



**National Aeronautics and  
Space Administration  
Langley Research Center**

**Scientific and Technical  
Information Program Office**

# **Scientific and Technical Aerospace Reports**

# STAIR

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## NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA scientific and technical information (STI) program plays a key part in helping NASA maintain this important role.

The NASA STI program operates under the auspices of the Agency Chief Information Officer. It collects, organizes, provides for archiving, and disseminates NASA's STI. The NASA STI program provides access to the NASA Aeronautics and Space Database and its public interface, the NASA Technical Report Server, thus providing one of the largest collections of aeronautical and space science STI in the world. Results are published in both non-NASA channels and by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA Programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.

- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.
- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services also include creating custom thesauri, building customized databases, and organizing and publishing research results.

For more information about the NASA STI program, see the following:

- Access the NASA STI program home page at <http://www.sti.nasa.gov>
- E-mail your question via the Internet to [help@sti.nasa.gov](mailto:help@sti.nasa.gov)
- Fax your question to the NASA STI Help Desk at (301) 621-0134
- Phone the NASA STI Help Desk at (301) 621-0390
- Write to:  
NASA STI Help Desk  
NASA Center for AeroSpace Information  
7115 Standard Drive  
Hanover, MD 21076-1320

# Introduction

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

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

*STAR* includes citations to R&D results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

## The NASA STI Program

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

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces, and disseminates both NASA's internal STI and worldwide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA Aeronautics and Space Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up-to-date NASA STI, visit the STI Program's Web site at <http://www.sti.nasa.gov>.

# NASA STI Availability Information

## NASA Center for AeroSpace Information (CASI)

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

Each citation in *STAR* indicates a 'Source of Availability.' When CASI is indicated, the user can order this information directly from CASI using the [STI Online Order Form](#), e-mail to [help@sti.nasa.gov](mailto:help@sti.nasa.gov), or telephone the STI Help Desk at 301-621-0390. Before ordering you may access [price code tables](#) for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

## National Technical Information Service (NTIS)

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

## The Federal Depository Library Program (FDLP)

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

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

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

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**[Subject Term Index](#)**

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# SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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

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VOLUME 46, NUMBER 04

MARCH 3, 2008

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.

**20080008828** NASA Dryden Flight Research Center, Edwards, CA, USA

### **Dryden Flight Research Center**

Kostyk, Christopher Barry; January 2007; 13 pp.; In English; Thermal and Fluids Analysis Workshop (TFAWS 2007), 10-14 Sep. 2007, Warrensville Heights, OH, USA; Original contains color and black and white illustrations; No Copyright;

Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008828>

As part of a session at the 2007 Thermal & Fluids Analysis Workshop (TFAWS), an overview of the operations at NASA Dryden Flight Research Center was given. Mission support at this site includes the Aeronautics Research Mission Directorate (ARMD); Exploration Systems Mission Directorate (ESMD), Science - ER-2; Science - G3 UAVSAR; Science - Ikhana and Space Operations. In addition, the presentation describes TFAWS related work at Dryden.

Derived from text

*Research Facilities; Aeronautical Engineering; Test Facilities*

**20080008835** NASA Langley Research Center, Hampton, VA, USA

### **PLIF Imaging of Capsule RCS Jets, Shear Layers, and Simulated Forebody Ablation**

Inman, Jennifer A.; Danehy, Paul M.; Alderfer, David W.; Buck, Gregory M.; McCrea, Andrew; January 07, 2008; 14 pp.; In English; 46th AIAA Aerospace Sciences Meeting and Exhibit, 7-10 Jan. 2008, Reno, NV, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 644423.05; Copyright; Avail.: CASI: [A03](#), Hardcopy

Planar laser-induced fluorescence (PLIF) has been used to investigate hypersonic flows associated with capsule reentry vehicles. These flows included reaction control system (RCS) jets, shear layer flow, and simulated forebody heatshield ablation. Pitch, roll, and yaw RCS jets were studied. PLIF obtained planar slices in these flowfields. These slices could be viewed individually or they could be combined using computer visualization techniques to reconstruct the three dimensional shape of the flow. The tests described herein were conducted in the 31-Inch Mach 10 Air Tunnel at NASA Langley Research Center. Improvements to many facets of the imaging system increased the efficiency and quality of both data acquisition, in addition to increasing the overall robustness of the system.

Author

*Laser Induced Fluorescence; Reentry Vehicles; Hypersonic Flow; Shear Layers; Forebodies; Heat Shielding; Ablation; Roll; Yaw*

**20080008875** NASA Dryden Flight Research Center, Edwards, CA, USA

### **Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908**

Bowers, Al; Cole, Jennifer Hansen; Martin, Cam; January 2008; 60 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: [A04](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008875>

This viewgraph presentation reviews the Wright Brothers's flight research during the 10 years between 1899 and 1908. The Wright Brothers began their research in flight with gliders. The presentation shows pictures, replicas and characteristics



of the gliders that the Wright Brothers used. This presentation is not just a history lesson. In the end it investigates ‘What Does Flight Research Accomplish?’ Flight research can serve many uses, such as Separates the Real from the Imagined, Uncovers the Unexpected and the Overlooked, Forces the Realistic Integration of the Pilot, Forces the Development of Reliable Prediction and Test Processes, Requires Every Problem to Be Addressed, Promotes Technology Transfer, and Builds a Core Technical Team,

CASI

*Gliders; Flight Test Vehicles; Flight Tests; Histories*

**20080009511** NASA, Washington, DC USA

**Nonsurvivable momentum exchange system**

Roder, Russell, Inventor; Ahronovich, Eliezer, Inventor; Davis, III, Milton C., Inventor; November 6, 2007; 8 pp.; In English  
Patent Info.: Filed September 29, 2005; US-Patent-7,290,737; US-Patent-Appl-SN-11/251,537; No Copyright; Avail.:

CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009511>

A demisable momentum exchange system includes a base and a flywheel rotatably supported on the base. The flywheel includes a web portion defining a plurality of web openings and a rim portion. The momentum exchange system further includes a motor for driving the flywheel and a cover for engaging the base to substantially enclose the flywheel. The system may also include components having a melting temperature below 1500 degrees Celsius. The momentum exchange system is configured to demise on reentry.

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

*Flywheels; Momentum*

**20080009516** NASA, Washington, DC USA

**Method and associated apparatus for capturing, servicing and de-orbiting earth satellites using robotics**

Cepollina, Frank J., Inventor; Burns, Richard D., Inventor; Holz, Jill M., Inventor; Corbo, James E., Inventor; Jedhrich, Nicholas M., Inventor; July 10, 2007; 48 pp.; In English

Patent Info.: Filed May 6, 2005; US-Patent-7,240,879; US-Patent-Appl-SN-11/124,592; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009516>

This invention is a method and supporting apparatus for autonomously capturing, servicing and de-orbiting a free-flying spacecraft, such as a satellite, using robotics. The capture of the spacecraft includes the steps of optically seeking and ranging the satellite using LIDAR; and matching tumble rates, rendezvousing and berthing with the satellite. Servicing of the spacecraft may be done using supervised autonomy, which is allowing a robot to execute a sequence of instructions without intervention from a remote human-occupied location. These instructions may be packaged at the remote station in a script and uplinked to the robot for execution upon remote command giving authority to proceed. Alternately, the instructions may be generated by Artificial Intelligence (AI) logic onboard the robot. In either case, the remote operator maintains the ability to abort an instruction or script at any time, as well as the ability to intervene using manual override to teleoperate the robot. In one embodiment, a vehicle used for carrying out the method of this invention comprises an ejection module, which includes the robot, and a de-orbit module. Once servicing is completed by the robot, the ejection module separates from the de-orbit module, leaving the de-orbit module attached to the satellite for de-orbiting the same at a future time. Upon separation, the ejection module can either de-orbit itself or rendezvous with another satellite for servicing. The ability to de-orbit a spacecraft further allows the opportunity to direct the landing of the spent satellite in a safe location away from population centers, such as the ocean.

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

*Robotics; Ejection; Satellites*



## 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.

**20080008839** NASA Glenn Research Center, Cleveland, OH, USA

### **A 1/10 Scale Model Test of a Fixed Chute Mixer-Ejector Nozzle in Unsuppressed Mode, Part 1, Test Overview**

Wolter, John D.; December 2007; 24 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.03.11.03

Report No.(s): NASA/TM-2007-213601/PART1; E-15068/PART1; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008839>

This paper discusses a test of a nozzle concept for a high-speed commercial aircraft. While a great deal of effort has been expended to understand the noise-suppressed, take-off performance of mixer-ejector nozzles, little has been done to assess their performance in unsuppressed mode at other flight conditions. To address this, a 1/10th scale model mixer-ejector nozzle in unsuppressed mode was tested at conditions representing transonic acceleration, supersonic cruise, subsonic cruise, and approach. Various configurations were tested to understand the effects of acoustic liners and several geometric parameters, such as throat area, expansion ratio, and nozzle length on nozzle performance. Thrust, flow, and internal pressures were measured. A statistical model of the peak thrust coefficient results is presented and discussed.

Author

*Mathematical Models; Mixers; Convergent-Divergent Nozzles; Scale Models; Exhaust Nozzles; Nozzle Design*

## 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.

**20080008608** Nebraska Univ., Omaha, NE, USA

### **Journal of Air Transportation, Volume 12, No. 2 (ATRS Special Edition)**

Bowen, Brent D., Editor; Kabashkin, Igor, Editor; Fink, Mary, Editor; January 2007; ISSN 1544-6980; In English; See also 20080008609 - 20080008613

Contract(s)/Grant(s): NNG05GJ03H

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

Topics covered include: Competition and Change in the Long-Haul Markets from Europe; Insights into the Maintenance, Repair, and Overhaul Configurations of European Airlines; Validation of Fault Tree Analysis in Aviation Safety Management; An Investigation into Airline Service Quality Performance between U.S. Legacy Carriers and Their EU Competitors and Partners; and Climate Impact of Aircraft Technology and Design Changes.

Derived from text

*Air Transportation; Aircraft Safety; Safety Management; Flight Safety; Commercial Aircraft; Civil Aviation*

**20080008610** Embry-Riddle Aeronautical Univ., Daytona Beach, FL, USA

### **An Investigation into Airline Service Quality Performance between U.S. Legacy Carriers and Their EU Competitors and Partners**

Waguespack, Blaise, Jr.; Rhoades, Dawna L.; Tiernan, Siobhan; Journal of Air Transportation, Volume 12, No. 2 (ATRS Special Edition); January 2007, pp. 59-71; In English; See also [20080008608](#); Copyright; Avail.: Other Sources

Published research on airline service quality has been investigated in two broad methods, either utilizing a survey methodology or an index/score system based on secondary operational statistics. However, little research exists examining service quality between US and EU carriers due to reporting issues in the past. With new public data sources appearing on EU airlines this research attempts to examine service quality measures between airlines operating across the North Atlantic who are both competitors and, due to alliance formation issues today, partners. Preliminary results support the conclusion that

EU airlines are delivering superior service quality on some key aspects of service quality than their US competitors and partners, but lost baggage issues among major EU carriers remains a major service difficulty.

Author

*Airline Operations; Air Transportation; Commercial Aircraft; Flight Operations; Comparison*

**20080008611** National Chiao Tung Univ., Taipei, Taiwan, Province of China

**Validation of Fault Tree Analysis in Aviation Safety Management**

Wong, Jinn-Tsai; Yeh, Wen-Chien; Journal of Air Transportation, Volume 12, No. 2 (ATRS Special Edition); January 2007, pp. 43-57; In English; See also [20080008608](#); Copyright; Avail.: Other Sources

In view of the frequent adoption of fault tree analysis (FTA) in aviation safety management and the importance of model validation in complex safety system, the validation of FTA with limited available data is a crucial issue worth being studied. This study proposes a rapid and efficient validation process, which combines the complement of the single-event and the multi-event validations, to cope with a variety of data availability problems. An illustration of 'aircraft lands with gear-up' event reveals that the proposed process works well and is able to deal with complicated tree structure relations.

Author

*Aircraft Safety; Fault Trees; Flight Safety; Probability Theory; Mathematical Models; Air Transportation; Proving*

**20080008612** Cardiff Univ., UK

**Insights into the Maintenance, Repair, and Overhaul Configurations of European Airlines**

Al-kaabi, Hamid; Potter, Andrew; Naim, Mohamed; Journal of Air Transportation, Volume 12, No. 2 (ATRS Special Edition); January 2007, pp. 27-42; In English; See also [20080008608](#); Copyright; Avail.: Other Sources

We determine the significant variables that impact on European airlines decisions to outsource their maintenance, repair and overhaul (MRO) function. We establish the relationship between the variables, the degree of outsourcing, and the impact these variables have on two criteria; MRO costs and airline punctuality. Analysis indicates that fleet size, fleet mix, percentage of leased aircraft and the airline business model impact decision making. Generally, Line Maintenance is retained as a critical in-house activity, while Engine Maintenance and Spares and Rotables are outsourced. While relative costs of the MRO activity will increase, this is outweighed by improvements in technical punctuality.

Author

*Airline Operations; Maintenance; Commercial Aircraft; Europe; Civil Aviation*

**20080008613** Westminster Univ., London, UK

**Competition and Change in the Long-Haul Markets from Europe**

Dennis, Nigel; Journal of Air Transportation, Volume 12, No. 2 (ATRS Special Edition); January 2007, pp. 4-26; In English; See also [20080008608](#); Copyright; Avail.: Other Sources

Long-haul operations remain crucial to the viability of many of the traditional European flag carriers. An analysis is made of the current services and it is shown that alliances and the recent round of airline failures have led to greater concentration on the major hubs. Aircraft and product developments are discussed. More non-stop destinations and higher frequencies are expected from the major European hubs to other world regions, coupled with increased non-European carrier service to second-tier cities in Europe. The scope for a long-haul low-cost airline is analyzed and traditional operations are shown to be in a relatively stronger position.

Author

*Airline Operations; Europe; Market Research; Viability*

**20080008836** NASA Langley Research Center, Hampton, VA, USA

**Subsonic Aircraft Safety Icing Study**

Jones, Sharon Monica; Reveley, Mary S.; Evans, Joni K.; Barrientos, Francesca A.; January 2008; 45 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 457280.02.07.07.02

Report No.(s): NASA/TM--2008-215107; L-19435; Copyright; Avail.: CASI: [A03](#), Hardcopy

NASA's Integrated Resilient Aircraft Control (IRAC) Project is one of four projects within the agency's Aviation Safety Program (AvSafe) in the Aeronautics Research Mission Directorate (ARMD). The IRAC Project, which was redesigned in the first half of 2007, conducts research to advance the state of the art in aircraft control design tools and techniques. A 'Key Decision Point' was established for fiscal year 2007 with the following expected outcomes: document the most currently

available statistical/prognostic data associated with icing for subsonic transport, summarize reports by subject matter experts in icing research on current knowledge of icing effects on control parameters and establish future requirements for icing research for subsonic transports including the appropriate alignment. This study contains: (1) statistical analyses of accident and incident data conducted by NASA researchers for this 'Key Decision Point', (2) an examination of icing in other recent statistically based studies, (3) a summary of aviation safety priority lists that have been developed by various subject-matter experts, including the significance of aircraft icing research in these lists and (4) suggested future requirements for NASA icing research. The review of several studies by subject-matter experts was summarized into four high-priority icing research areas. Based on the Integrated Resilient Aircraft Control (IRAC) Project goals and objectives, the IRAC project was encouraged to conduct work in all of the high-priority icing research areas that were identified, with the exception of the developing of methods to sense and document actual icing conditions.

Author

*Aircraft Safety; Aircraft Icing; Aircraft Accidents; Control Systems Design; Flight Safety; Ice Formation; Aeronautical Engineering*

**20080008874** NASA Glenn Research Center, Cleveland, OH, USA

### **Water Droplet Impingement on Simulated Glaze, Mixed, and Rime Ice Accretions**

Papadakis, Michael; Rachman, Arief; Wong, See-Cheuk; Yeong, Hsiung-Wei; Hung, Kuohsing E.; Vu, Giao T.; Bidwell, Colin S.; October 2007; 304 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG3-2838; WBS 22-077-41-08

Report No.(s): NASA/TM-2007-213961; E-15277; Copyright; Avail.: CASI: [A14](#), Hardcopy

Water droplet impingement data were obtained at the NASA Glenn Icing Research Tunnel (IRT) for a 36-in. chord NACA 23012 airfoil with and without simulated ice using a dye-tracer method. The simulated ice shapes were defined with the NASA Glenn LEWICE 2.2 ice accretion program and including one rime, four mixed and five glaze ice shapes. The impingement experiments were performed with spray clouds having median volumetric diameters of 20, 52, 111, 154, and 236 micron. Comparisons to the experimental data were generated which showed good agreement for the rime and mixed shapes at lower drop sizes. For larger drops sizes LEWICE 2.2 over predicted the collection efficiencies due to droplet splashing effects which were not modeled in the program. Also for the more complex glaze ice shapes interpolation errors resulted in the over prediction of collection efficiencies in cove or shadow regions of ice shapes.

Author

*Drop Size; Impingement; Aircraft Icing; Ice Formation; Mathematical Models; Airfoils*

**20080009429** City Univ. of New York, NY USA

### **Methods and systems for detection of ice formation on surfaces**

Alfano, Robert R., Inventor; Wang, Wubao, Inventor; Sztul, Henry, Inventor; Budansky, Yury, Inventor; December 25, 2007; 13 pp.; In English

Contract(s)/Grant(s): NCC1-03009

Patent Info.: Filed December 15, 2005; US-Patent-7,312,713; US-Patent-Appl-SN-11/303,190; No Copyright; Avail.:

CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009429>

A system for detecting ice formation on metal, painted metal and other material surfaces can include a transparent window having an exterior surface upon which ice can form; a light source and optics configured and arranged to illuminate the exterior surface of the window from behind the exterior surface; and a detector and optics configured and arranged to receive light backscattered by the exterior surface and any ice disposed on the exterior surface and determine the thickness of the ice layer. For example, the system can be used with aircraft by placing one or more windows in the wings of the aircraft. The system is used for a novel optical method for real-time on-board detection and warning of ice formation on surfaces of airplanes, unmanned aerial vehicles (UAVs), and other vehicles and stationary structures to improve their safety and operation.

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

*Detection; Ice Formation; Aircraft; Aircraft Safety*

**20080009542** NASA Ames Research Center, Moffett Field, CA, USA

### **Properties of Aircraft Clusters in the National Airspace System**

Bilimoria, Karl D.; Jastrzebski, Michael; [2006]; 3 pp.; In English; AIAA Aviation, Technology, Integration, and Operations Conference, 25-27 Sep. 2006, Wichita, KS, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Future air traffic management concepts generally include automated separation assurance as a key feature. It is of interest

to identify dynamic regions of local airspace where the separation assurance problem is especially challenging due to the presence of aircraft clusters (groups of proximate aircraft). This paper presents a methodology for automated identification of cluster patterns that maximize a performance index incorporating measures of density, separation, and stability. The clustering methodology was applied to 24-hour traffic scenarios, derived from recorded field data, across the National Airspace System. Results are presented for a future triple-volume traffic scenario at a single flight level. It was found that the clustering methodology generally produced dense, well-separated, and stable cluster patterns. An analysis of cluster distributions over space and time showed that the frequency of cluster occurrences at locations across the USA was not uniform, and there were many locations where clusters did not occur. On the other hand, there were some locations, especially in the Mid-west, that had a relatively high frequency of cluster occurrence. It was also found that clusters did not persist for long at any location, indicating that they are dynamic in nature.

Author

*Air Traffic Control; Airspace; National Airspace System; Aircraft Approach Spacing; Aircraft Safety; Collision Avoidance; Flight Safety*

**20080009565** Federal Aviation Administration, Washington, DC, USA; Auburn Univ., AL, USA

**Field Evaluation of Whole Airliner Decontamination Technologies for Narrow-body Aircraft**

Gale, William F.; Gale, Hyacinth S.; Watson, Jean; January 2008; 16 pp.; In English; Original contains black and white illustrations

Report No.(s): DOT/FAA/AM-08/2; Copyright; Avail.: CASI: [A03](#), Hardcopy

The outcome of a field evaluation of AeroClave's thermal decontamination system is discussed. This exercise evaluated the system both as a stand-alone technology and as a means of delivering STERIS vaporized hydrogen peroxide (VHP)\*. The report is submitted in the context of a decontamination technology selection exercise and work conducted on the efficacy of thermal decontamination. The field evaluation, performed on a McDonnell Douglas DC-9 aircraft, determined that the stand-alone thermal decontamination system exhibited reasonable temperature and relative humidity control capabilities. Indeed, the system reproduced the environmental conditions needed to be efficacious as an antiviral process, based on an earlier study. The thermal decontamination system also provided an effective means of providing environmental preconditioning for the use of VHP and for aeration after VHP exposure. The field evaluation did leave a number of unanswered issues which are discussed in the report. Overall, the field evaluation of both the stand-alone thermal decontamination system and the VHP add-in can be described as successful.

Author

*Decontamination; Technology Utilization; Hydrogen Peroxide; Thermal Analysis; DC 9 Aircraft; Aerospace Medicine*

## 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.

**20080009428** NASA, Washington, DC USA

**Delay banking for air traffic management**

Green, Steven M., Inventor; December 25, 2007; 13 pp.; In English

Patent Info.: Filed February 1, 2005; US-Patent-7,313,475; US-Patent-Appl-SN-11/053,713; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009428>

A method and associated system for time delay banking for aircraft arrival time, aircraft departure time and/or en route flight position. The delay credit value for a given flight may decrease with passage of time and may be transferred to or traded with other flights having the same or a different user (airline owner or operator). The delay credit value for a given aircraft flight depends upon an initial delay credit value, which is determined by a central system and depends upon one or more other flight characteristics. Optionally, the delay credit value decreases with passage of time. Optionally, a transaction cost is assessed against a delay credit value that is used on behalf of another flight with the same user or is traded with a different user.

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

*Air Traffic Control; Time Lag*

## 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.

**20080008609** Technische Univ., Munich, Germany

### **Climate Impact of Aircraft Technology and Design Changes**

Egelhofer, Regina; Marizy, Corinne; Cros, Christophe; Journal of Air Transportation, Volume 12, No. 2 (ATRS Special Edition); January 2007, pp. 72-97; In English; See also [20080008608](#); Copyright; Avail.: Other Sources

In this article we describe a method for considering, within the aircraft design process, aviation's impact on climate change. Models of worldwide air traffic are developed--for past, current and future fleets, the latter using market forecast information. Aircraft performance data are used to generate emission scenarios-- datasets of quantities of various emissions (CO<sub>2</sub>, NO<sub>x</sub>, etc.) and contrails on a latitude-longitude-altitude grid covering the globe. A new aircraft concept with a specific performance is introduced into such a model to quantify the resulting changes in emissions quantities. When it becomes available, a model or metric of the atmosphere will use the emission inventories to allow assessment of new aircraft concepts in terms of their actual climate effect. The method has been applied to assess, in terms of emissions, the impact of new aircraft technologies introduced between 1995 and 2005. A hypothetical emission scenario with a 1995- type fleet providing the air traffic of 2005 was generated. The results show the improved technology of the world fleet (> 100 seats) in this time period reduced global fuel consumption by around six to seven percent.

Author

*Air Traffic; Climate Change; Aircraft Design; Climate Models; Pollution Transport; Atmospheric Circulation*

**20080008716** Boeing Co., Chicago, IL USA

### **System and method for improved rotor tip performance**

Bussom, Richard, Inventor; McVeigh, Michael A., Inventor; Narducci, Robert P., Inventor; Zientek, Thomas A., Inventor; September 4, 2007; 13 pp.; In English

Contract(s)/Grant(s): NCC2-9019

Patent Info.: Filed July 23, 2004; US-Patent-7,264,200; US-Patent-Appl-SN-10/898,698; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008716>

The present invention discloses systems and methods for the performance enhancement of rotary wing aircraft through reduced torque, noise and vibration. In one embodiment, a system includes a sail having an aerodynamic shape positioned proximate to a tip of the rotor blade. An actuator may be configured to rotate the sail relative to the blade tip. A control system receives information from a rotorcraft system and commands the actuator to rotate the sail to a predetermined favorable rotor blade operating condition. In another embodiment, a method includes configuring the rotorcraft in a selected flight condition, communicating input signals to a control system operable to position sails coupled to tips of blades of a rotor assembly, processing the input signals according to a constraint condition to generate sail positional information, and transferring the sail positional information to the sail.

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

*Rotary Wing Aircraft; Rotors; Torque; Vibration; Noise Reduction; Sails*

**20080008721** Aerospace Computing, Inc., Mountain View, CA USA

### **Dividers for reduction of aerodynamic drag of vehicles with open cavities**

Storms, Bruce L., Inventor; August 28, 2007; 12 pp.; In English

Contract(s)/Grant(s): NAS2-03144

Patent Info.: Filed April 1, 2005; US-Patent-7,261,353; US-Patent-Appl-SN-11/097,052; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008721>

A drag-reduction concept for vehicles with open cavities includes dividing a cavity into smaller adjacent cavities through installation of one or more vertical dividers. The dividers may extend the full depth of the cavity or only partial depth. In either



application, the top of the dividers are typically flush with the top of the bed or cargo bay of the vehicle. The dividers may be of any material, but are strong enough for both wind loads and forces encountered during cargo loading/unloading. For partial depth dividers, a structural angle may be desired to increase strength.

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

*Aerodynamic Drag; Cavities; Dividers; Drag Reduction*

**20080008812** American Inst. of Aeronautics and Astronautics, Reston, VA, USA

### **High Hopes for HIFiRE Scramjet**

Wilson, J. R.; Aerospace America; November 2007; ISSN 0740-722X; Volume 46, No. 11, pp. 33-37; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

This article describes a six year, \$54 million collaboration between Boeing, the Univ. of Queensland (UQ), the Air Force Research Lab (AFRL), NASA and Australia's Defence Science and Technology Organization called Hypersonic International Flight Research Experimentation or HiFiRE. The program represents one of the largest U.S./Australian collaborations of its kind, including up to 10 flights testing various aspects of scramjet technology.

Author

*Supersonic Combustion Ramjet Engines; Research Aircraft; Hypersonics; Hypersonic Aircraft*

## **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.

**20080009592** NASA Johnson Space Center, Houston, TX, USA

### **ISS Contingency Attitude Control Recovery Method for Loss of Automatic Thruster Control**

Bedrossian, Nazareth; Bhatt, Sagar; Alaniz, Abran; McCants, Edward; Nguyen, Louis; Chamitoff, Greg; [2008]; 15 pp.; In English; 31st Annual American Astronomical Society GN&C Meeting, 1-6 Feb. 2008, Breckenridge, Co, USA; Original contains color illustrations

Contract(s)/Grant(s): 401769.06.04.01.02.04; Copyright; Avail.: CASI: [A03](#), Hardcopy

In this paper, the attitude control issues associated with International Space Station (ISS) loss of automatic thruster control capability are discussed and methods for attitude control recovery are presented. This scenario was experienced recently during Shuttle mission STS-117 and ISS Stage 13A in June 2007 when the Russian GN&C computers, which command the ISS thrusters, failed. Without automatic propulsive attitude control, the ISS would not be able to regain attitude control after the Orbiter undocked. The core issues associated with recovering long-term attitude control using CMGs are described as well as the systems engineering analysis to identify recovery options. It is shown that the recovery method can be separated into a procedure for rate damping to a safe harbor gravity gradient stable orientation and a capability to maneuver the vehicle to the necessary initial conditions for long term attitude hold. A manual control option using Soyuz and Progress vehicle thrusters is investigated for rate damping and maneuvers. The issues with implementing such an option are presented and the key issue of closed-loop stability is addressed. A new non-propulsive alternative to thruster control, Zero Propellant Maneuver (ZPM) attitude control method is introduced and its rate damping and maneuver performance evaluated. It is shown that ZPM can meet the tight attitude and rate error tolerances needed for long term attitude control. A combination of manual thruster rate damping to a safe harbor attitude followed by a ZPM to Stage long term attitude control orientation was selected by the Anomaly Resolution Team as the alternate attitude control method for such a contingency.

Author

*Attitude Control; Automatic Control; International Space Station; Thrust Control; Space Shuttle Missions; Avionics*

## 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.

**20080009482** General Electric Co., Schenectady, NY USA

#### **Crescentic ramp turbine stage**

Lee, Ching-Pang, Inventor; Tam, Anna, Inventor; Kirtley, Kevin Richard, Inventor; Lamson, Scott Henry, Inventor; May 22, 2007; 17 pp.; In English

Contract(s)/Grant(s): NAS3-01135

Patent Info.: Filed April 14, 2005; US-Patent-7,220,100; US-Patent-Appl-SN-11/106,198; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009482>

A turbine stage includes a row of airfoils joined to corresponding platforms to define flow passages therebetween. Each airfoil includes opposite pressure and suction sides and extends in chord between opposite leading and trailing edges. Each platform includes a crescentic ramp increasing in height from the leading and trailing edges toward the midchord of the airfoil along the pressure side thereof.

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

*Airfoils; Gas Turbine Engines; Ramps*

## 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.

**20080009475** General Electric Co., Niskayuna, NY USA

#### **Short range RF communication for jet engine control**

Sexton, Daniel White, Inventor; Hershey, John Erik, Inventor; June 26, 2007; 16 pp.; In English

Contract(s)/Grant(s): NAS3-27720

Patent Info.: Filed February 26, 2002; US-Patent-7,236,503; US-Patent-Appl-SN-10/082,382; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009475>

A method transmitting a message over at least one of a plurality of radio frequency (RF) channels of an RF communications network is provided. The method comprises the steps of detecting a presence of jamming pulses in the at least one of the plurality of RF channels. The characteristics of the jamming pulses in the at least one of the plurality of RF channels is determined wherein the determined characteristics define at least interstices between the jamming pulses. The message is transmitted over the at least one of the plurality of RF channels wherein the message is transmitted within the interstices of the jamming pulse determined from the step of determining characteristics of the jamming pulses.

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

*Communication Equipment; Communication Networks; Engine Control; Jet Engines; Radio Communication; Radio Frequencies; Jamming*

**20080009492** AeroVironment, Inc., Monrovia, CA USA

#### **Aircraft control system**

Lisoski, Derek L., Inventor; Kendall, Greg T., Inventor; April 3, 2007; 43 pp.; In English

Patent Info.: Filed December 5, 2002; US-Patent-7,198,225; US-Patent-Appl-SN-10/310,415; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009492>

A solar rechargeable, long-duration, span-loaded flying wing, having no fuselage or rudder. Having a two-hundred foot wingspan that mounts photovoltaic cells on most all of the wing's top surface, the aircraft uses only differential thrust of its eight propellers to turn, pitch and yaw. The wing is configured to deform under flight loads to position the propellers such that the control can be achieved. Each of five segments of the wing has one or more motors and photovoltaic arrays, and produces



its own lift independent of the other segments, to avoid loading them. Five two-sided photovoltaic arrays, in all, are mounted on the wing, and receive photovoltaic energy both incident on top of the wing, and which is incident also from below, through a bottom, transparent surface.

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

*Aircraft Control; Control Systems Design; Wings; Solar Arrays*

## 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*.

**20080008605** NASA Johnson Space Center, Houston, TX, USA

#### **Decadal Planning Team Mars Mission Analysis Summary**

Drake, Bret G.; July 2007; 106 pp.; In English; See also 20080008606 - 20080008607; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2007-214761; JSC 63725; S-1012; No Copyright; Avail.: CASI: [A06](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008605>

In June 1999, the NASA Administrator chartered an internal NASA task force, termed the Decadal Planning Team, to create new integrated vision and strategy for space exploration. The efforts of the Decadal Planning Team evolved into the Agency-wide team known as the NASA Exploration Team (NEXT). This team was also instructed to identify technology roadmaps to enable the science-driven exploration vision, established a cross-enterprise, cross-center systems engineering team with emphasis focused on revolutionary not evolutionary approaches. The strategy of the DPT and NEXT teams was to 'Go Anywhere, Anytime' by conquering key exploration hurdles of space transportation, crew health and safety, human/robotic partnerships, affordable abundant power, and advanced space systems performance. During the DPT and NEXT study cycles, several architectures were analyzed including missions to the Earth-Sun Libration Point, the Earth-Moon Gateway and Earth-Moon Libration Point, the lunar surface, Mars (both short and long stays), one-year round trip Mars, and near-Earth asteroids. Although there was much emphasis placed on utilization of existing launch capabilities, the team concluded that missions in near-Earth space are only marginally feasible and human missions to Mars were not feasible without a heavy lift launch capability. In addition, the team concluded that missions in Earth's neighborhood, such as to the moon, can serve as stepping-stones toward further deep-space missions in terms of proving systems, technologies, and operational concepts.

Author

*Space Exploration; Systems Engineering; Lunar Surface; Deep Space; Space Transportation; Aerospace Medicine*

**20080008606** NASA Johnson Space Center, Houston, TX, USA

#### **DPT Mars Short-Stay Mission Architecture Status: Mid-Term (2018) Nuclear Thermal Propulsion System Option**

Drake, Bret G.; Decadal Planning Team Mars Mission Analysis Summary; July 2007, pp. 1-43; In English; See also [20080008605](#); Original contains color illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008606>

The viewgraph presentation reports the results of the Decadal Planning Team's study of a short-stay mission to Mars. The report includes ground rules and assumptions; trajectory options, including a flyby of Venus on the return trip; a systems overview including transit habitat, descent/ascent vehicles, and interplanetary transportation; technology needs; and an architecture summary that reviews strengths and weaknesses of the plans, issues and follow-on work, and remaining work.

CASI

*Mars Missions; Nuclear Propulsion; Interplanetary Trajectories; Trajectories; Mission Planning*

**20080009519** Johns Hopkins Univ., Baltimore, MD USA

**Method for deploying multiple spacecraft**

Sharer, Peter J., Inventor; May 22, 2007; 23 pp.; In English

Contract(s)/Grant(s): NAS5-97271

Patent Info.: Filed July 6, 2004; US-Patent-7,219,858; US-Patent-Appl-SN-10/884,901; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009519>

A method for deploying multiple spacecraft is disclosed. The method can be used in a situation where a first celestial body is being orbited by a second celestial body. The spacecraft are loaded onto a single spaceship that contains the multiple spacecraft and the spacecraft is launched from the second celestial body towards a third celestial body. The spacecraft are separated from each other while in route to the third celestial body. Each of the spacecraft is then subjected to the gravitational field of the third celestial body and each of the spacecraft assumes a different, independent orbit about the first celestial body. In those situations where the spacecraft are launched from Earth, the Sun can act as the first celestial body, the Earth can act as the second celestial body and the Moon can act as the third celestial body.

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

*Spacecraft Orbits; Orbital Mechanics; Deployment*

14

**GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)**

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

**20080009439** Boeing Co., Chicago, IL USA

**Methods and systems for advanced spaceport information management**

Fussell, Ronald M., Inventor; Ely, Donald W., Inventor; Meier, Gary M., Inventor; Halpin, Paul C., Inventor; Meade, Phillip T., Inventor; Jacobson, Craig A., Inventor; Blackwell-Thompson, Charlie, Inventor; November 27, 2007; 15 pp.; In English

Contract(s)/Grant(s): NAS10-02007; NAS10-11400

Patent Info.: Filed March 17, 2005; US-Patent-7,302,364; US-Patent-Appl-SN-11/083,420; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009439>

Advanced spaceport information management methods and systems are disclosed. In one embodiment, a method includes coupling a test system to the payload and transmitting one or more test signals that emulate an anticipated condition from the test system to the payload. One or more responsive signals are received from the payload into the test system and are analyzed to determine whether one or more of the responsive signals comprises an anomalous signal. At least one of the steps of transmitting, receiving, analyzing and determining includes transmitting at least one of the test signals and the responsive signals via a communications link from a payload processing facility to a remotely located facility. In one particular embodiment, the communications link is an Internet link from a payload processing facility to a remotely located facility (e.g. a launch facility, university, etc.).

