupe, D.; Page, K.; Granot, J.; Ramirez-Ruiz, E.; Patel, S. K.; Burrows, D. N.; Mangano, V.; Barthelmy, S., et al.; [2005]; 2 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

We present new observations of the early X-ray afterglows of the first 27 gamma-ray bursts (GRBs) detected with the Swift X-ray Telescope (XRT). The early X-ray afterglows show a canonical behavior, where the light curve broadly consists of three distinct power law segments. These power law segments are separated by two corresponding break times. On top of this canonical behavior of the early X-ray light curve, many events have superimposed X-ray flares, which are most likely caused by internal shocks due to long lasting sporadx activity of the central engine, up to several hours after the GRB. We find that the initial steep decay is consistent with it being the tail of the prompt emission: from photons that are radiated at large angles relative to our line of sight. The first break in the light curve takes place when the forward shock emission becomes dominant, with the intermediate shallow flux decay likely caused by the continuous energy injection into the external shock. When this energy injection stops, a second break is then observed in the light curve. This energy injection increases

the energy of the afterglow shock by at least a factor of f greater than or approx. equal to 4, and augments the already severe requirements for the efficiency of the prompt gamma-ray emission.
Author
*Gamma Ray Bursts; Light Curve; X Ray Telescopes; Line of Sight; Gamma Rays; Afterglows*

**20050217203** NASA Johnson Space Center, Houston, TX, USA
**Martian Radiation Environment: Model Calculations and Recent Measurements with 'MARIE'**
Saganti, P. B.; Cucinotta, F. A.; zeitlin, C. J.; Cleghorn, T. F.; [2004]; 1 pp.; In English; 35th CSOPAR Scientific Assembly, 18-25 Jul. 2004, Paris, France; No Copyright; Avail.: Other Sources; Abstract Only

The Galactic Cosmic Ray spectra in Mars orbit were generated with the recently expanded HZETRN (High Z and Energy Transport) and QMSFRG (Quantum Multiple-Scattering theory of nuclear Fragmentation) model calculations. These model calculations are compared with the first eighteen months of measured data from the MARIE (Martian Radiation Environment Experiment) instrument onboard the 2001 Mars Odyssey spacecraft that is currently in Martian orbit. The dose rates observed by the MARIE instrument are within 10% of the model calculated predictions. Model calculations are compared with the MARIE measurements of dose, dose-equivalent values, along with the available particle flux distribution. Model calculated particle flux includes GCR elemental composition of atomic number, Z = 1-28 and mass number, A = 1-58. Particle flux calculations specific for the current MARIE mapping period are reviewed and presented.
Author
*Mars Environment; Nuclear Models; Mars Exploration; Galactic Cosmic Rays; Energy Transfer; Chemical Composition*

## 99
## 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.

**20050215101** NASA Marshall Space Flight Center, Huntsville, AL, USA
**FY 2003 Scientific and Technical Reports, Articles, Papers, and Presentations**
Fowler, B. A., Compiler; December 2004; 80 pp.; In English
Report No.(s): NASA/TM-2004-213605; M-1128; No Copyright; Avail.: CASI: A05, Hardcopy

This Technical Memorandum (TM) presents formal NASA technical reports, papers published in technical journals, and presentations by Marshall Space Flight Center (MSFC) personnel in FY 2003. It also includes papers of MSFC contractors. After being announced in STAR, all NASA series reports may be obtained from the National Technical Information Service, 5285 Port Royal Road, Spring.eld, VA 22161. The information in this TM may be of value to the scientific and engineering community in determining what information has been published and what is available.
Author
*Reports; Science; Engineering; Documents*

**20050216421** Sabanci Univ., Istanbul, Turkey
**A Comparative Study of Student Participation: A Case Study Comparing Classroom Discussions with WebCT Bulletin Board Discussions**
Uysal, Evrim; International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI-2004); [2004]; 22 pp.; In English; See also 20050216400; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper is a report on the findings of a study which was concerned with the impact of WebCT Bulletin Board Discussions on students studying English at the Upper Intermediate level in the preparatory year at a private university in Istanbul, Turkey. Specifically, the study investigated the following research questions: How does the participation level of the 'infrequent participants compare in WebCT and 1. Classroom environments? How do Upper-Intermediate students studying English in a private Turkish university 2. perceive the usefulness of WebCT Bulletin Board Discussions as opposed to Classroom Discussions? It was anticipated that WebCT Bulletin Board Discussions would act as communication facilitators for the infrequent participants in classroom discussions. Data regarding student profiles and the students' perceptions of classroom discussions and WebCT Bulletin Board Discussions was obtained through questionnaires administered prior to the start of the study. Data relating to participation levels was collected through the audio taping of classroom sessions and tallying

the logs of the WebCT Bulletin Board Discussion postings. These were then analyzed according to frequency of turns, turn-size and the nature of turns. The responses to the questionnaire revealed a noticeable preference for classroom discussions as opposed to WebCT Bulletin Board Discussions. The analysis of turn-taking showed that, in general, students took longer but somewhat fewer turns in the WebCT Bulletin Board Discussions. However, when it came to the infrequent participants the hypothesis was confirmed. These students took considerably more turns during the WebCT Bulletin Board Discussions and these turns were noticeably longer.

Author

*Frequencies; Hypotheses; Perception; Students*

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