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

*Space Transportation; Payloads; Information Management; Systems Management; Tests*

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*.

**20080008862** NASA Glenn Research Center, Cleveland, OH, USA

**Space Telecommunications Radio System (STRS) Architecture Goals/Objectives and Level 1 Requirements**

Briones, Janette C.; Johnson, Sandra K.; VanDerAar, Lisa; December 2007; 18 pp.; In English

Contract(s)/Grant(s): WBS439432.04.07.01

Report No.(s): NASA/TM-2007-215042; E-16230; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008862>

The Space Telecommunications Radio System (STRS) Architecture Requirements Document provides the basis for the

development of an open architecture for NASA Software Defined Radios (SDRs) for space use. The main objective of this document is to evaluate the goals and objectives and high level (Level 1) requirements that have bearing on the design of the architecture. The goals and objectives will provide broad, fundamental direction and purpose. The high level requirements (Level 1) intend to guide the broader and longer term aspects of the SDR Architecture and provide guidance for the development of level 2 requirements.

Author

*Radio Equipment; Radio Communication; Spacecraft Communication*

**20080009483** Draper (Charles Stark) Lab., Inc., Cambridge, MA USA

**Integrated inertial stellar attitude sensor**

Brady, Tye M., Inventor; Kourepenis, Anthony S., Inventor; Wyman, Jr., William F., Inventor; May 8, 2007; 36 pp.; In English Patent Info.: Filed July 16, 2003; US-Patent-7,216,036; US-Patent-Appl-SN-10/621,097; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009483>

An integrated inertial stellar attitude sensor for an aerospace vehicle includes a star camera system, a gyroscope system, a controller system for synchronously integrating an output of said star camera system and an output of said gyroscope system into a stream of data, and a flight computer responsive to said stream of data for determining from the star camera system output and the gyroscope system output the attitude of the aerospace vehicle.

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

*Aerospace Vehicles; Attitude (Inclination); Cameras; Controllers; Gyroscopes; Stars*

**20080009585** NASA Johnson Space Center, Houston, TX, USA

**Orion Navigation Sensitivities to Ground Station Infrastructure for Lunar Missions**

Getchius, Joel; Kukitschek, Daniel; Crain, Timothy; February 6, 2008; 22 pp.; In English; 31st Annual Guidance and Control Conference, 1-6 Feb. 2008, Breckenridge, CO, USA; Original contains color and black and white illustrations

Report No.(s): AAS 08-056; Copyright; Avail.: CASI: A03, Hardcopy

The Orion Crew Exploration Vehicle (CEV) will replace the Space Shuttle and serve as the next-generation spaceship to carry humans to the International Space Station and back to the Moon for the first time since the Apollo program. As in the Apollo and Space Shuttle programs, the Mission Control Navigation team will utilize radiometric measurements to determine the position and velocity of the CEV. In the case of lunar missions, the ground station infrastructure consisting of approximately twelve stations distributed about the Earth and known as the Apollo Manned Spaceflight Network, no longer exists. Therefore, additional tracking resources will have to be allocated or constructed to support mission operations for Orion lunar missions. This paper examines the sensitivity of Orion navigation for lunar missions to the number and distribution of tracking sites that form the ground station infrastructure.

Author

*Crew Exploration Vehicle; Space Shuttle Missions; Navigation; Radiometers; Ground Stations*

## 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*.

**20080008867** NASA Langley Research Center, Hampton, VA, USA

**Photogrammetric Measurements of CEV Airbag Landing Attenuation Systems**

Barrows, Danny A.; Burner, Alpheus W.; Berry, Felecia C.; Dismond, Harriett R.; Cate, Kenneth H.; January 07, 2008; 14 pp.; In English; 46th AIAA Aerospace Sciences Meeting and Exhibit, 7-10 Jan, Reno, NV, USA; Original contains color and black and white illustrations

Report No.(s): AIAA Paper-2008-0846; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008867>

High-speed photogrammetric measurements are being used to assess the impact dynamics of the Orion Crew Exploration Vehicle (CEV) for ground landing contingency upon return to earth. Test articles representative of the Orion capsule are

dropped at the NASA Langley Landing and Impact Research (LandIR) Facility onto a sand/clay mixture representative of a dry lakebed from elevations as high as 62 feet (18.9 meters). Two different types of test articles have been evaluated: (1) half-scale metal shell models utilized to establish baseline impact dynamics and soil characterization, and (2) geometric full-scale drop models with shock-absorbing airbags which are being evaluated for their ability to cushion the impact of the Orion CEV with the earth's surface. This paper describes the application of the photogrammetric measurement technique and provides drop model trajectory and impact data that indicate the performance of the photogrammetric measurement system.

Author  
*Photogrammetry; Crew Exploration Vehicle; Spacecraft Landing; Landing Simulation; Inflatable Structures*

**20080009572** Clarkson Univ., Potsdam, NY, USA

### **Modeling the Spin Motor Current of the International Space Station's Control Moment Gyroscopes**

Pereira, Miguel A.; [2008]; 2 pp.; In English; Thesis Defense, 30 Jun 2008, Potsdam, NY, USA; Copyright; Avail.: Other Sources; Abstract Only

The International Space Station (ISS) attitude control is provided by two means: The Russian Segment uses thrusters and the U.S. Segment uses double-gimbaled control moment gyroscopes (CMG). CMGs are used as momentum exchange devices, providing non propulsive attitude control for the vehicle. The CMGs are very important for the ISS program because, first, they save propellant - which needs to be transferred to the Station in special cargo vehicles - and, second, they provide the microgravity environment on the Station - which is necessary for scientific experiments planned for the ISS mission. Since 2002, when one of the CMG on the ISS failed, all CMGs are closely monitored. High gimbal rates, vibration spikes, unusual variations of spin motor current and bearing temperatures are of great concern, since these parameters are the CMG health indicators. The telemetry analysis of these and some other CMG parameters is used to determine constraints and make changes to the CMGs operation on board. These CMG limitations, in turn, may limit the ISS attitude control capabilities and may be critical to ISS operation. Therefore, it is important to know whether the CMG parameter is nominal or out of family, and why. The goal of this project is to analyze an important CMG parameter - spin motor current. Some operational decisions are made now based on the spin motor current signatures. The spin motor current depends on gimbal rates, ISS rates, and spin bearing friction. The spin bearing friction in turn depends on the bearing temperatures, wheel rates, normal load - which is a function of gimbal and wheel rates - lubrication, etc. The first task of this project is to create a spin motor current mathematical model based on CMG dynamics model and the current knowledge on bearing friction in microgravity.

Author

*International Space Station; Control Moment Gyroscopes; Microgravity; Loads (Forces); Attitude Control; Mathematical Models*

**20080009574** NASA Johnson Space Center, Houston, TX, USA

### **Hypervelocity Impact Evaluation of Metal Foam Core Sandwich Structures**

Yasensky, John; Christiansen, Eric L.; August 2007; 110 pp.; In English; Original contains color and black and white illustrations

Report No.(s): JSC63945; Copyright; Avail.: CASI: [A06](#), Hardcopy

A series of hypervelocity impact (HVI) tests were conducted by the NASA Johnson Space Center (JSC) Hypervelocity Impact Technology Facility (HITF) [1], building 267 (Houston, Texas) between January 2003 and December 2005 to test the HVI performance of metal foams, as compared to the metal honeycomb panels currently in service. The HITF testing was conducted at the NASA JSC White Sands Testing Facility (WSTF) at Las Cruces, New Mexico. Eric L. Christiansen, Ph.D., and NASA Lead for Micro-Meteoroid Orbital Debris (MMOD) Protection requested these hypervelocity impact tests as part of shielding research conducted for the JSC Center Director Discretionary Fund (CDDF) project. The structure tested is a metal foam sandwich structure; a metal foam core between two metal facesheets. Aluminum and Titanium metals were tested for foam sandwich and honeycomb sandwich structures. Aluminum honeycomb core material is currently used in Orbiter Vehicle (OV) radiator panels and in other places in space structures. It has many desirable characteristics and performs well by many measures, especially when normalized by density. Aluminum honeycomb does not perform well in Hypervelocity Impact (HVI) Testing. This is a concern, as honeycomb panels are often exposed to space environments, and take on the role of Micrometeoroid / Orbital Debris (MMOD) shielding. Therefore, information on possible replacement core materials which perform adequately in all necessary functions of the material would be useful. In this report, HVI data is gathered for these two core materials in certain configurations and compared to gain understanding of the metal foam HVI performance.

Derived from text

*Hypervelocity Impact; Honeycomb Structures; Sandwich Structures; Metal Foams; Space Debris; Spacecraft Structures; Aerospace Engineering*

**20080009583** NASA Johnson Space Center, Houston, TX, USA

**Guidance, Navigation, and Control System Design in a Mass Reduction Exercise**

Crain, Timothy; Begly, Michael; Jackson, Mark; Broome, Joel; February 06, 2008; 21 pp.; In English; 31st Annual AAS Guidance and Control Meeting, 1-6 Feb. 2008, Breckenridge, CO; Original contains color and black and white illustrations  
Report No.(s): AAS 08-061; Copyright; Avail.: CASI: [A03](#), Hardcopy

Early Orion GN&C system designs optimized for robustness, simplicity, and utilization of commercially available components. During the System Definition Review (SDR), all subsystems on Orion were asked to re-optimize with component mass and steady state power as primary design metrics. The objective was to create a mass reserve in the Orion point of departure vehicle design prior to beginning the PDR analysis cycle. The Orion GN&C subsystem team transitioned from a philosophy of absolute 2 fault tolerance for crew safety and 1 fault tolerance for mission success to an approach of 1 fault tolerance for crew safety and risk based redundancy to meet probability allocations of loss of mission and loss of crew. This paper will discuss the analyses, rationale, and end results of this activity regarding Orion navigation sensor hardware, control effectors, and trajectory design.

Author

*Control Systems Design; Navigation Instruments; Guidance (Motion); Design Analysis; Control Equipment; Trajectories; Systems Analysis*

**20080009584** NASA Johnson Space Center, Houston, TX, USA

**Lunar Ascent and Rendezvous Trajectory Design**

Sostaric, Ronald R.; Merriam, Robert S.; February 06, 2008; 23 pp.; In English; 31st Annual AAS Guidance and Control Conference, 1-6 Feb. 2008, Breckenridge, Co, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): ALHAT Proj. 079749.01.10

Report No.(s): AAS 08-066; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009584>

The Lunar Lander Ascent Module (LLAM) will leave the lunar surface and actively rendezvous in lunar orbit with the Crew Exploration Vehicle (CEV). For initial LLAM vehicle sizing efforts, a nominal trajectory, along with required delta-V and a few key sensitivities, is very useful. A nominal lunar ascent and rendezvous trajectory is shown, along with rationale and discussion of the trajectory shaping. Also included are ascent delta-V sensitivities to changes in target orbit and design thrust-to-weight of the vehicle. A sample launch window for a particular launch site has been completed and is included. The launch window shows that budgeting enough delta-V for two missed launch opportunities may be reasonable. A comparison between yaw steering and on-orbit plane change maneuvers is included. The comparison shows that for large plane changes, which are potentially necessary for an anytime return from mid-latitude locations, an on-orbit maneuver is much more efficient than ascent yaw steering. For a planned return, small amounts of yaw steering may be necessary during ascent and must be accounted for in the ascent delta-V budget. The delta-V cost of ascent yaw steering is shown, along with sensitivity to launch site latitude. Some discussion of off-nominal scenarios is also included. In particular, in the case of a failed Powered Descent Initiation burn, the requirements for subsequent rendezvous with the Orion vehicle are outlined.

Author

*Lunar Trajectories; Ascent Trajectories; Rendezvous Trajectories; Lunar Module; Position (Location); Lunar Orbits; Lunar Surface*

**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*.

**20080009580** NASA Johnson Space Center, Houston, TX, USA

**A Self Contained Method for Safe and Precise Lunar Landing**

Paschall, Stephen C., II; Brady, Tye; Cohan, Babak; Sostaric, Ronald; [2008]; 13 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 mar. 2008, Big Sky, MT, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): ALHAT Proj. PWC: 079749.01.10

Report No.(s): IEEEAC Paper-1643, Version 1; Copyright; Avail.: Other Sources

The return of humans to the Moon will require increased capability beyond that of the previous Apollo missions. Longer



stay times and a greater flexibility with regards to landing locations are among the many improvements planned. A descent and landing system that can land the vehicle more accurately than Apollo with a greater ability to detect and avoid hazards is essential to the development of a Lunar Outpost, and also for increasing the number of potentially reachable Lunar Sortie locations. This descent and landing system should allow landings in more challenging terrain and provide more flexibility with regards to mission timing and lighting considerations, while maintaining safety as the top priority. The lunar landing system under development by the ALHAT (Autonomous precision Landing and Hazard detection Avoidance Technology) project is addressing this by providing terrain-relative navigation measurements to enhance global-scale precision, an onboard hazard-detection system to select safe landing locations, and an Autonomous GNC (Guidance, Navigation, and Control) capability to process these measurements and safely direct the vehicle to this landing location. This ALHAT landing system will enable safe and precise lunar landings without requiring lunar infrastructure in the form of navigation aids or a priori identified hazard-free landing locations. The safe landing capability provided by ALHAT uses onboard active sensing to detect hazards that are large enough to be a danger to the vehicle but too small to be detected from orbit, given currently planned orbital terrain resolution limits. Algorithms to interpret raw active sensor terrain data and generate hazard maps as well as identify safe sites and recalculate new trajectories to those sites are included as part of the ALHAT System. These improvements to descent and landing will help contribute to repeated safe and precise landings for a wide variety of terrain on the Moon.

Author

*Lunar Landing; Autonomous Navigation; Guidance (Motion); Landing Aids; Mission Planning; Systems Engineering; Navigation Aids; Controllability*

**20080009587** NASA Johnson Space Center, Houston, TX, USA

#### **Optical Navigation for the Orion Vehicle**

Crain, Timothy; Getchius, Joel; D'Souza, Christopher; January 27, 2008; 17 pp.; In English; 18th AASIAA Space Flight Mechanics Meeting, 27-31 Jan. 2008, Galveston, TX, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The Orion vehicle is being designed to provide nominal crew transport to the lunar transportation stack in low Earth orbit, crew abort prior during transit to the moon, and crew return to Earth once lunar orbit is achieved. One of the design requirements levied on the Orion vehicle is the ability to return to the vehicle and crew to Earth in the case of loss of communications and command with the Mission Control Center. Central to fulfilling this requirement, is the ability of Orion to navigate autonomously. In low-Earth orbit, this may be solved with the use of GPS, but in cis-lunar and lunar orbit this requires optical navigation. This paper documents the preliminary analyses performed by members of the Orion Orbit GN&C System team.

Author

*Global Positioning System; Navigation; Lunar Orbits; Low Earth Orbits; Crew Exploration Vehicle*

## 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*.

**20080008840** NASA Glenn Research Center, Cleveland, OH, USA

#### **Experimental Performance Evaluation of a High Speed Permanent Magnet Synchronous Motor and Drive for a Flywheel Application at Different Frequencies**

Nagorny, Aleksandr S.; Jansen, Ralph H.; Kankam, M. David; December 2007; 13 pp.; In English; 17th International Conference on Electric Machines (ICEM 2006), 2-5 Sep. 2006, Chania, Greece; Original contains color and black and white illustrations

Contract(s)/Grant(s): NASW-99027; WBS 22-755-922-20

Report No.(s): NASA/TM-2007-214428; E-15705; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008840>

This paper presents the results of an experimental performance characterization study of a high speed, permanent magnet motor/generator (M/G) and drive applied to a flywheel module. Unlike the conventional electric machine the flywheel M/G is not a separated unit; its stator and rotor are integrated into a flywheel assembly. The M/G rotor is mounted on a flywheel

rotor, which is magnetically levitated and sealed within a vacuum chamber during the operation. Thus, it is not possible to test the M/G using direct load measurements with a dynamometer and torque transducer. Accordingly, a new in-situ testing method had to be developed. The paper describes a new flywheel M/G and drive performance evaluation technique, which allows the estimation of the losses, efficiency and power quality of the flywheel high speed permanent magnet M/G, while working in vacuum, over wide frequency and torque ranges. This method does not require any hardware modification nor any special addition to the test rig. This new measurement technique is useful for high-speed applications, when applying an external load is technically difficult.

Author

*Flywheels; Synchronous Motors; Permanent Magnets; High Speed; Rotors; Stators; Loads (Forces); Magnetic Suspension; Performance Tests*

**20080008868** Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

**Advanced Propulsion for the XXIst Century**

Frisbee, Robert H.; July 14, 2003; 15 pp.; In English; AIAA/ICAS International Air and Space Symposium and Exposition, 14-17 July 2003, Dayton, OH, USA; Original contains black and white illustrations

Report No.(s): AIAA Paper-2003-2589; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40612>

This document represents a poster presentation offered at the AIAA/CAS International Air & Space Symposium and Exposition from July 14-17, 2003 in Dayton Ohio. This presentation outlines advanced space propulsion concepts as well as associated research and industry activities during the 21st century.

Derived from text

*Spacecraft Propulsion; Technology Assessment*

## 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*.

**20080009457** NASA, Washington, DC USA

**Water outlet control mechanism for fuel cell system operation in variable gravity environments**

Vasquez, Arturo, Inventor; McCurdy, Kerri L., Inventor; Bradley, Karla F., Inventor; July 31, 2007; 9 pp.; In English

Patent Info.: Filed June 16, 2004; US-Patent-7,250,075; US-Patent-Appl-SN-10/874,004; No Copyright; Avail.: CASI: **A02**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009457>

A self-regulated water separator provides centrifugal separation of fuel cell product water from oxidant gas. The system uses the flow energy of the fuel cell's two-phase water and oxidant flow stream and a regulated ejector or other reactant circulation pump providing the two-phase fluid flow. The system further uses a means of controlling the water outlet flow rate away from the water separator that uses both the ejector's or reactant pump's supply pressure and a compressibility sensor to provide overall control of separated water flow either back to the separator or away from the separator.

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

*Centrifugal Force; Controllers; Fuel Cells; Gravitation; Oxidizers; Separators; Water*

## 24

### COMPOSITE MATERIALS

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

**20080009430** NASA, Washington, DC USA

**Approach for achieving flame retardancy while retaining physical properties in a compatible polymer matrix**

Williams, Martha K., Inventor; Smith, Trent M., Inventor; December 18, 2007; 13 pp.; In English

Patent Info.: Filed October 6, 2004; US-Patent-7,309,738; US-Patent-Appl-SN-10/962,827; No Copyright; Avail.: CASI:

**A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009430>

The invention provides polymer blends containing polyhydroxyamide and one or more flammable polymers. The polymer



blends are flame retardant and have improved durability and heat stability compared to the flammable polymer portion of the blends. Articles containing the polymer blends are also provided.

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

*Flame Retardants; Polymer Blends; Flammability; Thermal Stability*

**20080009440** Vermont Univ., Burlington, VT USA

**Self-healing cable apparatus and methods**

Huston, Dryver, Inventor; Esser, Brian, Inventor; November 27, 2007; 12 pp.; In English

Contract(s)/Grant(s): NCC5-581

Patent Info.: Filed February 27, 2006; US-Patent-7,302,145; US-Patent-Appl-SN-11/362,611; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009440>

Self-healing cable apparatus and methods are disclosed. The cable has a central core surrounded by an adaptive cover that can extend over the entire length of the cable or just one or more portions of the cable. The adaptive cover includes a protective layer having an initial damage resistance, and a reactive layer. When the cable is subjected to a localized damaging force, the reactive layer responds by creating a corresponding localized self-healed region. The self-healed region provides the cable with enhanced damage resistance as compared to the cable's initial damage resistance. Embodiments of the invention utilize conventional epoxies or foaming materials in the reactive layer that are released to form the self-healed region when the damaging force reaches the reactive layer.

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

*Cables; Coverings; Abrasion Resistance; Epoxy Matrix Composites; Foams*

**20080009444** Ultramet Co., Pacoima, CA USA

**Method of making carbon fiber-carbon matrix reinforced ceramic composites**

Williams, Brian, Inventor; Benander, Robert, Inventor; November 20, 2007; 8 pp.; In English

Contract(s)/Grant(s): NAS8-99093

Patent Info.: Filed April 15, 2004; US-Patent-7,297,368; US-Patent-Appl-SN-10/824,746; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009444>

A method of making a carbon fiber-carbon matrix reinforced ceramic composite wherein the result is a carbon fiber-carbon matrix reinforcement is embedded within a ceramic matrix. The ceramic matrix does not penetrate into the carbon fiber-carbon matrix reinforcement to any significant degree. The carbide matrix is a formed in situ solid carbide of at least one metal having a melting point above about 1850 degrees centigrade. At least when the composite is intended to operate between approximately 1500 and 2000 degrees centigrade for extended periods of time the solid carbide with the embedded reinforcement is formed first by reaction infiltration. Molten silicon is then diffused into the carbide. The molten silicon diffuses preferentially into the carbide matrix but not to any significant degree into the carbon-carbon reinforcement. Where the composite is intended to operate between approximately 2000 and 2700 degrees centigrade for extended periods of time such diffusion of molten silicon into the carbide is optional and generally preferred, but not essential.

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

*Carbon; Carbon Fibers; Ceramic Matrix Composites; Embedding; Fiber Composites; High Temperature; Thermal Resistance; Coatings*

**20080009467** TDA Research, Inc., Wheat Ridge, CO USA

**Nanoparticles modified with multiple organic acids**

Cook, Ronald Lee, Inventor; Luebben, Silvia DeVito, Inventor; Myers, Andrew William, Inventor; Smith, Bryan Matthew, Inventor; Elliott, Brian John, Inventor; Kreutzer, Cory, Inventor; Wilson, Carolina, Inventor; Meiser, Manfred, Inventor; July 17, 2007; 27 pp.; In English

Contract(s)/Grant(s): NAS9-03017

Patent Info.: Filed May 3, 2005; US-Patent-7,244,498; US-Patent-Appl-SN-11/120,650; No Copyright; Avail.: CASI: A03,

Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009467>

Surface-modified nanoparticles of boehmite, and methods for preparing the same. Aluminum oxyhydroxide nanoparticles are surface modified by reaction with selected amounts of organic acids. In particular, the nanoparticle surface is modified by

reactions with two or more different carboxylic acids, at least one of which is an organic carboxylic acid. The product is a surface modified boehmite nanoparticle that has an inorganic aluminum oxyhydroxide core, or part aluminum oxyhydroxide core and a surface-bonded organic shell. Organic carboxylic acids of this invention contain at least one carboxylic acid group and one carbon-hydrogen bond. One embodiment of this invention provides boehmite nanoparticles that have been surface modified with two or more acids one of which carries at least one reactive functional group. Another embodiment of this invention provides boehmite nanoparticles that have been surface modified with multiple acids one of which has molecular weight or average molecular weight greater than or equal to 500 Daltons. Yet, another embodiment of this invention provides boehmite nanoparticles that are surface modified with two or more acids one of which is hydrophobic in nature and has solubility in water of less than 15 by weight. The products of the methods of this invention have specific useful properties when used in mixture with liquids, as filler in solids, or as stand-alone entities.

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

*Aluminum Oxides; Nanoparticles*

**20080009491** Boeing Co., Chicago, IL USA

**Ceramic fiber insulation impregnated with an infra-red retardant coating and method for production thereof**

Zinn, Alfred A., Inventor; Tarkanian, Ryan Jeffrey, Inventor; April 3, 2007; 16 pp.; In English

Contract(s)/Grant(s): NAS9-200000

Patent Info.: Filed August 16, 2002; US-Patent-7,198,839; US-Patent-Appl-SN-10/222,503; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009491>

The invented insulation is a ceramic fiber insulation wherein the ceramic fibers are treated with a coating which contains transition metal oxides. The invented process for coating the insulation is a process of applying the transition metal oxide coating to the fibers of the insulation after the fibers have been formed into a tile or other porous body. The coating of transition metal oxide lowers the transmittance of radiation through the insulation thereby lowering the temperature of the backface of the insulation and better protecting the structure that underlies the insulation.

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

*Ceramic Fibers; Coating; Insulation; Metal Oxides*

## 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*.

**20080009448** NASA, Washington, DC USA

**Microparticle analysis system and method**

Morrison, Dennis R., Inventor; November 13, 2007; 18 pp.; In English

Patent Info.: Filed December 9, 2003; US-Patent-7,295,309; US-Patent-Appl-SN-10/734,753; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009448>

A device for analyzing microparticles is provided which includes a chamber with an inlet and an outlet for respectively introducing and dispensing a flowing fluid comprising microparticles, a light source for providing light through the chamber and a photometer for measuring the intensity of light transmitted through individual microparticles. The device further includes an imaging system for acquiring images of the fluid. In some cases, the device may be configured to identify and determine a quantity of the microparticles within the fluid. Consequently, a method for identifying and tracking microparticles in motion is contemplated herein. The method involves flowing a fluid comprising microparticles in laminar motion through a chamber, transmitting light through the fluid, measuring the intensities of the light transmitted through the microparticles, imaging the fluid a plurality of times and comparing at least some of the intensities of light between different images of the fluid.

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

*Microparticles; Imaging Techniques; Light Sources; Fluid Flow; Optical Resonance*

**20080009456**

**Process for derivatizing carbon nanotubes with diazonium species**

Tour, James M., Inventor; Bahr, Jeffrey L., Inventor; Yang, Jiping, Inventor; July 31, 2007; 25 pp.; In English

Contract(s)/Grant(s): NCC9-77

Patent Info.: Filed January 29, 2002; US-Patent-7,250,147; US-Patent-Appl-SN-10/470,517; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009456>

The invention incorporates new processes for the chemical modification of carbon nanotubes. Such processes involve the derivatization of multi- and single-wall carbon nanotubes, including small diameter (ca. 0.7 nm) single-wall carbon nanotubes, with diazonium species. The method allows the chemical attachment of a variety of organic compounds to the side and ends of carbon nanotubes. These chemically modified nanotubes have applications in polymer composite materials, molecular electronic applications and sensor devices. The methods of derivatization include electrochemical induced reactions thermally induced reactions (via in-situ generation of diazonium compounds or pre-formed diazonium compounds), and photochemically induced reactions. The derivatization causes significant changes in the spectroscopic properties of the nanotubes. The estimated degree of functionality is ca. 1 out of every 20 to 30 carbons in a nanotube bearing a functionality moiety. Such electrochemical reduction processes can be adapted to apply site-selective chemical functionalization of nanotubes. Moreover, when modified with suitable chemical groups, the derivatized nanotubes are chemically compatible with a polymer matrix, allowing transfer of the properties of the nanotubes (such as, mechanical strength or electrical conductivity) to the properties of the composite material as a whole. Furthermore, when modified with suitable chemical groups, the groups can be polymerized to form a polymer that includes carbon nanotubes ##STR00001##.

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

*Azo Compounds; Carbon Nanotubes; Electrochemistry*

**20080009473** California Inst. of Tech., Pasadena, CA USA

**Pyrolyzed-parylene based sensors and method of manufacture**

Tai, Yu-Chong, Inventor; Liger, Matthieu, Inventor; Miserendino, Scott, Inventor; Konishi, Satoshi, Inventor; July 3, 2007;

27 pp.; In English

Contract(s)/Grant(s): NCC2-13644

Patent Info.: Filed October 25, 2004; US-Patent-7,238,941; US-Patent-Appl-SN-10/973,938; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009473>

A method (and resulting structure) for fabricating a sensing device. The method includes providing a substrate comprising a surface region and forming an insulating material overlying the surface region. The method also includes forming a film of carbon based material overlying the insulating material and treating to the film of carbon based material to pyrolyze the carbon based material to cause formation of a film of substantially carbon based material having a resistivity ranging within a predetermined range. The method also provides at least a portion of the pyrolyzed carbon based material in a sensor application and uses the portion of the pyrolyzed carbon based material in the sensing application. In a specific embodiment, the sensing application is selected from chemical, humidity, piezoelectric, radiation, mechanical strain or temperature.

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

*Fabrication; Pyrolysis; Bolometers; Electromagnetic Radiation*

**20080009478** Arizona Univ., Phoenix, AZ USA

**Method of producing purified carotenoid compounds**

Eggink, Laura, Inventor; June 12, 2007; 6 pp.; In English

Contract(s)/Grant(s): NAGW-547

Patent Info.: Filed December 28, 2000; US-Patent-7,229,786; US-Patent-Appl-SN-10/169,117; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009478>

A method of producing a carotenoid in solid form includes culturing a strain of Chlorophyta algae cells in a minimal inorganic medium and separating the algae comprising a solid form of carotenoid. In one embodiment of the invention, the strain of Chlorophyta algae cells includes a strain of Chlamydomonas algae cells.

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

*Algae; Carotenoids*

**20080009500** NASA, Washington, DC USA

**Corrosion prevention of cold rolled steel using water dispersible lignosulfonic acid doped polyaniline**

Viswanathan, Tito, Inventor; February 20, 2007; 9 pp.; In English

Patent Info.: Filed August 26, 2005; US-Patent-7,179,404; US-Patent-Appl-SN-11/215,205; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009500>

The invention provides coatings useful for preventing corrosion of metals. The coatings comprise a film-forming resin and conductive polymers comprising linearly conjugated  $\pi$ -systems and residues of sulfonated lignin or a sulfonated polyflavonoid or derivatives of sulfonated lignin or a sulfonated polyflavonoid. The invention also provides a latex formulation of the coatings, and articles of manufacture comprising a metal substrate and a coating in contact with the metal substrate. Official Gazette of the U.S. Patent and Trademark Office

*Cold Rolling; Corrosion Prevention; Doped Crystals; Steels*

**20080009505** Advanced Fuel Research, Inc., East Hartford, CT USA

**Pyrolysis processing for solid waste resource recovery**

Serio, Michael A., Inventor; Kroo, Erik, Inventor; Wojtowicz, Marek A., Inventor; Suuberg, Eric M., Inventor; January 30, 2007; 14 pp.; In English

Contract(s)/Grant(s): NAS2-99001; NAS2-00007

Patent Info.: Filed July 10, 2001; US-Patent-7,169,197; US-Patent-Appl-SN-09/902,425; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009505>

Solid waste resource recovery in space is effected by pyrolysis processing, to produce light gases as the main products (CH<sub>4</sub>, H<sub>2</sub>, CO, H<sub>2</sub>O, NH<sub>3</sub>) and a reactive carbon-rich char as the main byproduct. Significant amounts of liquid products are formed under less severe pyrolysis conditions, and are cracked almost completely to gases as the temperature is raised. A primary pyrolysis model for the composite mixture is based on an existing model for whole biomass materials, and an artificial neural network models the changes in gas composition with the severity of pyrolysis conditions.

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

*Pyrolysis; Solid Wastes*

**20080009590** NASA Langley Research Center, Hampton, VA, USA

**ACE-FTS Observation of a Young Biomass Burning Plume: First Reported Measurements of C<sub>2</sub>H<sub>4</sub>, C<sub>3</sub>H<sub>6</sub>O, H<sub>2</sub>CO and PAN by Infrared Occultation from Space**

Coheur, Pierre-Francois; Herbin, Herve; Clerbaux, Cathy; Hurtmans, Daniel; Wespes, Catherine; Carleer, Michel; Turquety, Solene; Rinsland, Curtis P.; Remedios, John; Hauglustaine, Didier; Boone, Chris D.; Bernath, Peter F.; January 2007; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 281945.02.32.01.07; Copyright; Avail.: CASI: [A03](#), Hardcopy

In the course of our study of the upper tropospheric composition with the infrared 35 Atmospheric Chemistry Experiment Fourier Transform Spectrometer (ACE FTS), we 36 found an occultation sequence that on 8 October 2005, sampled a remarkable plume near the 37 east coast of Tanzania. Model simulations of the CO distribution in the Southern hemisphere 38 are performed for this period and they demonstrate that the emissions for this event originated 39 from a nearby forest fire, after which the plume was transported from the source region to the 40 upper troposphere. Taking advantage of the very high signal-to-noise ratio of the ACE FTS 41 spectra over a wide wavenumber range (750-4400 cm<sup>-1</sup>), we present in-depth analyses of the 42 chemical composition of this plume in the middle and upper troposphere, focusing on the 43 measurements of weakly absorbing pollutants. For this specific biomass burning event, we 44 report simultaneous observations of an unprecedented number of organic species. 45 Measurements of C<sub>2</sub>H<sub>4</sub> (ethene), C<sub>3</sub>H<sub>4</sub> (propyne), H<sub>2</sub>CO (formaldehyde), C<sub>3</sub>H<sub>6</sub>O (acetone) 46 and CH<sub>3</sub>COO<sub>2</sub>NO<sub>2</sub> (peroxyacetylnitrate, abbreviated as PAN) are the first reported 47 detections using infrared occultation spectroscopy from satellites. Based on the lifetime of the 48 emitted species, we discuss the photochemical age of the plume and also report, whenever 49 possible, the enhancement ratios relative to CO.

Author

*Acetone; Atmospheric Chemistry; Biomass Burning; Formaldehyde; Fourier Transformation; Infrared Spectroscopy; Occultation; Plumes*

**METALS AND METALLIC MATERIALS**

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

**20080008831** Minerals, Metals and Materials Society, Warrendale, PA, USA

**Moisture-Induced Delayed Spallation and Interfacial Hydrogen Embrittlement of Alumina Scales**

Smialek, James L.; JOM; January 15, 2008; Volume 58, No. 1, pp. 29-35; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

While interfacial sulfur is the primary chemical factor affecting Al<sub>2</sub>O<sub>3</sub> scale adhesion, moisture-induced delayed spallation appears as a secondary, but impressive, mechanistic detail. Similarities with bulk metallic phenomena suggest that hydrogen embrittlement from ambient humidity, resulting from the reaction  $\text{Al}(\text{sub alloy}) + 3(\text{H}_2\text{O})(\text{sub air}) = \text{Al}(\text{OH})(-) (\text{sub } 3) + 3\text{H}(+)$  may be the operative mechanism. This proposal was tested on pre-oxidized Rene N5 by standard cathodic hydrogen charging in 1N H<sub>2</sub>SO<sub>4</sub>, as monitored by weight change, induced current, and microstructure. Cathodic polarization at -2.0 V abruptly stripped mature Al<sub>2</sub>O<sub>3</sub> scales at the oxide-metal interface. Anodic polarization at +2.0 V, however, produced alloy dissolution. Finally, with no applied voltage, the acid electrolyte produced neither scale spallation nor alloy dissolution. Thus, hydrogen charging was detrimental to alumina scale adhesion. Moisture-induced interfacial hydrogen embrittlement is concluded to be the cause of delayed scale spallation and desktop thermal barrier coating failures.

Author

*Aluminum Oxides; Humidity; Hydrogen Embrittlement; Moisture; Spallation; Refractory Materials*

**20080008859** NASA Glenn Research Center, Cleveland, OH, USA

**Assessment of Creep Capability of HSR-EPM Turbine Airfoil Alloys**

MacKay, Rebecca A.; Garg, Anita; Ritzert, Frank J.; Locci, Ivan E.; December 2007; 46 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.03.11.03; RTOP 714-04-20

Report No.(s): NASA/TM-2007-214921; E-16143; Copyright; Avail.: CASI: [A03](#), Hardcopy

The High Speed Civil Transport (HSCT) mission of the High Speed Research-Enabling Propulsion Materials (HSR-EPM) Program represented a unique challenge for turbine airfoil materials because the highest operating temperatures occur during climb and supersonic cruise. The accumulated hot time of an HSCT engine before overhaul is many thousands of hours. This is significantly different from subsonic engines, where the maximum operating temperatures occur during takeoff and thrust reverse after landing, and the accumulated hot time before overhaul is about 300 hr. The goal of airfoil alloy development under the HSR-EPM Program was to develop an alloy with a 75 F increase in creep rupture capability over the average Rene N5/PWA 1484 baseline. Airfoil alloy development under the HSR-EPM Program pursued a path that led to evolutionary mechanical behavior improvements, resulting from increased amounts of high density, refractory metals. The purpose of the present paper is to describe the experimental work that was performed at NASA Glenn Research Center after the HSR-EPM Program ended. Emphasis will be placed on the creep behavior of coated specimens, as well as on the development and progression of phase instabilities during creep deformation. Mitigation techniques that were used to reduce phase instabilities are also discussed. Most of the work described in this report was performed at NASA Glenn during the years 2000 and 2001.

Author

*Turbine Blades; Single Crystals; High Temperature; Microstructure; Creep Properties; Creep Strength; Heat Resistant Alloys*

**20080009424** NASA Langley Research Center, Hampton, VA, USA

**Development and Processing Improvement of Aerospace Aluminum Alloys**

Lisagor, W. Barry; Bales, Thomas T.; December 2007; 227 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNL04AB64T; WU 23-794-40-4L

Report No.(s): NASA/CR-2007-215093; Copyright; Avail.: CASI: [A11](#), Hardcopy

This final report, in multiple presentation format, describes a comprehensive multi-tasked contract study to improve the overall property response of selected aerospace alloys, explore further a newly-developed and registered alloy, and correlate the processing, metallurgical structure, and subsequent properties achieved with particular emphasis on the crystallographic orientation texture developed. Modifications to plate processing, specifically hot rolling practices, were evaluated for Al-Li alloys 2195 and 2297, for the recently registered Al-Cu-Ag alloy, 2139, and for the Al-Zn-Mg-Cu alloy, 7050. For all of the alloys evaluated, the processing modifications resulted in significant improvements in mechanical properties. Analyses also



resulted in an enhanced understanding of the correlation of processing, crystallographic texture, and mechanical properties.  
Author

*Aluminum Alloys; Magnesium Alloys; Lithium Alloys; Zinc Alloys; Mechanical Properties; Crystallography*

**20080009425** NASA Langley Research Center, Hampton, VA, USA

**Development and Processing Improvement of Aerospace Aluminum Alloys-Development of AL-Cu-Mg-Ag Alloy (2139)**

Cho, Alex; Lisagor, W. Barry; Bales, Thomas T.; December 2007; 44 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNL04AB64T; WBS 23-794-40-4L

Report No.(s): NASA/CR-2007-215094; Copyright; Avail.: CASI: [A03](#), Hardcopy

This final report supplement in presentation format describes a comprehensive multi-tasked contract study to continue the development of the silver bearing alloy now registered as aluminum alloy 2139 by the Aluminum Association. Two commercial scale ingots were processed into nominal plate gauges of two, four and six inches, and were extensively characterized in terms of metallurgical and crystallographic structure, and resulting mechanical properties. This report includes comparisons of the property combinations for this alloy and 2XXX and 7XXX alloys more widely used in high performance applications. Alloy 2139 shows dramatic improvement in all combinations of properties, moreover, the properties of this alloy are retained in all gauge thicknesses, contrary to typical reductions observed in thicker gauges of the other alloys in the comparison. The advancements achieved in this study are expected to result in rapid, widespread use of this alloy in a broad range of ground based, aircraft, and spacecraft applications.

Author

*Aluminum Alloys; Magnesium Alloys; Silver Alloys; Copper Alloys; Mechanical Properties; Crystal Structure; Bearing Alloys*

**20080009514** NASA, Washington, DC USA

**Low density, high creep resistant single crystal superalloy for turbine airfoils**

MacKay, Rebecca A., Inventor; Gabb, Timothy P., Inventor; Smialek, James L, Inventor; Nathal, Michael V., Inventor; August 28, 2007; 9 pp.; In English

Patent Info.: Filed September 22, 2004; US-Patent-7,261,783; US-Patent-Appl-SN-10/946,286; No Copyright; Avail.:

CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009514>

A nickel-base superalloy article for use in turbines has increased creep resistance and lower density. The superalloy article includes, as measured in % by weight, 6.0-12.0% Mo, 5.5-6.5% Al, 3.0-7.0% Ta, 0-15% Co, 2.0-6.0% Cr, 1.0-4.0% Re, 0-1.5% W, 0-1.5% Ru, 0-2.0%-Ti, 0-3.0% Nb, 0-0.2% Hf, 0-0.02% Y, 0.001-0.005% B, 0.01-0.04% C, and a remainder including nickel plus impurities.

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

*Airfoils; Creep Strength; Heat Resistant Alloys; Single Crystals*

**20080009563** NASA Langley Research Center, Hampton, VA, USA

**Eddy Current COPV Overwrap and Liner Thickness Measurement System and Data Analysis for 40-Inch Kevlar COPVs SN002 and SN027**

Wincheski, Russell A.; January 2008; 16 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 377816.06.02.03.05

Report No.(s): NASA/TM-2008-215105; L-19427; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009563>

As part of the health assessment of flight spare 40in diameter Kevlar composite overwrapped pressure vessels (COPVs) SN002 and SN027 an eddy current characterization of the composite and liner thickness change during pressurization was requested under WSTF-TP-1085-07.A, 'Space Shuttle Orbiter Main Propulsion System P/N MC282-0082-0101 S/N 002 and Orbital Maneuvering System P/N MC282-0082-001 S/N 027 COPV Health Assessment.' The through the thickness strains have been determined to be an important parameter in the analysis of the reliability and likelihood of stress rupture failure. Eddy current techniques provide a means to measure these thicknesses changes based upon the change in impedance of an eddy current sensor mounted on the exterior of the vessel. Careful probe and technique design have resulted in the capability to independently measure the liner and overwrap thickness changes to better than +/- 0.0005 in. at each sensor location. Descriptions of the inspection system and test results are discussed.

Author

*Eddy Currents; Composite Wrapping; Pressure Vessels; Kevlar (Trademark); Linings; Impedance*

**20080009578** NASA Johnson Space Center, Houston, TX, USA

**Stress Corrosion Cracking Behavior of Peened Friction Stir Welded 2195 Aluminum Alloy Joints**

Hatamleh, Omar; Singh, Preet M.; Garmestani, H.; [2008]; 21 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

Surface treatment techniques like laser and shot peening were used to investigate their effect on stress corrosion cracking (SCC) on friction stir welded (FSW) 2195 aluminum alloy joints. The investigation consisted of two parts; the first part explored the peening effects on slow strain rate testing (SSRT) in a 3.5% NaCl solution, while the second part of the study investigated the effects of peening on corrosion while submerged in a 3.5% NaCl solution with no external loads applied. For the SSRT testing, the laser peened samples demonstrated superior properties to the other samples, nevertheless no signs of corrosion pitting or SCC were evident on any of the samples. For the second part of the study, the FSW plates were inspected periodically for signs of corrosion. After 60 days there were signs of corrosion pitting, but no stress corrosion cracking was noticed in any of the peened or unpeened samples.

Author

*Stress Corrosion Cracking; Aluminum Alloys; Friction Stir Welding; Metal Joints; Loads (Forces); Shot Peening; Strain Rate; Surface Treatment*

**27**

**NONMETALLIC MATERIALS**

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

**20080008720** FLX Micro, Inc., Cleveland, OH USA

**Silicon carbide and other films and method of deposition**

Mehregany, Mehran, Inventor; Zorman, Christian A., Inventor; Fu, Xiao-An, Inventor; Dunning, Jeremy L., Inventor; August 28, 2007; 13 pp.; In English

Contract(s)/Grant(s): NCA3-201

Patent Info.: Filed November 18, 2003; US-Patent-7,261,919; US-Patent-Appl-SN-10/716,006; No Copyright; Avail.:

CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008720>

A method of depositing a ceramic film, particularly a silicon carbide film, on a substrate is disclosed in which the residual stress, residual stress gradient, and resistivity are controlled. Also disclosed are substrates having a deposited film with these controlled properties and devices, particularly MEMS and NEMS devices, having substrates with films having these properties.

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

*Ceramics; Microelectromechanical Systems; Electrical Resistivity; Residual Stress; Silicon Carbides; Stress Distribution; Silicon Films*

**20080008854** NASA Glenn Research Center, Cleveland, OH, USA

**Evaluation of Silicon Nitride for Brayton Turbine Wheel Application**

Freedman, Marc R.; January 2008; 18 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 997180.10.03.01

Report No.(s): NASA/TM-2008-214803; E-15936; No Copyright; Avail.: CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008854>

Silicon nitride (Si<sub>3</sub>N<sub>4</sub>) is being evaluated as a risk-reduction alternative for a Jupiter Icy Moons Orbiter Brayton turbine wheel in the event that the Prometheus program design requirements exceed the creep strength of the baseline metallic superalloys. Five Si<sub>3</sub>N<sub>4</sub> ceramics, each processed by a different method, were screened based on the Weibull distribution of bend strength at 1700 F (927 C). Three of the Si<sub>3</sub>N<sub>4</sub> ceramics, Honeywell AS800, Kyocera SN282, and Saint-Gobain NT154, had bend strengths in excess of 87 ksi (600 MPa) at 1700 F (927 C). These were chosen for further assessment and consideration for future subcomponent and component fabrication and testing.

Author

*Brayton Cycle; Silicon Nitrides; Ceramics; Weibull Density Functions; Turbine Wheels; Creep Strength; Heat Resistant Alloys*



**20080009438** Rice Univ., Houston, TX USA

**Process for making polymers comprising derivatized carbon nanotubes and compositions thereof**

Tour, James M., Inventor; Bahr, Jeffrey L., Inventor; Yang, Jiping, Inventor; December 4, 2007; 25 pp.; In English

Contract(s)/Grant(s): NCC9-77

Patent Info.: Filed August 1, 2003; US-Patent-7,304,103; US-Patent-Appl-SN-10/632,284; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009438>

The present invention incorporates new processes for blending derivatized carbon nanotubes into polymer matrices to create new polymer/composite materials. When modified with suitable chemical groups using diazonium chemistry, the nanotubes can be made chemically compatible with a polymer matrix, allowing transfer of the properties of the nanotubes (such as mechanical strength) to the properties of the composite material as a whole. To achieve this, the derivatized (modified) carbon nanotubes are physically blended with the polymeric material, and/or, if desired, allowed to react at ambient or elevated temperature. These methods can be utilized to append functionalities to the nanotubes that will further covalently bond to the host polymer matrix, or directly between two tubes themselves. Furthermore, the nanotubes can be used as a generator of polymer growth, wherein the nanotubes are derivatized with a functional group that is an active part of a polymerization process, which would also result in a composite material in which the carbon nanotubes are chemically involved.

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

*Carbon Nanotubes; Composite Materials; Matrix Materials; Polymer Matrix Composites*

**20080009452** NASA, Washington, DC USA

**Carbon nanotube reinforced porous carbon having three-dimensionally ordered porosity and method of fabricating same**

Su, Ji, Inventor; Huang, Ngan Fong, Inventor; August 7, 2007; 12 pp.; In English

Patent Info.: Filed July 25, 2005; US-Patent-7,252,884; US-Patent-Appl-SN-11/190,212; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009452>

A solid carbon has CNTs dispersed therein and is formed about three-dimensionally ordered spherical voids arranged in an opal-like lattice.

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

*Carbon; Carbon Nanotubes; Fabrication; Porosity*

**20080009539** NASA Johnson Space Center, Houston, TX, USA

**Soft-Bake Purification of Single-Walled Carbon Nanotubes Produced by Pulsed Laser Vaporization**

Nikolaev, Pavel; Gorelik, Olga; Allada, Ramakumar; Sosa, Edward; Arepalli, Sivaram; Yowell, Leonard; [2007]; 26 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNJ05HI05C; No Copyright; Avail.: Other Sources

Metal impurities within as-produced single-walled carbon nanotubes (SWCNTs) are generally coated with thick shells of graphitic carbon, which prevent the acid treatments commonly used in SWCNT purification from attacking the metals. The purpose of this study was to determine a more effective and efficient means for the removal of metal impurities from SWCNT produced by pulsed laser vaporization (PLV). The method investigated was a modified version of a soft-bake purification procedure developed at Rice University, and in the current work the soft bake temperature suitable for PLV produced SWCNT was determined and several samples were purified. The quality of material was determined using the standard protocol developed at NASA Johnson Space Center and data was collected for several samples in order to determine the consistency and reproducibility of the purification yield and purity. The properties and quality of softbake purified material was compared to that of several equivalent materials purified by the JSC standard purification method. It is found that this modified procedure resulted in better purity of SWCNTs, while reducing the purification time by two thirds.

Author

*Carbon Nanotubes; Impurities; Metals; Purification; Vaporizing; Baking*

**20080009540** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Origin of Hydroxyl-CNT's in Metal-Less Carbon Nanotube Synthesis**

Benavides, Jeannette M.; Wells, Christopher C.; [2007]; 15 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The origin of hydroxyl-containing carbon nanotubes in a recently developed arc welding process for producing carbon

nanotubes is investigated via modeling and calculations. It is found that interactions between carbon ions and water in the process entwine the kinetics, leading to hydroxyl-CNTs. Finite limits for specific types of hydroxyl defects or additions to carbon nanotubes are discussed. Several strategies of calculations, including semi-empirical chemical modeling, are employed to understand the dynamics of the system. Kinetics and energy balances, as well its a proposed growth mechanism, are examined for the highly stable and alcohol soluble polyhydroxyl carbon nanotubes produced in the process.

Author

*Carbon Nanotubes; Hydroxyl Compounds; Arc Welding*

## 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*.

**20080009488** Ionfinity, LLC, Pasadena, CA USA

#### **Fuel cell with ionization membrane**

Hartley, Frank T., Inventor; April 24, 2007; 9 pp.; In English

Contract(s)/Grant(s): NAS7-1407

Patent Info.: Filed February 26, 2004; US-Patent-7,208,240; US-Patent-Appl-SN-10/786,232; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009488>

A fuel cell is disclosed comprising an ionization membrane having at least one area through which gas is passed, and which ionizes the gas passing therethrough, and a cathode for receiving the ions generated by the ionization membrane. The ionization membrane may include one or more openings in the membrane with electrodes that are located closer than a mean free path of molecules within the gas to be ionized. Methods of manufacture are also provided.

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

*Fuel Cells; Gas Ionization; Membranes*

## 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*.

**20080009463** California Inst. of Tech., Pasadena, CA USA

#### **Detection and enforcement of failure-to-yield in an emergency vehicle preemption system**

Bachelder, Aaron, Inventor; Wickline, Richard, Inventor; July 24, 2007; 13 pp.; In English

Patent Info.: Filed October 6, 2004; US-Patent-7,248,149; US-Patent-Appl-SN-10/960,129; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009463>

An intersection controlled by an intersection controller receives trigger signals from on-coming emergency vehicles responding to an emergency call. The intersection controller initiates surveillance of the intersection via cameras installed at the intersection in response to a received trigger signal. The surveillance may begin immediately upon receipt of the trigger signal from an emergency vehicle, or may wait until the intersection controller determines that the signaling emergency vehicle is in the field of view of the cameras at the intersection. Portions of the captured images are tagged by the intersection controller based on tag signals transmitted by the vehicle or based on detected traffic patterns that indicate a potential traffic violation. The captured images are downloaded to a processing facility that analyzes the images and automatically issues citations for captured traffic violations.

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

*Actuators; Controllers; Traffic Control; Emergencies*

## 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*.

**20080008588** Rostock Univ., Germany

**Power Loading in MIMO Multicarrier Transmission Systems for Multi-Pair Cables**

Lang, Christoph; Ahrens, Andreas; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2; July 2006, pp. 51-57; In English; See also [20080008582](#); Copyright; Avail.: CASI: [A02](#), Hardcopy

Crosstalk between neighboring wire pairs is one of the major impairments in digital transmission via multi-pair copper cables. For high-rate transmission, often the strong near-end crosstalk (NEXT) disturbance is avoided or suppressed and only the far-end crosstalk (FEXT) remains as crosstalk influence. If FEXT is present, signal parts are transmitted via the FEXT paths from the transmitter to the receiver in addition to the direct transmission paths. Therefore transmission schemes are of great practical interest, which take advantage of the signal parts transmitted via the FEXT paths. Here a SVD (singular-value decomposition) equalized MIMO (multiple-input multiple-output) multicarrier system is investigated. Based on the Lagrange multiplier method an optimal power allocation scheme is considered in order to reduce the overall bit-error rate at a fixed data rate and fixed QAM constellation sizes. For high FEXT couplings between neighboring wire pairs considerable gains are possible and the importance of FEXT exploitation becomes obvious.

Author

*Crosstalk; MIMO (Control Systems); Control Systems Design; Transmission Lines; Communication Cables; Frequency Division Multiplexing*

**20080008714** California Inst. of Tech., Pasadena, CA USA

**Roadside-based communication system and method**

Bachelder, Aaron D., Inventor; September 4, 2007; 12 pp.; In English

Patent Info.: Filed August 18, 2005; US-Patent-7,265,683; US-Patent-Appl-SN-11/208,243; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008714>

A roadside-based communication system providing backup communication between emergency mobile units and emergency command centers. In the event of failure of a primary communication, the mobile units transmit wireless messages to nearby roadside controllers that may take the form of intersection controllers. The intersection controllers receive the wireless messages, convert the messages into standard digital streams, and transmit the digital streams along a citywide network to a destination intersection or command center.

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

*Communication Equipment; Emergencies; Roads*

**20080008843** NASA Glenn Research Center, Cleveland, OH, USA

**Design and Measurement of Self-Matched, Dual-Frequency Coplanar-Waveguide-Fed Slot Antennas**

Omar, Amjad A.; Scardelletti, Maxmilian C.; Hejazi, Zuhair M.; Dib, Nihad; December 2007; 12 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 953033.01.03.15

Report No.(s): NASA/TP-2007-214952; E-16181; Copyright; Avail.: CASI: [A03](#), Hardcopy

This report presents two new designs of dual-frequency, coplanar-waveguide-fed, double-folded slot antennas. An important advantage of these antennas is that, because they are self-matched to the feeding coplanar waveguide, they do not need an external matching circuit. This reduces the antenna size and simplifies its design. To verify the designs, the authors measured and compared the return loss and radiation patterns with those obtained using available commercial software with good agreement. Dual-frequency slot antennas;

Author

*Slot Antennas; Impedance Matching; Waveguide Antennas; Antenna Radiation Patterns; Planar Structures; Circuits*

**20080009437** Cornell Univ., Ithaca, NY USA

**Real-time software receiver**

Ledvina, Brent M., Inventor; Psiaki, Mark L., Inventor; Powell, Steven P., Inventor; Kintner, Jr., Paul M., Inventor; December 4, 2007; 36 pp.; In English

Contract(s)/Grant(s): NCC5-563; NAG5-11819; NAG5-12089

Patent Info.: Filed December 22, 2005; US-Patent-7,305,021; US-Patent-Appl-SN-11/316,536; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009437>

A real-time software receiver that executes on a general purpose processor. The software receiver includes data acquisition and correlator modules that perform, in place of hardware correlation, baseband mixing and PRN code correlation using bit-wise parallelism.

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

*Real Time Operation; Radio Receivers; Computation; Global Positioning System*

**20080009445** Lockheed Martin Corp., Bethesda, MD USA

**System and method for transferring data on a data link**

Cole, Robert M., Inventor; Bishop, James E., Inventor; November 13, 2007; 16 pp.; In English

Contract(s)/Grant(s): NAS9-20000

Patent Info.: Filed January 22, 2003; US-Patent-7,296,211; US-Patent-Appl-SN-10/348,659; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009445>

A system and method are provided for transferring a packet across a data link. The packet may include a stream of data symbols which is delimited by one or more framing symbols. Corruptions of the framing symbol which result in valid data symbols may be mapped to invalid symbols. If it is desired to transfer one of the valid data symbols that has been mapped to an invalid symbol, the data symbol may be replaced with an unused symbol. At the receiving end, these unused symbols are replaced with the corresponding valid data symbols. The data stream of the packet may be encoded with forward error correction information to detect and correct errors in the data stream.

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

*Data Links; Packets (Communication); Data Transmission*

**20080009479** Boeing Co., Chicago, IL USA

**Method and systems for a radiation tolerant bus interface circuit**

Kinstler, Gary A., Inventor; June 5, 2007; 22 pp.; In English

Contract(s)/Grant(s): NAS8-01099

Patent Info.: Filed March 30, 2004; US-Patent-7,228,442; US-Patent-Appl-SN-10/813,152; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009479>

A bus management tool that allows communication to be maintained between a group of nodes operatively connected on two busses in the presence of radiation by transmitting periodically a first message from one to another of the nodes on one of the busses, determining whether the first message was received by the other of the nodes on the first bus, and when it is determined that the first message was not received by the other of the nodes, transmitting a recovery command to the other of the nodes on a second of the of busses. Methods, systems, and articles of manufacture consistent with the present invention also provide for a bus recovery tool on the other node that re-initializes a bus interface circuit operatively connecting the other node to the first bus in response to the recovery command.

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

*Circuits; Communication Equipment; Transmission; Bus Conductors; Interfaces*

**20080009487** Purdue Research Foundation, Lafayette, IN USA

**Communication system with adaptive noise suppression**

Kozel, David, Inventor; Devault, James A., Inventor; Birr, Richard B., Inventor; April 24, 2007; 15 pp.; In English

Patent Info.: Filed March 10, 2003; US-Patent-7,209,567; US-Patent-Appl-SN-10/390,259; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009487>

A signal-to-noise ratio dependent adaptive spectral subtraction process eliminates noise from noise-corrupted speech

signals. The process first pre-emphasizes the frequency components of the input sound signal which contain the consonant information in human speech. Next, a signal-to-noise ratio is determined and a spectral subtraction proportion adjusted appropriately. After spectral subtraction, low amplitude signals can be squelched. A single microphone is used to obtain both the noise-corrupted speech and the average noise estimate. This is done by determining if the frame of data being sampled is a voiced or unvoiced frame. During unvoiced frames an estimate of the noise is obtained. A running average of the noise is used to approximate the expected value of the noise. Spectral subtraction may be performed on a composite noise-corrupted signal, or upon individual sub-bands of the noise-corrupted signal. Pre-averaging of the input signal's magnitude spectrum over multiple time frames may be performed to reduce musical noise.

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

*Noise Reduction; Signal Processing; Signal to Noise Ratios*

**20080009490** Johns Hopkins Univ., Baltimore, MD USA

**Method of remotely estimating a rest or best lock frequency of a local station receiver using telemetry**

Fielhauer, Karl B., Inventor; Jensen, James R., Inventor; April 17, 2007; 14 pp.; In English

Contract(s)/Grant(s): NAS5-97271

Patent Info.: Filed December 12, 2003; US-Patent-7,206,575; US-Patent-Appl-SN-10/735,580; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009490>

A system includes a remote station and a local station having a receiver. The receiver operates in an unlocked state corresponding to its best lock frequency (BLF). The local station derives data indicative of a ratio of the BLF to a reference frequency of the receiver, and telemeters the data to the remote station. The remote station estimates the BLF based on (i) the telemetered data, and (ii) a predetermined estimate of the reference frequency.

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

*Estimating; Frequencies; Receivers; Telemetry*

**20080009512** California Inst. of Tech., Pasadena, CA USA

**Generating high precision ionospheric ground-truth measurements**

Komjathy, Attila, Inventor; Sparks, Lawrence, Inventor; Mannucci, Anthony J., Inventor; October 30, 2007; 20 pp.; In English

Patent Info.: Filed July 22, 2005; US-Patent-7,289,061; US-Patent-Appl-SN-11/187,244; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009512>

A method, apparatus and article of manufacture provide ionospheric ground-truth measurements for use in a wide-area augmentation system (WAAS). Ionospheric pseudorange/code and carrier phase data as primary observables is received by a WAAS receiver. A polynomial fit is performed on the phase data that is examined to identify any cycle slips in the phase data. The phase data is then leveled. Satellite and receiver biases are obtained and applied to the leveled phase data to obtain unbiased phase-leveled ionospheric measurements that are used in a WAAS system. In addition, one of several measurements may be selected and data is output that provides information on the quality of the measurements that are used to determine corrective messages as part of the WAAS system.

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

*Augmentation; Ground Truth; Ionospheres*

**20080009535** NASA Glenn Research Center, Cleveland, OH, USA

**Analysis of Cylindrical Coplanar-Strip Line Discontinuities and Coplanar-Strip-Fed Slot Antenna**

Dib, Nihad; Omar, Amjad; Scardelletti, Maximillian; [2007]; 12 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 953033.01.03.15; Copyright; Avail.: Other Sources

The paper reports a study of cylindrical coplanar stripline (CCPS) structures. Typical CCPS discontinuities such as an open circuit, and a series gap are analyzed using both the finite difference time domain (FDTD) technique and the finite element software HFSS. Moreover, a CCPS-fed slot antenna is studied both theoretically and experimentally. Good agreement among the presented results is obtained.

Author

*Cylindrical Bodies; Discontinuity; Slot Antennas; Strip Transmission Lines; Coplanarity*



## 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*.

**20080008715** NASA, Washington, DC USA

### **MEMS micro-translation device with improved linear travel capability**

Abushagur, Mustafa A. G., Inventor; Ferguson, Cynthia K., Inventor; Nordin, Gregory P., Inventor; English, Jennifer M., Inventor; September 4, 2007; 12 pp.; In English

Patent Info.: Filed October 26, 2004; US-Patent-7,265,476; US-Patent-Appl-SN-10/975,121; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008715>

A microscopic translation device for a microelectromechanical system includes a pair of linear stator assemblies disposed in spaced relation to define an elongate channel. Each assembly is formed by a plurality of stators arranged in a row along the channel. A shuttle member is disposed between the stator assemblies for translating movement along the channel. The shuttle member includes a plurality of rotors extending outwardly from opposite sides. The shuttle is grounded through the stator assemblies and includes a mounting area for an object to be translated. Electrical lines are individually connected to alternate stators of a plurality of groups of the stators. A current supply sequentially supplies current through the electrical lines to the alternate stators so as to effect charging of the stators in a predetermined sequence. This produces a tangential capacitive force that causes translation of the shuttle.

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

*Elongation; Microelectromechanical Systems; Stators; Capacitance*

**20080008723** NASA, Washington, DC USA

### **Hybrid power management system and method**

Eichenberg, Dennis J., Inventor; August 21, 2007; 8 pp.; In English

Patent Info.: Filed September 1, 2004; US-Patent-7,259,692; US-Patent-Appl-SN-10/931,205; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008723>

A system and method for hybrid power management. The system includes photovoltaic cells, ultracapacitors, and pulse generators. In one embodiment, the hybrid power management system is used to provide power for a highway safety flasher.

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

*Management Systems; Photovoltaic Cells; Electrochemical Capacitors; Pulse Generators*

**20080008834** NASA Langley Research Center, Hampton, VA, USA

### **2.4 Micron Cutoff AlGaAsSb/InGaAsSb Phototransistors for Shortwave IR Applications**

Refaat, Tamer F.; Abedin, Nurul; Sulima, Oleg V.; Swaminathan, Krishna; Ismail, Syed; Singh, Upendra N.; October 17, 2006; 17 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 478643.02.02.02.03; Copyright; Avail.: CASI: A03, Hardcopy

Shortwave infrared detectors are critical for several applications including remote sensing and optical communications. Several detectors are commercially available for this wavelength range, but they lack sufficient gain, which limits their detectivity. The characterization results of an AlGaAsSb/InGaAsSb phototransistor for shortwave IR application are reported. The phototransistor is grown using molecular beam epitaxy technique. Spectral response measurements showed a uniform responsivity between 1.2 and 2.4 micron region with a mean value of 1000 A/W. A maximum detectivity of  $3.4 \times 10^{11}$  cmHz<sup>1/2</sup>/W was obtained at 2 micron at -20 C and 1.3 V.

Author

*Infrared Detectors; Phototransistors; Heterojunction Devices*

**20080008842** NASA Glenn Research Center, Cleveland, OH, USA

**Lunar Surface-to-Surface Power Transfer**

Kerslake, Thomas W.; December 2007; 41 pp.; In English; Space Technology and Applications International Forum (STAIF-2008), 10-14 Feb. 2008, Albuquerque, NM, USA; Original contains color and black and white illustrations  
Contract(s)/Grant(s): WBS 644423.06.32.03.05.03

Report No.(s): NASA/TM-2007-215041; Paper number 167; E-16242; No Copyright; Avail.: CASI: [A03](#), Hardcopy  
ONLINE: <http://hdl.handle.net/2060/20080008842>

A human lunar outpost, under NASA study for construction in the 2020's, has potential requirements to transfer electric power up to 50-kW across the lunar surface from 0.1 to 10-km distances. This power would be used to operate surface payloads located remotely from the outpost and/or outpost primary power grid. This paper describes concept designs for state-of-the-art technology power transfer subsystems including AC or DC power via cables, beamed radio frequency power and beamed laser power. Power transfer subsystem mass and performance are calculated and compared for each option. A simplified qualitative assessment of option operations, hazards, costs and technology needs is also described. Based on these concept designs and performance analyses, a DC power cabling subsystem is recommended to minimize subsystem mass and to minimize mission and programmatic costs and risks. Avenues for additional power transfer subsystem studies are recommended.

Author

*Lunar Bases; Direct Current; Electric Power Transmission; Transmission Lines; Electricity*

**20080008869** Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

**Engineered Carbon Nanotube Materials for High-Q Nanomechanical Resonators**

Choi, Daniel S.; Hunt, Brian; Bronikowski, Mike; Epp, Larry; Hoenk, Michael; Hoppe, Dan; Kowalczyk, Bob; Wong, Eric; Xu, Jimmy; Adam, Douglas; Young, Rob; July 11, 2003; 12 pp.; In English; The International Conference on the Science and Application of Nanotubes (NT03), 7-11 July 2003, Seoul, Korea, Republic of; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40614>

This document represents a presentation offered by the Jet Propulsion Laboratory, with assistance from researchers from Brown University and Northrop Grumman. The presentation took place in Seoul, Korea in July 2003 and attempted to demonstrate the fabrication approach regarding the development of high quality factor (high-Q) mechanical oscillators (in the forms of a tunable nanotube resonator and a nanotube array radio frequency [RF] filter) aimed at signal processing and based on carbon nanotubes. The presentation also addressed parallel efforts to develop both in-plane single nanotube resonators as well as vertical array power devices.

Derived from text

*Carbon Nanotubes; Resonators; Q Factors; Nanofabrication; Mechanical Oscillators*

**20080009443** California Inst. of Tech., Pasadena, CA USA

**Flexible carbon-based ohmic contacts for organic transistors**

Brandon, Erik, Inventor; November 20, 2007; 12 pp.; In English

Patent Info.: Filed April 15, 2004; US-Patent-7,297,621; US-Patent-Appl-SN-10/826,140; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009443>

The present invention relates to a system and method of organic thin-film transistors (OTFTs). More specifically, the present invention relates to employing a flexible, conductive particle-polymer composite material for ohmic contacts (i.e. drain and source).

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

*Carbon; Thin Films; Transistors; Polymer Matrix Composites*

**20080009464** STAR Cryoelectronics, LLC, Los Alamos, NM USA

**Charge dissipative dielectric for cryogenic devices**

Cantor, Robin Harold, Inventor; Hall, John Addison, Inventor; July 24, 2007; 11 pp.; In English

Contract(s)/Grant(s): NAS5-00236; NAS5-00237

Patent Info.: Filed October 20, 2004; US-Patent-7,247,603; US-Patent-Appl-SN-10/970,539; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009464>

A Superconducting Quantum Interference Device (SQUID) is disclosed comprising a pair of resistively shunted



Josephson junctions connected in parallel within a superconducting loop and biased by an external direct current (dc) source. The SQUID comprises a semiconductor substrate and at least one superconducting layer. The metal layer(s) are separated by or covered with a semiconductor material layer having the properties of a conductor at room temperature and the properties of an insulator at operating temperatures (generally less than 100 Kelvins). The properties of the semiconductor material layer greatly reduces the risk of electrostatic discharge that can damage the device during normal handling of the device at room temperature, while still providing the insulating properties desired to allow normal functioning of the device at its operating temperature. A method of manufacturing the SQUID device is also disclosed.

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

*Cryogenics; Dielectrics; Josephson Junctions; SQUID (Detectors); Superconductivity*

**20080009471** Alliant Techsystems, Inc., Edina, MN USA

**Method and apparatus for detecting and determining event characteristics with reduced data collection**

Totman, Peter D., Inventor; Everton, Randy L., Inventor; Egget, Mark R., Inventor; Macon, David J., Inventor; July 10, 2007; 13 pp.; In English

Contract(s)/Grant(s): NAS8-97238

Patent Info.: Filed July 30, 2002; US-Patent-7,240,564; US-Patent-Appl-SN-10/208,518; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009471>

A method and apparatus for detecting and determining event characteristics such as, for example, the material failure of a component, in a manner which significantly reduces the amount of data collected. A sensor array, including a plurality of individual sensor elements, is coupled to a programmable logic device (PLD) configured to operate in a passive state and an active state. A triggering event is established such that the PLD records information only upon detection of the occurrence of the triggering event which causes a change in state within one or more of the plurality of sensor elements. Upon the occurrence of the triggering event, the change in state of the one or more sensor elements causes the PLD to record in memory which sensor element detected the event and at what time the event was detected. The PLD may be coupled with a computer for subsequent downloading and analysis of the acquired data.

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

*Data Acquisition; Failure Analysis; Programmable Logic Devices*

**20080009474** California Inst. of Tech., Pasadena, CA USA

**Wafer bonded virtual substrate and method for forming the same**

Atwater, Jr., Harry A., Inventor; Zahler, James M., Inventor; Morral, Anna Fontcuberta i, Inventor; July 3, 2007; 17 pp.; In English

Contract(s)/Grant(s): NAS3-02201

Patent Info.: Filed January 20, 2004; US-Patent-7,238,622; US-Patent-Appl-SN-10/761,918; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009474>

A method of forming a virtual substrate comprised of an optoelectronic device substrate and handle substrate comprises the steps of initiating bonding of the device substrate to the handle substrate, improving or increasing the mechanical strength of the device and handle substrates, and thinning the device substrate to leave a single-crystal film on the virtual substrate such as by exfoliation of a device film from the device substrate. The handle substrate is typically Si or other inexpensive common substrate material, while the optoelectronic device substrate is formed of more expensive and specialized electro-optic material. Using the methodology of the invention a wide variety of thin film electro-optic materials of high quality can be bonded to inexpensive substrates which serve as the mechanical support for an optoelectronic device layer fabricated in the thin film electro-optic material.

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

*Bonding; Optoelectronic Devices; Substrates; Wafers*

**20080009476** California Inst. of Tech., Pasadena, CA USA

**Increasing the dynamic range of CMOS photodiode imagers**

Pain, Bedabrata, Inventor; Cunningham, Thomas J., Inventor; Hancock, Bruce R., Inventor; June 26, 2007; 11 pp.; In English  
Patent Info.: Filed July 27, 2005; US-Patent-7,235,771; US-Patent-Appl-SN-11/191,603; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009476>

A multiple-step reset process and circuit for resetting a voltage stored on a photodiode of an imaging device. A first stage

of the reset occurs while a source and a drain of a pixel source-follower transistor are held at ground potential and the photodiode and a gate of the pixel source-follower transistor are charged to an initial reset voltage having potential less than that of a supply voltage. A second stage of the reset occurs after the initial reset voltage is stored on the photodiode and the gate of the pixel source-follower transistor and the source and drain voltages of the pixel source-follower transistor are released from ground potential thereby allowing the source and drain voltages of the pixel source-follower transistor to assume ordinary values above ground potential and resulting in a capacitive feed-through effect that increases the voltage on the photodiode to a value greater than the initial reset voltage.

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

*Energy Storage; CMOS; Dynamic Range; Electric Potential; Imaging Techniques; Photodiodes*

**20080009484** Auburn Univ., AL USA

**Graded junction termination extensions for electronic devices**

Merrett, J. Neil, Inventor; Isaacs-Smith, Tamara, Inventor; Sheridan, David C., Inventor; Williams, John R., Inventor; May 8, 2007; 10 pp.; In English

Contract(s)/Grant(s): NAGW-1192

Patent Info.: Filed August 9, 2005; US-Patent-7,214,627; US-Patent-Appl-SN-11/201,066; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009484>

A graded junction termination extension in a silicon carbide (SiC) semiconductor device and method of its fabrication using ion implementation techniques is provided for high power devices. The properties of silicon carbide (SiC) make this wide band gap semiconductor a promising material for high power devices. This potential is demonstrated in various devices such as p-n diodes, Schottky diodes, bipolar junction transistors, thyristors, etc. These devices require adequate and affordable termination techniques to reduce leakage current and increase breakdown voltage in order to maximize power handling capabilities. The graded junction termination extension disclosed is effective, self-aligned, and simplifies the implementation process.

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

*Fabrication; Semiconductor Devices; Silicon Carbides; P-N Junctions; Semiconductor Diodes*

**20080009485** NASA, Washington, DC USA

**String resistance detector**

Hall, A. Daniel, Inventor; Davies, Francis J., Inventor; May 1, 2007; 16 pp.; In English

Patent Info.: Filed March 6, 2006; US-Patent-7,212,934; US-Patent-Appl-SN-11/370,379; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009485>

Method and system are disclosed for determining individual string resistance in a network of strings when the current through a parallel connected string is unknown and when the voltage across a series connected string is unknown. The method/system of the invention involves connecting one or more frequency-varying impedance components with known electrical characteristics to each string and applying a frequency-varying input signal to the network of strings. The frequency-varying impedance components may be one or more capacitors, inductors, or both, and are selected so that each string is uniquely identifiable in the output signal resulting from the frequency-varying input signal. Numerical methods, such as non-linear regression, may then be used to resolve the resistance associated with each string.

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

*Electric Potential; Strings*

**20080009486** Florida Univ., Gainesville, FL USA

**Electromechanical acoustic liner**

Sheplak, Mark, Inventor; Cattafesta, III, Louis N., Inventor; Nishida, Toshikazu, Inventor; Horowitz, Stephen Brian, Inventor; May 1, 2007; 19 pp.; In English

Contract(s)/Grant(s): NAG1-2261

Patent Info.: Filed August 16, 2004; US-Patent-7,212,641; US-Patent-Appl-SN-10/919,150; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009486>

A multi-resonator-based system responsive to acoustic waves includes at least two resonators, each including a bottom

plate, side walls secured to the bottom plate, and a top plate disposed on top of the side walls. The top plate includes an orifice so that a portion of an incident acoustical wave compresses gas in the resonators. The bottom plate or the side walls include at least one compliant portion. A reciprocal electromechanical transducer coupled to the compliant portion of each of the resonators forms a first and second transducer/compliant composite. An electrical network is disposed between the reciprocal electromechanical transducer of the first and second resonator.

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

*Electromechanics; Resonators; Sound Generators; Sound Waves; Walls*

**20080009502** NASA, Washington, DC USA

**Low power, high voltage power supply with fast rise/fall time**

Bearden, Douglas B., Inventor; February 13, 2007; 6 pp.; In English

Patent Info.: Filed March 10, 2006; US-Patent-7,177,164; US-Patent-Appl-SN-11/376,632; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009502>

A low power, high voltage power supply system includes a high voltage power supply stage and a preregulator for programming the power supply stage so as to produce an output voltage which is a predetermined fraction of a desired voltage level. The power supply stage includes a high voltage, voltage doubler stage connected to receive the output voltage from the preregulator and for, when activated, providing amplification of the output voltage to the desired voltage level. A first feedback loop is connected between the output of the preregulator and an input of the preregulator while a second feedback loop is connected between the output of the power supply stage and the input of the preregulator.

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

*Electric Potential; High Voltages; Low Voltage*

**20080009515** Illinois Inst. of Tech., Chicago, IL USA

**Electrode design for electrohydrodynamic conduction pumping**

Yagoobi, Jamal Seyed, Inventor; August 28, 2007; 16 pp.; In English

Patent Info.: Filed June 16, 2003; US-Patent-7,261,521; US-Patent-Appl-SN-10/504,996; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009515>

An electrohydrodynamic conduction liquid pumping system includes a vessel configured to contain a liquid or a liquid/vapor therein. This vessel can be of a elongate conduit configuration, an elongate channel configuration or a liquid enclosure configuration. At least a single pair of electrodes are disposed in a spaced apart relation to each other on the vessel and configured to be oriented in the liquid. A power supply is coupled to the electrodes and operable to generate electric fields in between the pair of electrodes, the electric forces inducing a net liquid movement relative to the vessel. Various electrode designs are embraced within the concept of this invention.

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

*Electrodes; Electrohydrodynamics; Liquid-Vapor Interfaces*

**20080009528** Science Applications International Corp., Houston, TX, USA

**Lithium Battery Analysis: Probability of Failure Assessment Using Logistic Regression**

Moebes, Travis A.; [2007]; 7 pp.; In English; SASCom Conference, 15 May 2007, Arlington, VA, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

Approximately by 52 columns of Vendor Acceptance Data were processed through Logistic Regression using Insightful Miner (IM) and SAS Enterprise Miner (EM) to find any significant correlation between 52 test output parameters (independent variables) and the pass/fail outcome for each of the 1400 cells tested (approx.). The goal is to find what the good predictors to detect good or bad cells in the form of a best Logistic Regression model. The model determination processing was followed by model statistical acceptance processing. This overall processing and analysis improved the model selection in coefficient estimates based on t-statistics, analysis of deviance(R Square), and Likelihood Ratio Chi-Square test parameters for global null hypothesis. All results were similar in both IM and EM processing and model building. Future data may be integrated into the model, thus reusing the results of previous data.

Author

*Failure; Lithium Batteries; Regression Analysis; Statistical Tests; Failure Analysis*

## 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*.

**20080008830** NASA Langley Research Center, Hampton, VA, USA

### Hybrid LES/RANS Simulation of Transverse Sonic Injection into a Mach 2 Flow

Boles, John A.; Edwards, Jack R.; Baurle, Robert A.; January 07, 2008; 19 pp.; In English; 46th AIAA Aerospace Sciences Meeting and Exhibit, 7-10 Jan. 2008, Reno, NV, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): T002-34-01; NNX07AC27A-S02; WBS 599489.02.07.07.03.66

Report No.(s): AIAA Paper-2008-0622; Copyright; Avail.: CASI: [A03](#), Hardcopy

A computational study of transverse sonic injection of air and helium into a Mach 1.98 cross-flow is presented. A hybrid large-eddy simulation / Reynolds-averaged Navier-Stokes (LES/RANS) turbulence model is used, with the two-equation Menter baseline (Menter-BSL) closure for the RANS part of the flow and a Smagorinsky-type model for the LES part of the flow. A time-dependent blending function, dependent on modeled turbulence variables, is used to shift the closure from RANS to LES. Turbulent structures are initiated and sustained through the use of a recycling / rescaling technique. Two higher-order discretizations, the Piecewise Parabolic Method (PPM) of Colella and Woodward, and the SONIC-A ENO scheme of Suresh and Huyhn are used in the study. The results using the hybrid model show reasonably good agreement with time-averaged Mie scattering data and with experimental surface pressure distributions, even though the penetration of the jet into the cross-flow is slightly over-predicted. The LES/RANS results are used to examine the validity of commonly-used assumptions of constant Schmidt and Prandtl numbers in the intense mixing zone downstream of the injection location.

Author

*Large Eddy Simulation; Reynolds Averaging; Gas Injection; Cross Flow; Mach Number; Navier-Stokes Equation; Turbulence Models; Computational Fluid Dynamics*

**20080008847** NASA Langley Research Center, Hampton, VA, USA

### Heat Sponge: A Concept for Mass-Efficient Heat Storage

Splinter, Scott C.; Blosser, Max L.; Gifford, Andrew R.; January 07, 2008; 19 pp.; In English; 46th AIAA Aerospace Sciences Meeting and Exhibit, 7-10 Jan. 2008, Reno, NV, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 599489.02.07.07.02.03; Copyright; Avail.: CASI: [A03](#), Hardcopy

The heat sponge is a device for mass-efficient storage of heat. It was developed to be incorporated in the substructure of a re-entry vehicle to reduce thermal- protection-system requirements. The heat sponge consists of a liquid/vapor mixture contained within a number of miniature pressure vessels that can be embedded within a variety of different types of structures. As temperature is increased, pressure in the miniature pressure vessels also increases so that heat absorbed through vaporization of the liquid is spread over a relatively large temperature range. Using water as a working fluid, the heat-storage capacity of the liquid/vapor mixture is many times higher than that of typical structural materials and is well above that of common phase change materials over a temperature range of 200 F to 700 F. The use of pure ammonia as the working fluid provides a range of application between 432 deg R and 730 deg R, or the use of the more practical water-ammonia solution provides a range of application between 432 deg R and 1160 deg R or in between that of water and pure ammonia. Prototype heat sponges were fabricated and characterized. These heat sponges consisted of 1.0-inch-diameter, hollow, stainless-steel spheres with a wall thickness of 0.020 inches which had varying percentages of their interior volumes filled with water and a water-ammonia solution. An apparatus to measure the heat stored in these prototype heat sponges was designed, fabricated, and verified. The heat-storage capacity calculated from measured temperature histories is compared to numerical predictions.

Author

*Heat Storage; Ammonia; Liquid-Gas Mixtures; Water; Working Fluids; Pressure Vessels*

**20080009506** Georgia Tech Research Inst., Atlanta, GA USA

### Stagnation point reverse flow combustor for a combustion system

Zinn, Ben T., Inventor; Neumeier, Yedidia, Inventor; Seitzman, Jerry M., Inventor; Jagoda, Jechiel, Inventor; Hashmonay, Ben-Ami, Inventor; January 30, 2007; 30 pp.; In English

Contract(s)/Grant(s): NCC3-982

Patent Info.: Filed May 11, 2005; US-Patent-7,168,949; US-Patent-Appl-SN-11/127,038; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009506>

A combustor assembly includes a combustor vessel having a wall, a proximate end defining an opening and a closed distal

end opposite said proximate end. A manifold is carried by the proximate end. The manifold defines a combustion products exit. The combustion products exit being axially aligned with a portion of the closed distal end. A plurality of combustible reactant ports is carried by the manifold for directing combustible reactants into the combustion vessel from the region of the proximate end towards the closed distal end.

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

*Combustion; Stagnation Point*

## 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*.

**20080009441** NASA, Washington, DC USA

#### **Optimal binarization of gray-scaled digital images via fuzzy reasoning**

Dominguez, Jesus A., Inventor; Klinko, Steven J., Inventor; November 20, 2007; 12 pp.; In English

Patent Info.: Filed February 11, 2004; US-Patent-7,298,897; US-Patent-Appl-SN-10/779,551; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009441>

A technique for finding an optimal threshold for binarization of a gray scale image employs fuzzy reasoning. A triangular membership function is employed which is dependent on the degree to which the pixels in the image belong to either the foreground class or the background class. Use of a simplified linear fuzzy entropy factor function facilitates short execution times and use of membership values between 0.0 and 1.0 for improved accuracy. To improve accuracy further, the membership function employs lower and upper bound gray level limits that can vary from image to image and are selected to be equal to the minimum and the maximum gray levels, respectively, that are present in the image to be converted. To identify the optimal binarization threshold, an iterative process is employed in which different possible thresholds are tested and the one providing the minimum fuzzy entropy measure is selected.

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

*Gray Scale; Image Analysis; Thresholds; Pixels; Conversion*

**20080009450** NASA, Washington, DC USA

#### **Wireless fluid level measuring system**

Taylor, Bryant D., Inventor; Woodard, Stanley E., Inventor; August 14, 2007; 12 pp.; In English

Patent Info.: Filed September 12, 2005; US-Patent-7,255,004; US-Patent-Appl-SN-11/229,438; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009450>

A level-sensing probe positioned in a tank is divided into sections with each section including (i) a fluid-level capacitive sensor disposed along the length thereof, (ii) an inductor electrically coupled to the capacitive sensor, (iii) a sensor antenna positioned for inductive coupling to the inductor, and (iv) an electrical conductor coupled to the sensor antenna. An electrically non-conductive housing accessible from a position outside of the tank houses antennas arrayed in a pattern. Each antenna is electrically coupled to the electrical conductor from a corresponding one of the sections. A magnetic field response recorder has a measurement head with transceiving antennas arrayed therein to correspond to the pattern of the housing's antennas. When a measurement is to be taken, the measurement head is mechanically coupled to the housing so that each housing antenna is substantially aligned with a specific one of the transceiving antennas.

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

*Depth Measurement; Fluids; Housings; Antennas; Electric Conductors*



**20080009453** California Inst. of Tech., Pasadena, CA USA

**Holographic memory using beam steering**

Chao, Tien-Hsin, Inventor; Hanan, Jay C., Inventor; Reyes, George F., Inventor; Zhou, Hanying, Inventor; July 31, 2007; 24 pp.; In English

Contract(s)/Grant(s): NAS7-1407

Patent Info.: Filed August 4, 2006; US-Patent-7,251,066; US-Patent-Appl-SN-11/462,495; No Copyright; Avail.: CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009453>

A method, apparatus, and system provide the ability for storing holograms at high speed. A single laser diode emits a collimated laser beam to both write to and read from a photorefractive crystal. One or more liquid crystal beam steering spatial light modulators (BSSLMS) steer a reference beam, split from the collimated laser beam, at high speed to the photorefractive crystal.

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

*Beam Steering; High Speed; Holography; Memory (Computers); Semiconductor Diodes*

**20080009480** Florida Univ., Gainesville, FL USA

**Radiography by selective detection of scatter field velocity components**

Jacobs, Alan M., Inventor; Dugan, Edward T., Inventor; Shedlock, Daniel, Inventor; May 29, 2007; 12 pp.; In English

Patent Info.: Filed July 20, 2004; US-Patent-7,224,772; US-Patent-Appl-SN-10/896,243; No Copyright; Avail.: CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009480>

A reconfigurable collimated radiation detector, system and related method includes at least one collimated radiation detector. The detector has an adjustable collimator assembly including at least one feature, such as a fin, optically coupled thereto. Adjustments to the adjustable collimator selects particular directions of travel of scattered radiation emitted from an irradiated object which reach the detector. The collimated detector is preferably a collimated detector array, where the collimators are independently adjustable. The independent motion capability provides the capability to focus the image by selection of the desired scatter field components. When an array of reconfigurable collimated detectors is provided, separate image data can be obtained from each of the detectors and the respective images cross-correlated and combined to form an enhanced image.

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

*Radiation Detectors; Radiography; Collimation*

**20080009521**

**Hybrid-dual-fourier tomographic algorithm for a fast three-dimensional optical image reconstruction in turbid media**

Alfano, Robert R., Inventor; Cai, Wei, Inventor; May 15, 2007; 20 pp.; In English

Patent Info.: Filed June 5, 2003; US-Patent-7,218,959; US-Patent-Appl-SN-10/456,264; No Copyright; Avail.: CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009521>

A reconstruction technique for reducing computation burden in the 3D image processes, wherein the reconstruction procedure comprises an inverse and a forward model. The inverse model uses a hybrid dual Fourier algorithm that combines a 2D Fourier inversion with a 1D matrix inversion to thereby provide high-speed inverse computations. The inverse algorithm uses a hybrid transfer to provide fast Fourier inversion for data of multiple sources and multiple detectors. The forward model is based on an analytical cumulant solution of a radiative transfer equation. The accurate analytical form of the solution to the radiative transfer equation provides an efficient formalism for fast computation of the forward model.

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

*Image Reconstruction; Fourier Transformation; Algorithms; Tomography*

**20080009522** Johns Hopkins Univ., Baltimore, MD USA

**Method and apparatus for multiple-projection, dual-energy x-ray absorptiometry scanning**

Charles, Jr., Harry K., Inventor; Beck, Thomas J., Inventor; Feldmesser, Howard S., Inventor; Magee, Thomas C., Inventor; April 10, 2007; 31 pp.; In English

Contract(s)/Grant(s): NCC9-58

Patent Info.: Filed August 14, 2003; US-Patent-7,203,274; US-Patent-Appl-SN-10/399,617; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009522>

Methods and apparatuses for advanced, multiple-projection, dual-energy X-ray absorptiometry scanning systems include combinations of a conical collimator; a high-resolution two-dimensional detector; a portable, power-capped, variable-exposure-time power supply; an exposure-time control element; calibration monitoring; a three-dimensional anti-scatter-grid; and a gantry-gantry base assembly that permits up to seven projection angles for overlapping beams. Such systems are capable of high precision bone structure measurements that can support three dimensional bone modeling and derivations of bone strength, risk of injury, and efficacy of countermeasures among other properties.

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

*Scanners; Collimators; X Ray Absorption*

### 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*.

**20080008829** NASA Langley Research Center, Hampton, VA, USA

**Efficient Operation of Conductively Cooled Ho:Tm:LuLiF Laser Oscillator/Amplifier**

Yu, Jirong; Bai, Yingxin; Trieu, Bo; Petros, M.; Petzar, Paul; Lee, Hyung; Singh, U.; January 27, 2008; 3 pp.; In English; Advanced Solid State Photonics, 27-30 Jan. 2008, Nara, Japan; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 478643.02.02.02.11; Copyright; Avail.: CASI: [A01](#), Hardcopy

A conductively-cooled Ho:Tm:LuLiF laser oscillator generates 1.6J normal mode pulses at 10Hz with optical to optical efficiency of 20%. When the laser head module is used as the amplifier, the double-pass small-signal amplification exceeds 25.

Author

*Pulsed Lasers; Crystal Oscillators; Amplifiers*

### 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*.

**20080008841** NASA Glenn Research Center, Cleveland, OH, USA

**Pitting and Bending Fatigue Evaluations of a New Case-Carburized Gear Steel**

Krantz, Timothy; Tufts, Brian; December 2007; 14 pp.; In English; International Design Engineering Technical Conferences and COmputers, 4-7 Sep. 2007, Las Vegas, NV; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 877868.02.07.03.01.01

Report No.(s): NASA/TM-2007-215009; ARL-TR-4123; E-16196; Copyright; Avail.: CASI: [A03](#), Hardcopy

The power density of a gearbox is an important consideration for many applications and is especially important for gearboxes used on aircraft. One approach to improving power density of gearing is to improve the steel properties by design of the alloy. The alloy tested in this work was designed to be case-carburized with surface hardness of Rockwell C66 after hardening. Test gear performance was evaluated using surface fatigue tests and single-tooth bending fatigue tests. The performance of gears made from the new alloy was compared to the performance of gears made from two alloys currently used for aviation gearing. The new alloy exhibited significantly better performance in surface fatigue testing, demonstrating the value of the improved properties in the case layer. However, the alloy exhibited lesser performance in single-tooth bending

fatigue testing. The fracture toughness of the tested gears was insufficient for use in aircraft applications as judged by the behavior exhibited during the single tooth bending tests. This study quantified the performance of the new alloy and has provided guidance for the design and development of next generation gear steels.

Author

*Metal Fatigue; Gears; Steels; Transmissions (Machine Elements); Bending Fatigue; Fatigue Tests; Hardness; Pitting*

**20080008878** Beijing Univ. of Technology, Beijing, China

**Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology**

Chen, Wuyi, Editor; Yamane, Yasuo, Editor; Fan, Rui, Editor; Usuki, Hiroshi, Editor; Ochi, Akio, Editor; November 09, 2006; 574 pp.; In English; Eighth International Conference on Progress of Machining Technology, 9-11 Nov. 2006, Matsue, Japan; See also 20080008879 - 20080009008; Original contains black and white illustrations

Report No.(s): ICPMT2006; Copyright; Avail.: Other Sources

ICPMT was first held as the International Conference on Progress of Cutting and Grinding (ICPGG) in 1992. The ICPCG merged with International Conference on Machining Technology (ICMT) to form the International Conference on Progress of Machining Technology (ICPMT) in 2000. The main thrust of the ICPMT is the basic machining technology, such as cutting, grinding, abrasive machining, unconventional machining, monitoring of the machining process, surface integrity, virtual manufacturing, CAD/CAM/CAPP, etc.

Derived from text

*Machining; Technology Utilization; Conferences; Mechanical Engineering; Numerical Analysis*

**20080008879** Tokushima Prefectural Industrial Technology Center, Tokushima, Japan

**Cavitation Effect of Cutting Fluid in Micro Drilling**

Ogawa, Hitoshi; Masuda, Masahiro; Oyama, Akira; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 261-264; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Ultrasonic vibration has been applied to micro drilling of hard and brittle materials such as single crystalline silicon and glass etc. and ultra precision diamond turning of stainless steel, and has led to superior results. The methods proposed so far, however, need the special equipments to vibrate directly tool or workpiece. This paper proposes a new ultrasonic vibration aided method that vibrates the cutting fluid in which tool and workpiece are soaked. The principle is to accelerate the chip removal by the cavitation generated in the fluid. The effect which applies this method to micro drilling of SUS304 is estimated. In addition, the behavior of cavitation is observed using a high-speed camera in drilling of acrylic resin. The obtained results are as follows. Compared with conventional drilling, this method smoothes chip removal and reduces adhesion and/or welding of chip owing to the cavitation generated at the front of the drill, and in consequence brings out longer tool life and smaller surface roughness. Furthermore, the cooling performance also matches up to the conventional oiling.

Author

*Cavitation Flow; Cutting; Drilling; Vibration; Surface Roughness; High Speed; Adhesion; Precision*

**20080008880** Kobe Steel Ltd., Japan

**Better Use of MnS Inclusions in Improving Machinability of Steels**

Yaguchi, Hiroshi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 485-489; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Possible mechanisms by which MnS inclusions improve machinability have been discussed in order to have better ideas to consider free-machining steels with better use of MnS inclusions. Special care is taken in cutting temperature, since it is known that the dominant tool wear mechanisms changes according cutting temperature. This suggests that the major mechanism improving machinability by MnS inclusions can also change depending on cutting temperature. It is suggested that MnS improves machinability mechanically at low temperature region especially when BUE is formed. This explains why large and globular inclusions are better as proposed by many researchers. On the other hand, suppression of tribo-chemical wear is probably the most important role. In this case, large and globular inclusions could not always be beneficial in improving machinability. The effects of MnS inclusions on mechanical properties and chip disposability are also discussed. It is necessary to consider these factors in addition to the effect on tool lives of various tool materials in designing the actual free-machining

steels. This is because the effects of MnS morphology on some of the requirements are contradictory to each other.

Author

*Mechanical Properties; Machining; Cutting; Steels; Wear; Inclusions; Chips*

**20080008881** Kagawa Univ., Takamatsu, Japan

**Tribological Action and Cutting Performance of Lubricant Esters for Near-dry Machining**

Wakabayashi, Toshiaki; Suda, Satoshi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 491-496; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

As an optimal lubricant for near-dry machining, such as MQL machining, this paper introduces some synthetic polyol esters having the high biodegradability, excellent oxidation stability and satisfactory cutting performance. The fundamental investigation regarding their tribological action demonstrates synthetic esters possess the preferable adsorption ability on to the freshly cut metal surfaces and this ability can be enhanced by surrounding oxygen. This may result in effective lubricating film formation and is probably in close connection with their satisfactory MQL cutting performance.

Author

*Tribology; Lubricants; Esters; Machining; Metal Surfaces; Adsorption; Lubrication*

**20080008882** Kolej Univ. Kejuruteraan Utara, Malaysia

**Effect of Electrical Parameters on the PMD-EDM Performances of Titanium Alloy**

Zahiruddin M. Z.; Rahim, E. A.; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 245-248; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper presents a study of the PMD-EDM machining of Ti-6Al-4V using Taguchi approaches. Electrical Discharge Machining (EDM) is a potential process to machine such material due to the properties of nonmechanical contact between tool and workpiece and capable to machine intricate shape. Powder Mixed in Dielectric (PMD) was proved to improve the EDM performance measures. In this work, the influence of design factors namely intensity (I), pulse duration (ti), pulse-off time (to) and open circuit voltage (U) were studied. Material removal rate (MRR), volumetric electrode wear rate (EW) and surface roughness were evaluated at various machining conditions. PMD-EDM showed a significant improvement in terms of surface quality when compared with non-added powder EDM.

Author

*Powder (Particles); Dielectrics; Electrodes; Machining; Titanium Alloys; Pulse Duration*

**20080008883** Hyogo Univ., Japan

**FEM Analysis of Bending Deformation in Laser Forming of Mg Alloy**

Okuda, Kiochi; Hayashida, Hayato; Nunobiki, Masayuki; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 249-252; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Plastic bending properties and deformation mechanism of magnesium alloy plate (AZ31) by CO2 laser forming process are investigated based on a simulation analysis. In this paper, the analysis of heat transfer by conduction and thermal deformation are conducted with a finite element method. The simulation model that the shuttle motion of the laser is given along the width (60mm) of the plate (a thickness of 1 mm) is made. The moving heat source with Gaussian distribution strength is given. The temperature distribution, the thermal stress and the thermal deformation are calculated and then their interrelation is discussed. It was found that the laser spot diameter and the thickness of plate greatly influence the bending direction.

Author

*Bending; Deformation; Finite Element Method; Lasers; Simulation*

**20080008884** Numazu Coll. of Technology, Shizuoka, Japan

**Development of Geometrical Model Kernel Based on Boundary-Map Data Structure**

Fujio, Mikio; Yagishita, Hukuzo; Suzuki, Hiroshi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 305-308; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Although the geometric model kernels used in current CAD/CAM systems are suitable for representing 3D shapes

precisely, little attention has been given to the generation of CAM data. When applying these geometric models to CAM systems, problems occasionally arise such as inaccuracy of generated tool paths, problems with the execution speed for checking the interference between a tool and a model shape, and machining errors caused by small deformations due to cutting forces and heat. Therefore, a new geometric model named the 'boundary-map geometric model', which is based on decomposition models and is suitable for CAM functions, has developed. Boundary-map data structures are part of decomposition models such as voxel, Z-map, or cell models. In this study, CAM functions, basic data-handling processes, and various boundary-map data structures are reconstructed and integrated to create a geometric model kernel. This paper examines the constitution of the geometrical model kernel, the structure of boundary-map kernel data, the basic kernel functions, and some typical application-program interfaces (API). The application results of each developed CAM function are demonstrated. Key words Boundary-Map data structure, geometric model kernel, tool path, NC geometric cutting simulator

Author

*Kernel Functions; Computer Aided Design; Computer Aided Manufacturing; Boundaries; Data Structures*

**20080008885** Beijing Univ. of Aeronautics and Astronautics, Beijing, China

**Research on Regulation of Thin Wall Integral Structure Distortion during Machining**

Liu, Dong; Chen, Wuyi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 531-534; In English; See also [20080008878](#); Original contains black and white illustrations; Copyright; Avail.: Other Sources

The FEM model was established in order to study the distortion of thin wall integral structure during NC machining. The original residual stress was applied on aluminum blank. The deformable regulation of thin wall integral structure during machining was studied using inactive element technology of FEM software. The results of simulation indicated that the process of distortion could be divided into stiffness sensitive stage and stiffness insensitive stage. The distortion of part increased with the bending stiffness of part decreased in the stiffness sensitive stage; but in the stiffness insensitive stage, the distortion of part decreased with the bending stiffness of part decreased. There existed a deformable critical point between these two stages. Key Words thin wall integral structure, machining distortion, residual stress, finite element simulation

Author

*Distortion; Thin Walls; Residual Stress; Machining; Deformation; Bending*

**20080008886** BeiHang Univ., Beijing, China

**Engineering Change Management for Complex Products**

Guo, Jianfei; Qiao, Lihong; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 81-84; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper addresses the engineering change management problem for complex products with product lifecycle consideration. Two important technologies in engineering change are discussed. One is the engineering change process modeling based on the analysis of key characteristics of engineering change, the other is hierarchical product data version control. The implementation of engineering change management in Teamcenter PDM system is provided. This study offers an effective method to resolve the engineering change management problem for complex products in manufacturing enterprises.

Author

*Engineering Management; Manufacturing; Management Systems*

**20080008887** Niigata Univ., Niigata, Japan

**Study on High Speed and High Accuracy Machining of Scroll Shape Workpiece - Development of End Mill for High Accurate Machining and Long Tool Life**

Matsuhashi, Hideaki; Iwabe, Hiroyuki; Masuda, Masami; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 209-212; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

End mills are used frequently for the machining of scroll shape parts. However, the required value of the shape accuracy of the scroll wall surface is very small, less than 5 micrometers. For this reason, it is necessary to change the tool in use for a short cutting distance. So, this research is aimed at the development of a long-lived tool in the high speed machining of a scroll wall surface. At first, two types of tool with different average grain size of WC were prepared for an experiment.



Secondarily, the cutting trials were performed using experimental tools. The dimensional and shape accuracy of the surface of the wall were measured and examined using experimental data. According to the results, the tool with the smaller average grain size of WC displayed the highest durability. Moreover, the flank wear width of trial tools were compared to each other. And it was shown that the wear rate of the most durable tool is smaller than that of the other tool with the larger average grain size of WC.

Author

*Milling Machines; Accuracy; Shapes; Forming Techniques*

**20080008888** North Univ. of China, Yuan, China

**Study on Human Interface in Precision Machining Analyzing the Physiological Information**

Chi, Huanzhong; Wang, Fan; Hou, Junfu; Li, Mengqun; Yang, Bo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

At present, the relationship between subject and machine is closer and closer. The subject will play more important role in precision machining. Many researches on human interface have been done so far. However, the research on human interface about physiological state of subject in precision machining is fewer so the research on the physiological state of the subject is very necessary. In this research, human physiological information in precision machining was tested through sensor measurement system. The sensor measurement system realizes measuring on line as well as possible in order to ensure the precision of result of measurement. In addition, the results of test and multiple regression analysis show that there is close correlation between the physiological information and fatigue symptom in precision machining. Estimating fatigue is possible through physiological information in ergonomics.

Author

*Human Factors Engineering; Machining; Physiology; Man Machine Systems*

**20080008889** Tokyo Denki Univ., Japan

**Distortion of Thin Plate Caused by Residual Stress in Face Turning**

Shirakasahi, Takahiro; Takahasi, Souhei; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 515-518; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The troublesome matters for obtaining a high accuracy product by machining are a distortion caused by machining force and residual stress. The latter is one of the most trouble some matter. In the paper a distortion due to residual stress is discussed. In face turning of thin plate a machined product is usually distorted. Firstly geometry of distorted plate is measured for some cutting condition. Then an effect of cutting tool geometry is precisely discussed combined with cutting conditions. When a tool nose radius is small enough, the distortion of the plate is mainly caused by the circular residual stress, and simple concave geometry is realized. On the other hand, when a tool nose radius is lager than radial feed rate, the distortion is caused by the combined effect of circular and radial stresses, the plate is distorted like a trumpet horn geometry. Finally in order to restrain the deformation in face turning, the cutting conditions included a tool nose geometry is discussed.

Author

*Distortion; Machining; Residual Stress; Thin Plates*

**20080008890** Guangdong Mechanical and Electrical College, Guangdong, China

**Influence of Cutting Parameters on Cutting Forces in High-Speed Milling of Thin-Walled Graphite Electrode**

Zhouling, HU; Chengyong, WANG; Li, ZHOU; Hao, FU; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 341-344; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

In order to solve the breakage, crack or poor surface quality occurred in processing thin-walled graphite electrode, by means of orthogonal experiments the individual action and interaction of the cutting parameters to the cutting forces were analyzed. Optimization of technological parameters and processing strategies are proposed for high speed milling of thin walled graphite electrode. The thin walled graphite electrode with thickness 0.1 mm, height 20 mm was achieved finally.

Author

*Cutting; Electrodes; Graphite; Thin Walls; Milling Machines*

**20080008891** Sydney Univ., Australia

**A Semi-Analytical Method for the Modelling of Grinding Forces**

Alauddin, M.; Zhang, L. C.; Hashmi, M. S. J.; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 401-404; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper describes a new semi-analytical method for the modelling of grinding forces, by combining the dimensional analysis with the response surface methodology. The predictive grinding force model was developed in terms of spindle speed, work speed, depth of cut, width of cut and the strength of the work material. The model was then validated by variance analysis. The new technique can significantly reduce the number of experiments required for the force modelling and thereby is cost-effective.

Author

*Grinding; Dimensional Analysis; Mechanical Properties; Cutting; Spindles*

**20080008892** Harbin Univ. of Science and Technology, Harbin, China

**Research on the Influence of Workpiece Curvature on Cutting Force in NC Machining**

Zhang, Huiping; Li, Zhenjia; Zheng, Minli; Jiang, Bin; Yan, Fugang; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 429-432; In English; See also [20080008878](#)

Contract(s)/Grant(s): NSF-E9909; Copyright; Avail.: Other Sources

In this paper, in order to obtain the best tool path in NC machining, the influence of workpiece curvature on the change of cutting force in NC machining is analyzed. Based on differential geometry, the normal curvature mathematic model of every point on ellipsoid along with the cutting direction is built. Using the MATLAB software, the relationship between the normal curvature of freeform surface and cutting force is established. The cutting force decreases while the normal curvature increases. To verify the relationship, the experiment is performed and the experimental result accords with the theoretic prediction. The establishment of this theory provides the theoretic base for optimizing tool path in NC machining.

Author

*Curvature; Machining; Mathematical Models; Cutting; Surface Geometry*

**20080008893** Beijing Univ. of Aeronautics and Astronautics, Beijing, China

**The Improvement of Data Structures in Minimal Path Sets Used in Design and Manufacture Reliability Model**

Zong, Xiao; Wang, Chunjie; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 73-76; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The data structure is important in the minimal path sets method. For increasing the calculation efficiency and precision, and to deal with large numbers of data, a new data structure was developed. The reliability model composed with numerous nodes could be dealt with the new data structure, and the minimal path sets method's application range is extended, which is also helpful for the reliability calculation of the complex system.

Author

*Data Structures; Reliability Analysis; Complex Systems*

**20080008894** Gifu Univ., Gifu, Japan

**Buffer Size Decision for Balanced and Unbalanced Flexible Transfer Line with Rework Paths**

AbuQudeiri, Jaber; Yamamoto, Hidehiko; Jamali, Mohamed Anouar; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 77-80; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The buffer size decision for the flexible transfer line (FTL) gains more and more importance because of growing FTL complexity and production costs. This paper presents a production simulator system (PSS) to find the near optimum buffer size for balanced and unbalanced flexible transfer line with rework paths (FTL-R) that achieves the best production efficiency of the FTL-R. The PSS consists of a genetic algorithm (GA) and a discrete simulator. In order to achieve the efficient use of the GA, we propose a new gene arrangement for the GA, referred to as the multiple distribution method (MDM). An application example was developed and after a number of operations based on PSS system, the sizes of all buffers for the FTL-R could

be found. It is also demonstrated that the production efficiency can be increased using the resulting buffer size. Keywords: flexible transfer line, rework path, buffer size, GA.

Author

*Genetic Algorithms; Simulators; Buffers*

**20080008895** Harbin Univ. of Science and Technology, Harbin, China

**Study on Force Density Function and Stress State of Cut-In Course of Complex Three-dimension Grooves Milling Insert**

Cheng, Yaonan; Li, Zhenjia; Wu, Qing; Qu, Guimin; Sun, Weijun; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 461-464; In English; See also [20080008878](#)

Contract(s)/Grant(s): NSF-50275042; Copyright; Avail.: Other Sources

Based on the rake face milling force density function we have the stress field analysis with the waved-edge milling insert (the rake face is wave curve plane) which is developed by the HarBin University of Science and Technology. For the cut-in disrepair problem, we establish the distributing and direction of the impact load while the instant cut-in. Based on the force density function, we made the stress state analysis of the complex three-dimension grooves milling insert by the elasticity mechanics method. The theoretic analysis result accords with the stress field analysis result well. All these studies provide the theoretic base for the cutter disrepair which is the key problem in the automatization production and groove optimization.

Author

*Grooves; Stress Analysis; Milling; Three Dimensional Models; Cutters; Loads (Forces); Optimization*

**20080008896** North China Univ. of Technology, Beijing, China

**Generation of Surface Micro-Topography in High Speed Dry Turning Hardened Steel**

Xueke, LUO; Yanmin, ZHANG; Honghai, XU; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 337-340; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

In this paper, the authors propose a new surface micro-topography modeling and develop a surface micro-topography simulation program. The purpose is to predict and control the surface roughness and to get required functional surface before high speed dry turning hardened steel with ceramic cutter. The investigation covers all factors affecting machined surface characteristics including tooling geometry, cutting parameters, machine tool vibrations, workpiece material property and cutting process variables and so on. By monitoring the process of high speed dry turning and detecting the surface micro-topography, which includes machined surface roughness, waviness, and form accuracy, the authors get some parameters of the dynamic cutting process. Based on experiments and theoretical analysis, it is clarified how the characteristics of high speed dry turning and dynamic cutting process, cutting parameters, tooling geometry, cutting vibrations affect the machined surface. In addition, the main factors are simulated in the surface micro-topography simulation process successfully. Machining case studies and their simulation results show the modeling will be used to predict machined surface micro-topography.

Author

*High Speed; Machine Tools; Cutters; Steels; Control Surfaces; Surface Roughness; Topography; Drying; Machining*

**20080008897** Tottori Univ., Japan

**An Improvement of Control Tactics for Pico-Positioning System**

Fujita, toshihito; Mizumoto, Hiroshi; Aii, Shiroh; Tazoe, Yoichi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 189-192; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

We have proposed an ultraprecision positioning system using an active aerostatic guideway that employs the Active Inherent Restrictor (abbreviated 'AIR') invented by the authors. The positioning resolution of the proposed positioning system was reported to be 10pm. Final goal of the positioning resolution of our system is 1pm, namely pico-positioning. However, the noise of the position sensor for the machine table and the air-film-vibration of the aerostatic guideway prevent the realization of pico-positioning. In the present paper, we propose an improved control tactics for pico-positioning, where the

signal from the feedback sensor is divided into two frequency ranges and the signal in each frequency range is processed individually for suppressing the influences of the sensor noise and the air-film-vibration on the positioning performance.

Author

*Positioning; Feedback Control; Tactics; Aerostatics*

**20080008898** Beijing Inst. of Tech., China

**Study on Stiffness Behavior of Stewart-Platform-Based Machine**

Fu, Tie; Yu, Qizun; Pang, Siqin; Ding, Hongsheng; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 185-188; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Stiffness is one of the main considerations in the design of Stewart-platform-based machine tools, namely, parallel kinematic machine tools (PKMT). This paper addresses some problems on stiffness of the machine tools. By using structural matrix analysis (SMA) and finite element (FEA) methods, the stiffness models of BKX-I parallel kinematic machine tools (BKX-I PKMT) are derived respectively, and are compared to validate each other. Finally, the stiffness distribution in the workspace of BKX-I PKMT is analyzed using Matlab software based on SMA sti&ess model, which will provide the basis for the design and performance improvement of this machine tool.

Author

*Kinematics; Machine Tools; Mathematical Models; Stiffness Matrix; Mechanical Engineering*

**20080008899** Tottori Univ., Japan

**Multiple Recycling of Water-Soluble Coolant Treated with an Enzyme-Activated Carbon Method**

Kondo, Yasuo; Yamaguchi, Kenji; Sakamoto, Satoshi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 153-156; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Water recovery from a chlorine-free emulsion type coolant was made using the enzyme (Lipase) - activated carbon method. The enzyme-activated carbon method can recover clear water with 0.1 of BRIX% from the spent coolant. The multiple recycling of water-soluble coolant showed no effect on the quality of recovered water. The water-soluble coolants diluted with a tap water and recovered water showed the same lubricating and cooling properties in a lapping of SUS304 with #320 abrasive paper. There was no difference in the lapping force, surface roughness and removal rate of work material between the lubricants diluted with a tap water and recovered water. The number of coolant recycling showed no effect on the lubricating and cooling properties of coolant. These facts indicated that the water recovered from the chlorine-free emulsion type coolant can be reutilized as a diluted solution for renewal coolant.

Author

*Water Reclamation; Coolants; Emulsions; Activated Carbon; Enzymes; Recycling; Lubrication*

**20080008900** Yonago National Coll. of Technology, Yonago, Japan

**A High-Speed Metabolic System for Water Recovery from Water-Soluble Coolant Using a Single Additive**

Yamaguchi, Kenji; Kondo, Yasuo; Sakamoto, Satoshi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 157-160; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Water-soluble coolant is widely used in the machining process. The waste treatment of spent water-soluble coolant has environmental problems. Moreover it takes large costs and time to convert the spent coolant into drainable water by chemical processing. To reduce the management cost and environment load of water-soluble coolant, authors have been studying on a metabolic system for water-soluble coolant. More than 90% of waste water-soluble coolant is composed of water phase. If the oily additives and contaminants can be isolated from the spent coolant with low energy and material consumption, the amount of waste coolant decreases remarkably because the recovered water phase is able to reutilize as a diluent of renewal coolant. In this report, we introduce a high-speed water recovery method from the spent water-soluble coolant. The proposed method can recover the water at a higher processing rate using a single kind of additive. The optimal conditions for recovering the water were experimentally examined.

Author

*Water Reclamation; Coolants; Additives; Waste Water; Waste Treatment; Cooling Systems; High Speed; Machining*

**20080008901** Makino Milling Machine Co. Ltd., Yamanashi, Japan

**Development of Coated Tools that Generate Wear-Resistant Protective Layers during High-Speed Dry Machining**

Nakashima, Shogo; Usuki, Hiroshi; Furuya, Satoshi; Yamane, Yasuo; Kano, Takashi; Kubota, Kazuyuki; Shima, Norihiko; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 89-92; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper presents the development and experimental investigation of coated tools that generate wear-resistant protective layers during use. Different materials, including grey cast iron and the carbon steel, having specific chemical compositions were machined using several coated tools. Under certain operating conditions, a wear-resistant protective layer was generated on the coated tools. During turning of cast iron and carbon steel, the protective layers were generated only on certain materials having a specific chemical composition. However, during face milling, the protective layer was generated not only on Ca deoxidized steel but also on generic steel.

Author

*Carbon Steels; Coatings; Iron Alloys; Machining; Steels; Wear Resistance*

**20080008902** Tottori Univ., Japan

**Study on Re-Sharpening Technology of Ball End Mills**

Tanaka, Hisataka; Kato, Akira; Sugiyama, Naotoshi; Kimura, Katuyo; Sato, Masahiko; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 93-96; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Ball end mills are widely used for milling of molds with sculptured surfaces. Cutting edges of ball end mills are so complicated that re-sharpening is difficult. Therefore, re-sharpened ball end mills are fewer than re-sharpened drills. However, re-sharpening of ball end mills is required to save mineral resources and tool cost. The aim of this study is to examine the practical use of re-sharpening of ball end mills. Firstly, cutting edge geometry has been measured. Secondly, the cutting edge has been modeled and re-sharpening data has been generated. Thirdly, a re-sharpening machine for ball end mills has been developed. Lastly, re-sharpening experiments and tool life experiments of re-sharpened ball end mills have been carried out. The results obtained are as follows. 1) There are cases in which the tool life of re-sharpened ball end mill is over eighty per cent of the tool life of new ball end mill. 2) The tool life of re-sharpened ball end mills is influenced by grain size of grinding wheel. 3) Compared with a new tool, the initial wear of the re-sharpening tool is equivalent. As a result of this, it became clear that the re-sharpening of ball end mill is practical.

Author

*Milling Machines; Wear; Grinding Machines; Drills; Edges; Cutting; Grain Size*

**20080008903** Kanazawa Inst. of Tech., Ishikawa, Japan

**A Study on the High-Speed Milling of Polybenzimidazole -The Effect of Edge Sharpening of the Fine Crystalline Diamond-Coated Tool on the Finished Surface**

Hideharu, KATO; Kazuhiro, SHINTANI; Hiroyuki, HNYUU; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 345-348; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper deals with an experimental investigation of the high-speed face milling of polybenzimidazole (PBI) using a fine crystalline diamond-coated tool which has a reshaped sharp edge. Especially, the effects of a sharpened cutting edge and an increasing cutting speed on a machined surface are investigated. It has been confirmed that the edge of a diamond-coated tool could be reshaped in a sharpened form by a heat chemical polishing. The diamond-coated tool which has a reshaped edge is superior to a normal diamond-coated tool in machined surface (2micronRz or less) with little damage by cracks. Moreover, this tool when it has a rake angle of 10 degree is effective in controlling cracks. Furthermore, as a result of investigating the effects of different speeds on damages to a machined surface, it is clear that the best machined surface with very little damage is obtained at a cutting speed of 40.0 m/s . At less than 40.0m/s, the damage was determined by mainly micro-crack and, on the other hand, tear damage to the machined surface was observed at speeds beyond 40.0 m/s. The viscoelasticity behavior of the PBI material that accompanies a change of cutting temperature has an influence on these kinds of damages, and it is optimum at a cutting speed 40 m/s. Also, a drop in the bending strength after cutting can be limited to 2%.

Author

*Polybenzimidazole; High Speed; Machining; Crystallinity; Flexural Strength; Cutting; Coatings*



**20080008904** Kyushu Univ., Fukuoka, Japan

**Performance Improvement of Ni-W Electroplated Diamond Micro Tools**

Onikura, Hiromichi; Ohnishi, Osamu; Mori, Yuki; Kuo, Weichen; Nishihara, Kunio; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 385-388; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Electroplated diamond tools have been widely used for the machining of not only ductile materials but also brittle ones. The electroplated micro tools are useful from the total viewpoint of machining accuracy, efficiency and manufacturing cost, especially in the 3D machining of micro parts. The present paper is intended to establish the reliable fabrication and application methods of high-quality Ni-W electroplated tools. In the tool fabrication the stirring of solution is successfully tried to get uniform grit distribution on the tool surface, and the current density is optimized with respect to tool appearance and tool life. In the application of the fabricated tools an optimal grinding speed and an optimal feed rate are obtained with tool life.

Author

*Diamonds; Electroplating; Micromachining; Machine Tools; Tungsten; Nickel*

**20080008905** South China Univ. of Technology, Guangzhou, China

**Effect of Deep Cryogenic Treatment on the Wear Resistance of M10 Carbide Inserts**

Liu, Ya-jun; Wan, Zhen-ping; Tang, Yong; Zeng, Zhi-xin; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 201-204; In English; See also [20080008878](#)

Contract(s)/Grant(s): NSF-31322; Copyright; Avail.: Other Sources

Cryogenic treatment is a heat treatment process to improve the performances of tool and die steels. The experiments presented in the paper showed that the deep cryogenic treatment could improve the wear resistance of M10 carbide inserts. A complete phase transition of Co was observed by using X-ray diffraction spectrum after deep cryogenic treatment. This transition increased the abrasion resistance of M10 carbide inserts.

Author

*Carbides; Cryogenics; Heat Treatment; Wear Resistance; Martensitic Stainless Steels*

**20080008906** Osaka Univ., Osaka, Japan

**High Spatial Resolution Machining Utilizing Atmospheric Pressure Plasma -Machining Characteristics of Silicon**

Yamamura, Kazuya; Kato, Kunihito; Sano, Yasuhisa; Shibahara, Masafumi; Endo, Katsuyoshi; Mori, Yuzo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 257-260; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

By applying atmospheric-pressure plasma, we developed a new ultraprecision machining method named plasma chemical vaporization machining (PCVM). In this method, several types of rotary or pipe electrodes are prepared for optimizing the required machining characteristics. In particular, by rotating the electrode in a high-pressure environment, both supply of reactive species to the machining point and exhaust of reaction products are effectively performed. To realize a high-efficiency ultraprecision machining process, the optimum removal that corresponds to various spatial wavelengths should be prepared. The spatial resolution of the rotary electrode is 10-20mm, and the spatial resolution of the pipe electrode is 1-2mm. Therefore, the development of a new machining method that has a spatial resolution of submillimeter order is required. In this paper, we propose a new machining method in which reactive species generated in the atmospheric-pressure plasma are blown off to the workpiece surface through a small orifice that has a diameter of 10 micrometers, and report the machining characteristics of Si.

Author

*Atmospheric Pressure; High Resolution; Machining; Silicon; Spatial Resolution; Chemical Machining*

**20080008907** Hitachi Metals Ltd., Shimane, Japan

**Development of Novel Multi-Layer PVD Coating for Hot Forging Dies and Punches**

Honda, Fumiaki; Inoue, Ken; Inoue, Ken-ichi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 221-224; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The multi-layer coating (which is called 'TR-M' in this paper) was developed for hot forging dies and punches. TR-M has the excellent wear resistance, tribology at high temperature and trapping effect of lubricant on the surface sprayed in every

forging process. Since both some arc ion plating sources and some sputtering sources are needed to prepare TR-M, special hybrid PVD coating system was used to form it. It was found that the amount of lubricant keeping on the surface was enough even at the temperature range of poor adhesion, and the wear resistance at high temperature was so good that the softening and subsequent collapse caused by heating of friction did not occur. TR-M was applied to some punches and their lives were prolonged several times longer than those of conventional surface treatments.

Author

*Coating; Dies; High Temperature; Punches; Vapor Deposition; Sputtering*

**20080008908** Tokyo Univ., Japan

**Development of On-The-Machine Cutting Tool Re-Generating Technology Applying Composite Electroplating -Employment of Cobalt Matrix and Vacuum Annealing to Produce Edge Layer with Strong Adhesiveness**

Yanagihara, Kiyoshi; Tani, Yasuhiro; Tsuchiya, Kensuke; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 225-228; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

New cutting-edge forming process for on-the-machine cutting tool regeneration has been developed. In our previous report, nickel composite electroplating was utilized to re-generate a cutting-tool edge. The wear resistance of Nickel-Phosphorous- Silicon-Carbide (Ni-P-SiC) plating, however, was not sufficient to cut steel over the cutting speed of 10m/min. Then the newly developed process employs cobalt (Co) matrix plating in consideration of better affinity between a plated layer and a cemented carbides tool. The wear resistance of Co electroplating layer, however, was not still sufficient to cut steel over the cutting speed of 10m/min. Thus vacuum annealing on the plated cobalt layer was adopted for the edge-forming process. The annealing process generated diffusion between the plated layer and the base materials of the tool, and produced an intermediate phase. Finally the combination of Co plating and annealing process prevent the flaking of the formed edge-layer, and cutting ISO 1045 steel was achieved at the cutting speed of over 50dmin. Key words cutting, cutting tool, coating, on-the-machine tool re-generation

Author

*Electroplating; Cutting; Machine Tools; Cobalt; Vacuum; Annealing; Adhesion*

**20080008909** Beijing Inst. of Tech., China

**Research for Visualization of Distribution of Cutting Tool Life**

Zhang, J. Y.; Pang, S. Q.; Yu, Q. X.; Jiao, Y. H.; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 217-220; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The process of data visualization is an important aspect in cutting database. Users can directly compare wear levels of different brands of cutting tools machining different parts, in order to choose the better cutting tools conveniently. Visualized graphic processing and calculation with MATLAB software has the advantage of good graph quality and high speed. It can increase the efficiency of the data processing. It makes it possible and convenient to fit the data in the cutting database by means of visualized graphics.

Author

*Data Processing; Scientific Visualization; Machining; Cutting; Data Bases*

**20080008910** Okayama Univ., Japan

**Newly Developed CuW Electrode for High Performance EDM**

Oue, Shingo; Okada, Akira; Uno, Yoshiyuki; Shoji, Takayuki; Fukushima, Takahiro; Terada, Osamu; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 273-276; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper introduces a newly developed CuW electrode for high performance electrical discharge machining (EDM). Conventional CuW electrode used widely for high precision EDM is generally made by melting method, and the mixture ratio of Cu and W is restricted within narrow limits. On the other hand, it can be changed extensively in the case of a new CuW electrode made by powder sintering method. In order to obtain the higher metal removal rate with smaller electrode wear rate, the optimum mixture ratio of Cu and W was investigated. Experimental results show that the EDM characteristics such as metal removal rate, electrode wear rate and the surface finish for metal mold steel greatly depend on the mixture ratio of CuW electrode. The electrode wear rate could be reduced by using the new CuW electrode with proper mixture ratios, compared with the conventional one, since workpiece material adhered to the electrode end surface during machining and prevented the

electrode from wearing with high temperature. Also, better machining stability and better surface finish could be attained under proper mixture ratios of Cu and W. Therefore, the new CuW electrode made by powder sintering method has high possibility for higher performance EDM. Key words: electrical discharge machining(EDM), CuW electrode, electrode wear, surface roughness, powder sintering

Author

*Electrodes; Sintering; Powder (Particles); Surface Finishing; Surface Roughness; Wear*

**20080008912** London South Bank Univ., London, UK

**Difficulty in Machining Calculated from Mechanical and Thermal Properties of Difficult-to-Cut Material**

Yamane, Yasuo; Sekiya, Katsuhiko; Narutaki, Norihiko; Ezugwu, Emmanuel O.; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 497-501; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The paper deals with a difficulty in machining that can be calculated from the mechanical and thermal properties of difficult-to-cut material. The calculated difficulty has good relation to the inverse of machinability rating (MR). To calculate that, a radar chart composed from four properties, hardness, tensile strength, elongation and thermal character, of a work material is used. The radar chart gives a feature of the work material, therefore, the rough strategy about machining can be estimated from the chart.

Author

*Cutting; Mechanical Properties; Tensile Strength; Machining; Elongation; Hardness*

**20080008913** Hitachi Metals Ltd., Shimane, Japan

**Properties of New Cold Die Steel Attaining Both Easy Die Fabrication and Die Life**

Abe, Yukio; Kubota, Kunichika; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 33-36; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Recently, high-tensile strength steels have been widely applied in automobile industry. The high-tensile steel is hard to form, therefore die needs high performance and wear resistance is also important for die steel. In addition, good machinability is also important for die fabrication because of lower cost needs. In general, it is difficult to raise both wear resistance and machinability. New cold die steel has been developed by profitable alloy design and control of microstructure. This material has good machinability keeping superior wear resistance. In this paper, we introduce these properties, machinability, wear resistance and applications of this new steel.

Author

*High Strength Steels; Wear Resistance; Tensile Strength; Fabrication; Cold Working; Carbides*

**20080008914** Hebei Univ. of Technology, Tianjin, People's Republic of China

**The Kinematics Analysis of A Novel 5-DoF Serial-Parallel Machine Tool**

Gao, Tie-hong; Qi, Jiang-bo; Cao, Jun-yi; Li, Shi-jie; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 61-64; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The available workspace of parallel kinematic machine tool (PKM) is always very small, which is a common problem existing in PKM. Meanwhile, the PKM with multi-DOF is always with high degree couple and complex NC system, and it's hard to build up the move modeling. Because of the problems existing in the PKM mentioned above, this paper proposed a novel series-parallel machine tool with 5-DOF. The parallel mechanism of this series-parallel machine tool was with 3-HSS structure, and the three ballscrews of the parallel mechanism were set horizontally. The series mechanism was a traditional turning mechanism with 2-DOF installed on the mobile platform of the parallel machine tool. This series-parallel machine tool made full use of the advantages of the parallel mechanisms with less than 6-DOF and series mechanisms, and its available workspace was big. The kinematic analysis of this machine tool was done using coordinate conversion method of parallel mechanism and D-H method. Based on this, the direct kinematics and inverse kinematics were obtained. The prototype of the series-parallel machine tool have been manufactured, and the correctness of the direct kinematics and inverse kinematics have also been verified by the NC system of the prototype.

Author

*Kinematics; Machine Tools; Degrees of Freedom*

**20080008915** Okayama Univ., Japan

**Grinding Process for the Finest Surface Finish with Super-Soft Grade Resinoid Bond Wheel**

Ohashi, Kazuhito; Tsukamoto, Shinya; Nakajima, Toshikatsu; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 417-420; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The polyvinyl alcohol (PVA) bond wheel is a typical elastic wheel using in precision finishing of a cylinder, a roll, a magnetic head and so on, but it can't allow using grinding fluid because of its too poor water resistance. So the super-soft grade resinoid wheel, of which the bonding material is prepared by the interaction of PVA and thermosetting plastics, is developed. The surface roughness decreases down to the minimum just after the start of plunge grinding. In this paper, the grinding method with the resinoid bond wheel is proposed to achieve the finest surface finish of workpiece, based on such minimizing phenomenon of surface roughness. Main conclusions obtained in this paper are as follows: (1) The finest surface finish can be obtained by spark-out grinding operation just at the right moment when the surface roughness of workpiece decreases down to the minimum. (2) The surface finish by this grinding operation decreases with decreasing the initial surface roughness, but the shrinkage in surface roughness during the spark-out grinding process increases with increasing initial surface roughness. (3) The repetition of this grinding operation without dressing makes the surface finish smaller than that by a general grinding operation with larger depth of cut before spark-out grinding.

Author

*Surface Finishing; Bonding; Cutting; Surface Roughness; Polyvinyl Alcohol; Grinding*

**20080008916** North Univ. of China, Yuan, China

**Study on Human Interface in Precision Machining Analyzing the Operational Information**

Hou, Junfu; Wang, Fan.; Chi, Huanzhong; Li, Mengqun; Yang, Bo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 361-364; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

With the development of science, many ergonomics opinions have been introduced into the machining industry especially in precision machining. These ideas inject fresh blood into enterprises and offer precious development opportunity. The operational information is the fundamental part of advanced research, so its effects on operators and the production quality must be well commanded. Aiming at studying the human interface, the operational and fatigue information in precision machining have been measured in this paper. In order to ensure the precision, we realized the on-line measurement as well as possible. This operational information is comprised of cutting force, torque, speed of hand wheel rotation, length of locus, task time and task error. The fatigue information is comprised of subjective fatigue and critical flicker fusion frequency (CFF). In the end, the testing result and multiple regression analysis showed that both the degree of fatigue and the skill level had strong connection with operational information. Key words Human interface, Precision machining, Operational information, Fatigue, Multiple regression analysis

Author

*Human Factors Engineering; Information Analysis; Precision; Machining; Regression Analysis; Errors; Time Measurement*

**20080008917** Okayama Prefectural Univ., Okayama, Japan

**Study on Machining of Large Acrylic Lens for Optical Elements**

Katsuta, Tomonori; Yokomizo, Seiichi; Sasaki, Makoto; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 507-510; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Injection molding has generally been used in the production of plastic lenses. However, it is difficult to make the die and optimize the molding conditions for large-sized lenses. In this study, the cutting of a large-sized acrylic lens using an ultra-precision lathe was attempted. The finishing condition for the acrylic was examined with various kinds of cutting tools in the ultraprecision lathe. As a result, it was clear that the tool material affects optical characteristics such as the transmissivity and refractive index. But, by using a monocrystalline diamond tool with superior thermal characteristics, a large acrylic lens 430 mm in diameter could be cut, and the optical characteristics of acrylic material could be retained.

Author

*Acrylic Resins; Cutters; Lenses; Machining*

**20080008918** Tsinghua Univ., Beijing, China

**Research on the Fabrication Time and Surface Quality of the Two Photon Three Dimension Microfabrication**

Wei, Peng; Zhu, Yu; Duan, Guanghong; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 511-; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

In order to reduce the fabrication time and improve the surface quality of the object in the two-photon three dimension microfabrication, the comprehensive evaluation index was introduced, in which the relation between the exposure time and the rate of overlap with the fabrication time and the surface quality was described in detail. Based on the evaluation index the objective function was given. And the improved genetic algorithm was used for obtaining the optimal solution of the objective function. Simulation results indicate that the method is useful to some extent.

Author

*Fabrication; Photons; Polymerization*

**20080008919** Tokyo Univ. of Agriculture and Technology, Japan

**Control of Cutter Marks Array on a Surface by Patch Division Milling**

Matsuda, Hiroshi; Sasahara, Hiroyuki; Tsutsumi, Masaomi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 519-522; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper proposes a patch division milling that can control cutter marks array on a machined surface. The surface is divided into a lot of same size small patch segments such as triangles, quadrilaterals, or hexagons. The whole inside area of each patch is machined with high feed rate along a helical tool path. The surface texture is generated by the cutting edges of the ball-end mill within a patch area, and after the machining of series of patches, the machined surface is covered with many patches. It is shown that the aligned state of cutter marks array on the patch can be controlled by the cross feed, the feed speed per tooth, the number of teeth and the side length of patch. The geometric pattern of patches array and cutter marks array by the proposed patch division milling agrees well with simulation results.

Author

*Cutters; Machining*

**20080008920** Niigata Univ., Niigata, Japan

**Direct Milling of Straight Bevel Gear for Precision Forging Die**

Kawasaki, Kazumasa; Shinma, Kazuyoshi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 325-328; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

In the manufacture of straight bevel gears, a precision forging method has been mainly used in recent years and the precision forging die has been usually manufactured using an electro discharge machining. However, it is difficult to content high productivity and low manufacturing cost using an electro discharge machining because the gears are produced through a process of several steps. In this paper, a direct milling of the straight bevel gear for the precision forging die is developed in order to improve the productivity and manufacturing cost for the gear production. The tooth profile of the straight bevel gear generated by a quasi-complementary crown gear instead of a usual complementary crown gear is introduced. For this study, first the numerical coordinates on the tooth profile of the straight bevel gear were calculated and the tooth profiles were modeled using a 3D-CAD system. Afterward, the direct milling of the straight bevel gear for the precision forging die in the hardened state was carried out using a CNC milling machine based on a CAM process through the calculated numerical coordinates.

Author

*Bevel Gears; Milling Machines; Dies; Forging; Precision; Computer Aided Design; Machining*

**20080008921** Kagawa Univ., Takamatsu, Japan

**Tribology and Cutting Performance of Esters for MQL Machining**

Tsukuda, Akira; Atsuta Toshifumi; Suda, Satoshi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 161-164; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Synthetic esters have recently been used as a high performance lubricant in minimal quantity lubrication (MQL) machining. However, there is little understanding about the relationship between the cutting performance and the tribological



action of these esters. This study therefore investigates the tribological characteristics of some synthetic polyol esters for MQL machining by using a basic friction test. In the results of this friction test, an ester having more ester bonds in one molecule showed the better lubricity and such trend was prominent at higher sliding speed in the range of the test conditions. The study also evaluated the practical cutting performance of these polyol esters by using a turning test. This evaluation presented, particularly at the cutting speed of 50m/min, an ester showing the better lubricity provided the higher cutting performance.

Author

*Bonding; Cutting; Esters; Lubrication; Tribology; Machining*

**20080008922** Beijing Univ. of Aeronautics and Astronautics, Beijing, China

**The Algorithm of Former S-Shape Acceleration/Deceleration in CNC System**

Cao, Yunan; Chen, Youdong; Wei, Hongxing; Wang, Tianmiao; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 165-168; In English; See also [20080008878](#)

Contract(s)/Grant(s): NNSF-60404019; Copyright; Avail.: Other Sources

The acceleration/deceleration(acc/dec) algorithm is the most important part of the CNC system, and is the core technology in the CNC research field. In this paper, firstly, the advantages of the S-shape acc/dec algorithm are analyzed. Based on these facts, a new algorithm of the S-shape acc/dec is given. This algorithm can avoid generating the 'tail' phenomenon in deceleration zone. Then the algorithm is confirmed by the simulations and experiments. The result indicates that this algorithm can shorten the deceleration time and improve the efficiency of the S-shape acc/dec significantly. Keywords S-shape acceleration/deceleration, acceleration derivative, distance of the deceleration zone, remain distance

Author

*Algorithms; Deceleration; Acceleration; Derivation; Shapes*

**20080008923** Tottori Univ., Japan

**Improvement in Chatter-Vibration-Resistant of BT-Type Tool Holder with Improving of Contact State between Taper Surfaces**

Uehara, Kazutake; Obata, Fumio; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 169-172; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

To meet the demands of high-efficiency and high-precision machining, machining centers with high-speed spindles are used for machining die. The more the spindle speed increases, the more the chatter-vibration-resistance of the spindle-system composed of a spindle and a tool holder decreases. It is mainly attributed to the centrifugal force acting on the spindle system. At higher spindle speeds, the spindle speed makes the contact state between the tool holder taper shank surface and the spindle taper surface worse, resulting in a decrease in grasping force of the tool holder, which is also not preferable in view of workers' safety. This study aimed to improve the chatter-vibration-resistance of BT-type tool holders with improving the contact state between the taper surfaces at higher spindle speeds. A method to improve the bending rigidity of the tool holder was proposed by numerical examinations of the contact state.

Author

*Machine Tools; High Speed; Machining; Tapering; Vibration*

**20080008924** Beijing Univ. of Aeronautics and Astronautics, Beijing, China

**Study on Calibration of 3PSS Parallel Kinematic Machines**

Zhang, Xiaowu; Chen, Wuyi; Han, Xianguo; Pei, Baoqing; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 193-196; In English; See also [20080008878](#)

Contract(s)/Grant(s): SYS100060411; Copyright; Avail.: Other Sources

The calibration of a 3PSS parallel kinematic machine (PKM) using a laser tracker was presented. Keep one of the carriages fixed and move the other two, the position of the moving platform was changed. At each position, the laser tracker recorded the coordinates of the target reflector which were fixed on the struts and the moving platform. Fit a sphere through these coordinates, and the center of sphere was the coordinates of the joints center. The coordinates of the joints center both on the carriages and on the moving platform could be achieved by one group of measurement, so the error caused by transformation of measurement coordinate system could be reduced.

Author

*Calibrating; Kinematics; Coordinates; Reflectors; Lasers*

**20080008925** Naruto Univ. of Education, Japan

**Slicing Performance of Work Rotating Type Multi-Wire Saw - Fundamental Experiments of High Viscosity Slurry**  
Sakamoto, Satoshi; Kondo, Yasuo; Yamaguchi, Kenji; Murakami, Noboru; Akita, Norio; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 397-400; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Slicing with work rotating type multi-wire saw will be considered as one of the effective methods for slicing hard and brittle materials such as silicon ingots. In order to minimize the machining cost of hard and brittle materials in multi-wire saw slicing, a work rotating type multi-wire sawing with high viscosity slurry had been developed. The high viscosity slurry is inferior to the conventional slurry in removing ability of chips from the slicing regions due to its poor permeability. However, the high viscosity slurry showed good slicing characteristics in the work rotating type multi-wire saw slicing, because the work rotating type multi-wire saw has an excellent performance in the supplying of slurry and the discharging of chips at slicing regions. This indicated that the machining cost would be minimized by using the high viscosity slurry. The slicing performance with mixed slurry was also discussed by changing the mixing ratio of abrasive grains with various kinds of particle sizes in the slurry. High accuracy and highly effective slicing can be achieved by using the mixed slurry with an appropriate mixing ratio of abrasive grains.

Author

*Slicing; Slurries; Viscosity; Wire; Brittle Materials; Rotation*

**20080008926** Toyohashi Univ. of Technology, Aichi, Japan

**Development of a Chip-Breaking Tool for Tapping -Strength of Tapped Thread**

Yamauchi, Masako; Horiuchi, Osamu; Shibata, Takayuki; Murakami, Yoshihiko; Sugano, Hiroto; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 237-240; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

In tapping, chips jammed in the tap's flute or twined around the tap cause tool breakage very frequently. It has been an obstacle to automation of tapping. In previous study, to resolve this problem, a chip-breaking tool was developed and its effectiveness was ascertained by experiments. The chip-breaking tool forms V-grooves axially on the inner wall of hole before tapping. In tapping, the axial V-grooves make the cutting discontinuous and short chips are produced. It can obtain a good performance in tapping. However, the axial V-grooves remain in the internal thread and the thread ridge becomes discontinuous. Therefore it may reduce the strength of tapped thread. In this study, strength of threads tapped by above-mentioned method was investigated by tensile test and compared with strength of threads tapped by conventional method where the chip-breaking tool was not used. The main results obtained are as follows. (1) The fracture mode differed depending on the strength grade of bolts and the length of thread engagement. (2) However there found little difference between the tensile strengths of both type of tapped thread. Therefore it has been ascertained that the chip-breaking tool does not reduce the strength of tapped thread.

Author

*Chips; Taps; Fracture Mechanics; Mechanical Properties; Threads*

**20080008927** Tokushima Univ., Japan

**Investigation of Tool Geometry and Machining Conditions for Fracture Size Minimization in Miniature Drilling of Alumina Ceramic with Electroplated Diamond Tool**

Oyama, Akira; Masuda, Masahiro; Sasaki, Kenichi; Ogawa, Hitoshi; Handa, Shinichi; Takechi, Kiyotaka; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 121-124; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper deals with through hole drilling of alumina ceramic using an electroplated diamond tool in order to find out tool geometries, drilling conditions and grain size under where smaller fracture size at the hole exit and longer tool life are given. It is clarified from the observation of thrust force that the tool with rectangle section and bowl end is effective on the chip removal and the control of fracture size. In addition, the induction of step feed contributes to smaller thrust force and longer tool life. The machining system proposed can control a fracture size of 100 microns or less using a mesh size of #200 and can maintain the drilling number of 100 times or over in drilling of a depth of 3.4mm. The mesh size #300 or over brings out a fracture size of around 50pm and the smaller dispersion. electroplated diamond tool, alumina ceramic, through hole drilling, fracture size, tool geometry, grain size

Author

*Drilling; Holes (Mechanics); Electroplating; Aluminum Oxides; Ceramics; Machining*

**20080008928** Hyogo Univ., Hyogo, Japan

**Effect of Surface Texture of PTFE on Adhesion Property of Metal Thin Film**

Okuda, Koichi; Tsuneyoshi, Tatsunori; Yamashita, Shuhei; Hattori, Tadashi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 503-506; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

In this paper, the effect of the surface texture of PTFE on the adhesion property of metal thin film by sputtering Cr is described. The surface is finished by some machining methods such as an ultra-precision cutting, a conventional cutting and an abrasive machining. The relationship between the surface texture parameters such as the surface roughness, the anisotropy and the surface properties such as the hydrophilic property, the friction coefficient, the adhesion strength of sputtered Cr film is investigated. The following remarks were found. When the surface roughness became larger, the hydrophilicity was slightly reduced and the adhesion strength of Cr film was improved. The adhesion strength with the cut surface exceeded that with the ground surface. Key words PTFE, ultra-precision cutting, surface texture, Cr thin film, hydrophilicity, adhesion strength

Author

*Metal Films; Thin Films; Adhesion; Polytetrafluoroethylene; Surface Properties; Surface Roughness; Textures*

**20080008929** Hitachi Metals Ltd., Yasugi, Japan

**A Study on Machinability of High Hardness Die Steels at Rapid Cutting Speed**

Kataoka, Kota; Nakatsu, Hideshi; Tamura, Yasushi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 433-436; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The influence of the microstructure and the alloying elements on the machinability of high hardness die steels was investigated. It was revealed that adjusting silicon and carbon content was effective in rapid speed cutting.

Author

*Steels; Cutting; Machining; Hardness; Dies; Carbon; Silicon; Adhesives; Lubricants*

**20080008930** Zhuzhou Cemented Carbide Cutting Tools Co. Ltd., Zhuzhou, China

**Application Investigation on Drill Cross Section Profile (DCSP) of Solid**

Yun, He; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 229-232; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Drill cross section profile(DCSP) is a feature parameter of twist drill flute. Drill rake face is consisted of helix flute. There are many types of drill relief surface, such as plane and cone and ellipsoid and hyperboloid, etc. Much investigation on relief surface types and grinding way were presented. But, the research on changing rake face type, such as DCSP is very few to be done. In this paper, the application investigation on DCSP of solid carbide is presented. The serial drills SU, ST, SH with different DCSP are designed and manufactured. The comparison cutting tests are performed with them and other drills. The result shows that different flute form can be get by changing DCSP in order to suit different cutting condition.

Author

*Carbides; Drills; Solids; Drilling; Machining*

**20080008931** Hitachi Metals Ltd., Shimane, Japan

**Development of Advanced Multi-Layer PVD Coating for Aluminum Die-Casting Metal Molds**

Inoue, Ken; Honda, Fumiaki; Inoue, Ken-ichi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 241-244; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The multi-layer PVD coating (which is called 'TR-S' in this paper) for aluminum die-casting metal molds was designed on the basis of the investigation of broken molds. TR-S was formed by arc ion plating method with some kinds of target materials. It was found that the deformability of TR-S is so good that even when the substrate was deformed, cracks did not occur in it. The oxidation temperature of TR-S is around 673K and the brittle oxide film prevents molten aluminum from adhering to it during frictional tests at 773K in air. In addition, TR-S's chemical-resistance against molten aluminum is the same as CrN and TiN. TR-S was applied to the core-pin molds and increase their lives by 1.5 to 6.0 times longer than that of the conventional coatings.

Author

*Aluminum; Coating; Dies; Molds; Vapor Deposition; Machine Tools*

**20080008932** Beijing Univ. of Aeronautics and Astronautics, Beijing, China

**Design of a Polishing Machine for Dome-Shaped CVD DIAMOND**

Yongtao, Ma; Wuyi, Chen; Rui, Fan; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 97-100; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

A special machine is designed for polishing dome-shaped CVD diamond films based on the method of hot iron plate. The polishing condition is so rigid that special structure must be taken into account to get the high temperature and vacuum. Experiments show that the whole machine can meet the basic need for polishing besides temperature. After innovation, it will be put into use for the diamond polishing.

Author

*Domes (Structural Forms); Vapor Deposition; Polishing; Mechanical Engineering; Machining; Diamond Films*

**20080008933** Sydney Univ., Australia

**Material Removal Mechanism in Dynamic Friction Polishing of PCD**

Chen, Y.; Zhang, L. C.; Arsecularatne, J. A.; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 117-120; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper investigates the material removal mechanism of the dynamic friction polishing of polycrystalline diamond (PCD), which utilizes the thermo-chemical reaction between a diamond surface and a metal disk rotating at a high peripheral speed. Experiments were carried out to identify the mechanism by analysing the specimen surfaces and debris produced by polishing. Scanning electron microscopy, energy dispersive x-ray, X-ray diffraction and Raman spectroscopy were used for the analysis. It was found that the material removal in polishing occurred in a rather complex way, which can be a chemo-mechanical process, diffusion, oxidization and evaporation, or their combinations.

Author

*Diamonds; Friction; Polycrystals; Composite Materials; Mechanical Engineering; Polishing; Machining*

**20080008934** BeiHang Univ., Beijing, China

**Research and Development of Programmable Logic Controller for Machine**

Wang, Tianmiao; Chen, Youdong; Wei, Hongxing; Yao, Yuan; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 173-176; In English; See also [20080008878](#)

Contract(s)/Grant(s): nnsf-60404019; Copyright; Avail.: Other Sources

This paper presents an approach to develop a programmable logic controller for machine tool. A general structure of the PLC is implemented, which is composed of integrated development environment and executive. The integrated development environment communicate with executive via immediate code. The ladder diagrams are executed by converting into instruction lists, then the instruction lists is translated into immediate code. The PLC is developed on the Intel Xscale 270 and the integrated development environment is implemented on the MiniGUI. Keywords Programmable logic controller, Ladder diagram, Instruction list, Integrated development environment

Author

*Programmable Logic Devices; Machine Tools; Controllers*

**20080008935** Okayama Univ. of Science, Japan

**Atmosphere Effects on Ductile-Brittle Transition for Ductile Regime Machining of Glass**

Ianeda, Toshiaki; Nishioka, Takanori; Anthony, Laurence; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 381-384; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

In this paper we investigate atmosphere effects on the ductile-brittle transition of BK7 plates in glass scratch tests. The experimental results demonstrate that the ductile area can be enlarged by applying agents such as distilled water, oleic acid, and n-Stearyltrimethylammonium (amine) to the surface of the BK7 plate, and the best performance is obtained using amine.

Author

*Atmospheric Effects; Ductile-Brittle Transition; Ductility; Glass*

**20080008936** Osaka Univ., Osaka, Japan

**Machining Characteristics of Ultraprecision Atmospheric Pressure Plasma Process**

Yamamura, Kazuya; Ueno, Koji; Fujiwara, Akihiro; Sano, Yasuhisa; Osikane, Yasusi; Shibahara, Masafumi; Endo, Katsuyoshi; Mori, Yuzo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 265-268; In English; See also [20080008878](#)

Contract(s)/Grant(s): MOE-08CE2004; Copyright; Avail.: Other Sources

Plasma chemical vaporization machining (CVM) is the high-efficient chemical machining method using high density neutral radical which is generated by atmospheric pressure radio frequency (RF) plasma. There is no deformed layer on the machined surface, because the machining mechanism is pure chemical. Various applied research which utilized the advantage of this machining method are carried out, and especially, it is expected as a high-efficient machining method for fabricating ultraprecision optical components such as the X-ray focusing mirror. As a result of fabricating the elliptical mirror made of the silicon for focusing the hard X-ray, a figure accuracy higher than 3nm (p-v) was achieved. Then the defect density of the surface machined by plasma CVM was under 1/100 in comparison with the surface machined by conventional mechanical polishing and argon ion sputtering, and very low defect density which was equivalent to the chemical etched surface was obtained. To achieve the practical use of this machining method, it is necessary to modify the developed machine. Because simple handling lead to mass productivity. So the plasma CVM machine without vacuum chamber was developed and as a result the preparation time before the main process could be reduced. In this paper, the machining characteristics of silicon wafer by using developed machine was reported, and also obtained the analyzing result of the plasma by optical emission spectroscopy.

Author

*Atmospheric Pressure; Machining; Precision; Fabrication; Plasmas (Physics)*

**20080008937** Kumamoto Prefectural Coll. of Technology, Kumamoto, Japan

**Study on Cutting of Hardened Steel by PCD End Mill Tool**

Nakano, Takayuki; Touge, Mutsumi; Watanabe, Junji; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 457-460; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The hardened die steel was machined by the PCD end mill tool under various cutting conditions. The present study using the PCD tool is focused the main purpose on the reduction of the hand-finishing processing time and the thickness of the affected layer by making use of diamond characteristics. Three kinds of the mist cooling methods were applied to reduce the tool wear and the cutting temperature. The well cooling effect of the mist cooling is expected to produce the wide application of the PCD tool even to the fine finishing of the hardened ferrous materials. The width of flank wear and the surface roughness of work material with an increase in the cutting length were measured. The flank face of tool was also observed by an EDX/SEM and the laser scanning microscope. From the experiment results, although there were few effects of the mist cooling on the reduction of the cutting temperature, the tool wear was clearly reduced by an oil-water mist cooling method among three kinds of the mist cooling methods. A new mechanism was discussed through the detailed observation of the flank face using an EDX.

Author

*Milling Machines; Machine Tools; Steels; Metal Cutting; Hardening (Materials)*

**20080008938** Tottori Univ., Japan

**A Vibrating Touch-Probe for Micro CMM**

Fukada, Kazuyuki; Mizumoto, Hiroshi; Arai, Shiroh; Yabuya, Makoto; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 547-550; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

A new type of vibrating touch-probe for measuring small part such as the die of a pick-up lens is proposed. The probe is excited by a piezoelectric actuator and the probe vibration is monitored by a capacitance sensor. When the probe does not touch an object, FFT analysis of the sinusoidal vibration of the probe shows a single line spectrum. As the probe touches the object, harmonic components appear in the spectrum. When the power of the second harmonic exceeds a threshold level, it is judged that the probe touches the object. By using this touching criterion, the measuring pressure can be less than a conventional touch probe. Experimental analysis shows the measuring performance of the probe including the sensitivity for an inclined plane. The result of the analysis indicates that the proposed touch probe is suitable for on-machine measurement of small parts.

Author

*Touch; Vibration; Numerical Analysis; Microcomputers; Detection*



**20080008939** Beijing Univ. of Aeronautics and Astronautics, Beijing, China

**Temperature Measurement in Grinding Titanium Alloys**

Zhang, Hongxia; Chen, Wuyi; Chen, Zhitong; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 421-424; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Titanium alloys are more and more widely used in aeronautics and astronautics industry. Owing to their low thermal conductivity, excessive grinding temperature not only leads to thermal damage that greatly deteriorates the surface quality, but also accelerates tool wear. Research on grinding temperature during grinding these 'difficult-to-grind' materials has been one emphasis. In the present work, grinding temperature was measured using a pair of thermocouple composed of the workpiece material and a single enameled constantan wire which was implanted in the workpiece. A kind of feasible technique of calibration for quasi-artificial thermocouple was detailed. A new kind of SG wheel was used in the grinding of titanium alloy and some conclusions related to grinding temperature were drawn.

Author

*Temperature Measurement; Titanium Alloys; Grinding; Thermal Conductivity; Low Conductivity; Thermocouples*

**20080008940** Henan Polytechnic Univ., Henan, China

**Study on Ultrasonic Grinding Temperature Field Characteristics of Structure Ceramics**

Liu, Chuanshao; Zhang, Dongmei; Jiao, Feng; Gao, Guofu; Zhao, Bo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 413-416; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Contrast experiments on grinding temperature field of ZrO<sub>2</sub> in conventional and ultrasonic grinding were carried out in the paper with manual thermocouple. The relationship between grinding parameters and grinding temperature was clarified through theoretical analysis. Research results show that the farther the distance between grinding surface and heat source kept, the smaller the peak value of temperature was. With the increases of grinding depth, grinding speed and work table speed, workpiece surface temperature would increase accordingly. It was proved that grinding depth was the most vital factor influencing grinding temperature field by orthogonal experiments. Furthermore, comparing with high surface layer temperature in conventional grinding, ultrasonic grinding can reduce grinding temperature effectively.

Author

*Grinding; Ultrasonics; Temperature Distribution; Surface Temperature; Heat Sources; Ceramics; Zirconium Oxides*

**20080008941** Northwestern Polytechnical Univ., Xian, China

**A New Method for 3D Cutting Force Modeling in Ball End Milling Process**

Wan, Min; Zhang, Wei-hong; Tan, Gang; Qin, Guo-hua; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 449-452; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

For ball end milling, a simple and new approach is suggested for determining the cutting force coefficients and the runout parameters from the measured cutting force data. A criterion for synchronizing the predicted and the measured cutting force signals is also proposed. The validity of the present approach is demonstrated with simulation and experiment data.

Author

*Cutters; Cutting; Grinding (Comminution); Milling (Machining); Coefficients*

**20080008942** Qingdao Univ. of Science and Technology, Qingdao, China

**A Novel 3PRS/UPS Redundant Parallel Machine Tool and Its Pose Errors**

Liang, Hui; Bai, Zhifu; Chen, Wuyi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 181-184; In English; See also [20080008878](#)  
Contract(s)/Grant(s): NNSF-50375010; Copyright; Avail.: Other Sources

Limited workspace and low accuracy are two main reasons that restrict the development of parallel machines. Based on the comprehensive analysis of the techniques for expanding the workspace, this paper proposed a novel parallel machine structure called 3PRS/UPS, which had larger workspace and better performance. The pose error model was established on the basis of closed-loop vector method and over-constraint accuracy analysis. The model provided references for the accuracy analysis of parallel machines. Computing simulation example was presented. The results showed that redundant parallel machines had high position accuracy.

Author

*Error Analysis; Machine Tools; Position Errors; Feedback Control*

**20080008943** Shandong Univ., Jinan, China

**Investigation of Intelligent Turning Tool Mechanism Model with Adjustable Tool Geometry**

Wu, Wenge; Liu, Zhanqiang; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 49-52; In English; See also [20080008878](#)

Contract(s)/Grant(s): NNSF-2005037766; Copyright; Avail.: Other Sources

Metal cutting is one of the most important methods of removing unwanted material in the production of mechanical components. The tool geometry such as rake angles and cutting edge inclination angles play significant roles in determining machining performance. Varying these angles directly affects effects of machining parameters such as cutting forces, cutting temperatures, tool wear, tool life, surface integrity, dimensional stability. The necessity and possibility of the on-line geometry adjustment of intelligent turning tools are investigated in this paper. A model of turning tool mechanism having the function of intelligent in-process controllability in changing the tool inclination angle and tool approach angle is described. The mechanism is realized through the use of three specific slopes which work simultaneously to compensate the tool tip deviation due to the change of inclination angles so that the tool tip always stays at working point in space. The tooling mechanism model may be used to on-line control and optimized the machining process.

Author

*Adjusting; Metal Cutting; Tooling; Machining; Mathematical Models; Mechanical Engineering*

**20080008944** Zhejiang Sci-Tech Univ., Hangzhou, People's Republic of China

**A Study of Mass Customization System Based-On Customer Loyalty Degree**

Li, Renwang; Shi, Yongjiang; Shan, Meihua; Zou, Tingting; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 85-88; In English; See also [20080008878](#)

Contract(s)/Grant(s): NNSF-50475036; Copyright; Avail.: Other Sources

As a 21st century-oriented production mode, Mass Customization (MC) aims to resolve the problem of dilemma existed in manufacturing for a long time. However, customer loyalty is one of the most important aspects for enterprise to obtain development, income and profit. Therefore, centering on the customer loyalty, this paper developed a MC system based on customer loyalty according to the aims of MC. Moreover, the system running circumstance, architecture mode and general scheme were introduced, and main function files were analyzed. Finally, several key modules of the system were elucidated or illustrated.

Author

*Manufacturing; Architecture (Computers); Modules*

**20080008945** Pontifical Catholic Univ. of Minas Gerais, Minas Gerais, Brazil

**Chip-Tool Interface Access and Chip-Breakability Investigations When Turning Nitronic 33(Registered TradeMark) Steel with Conventional and High-Pressure Coolant Supply**

Sales, Wisley Falco; Bonney, John; Ezugwu, Emanuel Okechukwu; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 25-28; In English; See also [20080008878](#)

Contract(s)/Grant(s): PDE-0333-04-2; Copyright; Avail.: Other Sources

Chip control in automated production lines is still poses serious problems when machining ductile metals like most steels. In the past 10 years cutting fluids applied under high-pressure (typically between 3-30 MPa) have been successfully implemented to improve chip breakability and machinability of titanium and nickel-base super-alloys. This study investigates the relationship between coolant pressure employed and plastic deformation in the primary and secondary shear planes as well as its effect on chip-breakability when turning high chromium base, Nitronic 33(Registered TradeMark), steel. Results show that improved coolant access to the cutting interfaces was achieved when turning with 14 MPa coolant pressure. Increase in the coolant pressure enhances chip breakage. Keywords: chip-tool interface access, chip breakability, high-pressure coolant supply, nitronic 33

Author

*Cutting; Chips; High Pressure; Steels; Ductility; Titanium Alloys; Nickel Alloys; Coolants*

**20080008946** Saint-Gobain Abrasives, Romulus, MI, USA

**The Status of Grinding in the Aerospace Industry**

Hitchiner, Mike; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 5-16; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The aerospace industry has seen dramatic changes in the last 10 years in how it processes engine components. JIT approaches to manufacturing, combined with improved casting technology and elimination of encapsulation methods for part holding has moved the industry away from CDCF grinding on large complex machines to CBN based grinding strategies for grinding nickel and cobalt based super-alloys on small purpose built 3, 4, and 5 axis machines. Improvements in wheel technology have also shifted some processing routes away from machining and broaching to grinding for aero-engine and even large land-based, power generation components. Machines are becoming more multi-functional with grinding based machines also milling, drilling and deburring while machining centers have acquired grinding capability. Mere heavy stock removal still necessitates creep feed grinding with conventional abrasive wheels, new coolant delivery strategies such as VIPER have been developed. These changes are not limited to the highest volume components such as blades, vanes, shrouds, honeycomb and buckets, but also chromed landing gear, curvic gear coupling and assembled blade tip grinding. This paper will review these technologies and the strategies for their selection. Key words grinding, aerospace, nickel alloys, machine tools.

Author

*Grinding Machines; Metal Grinding; Metal Finishing; Aerospace Industry; Engine Parts; Nickel Alloys*

**20080008947** Kanazawa Univ., Japan

**Turning of BN Free-Machining Steel**

Tanaka, Ryutaro; Yamane, Yasuo; Sekiya, Katsuhiko; Narutaki, Norihiko; Shiraga, Tetsuo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 477-483; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper deals with the machinability of BN (Boron Nitride) free-machining steel in turning. Tested work materials were plane carbon steel JIS S45C and BN free-machining steel. The JIS S45C used as the standard. The tool wear in turning BN free-machining steel was smaller than that in turning standard steel. BN free-machining steel showed slightly lower cutting temperature and smaller cutting force to compare with standard steel at the tested cutting speeds. At the tool wear region of P grade carbide tool after turning BN free-machining steel at high cutting speed, Al and N were detected as a layer. It is thought that one of the main reasons of outstanding machinability of BN free-machining steel is the deposited layer containing Al and N acts as diffusion barrier at the tool-chip interface. In turning larger Al content BN added steel with higher Ti content cutting tool, the influence of BN addition on the tool wear reduction was more remarkable.

Author

*Carbides; Cermets; Boron Nitrides; High Speed; Cutting; Steels; Machining*

**20080008948** Kyushu Univ., Fukuoka, Japan

**The Performance of Micro Long Flat Drill with a Diameter of 20 Micrometers in Drilling into Duralumin and Stainless Steel**

Aziz, Muhammad; Ohnishi, Osamu; Onikura, Hiromichi; Tsuruoka, Sho; Min, Seung-Ki; Koga, Toshinobu; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 373-376; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper highlights the study of fabrication of micro long flat drills with a nominal diameter of 20  $\mu\text{m}$  and a flute length of 200  $\mu\text{m}$  by precision grinding and their application to micro deep drilling. Micro long flat drills were made of ultra-fine grained cemented carbide which contains WC particles having a diameter of 90 nm. The study is firstly focused on establishing the drill shape having the best performance in micro deep drilling, especially the influence of web thickness. In drilling experiment, observation was conducted with the aim of finding the best conditions and method of micro deep drilling into both duralumin and stainless steel. This observation includes the applications of ultrasonic vibration (USV) and step drilling method. The study proved that there is the optimum web thickness with the best drilling performance. Furthermore, the application of USV brought the tool life longer significantly. Key words micro long flat drill, micro deep drilling, web thickness, ultrasonic vibration, step drilling

Author

*Drilling; Drills; Stainless Steels; Fabrication; Aluminum Alloys; Carbides*

**20080008949** Okayama Prefectural Univ., Okayama, Japan

**Ultra-Precision Machining using the Lathe with the On-Machine Measuring System**

Yoden, Horoyuki; Yoshikawa, Mitsuo; Yokomizo, Seiichi; Sumida, Tsuneto; Kunishida, Jun; Oshita, Isao; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 377-380; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The linear collider is required to accelerate the electron and the positron more than the typical circular accelerators. The key parts of the linear collider is the oxygen-free copper disks called 'Accelerator Cells'. The precise dimensional tolerance (less than +2micron), fine surface roughness (less than 0.1 micronRz) and a lot of cells (over 2 million) are needed in the manufacturing of the cells. So the ultra-precision and high efficient machining has to be achieved at the same time. Consequently, to achieve the required qualities, new ultra-precision lathe was developed. And the on-machine measuring system was installed on this lathe. This system can measure the diameter and the thickness of the cells without contact before machining. And the cells can be machined without loss of time and the error when the cell is remounted. From the measurement result of the cells by the coordinate measuring machine, it was confirmed that ultra-precision machining within the dimensional tolerance +/-2micron. And 34 minutes in machine time became possible. Thus, it was proved that the on-machine measuring system could function effectively.

Author

*Lathes; Machining; Nonintrusive Measurement*

**20080008950** Beijing Univ. of Aeronautics and Astronautics, Beijing, China

**Research And Development of Digital Design and Manufacture Environment for Production**

Wang, Chunjie; Zong, Xiao; Meng, Jinhui; Luo, Haitao; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 69-72; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

A digital design and manufacture environment for production with the example of a complex mechanical system is researched in this paper. The tools used for developing the environment are Microsoft VC6.0, protookit, Patran Command Language (PCL) and the assert command of ADAMS, cooperating with the PDM and reliability technology. With this environment, the virtual prototype of production can be built, the state and dynamical character of the production can be analyzed, the production reliability can be evaluated, in the design and manufacture process. the design and analysis work is automatic. In this environment, the product can be manufactured in NC system, the production development period is reduced and the quality is better.

Author

*Digital Techniques; Manufacturing; Mechanical Engineering; Complex Systems; Design Analysis; Research and Development*

**20080008951** Henan Polytechnic Univ., Henan, China

**Chip Formation Mechanism and Morphological Characteristics in Ultrasonic Cutting of SiCp/AL-MMC**

Jiao, Feng; Zhao, Bo; Liu, Chuanshao; Zhu, Xunsheng; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 141-144; In English; See also [20080008878](#)

Contract(s)/Grant(s): 0421001200; 0411053500; Copyright; Avail.: Other Sources

Based on dislocation theory and ultrasonic cutting theory, chip formation mechanism in ultrasonic cutting of SiCp/Al-MMC was studied in the paper. Through contrast experiments of conventional and ultrasonic cutting, chip morphological characteristics of SiCp/Al-MMC were investigated. Research results showed that the chips in conventional cutting were formed only through compression deformation between tool and material, presenting large deformation state. While in ultrasonic cutting, because of the tool-chip separating characteristic and the high frequency impact action of tool, long loose spiral chips with small plastic deformation could be acquired. Material removal mechanism of SiCp/Al-MMC in Ultrasonic cutting was somewhat similar to that of traditional non-reinforced materials. From chip formation angle, it could be validated that ultrasonic cutting was an effective machining method suitable for SiCp/Al-MMC.

Author

*Morphology; Silicon Carbides; Metal Matrix Composites; Chips; Ultrasonics; Cutting*

**20080008952** Beijing Univ. of Aeronautics and Astronautics, Beijing, China

**Finite Element Analysis on the Static Stiffness of a 3PRS/UPS Redundant Parallel Machine Tool**

Bai, Zhifu; Chen, Wuyi; Han, Xianguo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 65-68; In English; See also [20080008878](#)  
Contract(s)/Grant(s): NNSF-50375010; SYS100060411; Copyright; Avail.: Other Sources

Static stiffness is one of the most important performance specifications of parallel machines. The static stiffness of a novel 3PRSKJPS redundant parallel machine is analyzed by using ANSYS software. The machine prototype is designed to perform 5-face machining with an active limb to improve the orientation capability of the platform. Stiffness enhancement is studied due to the introduction of a redundant leg to the original machine. From both horizontal and vertical directions, stiffness comparison is carried out when the machine lies at different postures in the workspace. Basing on these results, a better subspace is pointed out for cutting process and this work provides reference for the further revised design of this machine tool.

Author

*Stiffness; Machine Tools; Finite Element Method; Machining; Cutting*

**20080008953** Kinki Univ., Wakayama, Japan

**Fabrication of Cutting Tools of Ultra Small Diameters Using Micro EDM**

Mizutani, Katsumi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 213-216; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper describes an Electro-Discharge Machining (EDM) process for fabricating end mills of the half-moon type and ball-end type and also presents the machining conditions for a hemispherical tip of the ball-end type. From experiments with a tungsten tool and cemented carbide tool using a micro-EDM machine capable of wire electrode discharge grinding (WEDG), the following results were obtained. (1) End mills of about 20-micrometer diameter can be fabricated from a series of machining steps on the end surface, circumference, and cutting edge. (2) For the hemispherical tip of the ball-end type, rough machining by electro-discharge drilling, in which the tool is the anode and the wire is the cathode, followed by fine machining with polarities inverse to the rough machining enables fabrication with a shape error of 3% in tool diameters of 10 micrometers and 20 micrometers. (3) The experimental relation  $vh(\sup P)=c$  ( $v$ : tool feed speed,  $h$ : tool feed,  $p$  and  $c$ : characteristic constants) was found as the condition for attaining a hemispherical tip in rough machining.

Author

*Fabrication; Micromachining; Tools; Cutting; Diameters*

**20080008954** Okayama Univ. of Science, Japan

**Automatic Restoration of Simplified 2d Drawings into Correct Drawings**

Tanaka, Masaji; Kaneeda, Toshiaki; Fukagawa, Junichi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 309-312; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Simplified expressions in 2D drawings such as mechanical drawings and rough sketches are artificial. They are not based on geometry but human understanding. Many methods have been tried to automatically recognize 2D drawings for the conversion to 3D models. However, these methods could not handle various kinds of 2D drawings because simplified expressions are often applied to 2D drawings when they become complex. Though several methods have been proposed to handle some kinds of simplified expressions, they are based on geometry. Therefore, it seems to be difficult to integrate their algorithms. In this paper, a method is proposed that omitted 2D drawings could be automatically restored into correct 2D drawings. In the method, to handle partial omissions in 2D drawings, learning systems are introduced. Various kinds of partial omissions could be restored by the method and many examples have been tested by experimental systems of the method. Key words simplified expression, partial omission, 2D drawing, learning system, automatic restoration

Author

*Restoration; Engineering Drawings; Algorithms; Three Dimensional Models*

**20080008955** Toshiba Machine Co.Ltd., Japan

**Deterministic Ultra-Precision Cutting of Cemented Carbide for Aspheric Mold**

Kuriyama, Kunitaka; Fukuta, Masahiko; Yamane, Yasuo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 353-356; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Needs for the deterministic manufacturing process of aspheric lens mold has been increasing. The ultra-precision



grinding, which is only the way of machining the lens, requires many experiences and skills because cemented carbides used as the mold inserts is one of the most difficult-to-cut materials. In this study, the possibility of the ductile mode cutting of cemented carbides with a mono-crystal diamond tool was examined. As a result, the high quality surface finish was achieved with suitable cutting conditions.

Author

*Cutting; Precision; Machining; Carbides; Cementation; Surface Finishing; Lenses*

**20080008956** Guangdong Univ. of Technology, Guangzhou, China

**Research on Electrochemical Machining of Micro-Part and Micro-Structure**

Guo, Zhongning; Mo, Binghua; Zeng, Fanzhang; Li, Yuanbo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 269-272; In English; See also [20080008878](#)

Contract(s)/Grant(s): NNSF-50475046; Copyright; Avail.: Other Sources

A set of experimental equipment is developed for three-dimensional Electrochemical Generating Micromachining (EGMM) research. Experiments are performed applying high-frequency short-pulse power supply. It is known that, micro-holes, micro-shafts, narrow slots and shaped microelectrodes can be readily fabricated if electrical parameters and electrolytes are well selected. The equipment also allows for on-line tool electrode fabricating without second clamping. Key words Electrochemical Machining, EGMM, Macro/Micro Dual-drive

Author

*Electrochemical Machining; Micromachining; Microstructure; Shafts (Machine Elements)*

**20080008957** Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China

**Wire Electrical Discharge Machining of Doped CVD Diamond Films**

Lu, Wen-zhuang; Zuo, Dun-wen; Wang, Min; Xu, Feng; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 41-44; In English; See also [20080008878](#)

Contract(s)/Grant(s): NSF BK2006189; NUAAA BCX105-08; Copyright; Avail.: Other Sources

The chemical vapor deposition (CVD) diamond films are hard, brittle, insulated, and difficult-to-machine. The inherent difficulties arise from the very advantage this material impart to a wide range of industrial applications. A new application of wire electrical discharge machining (WEDM) for machining of CVD diamond thick films is presented. Boron was doped in the diamond during the CVD deposition process to fabricate high-quality semi-conducting films, which makes it possible to machine diamond films by WEDM. The effect of discharge current on the cutting speed and the machined surface roughness in WEDM was investigated in details. A profilometer and scanning electron microscopy (SEM) were used to measure surface roughness and characterize morphology of the samples. A Raman spectroscopy was employed to characterize different phases of carbon on the machined surface. The machining mechanism was studied and the machining model was developed. Results show that B-doped diamond films can be efficiently machined by WEDM. The gasification, melting, oxidation and graphitization in the WEDM process are main reasons that the diamond films can be machined by WEDM. Key words CVD diamond thick film, doping, WEDM

Author

*Wire; Thick Films; Diamond Films; Cutting; Doped Crystals*

**20080008958** Muroran Inst. of Tech., Hokkaido, Japan

**A Fundamental Study of Compositional Machining Simulation**

Teramoto, Koji; Kaneko, Jun'ichi; Ishida, Tohru; Takeuchi, Yoshimi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 317-320; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper presents a concept of a compositional machining simulation. The concept is based on the building block type construction of the machining process simulator. The compositional simulation enables to estimate the phenomena from the various aspects by reusing the simulation modules. Furthermore, connecting the physics-based process simulation to the mechanistic process simulation, the preliminary experiments will be reduced. First, a modeling framework of compositional simulation is explained based on a multi-aspect process modelling. Then, two types of the composition procedures are

introduced. They are a trans-scale association and a trans-aspect association. Fundamental investigations of the composition are explained with example problems of the endmilling simulation.

Author

*Machining; Simulation; Connectors; Modules*

**20080008959** Southeast Univ., Nanjing, China

#### **Microfabrication of Microfluidic Channels on Soda-Lime Glass**

Zhu, Jijun; Cheng, Jia; Ang, Simon S.; Wang, Hong; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 389-392; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper describes the fabrication procedure of microfluidic channels on soda-lime glass with a polydimethylsiloxane (PDMS) elastomer seal. The microchannel fabrication process is based on microfabrication technology and includes the followings: spinning the positive photoresist AZ-4620 on the soda-lime glass, exposing and developing the photoresist, etching the microchannels using a buffered oxide etchant (BOE), and PDMS bonding. PDMS bonding to the glass substrate was achieved using oxygen plasma to change the surface characteristics of PDMS from hydrophobic to hydrophilic, thus enabling the PDMS and glass surfaces to bond by covalent forces. Scanning electron microscopy (SEM) photos peel tests, and fluid flow experiments demonstrate the integrity of the PDMS and glass bonds. Due to the excellent optical properties of the PDMS elastomer, these microfluidic chips with microchannels can be used to detect luminescence and fluorescence phenomena in bio-medical and bio-chemical applications occurring within the microchannels. Key words Microfabrication, microfluidic channels, PDMS elastomer, soda-lime glass substrate

Author

*Microfluidic Devices; Glass; Methyl Polysiloxanes; Elastomers; Hydrophobicity; Etchants; Fluid Flow; Microchannels*

**20080008960** Polytechnic Univ., Kanagawa, Japan

#### **Influences of Surface Roughness of Rake Face on Cutting Performance in Ductile Materials**

Sawa, Takekazu; Tomuro, Shinichi; Wada, Masaki; Okabe, Masayuki; Unno, Kuniaki; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 233-236; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

In the machining of metals, the chip formation influences largely on the cutting performance such as surface roughness of workpiece, cutting force, tool life and so on. The excellent chip formation requires a countermeasure for both tools and workpieces. When the tool is recognized, the rake face of tool where the chip is dominantly flown is very important. Especially in the case of ductile metals and alloys, the continuous chip appears and the rake angle increases. With this change, the cutting force decreases and, as a result, the cutting quality is improved. In addition, it is considered that the surface roughness of rake face may decrease because of the occurrence of more suitable chip flow. Simultaneously, the surface roughness of rake face becomes smoother so as to make the frictional force smaller. In this study, the effect of surface roughness of rake face on the cutting performance was experimentally examined. Cemented carbide tool (K10) is used as reference cutting tools. The cutting test was done repetitiously against aluminum workpiece (A5056). As a result, it is clarified that the surface roughness of rake face becomes intensively influential on the chip formation.

Author

*Surface Roughness; Ductility; Surface Roughness Effects; Friction Factor; Adhesion; Cutters*

**20080008961** Kinki Univ., Hiroshima, Japan

#### **Examination by Modeling on Cutting Temperature of the Titanium Alloys**

Ikuta, Akihiko; Fukaya, Yasuhiro; Kobatake, Shohei; Shinozaki, Kenji; Kuroki, Hidenori; Yamane, Yasuo; Aritoshi, Masatoshi; Hamaguchi, Kazuya; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 137-140; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The purpose of this study is to clarify the cutting temperature in an adhesion interface by modeling the cutting process in titanium alloys such as Ti-6Al-4V and P-Ti. In this study, the modeling methods were used friction welding and the irradiation of a YAG laser. When measuring the cutting temperature, the thermo-couple was attached to a cemented carbide tool, the cutting temperature of beta-Ti alloy was 460K in the rake face of tool even if the cutting time was only 10s and the cutting speed 100m/min. Moreover, when the laser irradiation power was 450W for 10s, the temperature on the rake face of the tool was 440K, almost the same as the cutting of the beta-Ti alloy. In addition, in measuring the friction welding

temperature of the titanium alloys and cemented carbide rod, the friction welding temperature had a rapid heating rate for 0.4s from the beginning the same as the cutting. In the calculation result of heat conduction analysis that used FEM that was changed only in power, there was a correlation between the cutting and the two models such as the friction welding and the laser irradiation in micro-area of heat conduction interface. From the results, the possibility that the cutting temperature of titanium alloys can be estimated in a short time and in a micro-area is shown by the friction welding and laser irradiation model.

Author

*Cutting; Titanium Alloys; Mathematical Models; Friction Welding; YAG Lasers*

**20080008962** Shiga Prefecture Univ., Shiga, Japan

#### **Cutting Performance of CBN-Coated End-Mills for Hardened Die Steel**

Nakagawa, Heisaburo; Ogawa, Keiji; Kohtani, Emi; Noma, Masao; Tokoro, Toshio; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 113-116; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

We developed a magnetically enhanced plasma ion plating method (MEP-IP method) for a new technology of cubic boron nitride (cBN) coating on cutting tools. A nonconductive cBN thin film can be coated on cemented carbide end-milling tools by this method. This paper reports the cutting performance of cBN-coated end-mill for hardened die steels. First, the plating conditions for cBN coating were investigated in order to achieve good coating for cutting tools. Second, the cutting performance of cBN-coated end-mills was evaluated. The cutting tool life of cBN-coated end-mills was measured and compared with that of TiAlN-coated tools. The superiority of the developed cBN-coated end-mill over TiAlN-coated end-mill for cutting hardened die steels was demonstrated.

Author

*Boron Nitrides; Cutting; Milling (Machining); Steels; Coatings; Milling Machines*

**20080008963** Hokkaido Univ., Sapporo, Japan

#### **Simultaneous Measurement Method of 3d Coordinates and Normal on a Specular Surface Using Double Images of Laser Spot**

Yamazaki, Tomoyuki; Onosato, Masahiko; Tanaka, Fumiki; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 539-542; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

A new method for non-contact shape measurement of a specular surface like metallic surface, is proposed. The principle of the proposed method is the simultaneous measurement of 3D coordinates and normal vector on a specular surface using double laser spot images. Position and direction of the reflected beam are detected by the projected spot image on a 1-axis movable screen. Then, the position and the normal vector of the reflection point on the surface are determined based on the law of ray reflection. Both position and normal vector are measured simultaneously. The system, based on the proposed method, contains only standard devices: a laser, a CCD camera and a screen. An experimental setup has been created to check the validity of the proposed method. To test the apparatus we measured some primitive shapes. The experimental results are shown and accuracy in addition to the properties of the proposed method, are evaluated.

Author

*Machining; Three Dimensional Models; Image Processing; Metal Surfaces; Lasers; Coordinates*

**20080008964** Hiroshima Univ., Japan

#### **Reduction of Adhesion with an Amorphous Silicon Coated Tool**

Tezuka, Ryo; Sekiya, Katsuhiko; Kato, Masahiko; Yamada, Keiji; Yamane, Yasuo; Nakasa, Keiji; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 205-208; In English; See also [20080008878](#)

Contract(s)/Grant(s): MOE-16656053; Copyright; Avail.: Other Sources

Amorphous SiC has superior tribological properties. These properties must be effective on reduction of adhesion of chip on tool face. In this investigation, newly developed amorphous Sic coated carbide insert was evaluated by turning of aluminium alloy. The tool showed superior resistance to adhesion comparable with diamond-like carbon (DLC) coated tool. The effect of oil-mist lubrication on adhesion depended on surface roughness of inserts, and was suppressed when machining with an insert having smooth surface.

Author

*Adhesion; Amorphous Silicon; Coatings; Silicon Carbides; Machining; Machine Tools*

**20080008965** Tsinghua Univ., Beijing, China

**Research on HSK Tool Holder Critical Rotary Speed Computational Model**

Feng, Pingfa; Xu, Daochun; Li, Guanghui; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 45-48; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Hollow and short taper (HSK) tool holder was regarded as one of the most applicable tool holder for High Speed Cutting (HSC) currently. HSK tool holder destruction forms were analyzed; destruction rules based on material intensity and clamp force were deduced; according to elasticity and plasticity theory we built up HSK holder critical rotary speed theoretic computational models and validated them by Finite Element Analysis (FEA) method. The critical rotary speed computational model can not only enhance HSC security, but also provide important warranty to exert HSK tool holder high-speed potential.

Author

*Critical Velocity; Holders; Mathematical Models; Metal Cutting; Machine Tools; Rotor Speed*

**20080008966** Shenyang Univ. of Technology, Shenyang, China

**Research on NC Machining Technology of Extrusion Screw**

Wang, Ke; Bao, Junshan; Chen, Xin; Fu, Yusheng; Sun, Xingwei; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 177-179; In English; See also [20080008878](#)

Contract(s)/Grant(s): NNSF-50475170; Copyright; Avail.: Other Sources

The screw extruder is widely applied in material compression, transportation and mixture procedures in chemical industry, rubber machinery, foodstuff and so on. The extrusion screw, as a key part of extruder, has high requirement for its shape and capability. Aimed at the characteristic of complex shapes of extrusion screw, such as varying lead, varying head number, varying ground radius, taper and so on, this paper presents a technology that can process all kinds of complex shaped screw by using the same end mill, just by changing the position of the end mill. It determines the machining path, realizes the auto-programming of screw machining process, and accomplishes the application of this technology based on NC machine of four universal driving shafts. Key words Extrusion screw, end mill, NC machining, four universal driving shafts

Author

*Milling Machines; Shafts (Machine Elements); Extruding; Machining; Tapering; Screws*

**20080008967** Tottori Univ., Japan

**A Binocular Robot Vision System with Quadrangle Recognition**

Yabuta, Yoshito; Mizumoto, Hiroshi; Arie, Shiro; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 197-200; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The authors have proposed a binocular robot vision system having an autonomously moving active viewpoint. By using this active viewpoint, the system constructs the correspondence between images of feature points of an object on the right and left retinas and calculates the spatial coordinates of the feature points. In the present paper, an intelligent function for recognizing quadrangles in the image is incorporated into the system. By using Hough transform, the system detects lines in the right and left images and searches regions surrounded by 4 straight lines, and then recognizes the regions as quadrangles. A quadrangle in the right image should have a counterpart in the left image. The information of such correspondence between the quadrangles in the right and left images is used for the calculation of the spatial coordinates of the object. The effect of the incorporated intelligent function on the performance of the robot vision system is shown experimentally by using a cube as an object.

Author

*Binocular Vision; Robots; Autonomy; Image Processing*

**20080008968** Nanchang Inst. of Aeronautical Technology, Jiangxi, China

**Kinematics Approaches for Automated Fixture Reconfiguration Planning**

Qin, Guohua; Wu, Zhuxi; Zhang, Weihong; Wan, Min; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 543-546; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The most important task of fixture design is to locate a workpiece with the acceptable position. This paper presents a general fixture model able to characterize the state of the workpiece which is produced by the fixture locating-scheme. The

fixture model is firstly proposed to decompose into the locating principle model and the locating error model. The locating principle model is used to verify the number and layout of the fixture locators/locating points whereas the locating error model formulates the relationship between the variations in the position and orientation of the workpiece and the dimensions/positions of locators. On the other hand, based on the conception of the robust design, the fixture design model is further established to improve the locating quality of the fixture. Finally, by means of some examples, a detailed discussion is made about how the analysis and optimal design of the locating-scheme is carried out. Key words Locating scheme, locating principle, locating error, optimal design

Author

*Fixtures; Position (Location); Kinematics; Decomposition; Error Analysis; Planning*

**20080008969** Hunan Univ. of Technology, Zhuzhou, People's Republic of China

**Wear Characteristics of Alumina-Based Ceramic Nozzles in Industrial Boilers**

Ding, Zeliang; Deng, Jianxin; Fan, Rui; Zeng, Xiaohong; Zou, Youngsheng; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 465-468; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Al<sub>2</sub>O<sub>3</sub>/TiC and Al<sub>2</sub>O<sub>3</sub>/(W,Ti)C alumina-based ceramic composites were prepared for the use of Coal Water Slurry (CWS) nozzle materials in industrial boilers. The wear rates and wear surface features of the nozzles made from these materials were investigated. Results showed that the product of hardness ( $H_{(sub\ t)}$ ) and fracture toughness ( $K_{(sub\ c)}$ ) of the ceramic materials plays an important role with respect to the wear rates of CWS ceramic nozzles. The Al<sub>2</sub>O<sub>3</sub>/TiC ceramic nozzles being with higher product of  $K_{(sub\ c)}$  and  $H_{(sub\ t)}$  exhibited lower wear rates, while the Al<sub>2</sub>O<sub>3</sub>/(W,Ti)C nozzles with low product of  $K_{(sub\ c)}$  and  $H_{(sub\ t)}$  showed higher wear rates. Analysis of wear bore surface of the nozzles demonstrated that the primary wear mechanisms of ceramic nozzles varied from entry to exit. The nozzle entry zone exhibited a brittle fracture with many local pits, the nozzle center zone exhibited polishing action with a very smooth surface, while the exit zone showed thermal shock damage with cracking and chipping. Key words Erosion wear, Ceramic Nozzles, Wear mechanisms, Coal Water Slurry (CWS)

Author

*Wear; Aluminum Oxides; Boilers; Ceramic Matrix Composites; Coal; Slurries; Fracture Strength*

**20080008970** Hyogo Univ., Himeji, Japan

**Study on Step at Grain Boundary in Ultra-Precision Cutting of Phosphor Bronze**

Okuda, Koichi; Ogawa, Emi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 393-396; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper deals with the step generated at the grain boundary in an ultra-precision diamond cutting of phosphor bronze for a metal mold of Fresnel lens. In this study, the cutting experiments were carried out with an ultra-precision cutting machine by a single crystal diamond tool in order to investigate the relationship between the generation of grain boundary step and the cutting conditions. It was found that the thrust component of the cutting force and the feed rate condition greatly influence the magnitude of the step at grain boundary.

Author

*Bronzes; Grain Boundaries; Phosphors; Precision; Machining; Metal Cutting*

**20080008971** Polytechnic Univ., Kanagawa, Japan

**Tooling Dynamics of MC Spindle System in Ball End Milling of Hardened Steels**

Okabe, Masayuki; Kobayashi, Yuta; Wada, Masaki; Yoneyama, Minoru; Fujitake, Shuji; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 53-56; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

In this paper, the static and dynamic characteristics of tool holders and tools are evaluated experimentally to give a clear basis for understanding the tooling dynamics in MC spindle system. Simultaneously, the consideration of the influence of the tooling dynamics on the surface quality was performed with the preliminary cutting tests for the high-speed ball end milling. And how to simply choose the optimal rotational speed is described for improving the quality of milled surfaces of the hardened steels. To verify the propriety of the selection method, the practical ball end milling was carried out by targeting the finishing process of the spherically shaped hardened steels. Through the experiments, it was found that the dominant factors of the tooling dynamics in MC spindle system are the deviation of static stiffness, the balance condition of static compliance,



and the distribution of natural frequencies. To predict the influence of the tooling dynamics in MC spindle system on the finishing quality, the preliminary cutting tests were verified to be effective. And we could prove that the optimal cutting conditions were obtained for every tooling system.

Author

*Holders; Milling (Machining); Spindles; Steels; Tooling; Metal Grinding*

**20080008972** Harbin Univ. of Science and Technology, Harbin, China

**Study on Groove Optimization of Complex Three-Dimension Grooves Milling Insert for Machining the Refractory Steel**

Li, Zhenjia; Cheng, Yaonan; Yan, Fugang; Zhao, Yonggang; Wang Yubin; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 441-444; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The heat density function was established for both the flat milling insert and the waved-edge milling insert based on the diathermanous theory and dimension analysis method. The mathematic model of the temperature field was set up by considering a heat source on a moving finite plane. The heat density function was taken as the boundary condition and the temperature fields analysis of the two inserts were made with the heavy FEM software ANSYS when cutting difficult-to-machine material 3Cr-1Mo-1/4V steel. What's more, we have the synthetically blurry judgment and forecast the predominant capability of the waved-edge milling insert with complex 3D grooves. The mathematical model between the milling temperature and the maximal adhering disrepair depth of the face was built based on the adhering disrepair experiments of cutting the 3Cr-1Mo-1/4V steel. The predominant capability of the waved-edge milling insert has been testified and the conclusion that the cutting capability of the waved-edge milling insert was superior to that of the flat milling insert also can be got. All these studies provide the theoretic and technical base for solving the adhering disrepair problem. Key words waved-edge milling insert, heat density function, temperature field, adhering disrepair

Author

*Grooves; Heat Sources; Temperature Distribution; Refractories; Milling (Machining); Cutting*

**20080008973** Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China

**Application of Sound Analysis Technique to Monitor Tool Wear during the Turning Process**

Li, Xiangfeng; Pan, Xuhui; Zuo, Dunwen; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 277-280; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The primary objective of this research is to monitor tool wear on-line. In this paper, tool wear monitoring during the turning is carried out by measuring the sound signal at 0.2m from the cutting zone by using of a sound level meter and analyzed in time and frequency domain. The work piece material is carbon steel and the cutting insert is made of cemented carbide. The depth of cut, the cutting speed, feed rate and flank wear of the tool are variables. Sound analysis technique to monitor tool wear is also presented. The technique consists of wavelet transform preprocessor for generating features followed by Back-Propagation artificial neural network. Using the wavelet transform, the cutting sound signal is decomposed into different frequency bands. The percentages of each band's energy are extracted to be the characteristics to monitor the tool condition. Meanwhile, a three-layer Back-Propagation artificial neural network is built up to recognize the cutting tool wear. And different neural networks are compared to determine the optimized neural network structure. The results prove that under the given circumstances the monitoring of tool wear by the sound emitted is a possible and relatively simple method.

Author

*Wavelet Analysis; Wear; On-Line Systems; Neural Nets; Cutters; Depth; Cutting; Carbon Steels*

**20080008974** Okayama Univ., Japan

**Fundamental Study on a Cavitation Aided Machining**

Ohashi, Kazuhito; Wang, Rongjun; Tsukamoto, Shinya; Nakajima, Toshikatsu; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 405-408; In English; See also [20080008878](#)

Contract(s)/Grant(s): NNSF-50575045; Copyright; Avail.: Other Sources

The purpose of this study is to make clear the machining effect of a new technique of cavitation aided machining (CAM) by which the workpiece can be easily finished in a fine surface with a very simple apparatus. The machining fluid, that is mixture of abrasive grains and water as carrier, is sucked by a pump, and the flow of machining fluid is controlled by a

restrictor. Then the cavitation phenomenon locally occurs by the rapid decrease of carrier pressure, so that abrasive grains in the mixed fluid come to interfere on the surface. In this report, the possibility of applying CAM to precision machining is investigated by analyzing the surface finish, the stock removal and the behavior of carrier. Main conclusions obtained in this paper are as follows: (1) Action of abrasive grains onto the surface is induced by very fine cavitation impact caused by cavitation occurred in the lower part from the center of restrictor in a flow. (2) At 2.0mm in clearance, the cavitation impact of carrier becomes strongest, so that the stock removal and the decrease of surface roughness have maximum. (3) CAM can be applied to an ultraprecision machining by which the surface finish of Al-Mg alloy is improved from 7.3nm Ra with ultraprecision cutting down to the surface finish at 6.6nm Ra.

Author

*Cavitation Flow; Machining; Surface Finishing; Cutting; Surface Roughness; Magnesium Alloys*

**20080008975** Guangdong Univ. of Technology, Guangzhou, China

**Development of Large-Scale Revolution Surface CNC Grinding Method and Surface Shape Error Simulation**

Zhou, Xuguang; Yan, Qiusheng; Dai, Jue; He, Bingqiang; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 409-412; In English; See also [20080008878](#)

Contract(s)/Grant(s): NNSF-50575045; Copyright; Avail.: Other Sources

Large-scale surfaces such as mould should have low roughness as well as high accuracy of geometry profile. It is an essential method to satisfy the accuracy demand with grinding process. In this paper, due to the variety of geometry profiles, an Arc Envelope Grinding Method (AEGM) is presented, the influences of setting error of diamond point, which dress the grinding wheel into an arc section by using numerical control function of NC grinding machine, upon the shape accuracy of plate-shaped grinding and the machined surface are analyzed theoretically. It is shown that shape error of the machined surface increases with the increase of diameter of the grinding wheel, radius of the arc section of the grinding wheel, dresser setting error in diameter direction, while the shape error of the machined surface becomes less and less with the distance to the center of the machined surface being closer and the curvature of the machined surface being smaller. The shape error of the machined surface is a non-sensitive factor, which is smaller than 1/10000 of the setting error of the dresser. Key words revolution surfaces, Arc Envelope Grinding Method (AEGM), wheel dressing, error analysis

Author

*Numerical Control; Grinding Machines; Surface Properties; Surface Roughness; Error Analysis*

**20080008976** Tottori Univ., Japan

**Measurement of Tool-Chip Interface Temperatures in the Diamond Cutting of Difficult-To-Cut Materials**

Sato, Masahiko; Miyazaki, Kazutomo; Tanaka, Hisataka; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 293-296; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

We measured diamond tool tip temperatures during the cutting of difficult-to-cut materials using a two-color pyrometer with an optical fiber. A conical, single point diamond tool was used as a cutting tool, and Ti-6Al-4V and SUS304 were used as workpieces. Infrared rays that radiated from the tool-chip interface and were transmitted through the diamond were accepted by an optical fiber inserted in the tool that led to the two-color pyrometer. This method makes it possible to measure the temperature of small areas, such as cutting points, in a rapid response time and without contact. We found the tool tip temperature to be approximately 700 C for Ti-6Al-4V and 450 C for SUS304 at a cutting speed of 18rnIs. The effects of tool tip temperature on the tool wear were also investigated.

Author

*Cutters; Cutting; Diamonds; Temperature Effects; Temperature Measurement*

**20080008977** Okayama Univ., Japan

**Cutting Characteristics of Thin Copper Plate by Q-Switched Single-Mode Fiber Laser With High-Performance Nozzle**

Shiwayama, Ken; Uno, Yoshiyuki; Okamoto, Yasuhiro; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 365-368; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The fundamental characteristics of laser cutting for thin copper plate by a Q-switched single-mode fiber laser were experimentally investigated, and the effects of the nozzle shape on cutting results are also discussed. In the case of traditional convergent nozzle with nitrogen assist gas, it was impossible to cut under any experiment condition, since assist gas pressure

on workpiece was lower. On the other hand, high speed cutting of 30mm/s could be carried out using high-performance Nozzle Laval 800 and Nozzle Laval 800 IEZ, since high assist gas pressure could be supplied on the workpiece. In addition, the dross height using Nozzle Laval 800 and Nozzle Laval 800 IEZ was very small less than 10 micron, and the very narrow kerf and straight cut shape could be obtained. Therefore Q-switched single-mode fiber laser with high-performance nozzles proved to be useful for cutting of thin copper plate.

Author

*Cutting; Thin Plates; Copper; Convergent Nozzles; Fiber Lasers; Metal Plates; Laser Cutting; Q Switched Lasers*

**20080008978** Osaka Univ., Suita, Japan

#### **Influence of WC And Co on Machinability in Mist and Dry Cutting of Cemented Carbides**

Fujiwara, Junsuke; Miyamoto, Takeshi; Kanayama, Hirokazu; Heo, Jung Sung; Hanasaki, Shinsaku; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 17-20; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Cemented carbides are sintered metals consist of hard particles (WC, TiC, TaC, etc) and metallic binder. They have high hardness and strength even at high temperature, and are used for not only cutting tools but also forming rolls, dies and so on. They are well known as difficult-to-cut materials. The tool wear is so severe in cutting with a diamond tool that grinding is commonly used for finish machining. As the results, the productivity becomes low and the production cost becomes high. In previous study, using with PCD (Poly-Crystal Diamond) the relationship between tool life and cutting conditions was made clear. For example, the tool life became shorter with the increase of the feed rate, and the tool life was independent of the depth of cut. Recently, the demand of the cemented carbides is increasing. In order to get high productivity, cutting finish is desirable instead of grinding. In this paper, three kinds of cemented carbides were turned with the PCD tool. And the influence of WC and Co on the machinability in dry and mist cutting was investigated in detail. As the result, the tool wear depended on the WC contents, and the lubricating action restrained the flank wear in the mist cutting. Summary of results are shown as follows: (1) In mist cutting of cemented carbides, the more the WC was included, the longer the tool life becomes. (2) The more the WC was included, the more chip shape becomes irregular.

Author

*Carbides; Cutting; Cementation; Machining; Hardness; Mist; High Strength; High Temperature*

**20080008979** Beijing Inst. of Tech., Beijing, China

#### **Modeling Serrated Chips Formation in High Speed Turning of Hardened Steel**

Umer, Usama; Xie, Lijing; Wang, Xibin; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 321-324; In English; See also [20080008878](#) Contract(s)/Grant(s): NNSF-50505003; NDSF-41318.1.2.2; Copyright; Avail.: Other Sources

With the increasing applications of High speed machining, serrated chip formation is becoming a more common phenomenon in metal cutting. Serrated chips usually occur in machining of difficult to cut materials at or above a threshold speed. This threshold speed value depends on the material properties like hardness and thermal conductivity. This paper describes a two dimensional Finite element model for serrated chip formation in high speed turning of hardened steel. ABAQUS/Explicit was utilized with an updated Lagrangian method to simulate serrated chips at different cutting speeds. The results show cyclic variation in the cutting forces at high cutting speeds. Also the length of cuts in the chip increases with the cutting speed and the chip changes from serrated to discontinuous.

Author

*Steels; Hardness; Finite Element Method; Chips; Metal Cutting*

**20080008980** Tokyo Denki Univ., Japan

#### **Effect of High Voltage Electric Field on Defect Free Machining of Glass**

Shirakashi, Takahiro; Watanabe, Ryo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 133-136; In English; See also [20080008878](#) Contract(s)/Grant(s): Q05M-05; MOE-17560105; Copyright; Avail.: Other Sources

A defect free machining of brittle material is a key technology for application of the materials. In machining of these materials many uncontrollable brittle fractures or cracks are easily generated and propagate, and the machined surface is deteriorated by generation of small and many cracks. In order to obtain a defect free surface the crack generation and propagation should be restrained. Since both crack generation and propagation are greatly affected by a surface energy or a fracture toughness of material, for restriction of the crack generation and propagation, the energy or toughness should be

increased. In the paper some methods for increasing fracture toughness are discussed. For example, selection of machining fluids and surface treatment of the materials etc are discussed. It is found through these discussions that the surface treatment is very effective for the increasing, and the effect is greatly promoted by applying the high voltage electric field. Finally the availability of the method is discussed through glass machining process.

Author

*Glass; Machining; Electric Fields; High Voltages; Surface Treatment; Brittle Materials*

**20080008981** Henan Polytechnic Univ., Henan, China

**Research on Cutting Temperature of PRMMCs with Ultrasonic Assistance**

Zhao, Bo; Cheng, Xueli; Gao, Guofu; Jiao, Feng; Liu, Chuanshao; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 125-128; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The experimental research on temperature of ultrasonic cutting particulate reinforced metal matrix composites was carried out in this paper. The cutting temperature under the two kind of processing way of common and ultrasonic cutting has been measured using the natural thermo-couple and the T thermo-couple. It was discovered that the cutting temperature in common cutting is much higher than that in ultrasonic cutting. The cutting temperature increases along with the cutting speed, feed speed and cutting depth. Furthermore, the typical temperature signal in ultrasonic cutting was obtained through experiment, indicating that the temperature in ultrasonic cutting was not only small but also stable.

Author

*Cutting; Depth; Metal Matrix Composites; Temperature Measurement*

**20080008982** Tokyo Inst. of Tech., Tokyo, Japan

**Effects of Pinpoint Oil Mist Jet on Flank Wear in Turning of Inconel 718**

Kamata, Yasuhiro; Nakayama, Kousuke; Shinozuka, Jun; Obikawa, Toshiyuki; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 145-148; In English; See also [20080008878](#)

Contract(s)/Grant(s): 14350068; 17360060; 18760094; Copyright; Avail.: Other Sources

Conventionally, a flood of water-immiscible and water-miscible cutting fluids have been used in machining of difficult-to-machine materials. Nowadays, dry or semi-dry machining of such materials is required from the viewpoints of the environmental and economical problems. In this study, minimal quantity lubrication (MQL) was applied to high-speed turning of nickel based superalloy, Inconel 718, and the influences of oil mist injection on the corner wear was studied experimentally. Generally, oil mist spreads out widely from the nozzle. Thus, oil mist becomes ineffective in the reduction of tool wear as the distance from the nozzle to the cutting point increases. For this reason, three types of nozzles, that is, single nozzle type, dual nozzles type and cover type, were prepared and installed close to the cutting point to make pinpoint supply of oil mist to the cutting point. Consequently, the cover type nozzle proved to be most effective in wear reduction. In addition, it is also effective in the reduction of the consumption of cutting oil. It was found that oil consumption can be decreased by more than 90% without any expense of tool life.

Author

*Inconel (Trademark); Mist; Oils; Solubility; Wear; Technology Utilization; Mechanical Engineering*

**20080008983** Dijet Industrial Co. Ltd., Osaka, Japan

**Machining Of Ceramics And Composite Materials By Beam End Mill And Beam Drill**

Takahashi, Yasutomo; Nakata, Toshiya; Yamamoto, Tsutomu; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 29-32; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

We describe the relationship among cutting condition, tool geometry and tool life on machining sintered ceramics for finishing peripheral surface by BEAM END MILL. Also we describe the machining data of BEAM DRILL on drilling CFRP (Carbon Fiber Reinforced Plastics) of composite material which has been using for airplane parts. Key words sintered diamond, 30° helix angle, sintered ceramics, composite materials

Author

*Carbon Fiber Reinforced Plastics; Ceramics; Machining; Milling Machines; Sintering; Composite Materials; Drilling*

**20080008984** Osaka Univ., Osaka, Japan

**Development of Ultraprecision Numerically Controlled Finishing Machine Utilizing Atmospheric Pressure Plasma**

Yamamura, Kazuya; Fujiwara, Akihiro; Ueno, Koji; Sano, Yasuhisa; Shibahara, Masafumi; Endo, Katsuyoshi; Mori, Yuzo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 253-256; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Extreme ultraviolet lithography (EUVL) is developed as a next generation's semiconductor device fabrication technology. In the EUVL system, the reflective optics is used, and flatness of 50 nm p-v or less is required to the photomask substrate. This performance cannot be achieved by conventional mechanical machining method such as turning, grinding, or lapping. For this request, we are proposing to apply the numerically controlled plasma CVM (Chemical Vaporization Machining) as a finishing method for photomask substrate. Plasma CVM is a chemical machining method using neutral radicals, which are generated by the atmospheric pressure plasma. By using the rotary electrode for generating the plasma, the machining efficiency, which is equal to the conventional mechanical machining method, is achieved. Furthermore, generated plasma is localized around the electrode with the effect of high-pressure atmosphere, so good spatial resolution of the machining is also achieved. The defect density of machined surface is very low, and it is equivalent to the chemical etching. In this paper, we report the machining characteristics of the quartz glass that is one of the photomask substrate materials by plasma CVM.

Author

*Fabrication; Chemical Machining; Atmospheric Pressure; Plasma Control; Semiconductor Devices; Surface Finishing; Photomasks*

**20080008985** Osaka Univ., Osaka, Japan

**Cutting Mechanism of Free-Machining Steel**

Fujiwara, Junsuke; Miyamoto, Takeshi; Iwami, Jun; Watari, Koji; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 469-472; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The leaded free-machining steel and the sulfuized free-machining steel are used in the production industry. However the use of the leaded free-machining steel is limited from an environmental problem. In order to develop new environmental friendly free machining steel, it is necessary to find out the behavior of inclusion in the work material for the improvement of the machining performance in detail. Therefore, the experiment was carried out to find out the mechanism of the lead inclusion on the machinability. In an orthogonal cutting, the deformation behavior of the lead inclusion in the work material was observed in the vicinity of tool face. Cutting forces were also measured and a finished surface was observed. Moreover, low speed orthogonal cutting in Scanning Electron Microscope (SEM) where was mounted a small cutting equipment in order to observe the deformation behavior more microscopically. As a result, it is clear that a crack grew from the interface of the slender leaded inclusion by the shearing deformation, which was extended perpendicular to rolling direction, and this crack contributed to chip breaking.

Author

*Cutting; Machining; Steels; Mechanical Engineering; Cracking (Fracturing)*

**20080008986** Sojo Univ., Kumamoto, Japan

**The High Efficiency Transfer System of Lubricating Oil in Oil-Mist Lubrication and Oil-air Lubrication**

Koreta, Noriyuki; Hosokawa, Shinya; Ario, Hidenobu; Sasaki, Masaaki; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 149-152; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The atomizing lubrication system such as the oil-mist and oil-air lubrication has been applied to the spindle bearing of the machine tools. For high-speed spindle, it is necessary to clarify the lubricant quantity adhered to objects, namely bearing and the transfer efficiency of lubricating oil in the piping system composed of pipes, pipe joints and manifold or mixing valve from the lubricating device to the nozzle. In 7th ICPMT, we reported about the relation between lubricating time and quantity adhered to objects, that is to say adhesion ratio. This paper reports the effect of materials of pipes on the transfer efficiency of lubricating oil and that its effect depends on the contact angle between pipes and lubricating oil.

Author

*Lubricating Oils; Mist; Lubrication Systems; Machine Tools*



**20080008987** Shenyang Univ. of Technology, Shenyang, China

**Research on Solid Modeling of Helical Surface Based on Measuring**

Sun, Xingwei; Zhang, Ping; Wang, Ke; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006; In English; See also [20080008878](#)  
Contract(s)/Grant(s): NNSF-50475170; NNSF-0522008; Copyright; Avail.: Other Sources

To reduce the technology gap with foreign standards and accelerate the development of new product and new technique, we can use the measuring modeling to make reversed design of the advanced prototype workpiece in any other countries. In this paper, we studied the measuring method of helical surface, and finished compensation, correction and picking out of measuring data. We created solid modeling of screw rotor by UG software, and established the foundation for further research on helical surface.

Author

*Solid Surfaces; Surfaces; Screws*

**20080008988** Leeds Univ., UK

**Experiments and Simulations on the Turning of a Low Carbon and a Re-sulphurised Low Carbon Steel**

Rahmad, Rohani; Childs, Thomas H. C.; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 473-476; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

A low carbon and a re-sulphurised low carbon steel, chosen for their similar mechanical properties, have been turned on a lathe and the cutting and thrust forces and chip thickness ratios have been measured. Finite element simulations have also been carried out, with input constitutive material properties that have been measured and friction coefficients fitted to give agreement between cutting forces. It is speculated that differences between simulated and physical results may arise from the friction modelling.

Author

*Low Carbon Steels; Mechanical Properties; Simulation; Machining; Mechanical Engineering; Mathematical Models*

**20080008989** Horkos Corp., Fukuyama, Japan

**Visualizing and Measuring of Splayed Mixture with Optical Dispersion Method for MQL Drilling**

Makiyama, Tadashi; Sekiya, Katsuhiko; Yamada, Keiji; Yamane, Yasuo; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 297-300; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The paper deals with the effects of consistency of discharged mixture of liquid lubricant and compressed air for MQL (minimum quantity lubrication) on drilling. In MQL process, consistency of mixture of lubricant critically effects on its tool life and accuracy of the hole. However, it is very difficult to detect discharged mixture because of its quite few quantity and high discharged speed. In this study, at first, the relation of consumed quantity of lubricant and discharged amount from the mixing device was studied. Then measuring system of mixture sprayed by drill was developed to use optical dispersion detection principle. Results obtained were as follows. 1) Amount of mixture was practically measured at the cutting point of a drill. 2) Output signals from optical sensor were almost linear under 300ml/h discharged. And inclination was different at 40ml/h. 3) Average of signals output was not affected by discharged pattern. 4) Light source by luminous diode with visible ray made it possible to see the mixture directory.

Author

*Optical Measurement; Lubricants; Compressed Air; Drilling; High Speed; Optical Measuring Instruments; Cutting; Lubrication*

**20080008990** Hebei Univ. of Technology, Tianjin, People's Republic of China

**Tool Wear Monitoring in Advanced Manufacture System Based on Multi-Source Information Fusion**

Guo, Lanshen; Li, Shijie; Zhang, Minglu; Gao, Tiehong; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 282-292; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

An in-depth study on key technology is represented to develop a system of tool wear monitoring in advanced manufacture system. In this study, various aspects associated with tool monitoring system are investigated in order to design an accurate tool wear monitoring system for modern machining systems. Because it cannot exhibit unique behavior found in regular modern machining systems, in conventional wear-monitoring method, a single monitoring signal, such as that of force,

temperature, ultrasound or AE, cannot exactly describe the state of tool work for monitoring in advanced manufacture. This paper, therefore, mainly researches on real-time cutter state monitoring using neural network, neural network integration and multi-sensor information integrating technology. Picture pattern-recognition and feature extracting are adopted and combined with other cutter information dynamically. The characteristic information is gathered using an appropriate model of cutter wear or damage. The decision and judgment effect of neural network are used to imitate the complicated nonlinear mapping relationship and to fuse multi-kind sensors that collect wearing and damage information and make decision and judgment rapidly.

Author

*Wear; Neural Nets; Information Systems; Multisensor Applications; Pattern Recognition; Real Time Operation; Machining*

**20080008991** Hitachi Metals Ltd., Shimane, Japan

#### **Machining Properties of Pre-Hardened Tool Steels for Plastic Molding**

Tohyama, Fumio; Hosoda, Yasuhiro; Inoue, Keiji; Nakatsu, Hideshi; Inoue, Yoshiyuki; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 21-24; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Most of plastic mold steels are supplied in pre-hardened condition. Mold makers machine and finish directly those steels without heat treatment. In this paper, pre-hardened steels for high precision plastic molds are classified and the machinability of typical grades are introduced with some examples. Key words plastic mold steel, hardness, machinability, tool wear, cutting speed

Author

*Casting; Machining; Steels; Wear; Hardness*

**20080008992** Fukuji National Coll. of Technology, Sabae, Japan

#### **In-Process Monitoring of Tool Temperature in End Milling by Newly Developed Compact Two-Color Pyrometer**

Okada, Masato; Hosokawa, Akira; Tanaka, Ryutaro; Ueda, Takashi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 281-284; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

A compact two-color pyrometer using an optical fiber is developed for the purpose of monitoring the tool temperature in end milling. The infrared rays radiated from the cutting tool are accepted by a chalcogenide glass fiber and led to the laminated-type InAs/InSb two-color detector. The detector is thermoelectrically cooled at -60 C without liquid nitrogen by Peltier device. Therefore the sensor is miniaturized and is easy to handle and mountable to the machine tool. This pyrometer has a good signal-to-noise ratio and large measurable range above approximately 200 C. In addition, it has a flat response up to approximately 100 kHz, which is enough speed to measure the temperature of a cutting tool in high speed end milling. The temperature of carbide tool during intermittent cutting of carbon steel is measured with this pyrometer developed. The tool wear is also judged by tool temperature. Key words end milling, tool temperature, two-color pyrometer, in-process measurement, tool flank wear

Author

*Pyrometers; Milling (Machining); Machine Tools; Optical Fibers; Infrared Radiation; Chalcogenides; High Speed; Wear*

**20080008993** Kagoshima National Coll. of Technology, Japan

#### **Monitoring of Tool Deflection and In-Process Control during End Milling by use of CCD Image**

Yoshimitsu, Shinichi; Kawano, Yoshihiro; Zuo, Dunwen; Satonaka, Shinobu; Yamashita, Shunichi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 285-288; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

In this study, a new technique is proposed for the in-process measurement of cutting force and the prediction of tool breakage, during the high speed milling with a small-diameter end mill. This technique is based on the newly developed visualization system with a high-speed CCD camera, image acquisition and image processing. The system can realize the precise measurement of tool deflection during the high speed milling. It was shown that the tool deflection had good correlation with the cutting force, where the static compliance and geometrical moment of inertia were introduced in the prediction of the cutting force. In order to control the constant cutting force in process, the cutting force that this system predicted was used for the feedrate override control. As a result, the prevention of tool breakage and the control of the cutting force were confirmed by the feedrate override control. Since this system is able to measure the tool deflection and to predict the cutting force in process, it is useful for monitoring the cutting state, controlling the constant cutting force and preventing

tool breakage in the high speed milling with the small diameter tool. Key words in-process control, projection image, end mill, high-speed milling, CCD

Author

*CCD Cameras; Deflection; Milling (Machining); Image Processing; Cutting; High Speed*

**20080008994** Hitachi Metals Ltd., Shimane, Japan

#### **A Study of Mirror Finishability in Plastic Mold Steels**

Inoue, Yoshiyuki; Nakatsu, Hideshi; Tamura, Yasushi; Tohyama, Furnio; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 535-538; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

An increase in importance of mirror finishability as the characteristics of mold materials for plastic injection molds is accompanied by an increase in the demand of engineering plastic polymers. For practical purposes, mirror finishability of molds can't be estimated by surface roughness and the reflectivity reported in previous papers. It is necessary to find out how to estimate the slight asperity copied from the mold to plastics. We are going to discuss the original method of estimating several mirror finishability and the relationship of minor finishability with the microstructure of mold materials.

Author

*Mirrors; Steels; Finishes; Plastics; Injection Molding; Metal Polishing*

**20080008995** Dijet Industrial Co. Ltd., Osaka, Japan

#### **Control of Burr in Machining Aluminum Material by New Face Milling Cutter with Diamond Inserts**

Fujii, Shigemitsu; Gao, Yongming; Yamamoto, Tsutomu; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 523-526; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Burr is the plasticity deformation part of the work material protruded from the terminal side edge to the outside on the cutting surface, and it is especially easy to be generated in the materials with high malleability like aluminum base alloy and high toughness like stainless steel. Therefore, in order to control the burr, cutting process should be operated to reduce the plastic deformation on the material terminal side edge, and the cutting force should be requested to decrease as the means. In this study, the generation of burr in face milling was mainly investigated relating to the geometry of the face milling cutter and the corner shape of diamond insert.

Author

*Aluminum Alloys; Machining; Inserts; Cutting; Diamonds; Cutters*

**20080008996** Tokyo Univ. of Agriculture and Technology, Japan

#### **Effect of Machining Conditions on Thermal Expansion in Fine Boring Process**

Tang, Yulong; Sasahara, Hiroyuki; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 425-428; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

One of the main causes of the machining error in the fine boring is the thermal expansion of the cylinder when the cutting energy flows into the workpiece and the cutting temperature increases. This paper determined quantitatively the energy flow rate into the workpiece under various cutting conditions. Especially, high cutting speed up to 900m/min with/without cutting fluid was conducted. Then, the thermal behavior affected by the cutting conditions was analyzed with FEM, and then, temperature field and the amount of thermal expansion of the cylinder was shown. Key words: cutting temperature, accuracy, fine boring, thermal expansion, FEM, energy flow into workpiece

Author

*Thermal Expansion; Machining; Drilling; Cutting; Flow Velocity; Temperature Distribution; Temperature Effects; Machine Tools*

**20080008997** Harbin Univ. of Science and Technology, Harbin, China

#### **Experiment Research on Capability of the Ultrafine Grain Waved-Edge Milling Insert**

Wang, Zhigang; Li, Zhenjia; Ning, Shiyong; Zhu, Ruiming; Zhu, Denghui; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 453-456; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

An experiment was made with ultrafine grain waved-edge (rake face is waved-edge) milling insert and flat groove milling

insert of some different material for researching the cutting capability of the ultrafine grain waved-edge milling insert. There is a contrast between 45 steel milling insert and ZG0CR13Ni5Mo stainless steel milling insert on their cutting force. Based on the study of the moving track of chip in space, the parameter equation of chip shape was founded. To chip shape, the contrast of the analysis and research was done in theory. Selecting the ultrafine grain material milling insert and YT14 (China) milling insert, CY250(Abroad) milling insert, the experiment of milling insert of cutting life was done for contrast on the analysis and research. The conclusion is obtained that the cutting capability of ultrafine grain waved-edge milling inserts is the best.

Author

*Milling; Cutting; Grooves; Inserts; Stainless Steels*

**20080008998** Wakayama National Coll. of Technology, Japan

**Electrical Discharge Machining with Isolated Bundled Fine Wire Electrodes**

Nishimoto, Keigo; Ika, Takeo; Hashiguchi, Kiyoto; Uno, Yoshiyuki; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 527-530; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper deals with the phenomenon in which two little electrical discharge craters are generated when one impulse discharge is added to two close thin insulated electrodes. Based on the experimental results, a new electrical discharge machining method is proposed with isolated bundled fine wire electrodes. In this method, the surface roughness is not deteriorated even if high discharge energy is added to an electrode in order to obtain the high removal rate. The influences of the discharge current on the discharge crater shape were investigated by using the bundled electrode of fine insulated wire. Furthermore, the effects of the repetitive discharge on the surface roughness were experimentally investigated. As a result, it was found that the generated crater on the workpiece consisted of plural craters when the peak current was over 200A and many shallow and wide craters were generated when the peak current was over 400A. The experimental analysis made it clear that the proposed method was effective for high performance electrical discharge machining.

Author

*Electrodes; Machining; Wire; Bundles; Electric Discharges*

**20080008999** Leeds Univ., UK

**A Framework for Assessing Data on Continuous Chip Formation and Two Questions Arising From That**

Childs, Thomas H. C.; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 1-4; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Mechanical analysis of continuous chip formation leads to expectations of relations between  $(\theta - \alpha)$  and  $\lambda$  and between  $\{\tan(\theta + \lambda - \alpha) + 2(\theta)\}$  and  $n/\sin(\theta)$  (notation is defined in the text). This paper compares physical and simulated machining test results with these expectations, to highlight that there is still a lack of understanding of even the most simple plane strain continuous chip formation, at least at a quantitative level. metal machining, continuous chips, modelling

Author

*Machining; Chips; Metal Working; Fragments; Finite Element Method*

**20080009000** Kobe Univ., Japan

**Surface Finish Improvement in Machining of Inconel 718 by Circular Vibration Ball End Milling**

Hettiarachchi, Nandita; Moriwaki, Toshimichi; Nakamoto, Keiichi; Saraie, Hidenori; Mochizuki, Akihiro; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 105-108; In English; See also [20080008878](#)

Contract(s)/Grant(s): JSPS-16360071; Copyright; Avail.: Other Sources

'Circular vibration milling' is achieved by vibrating a milling cutter along a circular locus about the machine spindle axis, in addition to its rotary motion. In recent research of the authors, a circular vibration milling device that can be attached to a general milling machine was developed and its performance was evaluated. With compared to conventional milling, circular vibration milling was proven capable of producing better surface finishes in machining difficult-to-cut materials. Inconel 718 is an increasingly used, but difficult-to-cut super alloy in the fields of aerospace and cryogenic applications. Inconel 718 was machined by using the developed circular vibration milling attachment. It was found that the finished surface quality could be significantly improved by using circular vibration milling with compared to the surface quality obtained by conventional

milling. The observed improvement of finished surface quality was supported by reduced tool wear on rake face.

Author

*Milling (Machining); Surface Finishing; Surface Roughness; Vibration; Cutting; Aerospace Engineering*

**20080009001** Hiroshima Univ., Japan

**On-Machine Evaluation Method for Misengagement of Toolholder by Inclusion of Chips**

Yamada, Keiji; Yamane, Yasuo; Sekiya, Katsuhiko; Makiyama, Tadashi; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 57-60; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The HSK toolholder-spindle connection has high stiffness by the taper and face fitting, but the misengagement is caused by the inclusion of chips between the spindle nose and the flange of toolholder. In the existing technique to evaluate the misengagement; the measurement of radial run-out of tool tip is commonly conducted, but the adaptability for different tools and the measuring time consumed are becoming considerable problems for large mass production lines. Therefore, in this paper, new methods to measure the run-out of toolholder are proposed and experimental evaluation of the method is carried out. Experimental result shows that the sensitivity of eddy-current sensor to monitor the inclusion of chip is improved by about 30% in proposed methods.

Author

*Chips; Machining; Stiffness; Adaptation; Tapering*

**20080009002** Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China

**Residual Stresses in Ti-6Al-4V High-Speed-Milled Under Stretching Fixation**

Zuo, Dunwen; Xu, Honghao; Bu, Guangbin; Zhao, Can; Wang, Min; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 329-332; In English; See also [20080008878](#)

Contract(s)/Grant(s): NNSF-50375072; Copyright; Avail.: Other Sources

The titanium alloy Ti-6Al-4V is milled under stretching fixation with different milling speed and stretching force. The maximum speed reaches to 566mlmin and the maximum force to 6330N when the stretching stress is 327MPa or 34.5% of the yield strength of the work material. The effects of the milling speed and the stretching force on the milling residual stresses are investigated by X-ray diffraction analysis. It is found that the stretching force has significant effect on the milling residual stress, and the stress on the work surface will be more compressive when a bigger stretching force is used. The effect of cutting speed on the residual stress tends to be smaller when a much higher speed is used, and the stress will keep a low compressive level at an ultra-high milling speed. As a result, stretching fixation is effective to control the residual stresses for high-speed milling of titanium alloy, and high level of compressive stresses can be obtained if a suitable combination of the milling speed and stretching force is used.

Author

*Titanium Alloys; Vanadium Alloys; Yield Strength; Residual Stress; Milling; X Ray Diffraction; Stretching; Mechanical Properties*

**20080009003** Zhejiang Univ. of Technology, Hangzhou, China

**A New Method of Machining Product Knowledge Representation for the Solution of Cost Reduction in Product Design Process**

Jiang, Shaofei; Lu, Chunfu; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 313-316; In English; See also [20080008878](#)

Contract(s)/Grant(s): NNSF-Y105207; NNSF-50305034; Copyright; Avail.: Other Sources

The knowledge of cost reduction for machining product is classified and the nested relation among all kind of knowledge is expressed. A new method of knowledge representation called CKE-R-F is put forward, which integrates cost element, rule and frame, and is suitable for the solution process during cost reduction. The knowledge base is built based on CKE-R-F, this knowledge based is used by solution procedure of cost reduction in product design process.

Author

*Product Development; Cost Reduction; Machining; Knowledge Based Systems; Knowledge Representation*



**20080009004** Daido Inst. of Tech., Nagoya, Japan

**The Improvement of Machinability of Hot Forming Die Steel SKD61**

Inoue, Takashi; Matsui, Masao; Tsuchida, Yutaka; Suzuki, Takashi; Fujii, Toshimitsu; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 129-132; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

The hot forming die steel SKD61 is difficult to machine by high speed dry cutting method. When doing so tool life is shortened and the finished surface roughness is large. To solve this problem, a new material based on a chemical element of SKD6 1 was developed. The new hot forming die steel and SKI36 1 were dry cut with CBN tools and ceramics tools. Machinability of the material was then compared to determine tool life, cutting chip shape. The results were that tool life was longer with the newly developed material with SKD61 and chip processing was also improved.

Author

*Chips; Surface Roughness; Hot Working; Steels; High Speed; Cutting*

**20080009005** Beijing Inst. of Tech., China

**Implementation of ALE Method in Modeling of High Speed Turning Operations for Hardened Steel**

UMER, Usama; XIE, Lijing; WANG, Xibin; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 349-352; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

This paper describes the use of ALE method in modeling of orthogonal high speed turning operations for hardened steel. The two formulation techniques namely the Lagrangian and the Eulerian has been used in the past by many researchers. Due to the various limitations of the two approaches, ALE method has been adopted for the orthogonal high speed turning operations. In this method, the chip separation is performed by the deformation of the workpiece and adaptive meshing capability of ABAQUS/Explicit. The whole chip formation procedure consists of two stages starts with the initial chip formation followed by chip growth. For comparison purpose, simulation is also performed with the Lagrangian model and the two models are compared with the experimental data. It has been found that ALE model results are in good agreement with the experimental ones as compared to the Lagrangian model.

Author

*High Speed; Steels; Chips; Computer Programs; Finite Element Method*

**20080009006** BeiHang Univ., Beijing, China

**Development of a Web-Based Manufacturing Knowledge Management System**

Tian, Pin; Qiao Lihong; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 301-304; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Based on implementing knowledge management (KM) in the manufacturing context, the paper discusses manufacturing knowledge and its classification and modeling. According to the given strategies and methodologies of KM and requirement analysis, a system structure of manufacturing knowledge management system (MKMS) is established and a prototype system has been developed. The research and the development of the system will provide a helpful reference and a feasible method for implementing MKMS in manufac~ng enterprises in the future. Key words Knowledge management, Knowledge management system, Manufacturing knowledge, Knowledge modeling, Manufacturing knowledge classification

Author

*Knowledge Based Systems; Management Systems; Classifications; Manufacturing*

**20080009007** South China Univ. of Technology, Guangzhou, China

**Effect of Cutting Speed on Cutting Heat in Turning of Carbon Steel**

Quan, Yanming; He, Zhenwei; Dou, Yong; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 333-336; In English; See also [20080008878](#)  
Contract(s)/Grant(s): NSFC-50475098; GDSTC-31323; Copyright; Avail.: Other Sources

This paper investigates the variety regularities of cutting heat fluxes in chips, workpiece and tool against cutting speed (200m/min to approx. 1000m/min) in turning of medium carbon steel. The calculation equations are listed based on the analytic method. The necessary parameters for calculating these cutting heat fluxes are obtained by means of turning experiments. The experiment and calculation results indicate that the heat flux ill chip increases almost linearly as cutting

speed increases, while the ratio of cutting heat transferred into workpiece and tool to the total cutting heat decreases with the increase of cutting speed.

Author

*Cutting; Carbon Steels; Machining; Heat Flux; Chips; High Speed*

**20080009008** Kyushu Polytechnic Coll., Kitakyushu, Japan

**Development of Production Device for Ni-W Electroplated Micro Grinding Tools and Machining Characteristics with the Fabricated Tools**

Nishihara, Kunio; Onikura, Hiromichi; Ohnishi, Osamu; Progress of Machining Technology: Proceedings of the Eighth International Conference on Progress of Machining Technology; November 09, 2006, pp. 357-360; In English; See also [20080008878](#); Copyright; Avail.: Other Sources

Ni-W electroplated micro diamond grinding tools with cylindrical substrate having a diameter of 100 microns were fabricated in ammonium citrate bath with the intention of improving the grain holding and the tool life. A semi-automatic production device of electroplated tools was developed, and the Ni-W electroplated micro diamond grinding tools were produced with automatic fabrication. As a result, the automatically fabricated tools were produced with the abrasive grain distributed uniformly. The high-quality electroplated tools were more produced in the automatic fabrication than in the manual one. Then, the grooving to the single crystalline silicon was done by using the fabricated electroplated tools, and the machining characteristics were examined. As a result, it was confirmed that a lot of the automatically fabricated electroplated tools could be used for a long tool life.

Author

*Electroplating; Fabrication; Machine Tools; Grooving; Abrasives; Cylindrical Bodies; Machining*

**20080009449** NASA, Washington, DC USA

**Thrust rollers**

Vranish, John M., Inventor; August 14, 2007; 17 pp.; In English

Patent Info.: Filed June 18, 2002; US-Patent-7,255,483; US-Patent-Appl-SN-10/093,621; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009449>

A thrust roller bearing system comprising an inner rotating member, an outer rotating member and multiple rollers coupling the inner rotating member with outer rotating member. The inner and outer rotating members include thrust lips to enable the rollers to act as thrust rollers. The rollers contact inner and outer rotating members at bearing contact points along a contact line. Consequently, the radial/tilt and thrust forces move synchronously and simultaneously to create a bearing action with no slipping.

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

*Roller Bearings; Rollers; Thrust Bearings*

**20080009458** United Technologies Corp., East Hartford, CT USA

**Shaft seal assembly and method**

Keba, John E., Inventor; July 31, 2007; 12 pp.; In English

Contract(s)/Grant(s): NAS8-01107

Patent Info.: Filed May 7, 2004; US-Patent-7,249,768; US-Patent-Appl-SN-10/841,652; No Copyright; Avail.: CASI: [A03](#),

Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009458>

A pressure-actuated shaft seal assembly and associated method for controlling the flow of fluid adjacent a rotatable shaft are provided. The seal assembly includes one or more seal members that can be adjusted between open and closed positions, for example, according to the rotational speed of the shaft. For example, the seal member can be configured to be adjusted according to a radial pressure differential in a fluid that varies with the rotational speed of the shaft. In addition, in the closed position, each seal member can contact a rotatable member connected to the shaft to form a seal with the rotatable member and prevent fluid from flowing through the assembly. Thus, the seal can be closed at low speeds of operation and opened at high speeds of operation, thereby reducing the heat and wear in the seal assembly while maintaining a sufficient seal during all speeds of operation.

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

*Shafts (Machine Elements); Seals (Stoppers); Fluid Flow*

**20080009459** NASA, Washington, DC USA

**Connector adapter**

Hacker, Scott C., Inventor; Dean, Richard J., Inventor; Burge, Scott W., Inventor; Dartez, Toby W., Inventor; July 31, 2007; 10 pp.; In English

Patent Info.: Filed July 1, 2005; US-Patent-7,249,540; US-Patent-Appl-SN-11/177,652; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009459>

An adapter for installing a connector to a terminal post, wherein the connector is attached to a cable, is presented. In an embodiment, the adapter is comprised of an elongated collet member having a longitudinal axis comprised of a first collet member end, a second collet member end, an outer collet member surface, and an inner collet member surface. The inner collet member surface at the first collet member end is used to engage the connector. The outer collet member surface at the first collet member end is tapered for a predetermined first length at a predetermined taper angle. The collet includes a longitudinal slot that extends along the longitudinal axis initiating at the first collet member end for a predetermined second length. The first collet member end is formed of a predetermined number of sections segregated by a predetermined number of channels and the longitudinal slot.

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

*Adapters; Connectors; Straps*

**20080009489** NASA, Washington, DC USA

**Screw-locking wrench**

Vranish, John M., Inventor; April 24, 2007; 16 pp.; In English

Patent Info.: Filed June 30, 2005; US-Patent-7,207,245; US-Patent-Appl-SN-11/174,454; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009489>

A tool comprises a first handle and a second handle, each handle extending from a gripping end portion to a working end portion, the first handle having first screw threads disposed circumferentially about an inner portion of a first through-hole at the working end portion thereof, the second handle having second screw threads disposed circumferentially about an inner portion of a second through-hole at the working end portion thereof, the first and second respective through-holes being disposed concentrically about a common axis of the working end portions. First and second screw locks preferably are disposed concentrically with the first and second respective through-holes, the first screw lock having a plurality of locking/unlocking screw threads for engaging the first screw threads of the first handle, the second screw lock having a plurality of locking/unlocking screw threads for engaging the second screw threads of the second handle. A locking clutch drive, disposed concentrically with the first and second respective through-holes, engages the first screw lock and the second screw lock. The first handle and the second handle are selectively operable at their gripping end portions by a user using a single hand to activate the first and second screw locks to lock the locking clutch drive for either clockwise rotation about the common axis, or counter-clockwise rotation about the common axis, or to release the locking clutch drive so that the handles can be rotated together about the common axis either the clockwise or counter-clockwise direction without rotation of the locking clutch drive.

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

*Locking; Screws; Wrenches*

**20080009494** NASA, Washington, DC USA

**Hand held device for wireless powering and interrogation of biomems sensors and actuators**

Miranda, Felix Antonio, Inventor; Simons, Rainee N, Inventor; March 13, 2007; 16 pp.; In English

Patent Info.: Filed November 8, 2004; US-Patent-7,191,013; US-Patent-Appl-SN-10/983,230; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009494>

A compact, hand-held device for wireless powering, interrogation and data retrieval from at least one implanted sensor. The hand-held device includes an antenna for powering an implanted sensor and for receiving data from the implanted sensor to the hand-held device for at least one of storage, display or analysis. The hand-held device establishes electromagnetic coupling with a low radiating radio frequency power inductor in the implanted sensor at a predefined separation and the antenna geometry allows for the antenna to power, interrogate and retrieve data from the implanted sensor without strapping

the hand-held device to a human body housing the implanted sensor The hand-held device optionally allows for activation of the implanted sensor only during interrogation and data retrieval.

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

*Actuators; Interrogation; Wireless Communication*

**20080009508** Boeing Co., Chicago, IL USA

**Cloverleaf microgyroscope with electrostatic alignment and tuning**

Challoner, A. Dorian, Inventor; Gutierrez, Roman C., Inventor; Tang, Tony K., Inventor; January 9, 2007; 11 pp.; In English Patent Info.: Filed May 11, 2004; US-Patent-7,159,441; US-Patent-Appl-SN-10/843,139; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009508>

A micro-gyroscope (10) having closed loop output operation by a control voltage ( $V_{sub.ty}$ ), that is demodulated by a drive axis (x-axis) signal  $V_{sub.thx}$  of the sense electrodes (S1, S2), providing Coriolis torque rebalance to prevent displacement of the micro-gyroscope (10) on the output axis (y-axis)  $V_{sub.thy}$ . Closed loop drive axis torque,  $V_{sub.tx}$  maintains a constant drive axis amplitude signal,  $V_{sub.thx}$ . The present invention provides independent alignment and tuning of the micro-gyroscope by using separate electrodes and electrostatic bias voltages to adjust alignment and tuning. A quadrature amplitude signal, or cross-axis transfer function peak amplitude is used to detect misalignment that is corrected to zero by an electrostatic bias voltage adjustment. The cross-axis transfer function is either  $V_{sub.thy}/V_{sub.ty}$  or  $V_{sub.tnx}/V_{sub.tx}$ . A quadrature signal noise level, or difference in natural frequencies estimated from measurements of the transfer functions is used to detect residual mistuning, that is corrected to zero by a second electrostatic bias voltage adjustment.

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

*Alignment; Electrostatics; Gyroscopes*

**20080009518** Ohio Aerospace Inst., Cleveland, OH USA

**Low conductivity and sintering-resistant thermal barrier coatings**

Zhu, Dongming, Inventor; Miller, Robert A., Inventor; March 6, 2007; 11 pp.; In English

Contract(s)/Grant(s): NCC3-617

Patent Info.: Filed November 17, 2005; US-Patent-7,186,466; US-Patent-Appl-SN-11/282,859; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009518>

A thermal barrier coating composition is provided. The composition has a base oxide, a primary stabilizer, and at least two additional cationic oxide dopants. Preferably, a pair of group A and group B defect cluster-promoting oxides is used in conjunction with the base and primary stabilizer oxides. The new thermal barrier coating is found to have significantly lower thermal conductivity and better sintering resistance. In preferred embodiments, the base oxide is selected from zirconia and hafnia. The group A and group B cluster-promoting oxide dopants preferably are selected such that the group A dopant has a smaller cationic radius than the primary stabilizer oxide, and so that the primary stabilizer oxide has a small cationic radius than that of the group B dopant.

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

*Thermal Control Coatings; Low Conductivity*

## 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*.

**20080008832** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**NASA Laser Remote Sensing Technology Needs for Earth Science in the Next Decade and Beyond**

Trait, David M.; Neff, Jon M.; Valinia, Azita; September 17, 2007; 11 pp.; In English; SPIE Remote Sensing Symposium, 17-21 Sep. 2007, Florence, Italy; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

In late 2005 the NASA Earth Science Technology Office convened a working group to review decadal-term technology needs for Earth science active optical remote sensing objectives. The outcome from this effort is intended to guide future

NASA investments in laser remote sensing technologies. This paper summarizes the working group findings and places them in context with the conclusions of the National Research Council assessment of Earth science needs, completed in 2007.

Author

*Earth Sciences; Laser Applications; Remote Sensing; Spaceborne Lasers; Technology Assessment*

**20080008846** NASA Langley Research Center, Hampton, VA, USA

**Comparison of CALIPSO-Like, LaRC, and MODIS Retrievals of Ice Cloud Properties over SIRTa in France and Florida during CRYSTAL-FACE**

Chiriaco, M.; Chepfer, H.; Haeffelin, M.; Minnis, P.; Noel, V.; Platnick, S.; McGill, M.; Baumgardner, D.; Dubuisson, P.; Pelon, J.; Spangenberg, D.; Sun-Mack, S.; Wind, G.; [2007]; 56 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 23-622-43-03; Copyright; Avail.: CASI: [A04](#), Hardcopy

This study compares cirrus particle effective radius retrieved by a CALIPSO-like method with two similar methods using MODIS, MODIS Airborne Simulator (MAS), and GOES imagery. The CALIPSO-like method uses lidar measurements coupled with the split-window technique that uses the infrared spectral information contained at the 8.65-micrometer, 11.15-micrometer and 12.05-micrometer bands to infer the microphysical properties of cirrus clouds. The two other methods, single passive remote sensing at visible and infrared wavelengths, are the operational MODIS cloud products (referred to by its archival product identifier MOD06 for MODIS Terra) and MODIS retrievals performed by the CERES team at LaRC (Langley Research Center) in support of CERES algorithms; the two algorithms will be referred to as MOD06- and LaRC-method, respectively. The three techniques are compared at two different latitudes: (i) the mid-latitude ice clouds study uses 18 days of observations at the Palaiseau ground-based site in France (SIRTa: Site Instrumental de Recherche par Teledetection Atmospherique) including a ground-based 532 nm lidar and the Moderate Resolution Imaging Spectrometer (MODIS) overpasses on the Terra Platform, (ii) the tropical ice clouds study uses 14 different flight legs of observations collected in Florida, during the intensive field experiment CRYSTAL-FACE (Cirrus Regional Study of Tropical Anvils and cirrus Layers-Florida Area Cirrus Experiment), including the airborne Cloud Physics Lidar (CPL) and the MAS. The comparison of the three methods gives consistent results for the particle effective radius and the optical thickness, but discrepancies in cloud detection and altitudes. The study confirms the value of an active remote-sensing method (CALIPSO-like) for the study of sub-visible ice clouds, in both mid-latitudes and tropics. Nevertheless, this method is not reliable in optically very thick tropical ice clouds.

Author

*Cloud Physics; Ice Clouds; Imaging Spectrometers; Cirrus Clouds; MODIS (Radiometry); Remote Sensing*

**20080008851** NASA Stennis Space Center, Stennis Space Center, MS, USA

**Mapping Historic Gypsy Moth Defoliation with MODIS Satellite Data: Implications for Forest Threat Early Warning System**

Spurce, Joseph P.; Hargrove, William; Ryan, Robert E.; Smooth, James C.; Prados, Don; McKellip, Rodney; Sader, Steven A.; Gasser, Jerry; May, George; January 10, 2008; 17 pp.; In English; 19th USDA Interagency Research Forum on Invasive Species, 8-11 Jan. 2008, Annapolis, MD, USA; Original contains color illustrations

Contract(s)/Grant(s): NNS04AB54T; NNS07AA29T

Report No.(s): SSTI-2220-0135; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008851>

This viewgraph presentation reviews a project, the goal of which is to study the potential of MODIS data for monitoring historic gypsy moth defoliation. A NASA/USDA Forest Service (USFS) partnership was formed to perform the study. NASA is helping USFS to implement satellite data products into its emerging Forest Threat Early Warning System. The latter system is being developed by the USFS Eastern and Western Forest Threat Assessment Centers. The USFS Forest Threat Centers want to use MODIS time series data for regional monitoring of forest damage (e.g., defoliation) preferably in near real time. The study's methodology is described, and the results of the study are shown.

CASI

*Defoliation; Forests; MODIS (Radiometry); Moths; Earth Observations (From Space); Deforestation*



**20080008852** Science Systems and Applications, Inc., Bay Saint Louis, MS, USA

**Improving an Atlantic Fisheries DSS using Sea Surface Salinity Data from NASA's Aquarius Mission**

Guest, DeNeice; June 2007; 4 pp.; In English

Contract(s)/Grant(s): NNS04AB54T

Report No.(s): SSTI-2220-0147; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008852>

This report assesses the capacity of incorporating NASA's Aquarius SSS (sea surface salinity) data into the SMAST (School of Marine Science and Technology) DSS for Fisheries Science. This data will enhance the SMAST DSS by providing SSS over a large area. Aquarius is a focused satellite mission designed to measure global SSS. SSS mapping is limited because conventional in situ SSS sampling is too sparse to give a large-scale view of the salinity variability. Aquarius will resolve missing physical processes that link the water cycle, the climate, and the ocean. The SMAST Fisheries program provides a DSS for fisheries science. It collects fisheries and environmental data, integrates them into a suite of data assimilation ocean models, and provides hindcasts, nowcasts, and forecasts for fisheries research, fisheries management, and the fishery industry. Currently, SMAST is using SSS data from the National Oceanic and Atmospheric Administration's National Data Buoy Center. The SMAST DSS would be enhanced with SSS data from the Aquarius mission.

Author

*Fisheries; Marine Technology; Salinity; Sea Water; Marine Resources; Fishes; Earth Observations (From Space)*

**20080008856** Science Systems and Applications, Inc., Bay Saint Louis, MS, USA

**NASA's Potential Contributions for Remediation of Retention Ponds Using Solar Ultraviolet Radiation and Photocatalysis**

Underwood, Lauren W.; Ryan, Robert E.; August 17, 2007; 7 pp.; In English

Contract(s)/Grant(s): NNS04AB54T

Report No.(s): SSTI-2220-0149; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008856>

This Candidate Solution uses NASA Earth science research on atmospheric ozone and aerosols data (1) to help improve the prediction capabilities of water runoff models that are used to estimate runoff pollution from retention ponds, and (2) to understand the pollutant removal contribution and potential of photocatalytically coated materials that could be used in these ponds. Models (the EPA's SWMM and the USGS SLAMM) exist that estimate the release of pollutants into the environment from storm-water-related retention pond runoff. UV irradiance data acquired from the satellite mission Aura and from the OMI Surface UV algorithm will be incorporated into these models to enhance their capabilities, not only by increasing the general understanding of retention pond function (both the efficacy and efficiency) but additionally by adding photocatalytic materials to these retention ponds, augmenting their performance. State and local officials who run pollution protection programs could then develop and implement photocatalytic technologies for water pollution control in retention ponds and use them in conjunction with existing runoff models. More effective decisions about water pollution protection programs could be made, the persistence and toxicity of waste generated could be minimized, and subsequently our natural water resources would be improved. This Candidate Solution is in alignment with the Water Management and Public Health National Applications.

Author

*Ultraviolet Radiation; Earth Sciences; Ponds; Solar Radiation; Water Pollution; Water Quality; Catalysis*

**20080008870** NASA Dryden Flight Research Center, Edwards, CA, USA

**NASA 2007 Western States Fire Missions (WSFM)**

Buoni, Greg; January 16, 2008; 35 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008870>

This viewgraph presentation describes the Western states Fire Missions (WSFM) that occurred in 2007. The objectives of this mission are: (1) Demonstrate capabilities of UAS to overfly and collect sensor data on widespread fires throughout Western US. (1) Demonstrate long-endurance mission capabilities (20-hours+). (2) Image multiple fires (greater than 4 fires per mission), to showcase extendable mission configuration and ability to either linger over key fires or station over disparate regional fires. (3) Demonstrate new UAV-compatible, autonomous sensor for improved thermal characterization of fires. (4) Provide automated, on-board, terrain and geo-rectified sensor imagery over OTH satcom links to national fire personnel and Incident commanders. (5) Deliver real-time imagery to (within 10-minutes of acquisition). (6) Demonstrate capabilities of OTS technologies (GoogleEarth) to serve and display mission-critical sensor data, coincident with other pertinent data

elements to facilitate information processing (WX data, ground asset data, other satellite data, R/T video, flight track info, etc). CASI

*Autonomy; Real Time Operation; Pilotless Aircraft; Reconnaissance Aircraft; Unmanned Aircraft Systems; Forest Fires*

**20080009497** InTime, Inc., Cleveland, MS USA

**Method and system for spatially variable rate application of agricultural chemicals based on remotely sensed vegetation data**

Hood, Kenneth Brown, Inventor; Seal, Michael R., Inventor; Lewis, Mark David, Inventor; Johnson, James William, Inventor; February 27, 2007; 15 pp.; In English

Contract(s)/Grant(s): NCC13-0001

Patent Info.: Filed July 10, 2004; US-Patent-7,184,859; US-Patent-Appl-SN-10/888,932; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009497>

Remotely sensed spectral image data are used to develop a Vegetation Index file which represents spatial variations of actual crop vigor throughout a field that is under cultivation. The latter information is processed to place it in a format that can be used by farm personnel to correlate and calibrate it with actually observed crop conditions existing at control points within the field. Based on the results, farm personnel formulate a prescription request, which is forwarded via email or FTP to a central processing site, where the prescription is prepared. The latter is returned via email or FTP to on-side farm personnel, who can load it into a controller on a spray rig that directly applies inputs to the field at a spatially variable rate. Official Gazette of the U.S. Patent and Trademark Office

*Agriculture; Crop Vigor; Remote Sensing; Vegetation*

**20080009537** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Comparison and Assimilation of Global Soil Moisture Retrievals from AMSR-E and SMMR**

Reichle, Rolf H.; Koster, Randal D.; Mahanama, Sarith P. P.; Njoku, Eni G.; Owe, Manfred; [2007]; 51 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

Two data sets of satellite surface soil moisture retrievals are first compared and then assimilated into the NASA Catchment land surface model. The first satellite data set is derived from 4 years of X-band (10.7 GHz) passive microwave brightness temperature observations by the Advanced Scanning Microwave Radiometer for the Earth Observing System (AMSR-E), and the second is from 9 years of C-band (6.6 GHz) brightness temperature observations by the Scanning Multichannel Microwave Radiometer (SMMR). Despite the similarity in the satellite instruments, the retrieved soil moisture data exhibit very large differences in their multi-year means and temporal variability because they are computed with different retrieval algorithms. The satellite retrievals are also compared to soil moisture product generated by the NASA Catchment land surface model when driven with surface meteorological data derived from observations. Both satellite data sets exhibit biases when compared to the model products. Prior to assimilation of the satellite retrievals into the land model, satellite-model biases are removed by scaling the satellite retrievals into the land model's climatology through matching of the respective cumulative distribution functions. Validation against in situ data shows that for both data sets the soil moisture fields from the assimilation are superior to either satellite data or model data alone. A global analysis of the innovations reveals how changes in model and observations error parameters may enhance filter performance in future experiments.

Author

*Climatology; Soil Moisture; Temperature Profiles; Remote Sensing; Satellite Observation*

**20080009591** NASA Johnson Space Center, Houston, TX, USA

**Astronaut Photography: 'Hands-on' Remote Sensing of the Earth**

Stefanov, William L.; [2008]; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NNJ05H10SC; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009591>

Remote sensing or the detection of surface material properties such as composition and texture without physical interaction with the material, is an important analytical approach and tool for investigating and monitoring processes taking place on and within the Earth's surface. For many Earth scientists, remotely sensed data is synonymous with satellite images. Remotely sensed data is typically collected by automated sensors onboard satellites in high polar and sun-synchronous orbits at approximately 700-900 kilometers altitude above the Earth's surface. The field of Earth (or terrestrial) remote sensing is rooted in the early days of the space race: spy satellites have collected imagery some of which is now declassified since the

beginning of the space program in the late 1950s. Civilian Earth-observing satellites have been operational since 1972. Today, the collection of publicly available, remotely sensed data is an important asset for scientists. If you ask a geologist, ecologist, geographer or other natural scientist to name datasets used for terrestrial remote sensing, he or she will most likely mention a number of satellite-based sensor known by acronyms such as the Landsat ETM+, MODIS, IKONOS, SPOT, or ASTER1. There is another remotely-sensed dataset available for terrestrial studies and applications such as urban planning photographic images of the Earth taken by astronauts from the Gemini missions of the 1960s to the present International Space Station (ISS) crews. The astronaut photography dataset (I focus here on imagery collected by the US Space Program; similar data collection was sponsored by the former Soviet Union Space Program from the mid-1960s to the present) covers much of the Earth's land and coastal surface, as well as atmospheric phenomena like hurricanes and aurora. Unlike the satellite-based sensors mentioned above, astronauts use off-the-shelf film and digital cameras to image the Earth, rather than mission-specific instruments. This limits astronaut photographs to the visible and near-infrared wavelengths in three bands (red, green, blue, and near-infrared with appropriate filters), similar to what is collected by aerial photograph surveys. The majority of astronaut photographs were taken from altitudes of 300 to 400 km the most notable exception being the Apollo missions to the Moon during 1969 - 1972. Currently the ISS is the primary manned platform for astronaut photography, which is acquired exclusively with digital cameras.

Author

*Remote Sensing; Artificial Satellites; Satellite Imagery; Surface Properties; Spacecrews; Space Stations; Digital Cameras; Geological Surveys; Mission Planning; Landsat Satellites*

## 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*.

**20080008855** NASA Glenn Research Center, Cleveland, OH, USA

#### **Performance and Comparison of Lithium-Ion Batteries Under Low-Earth-Orbit Mission Profiles**

Reid, Concha M.; Smart, Marshall C.; Bugga, Ratnakumar V.; Manzo, Michelle A.; Miller, Thomas B.; Gitzendanner, Rob; December 2007; 19 pp.; In English; 4th International Energy Conversion Engineering Conference and Exhibit (IECEC), 26-29 Jun. 2006, San Diego, CA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 083229.04.15.01.01

Report No.(s): NASA/TM-2007-214826; AIAA Paper-2006-4042; E-16018; Copyright; Avail.: CASI: [A03](#), Hardcopy

The performance of two 28 V, 25 Ah lithium-ion batteries is being evaluated under low-Earth-orbit mission profiles for satellite and orbiter applications. The batteries are undergoing life testing and have achieved over 12,000 cycles to 40 percent depth-of-discharge.

Author

*Lithium Batteries; Storage Batteries; Electrochemical Cells; Electric Batteries; Energy Storage; Space Missions; Mars Missions; Electric Power Supplies; Spacecraft Power Supplies*

**20080008860** NASA Glenn Research Center, Cleveland, OH, USA

#### **The NASA 'PERS' Program: Solid Polymer Electrolyte Development for Advanced Lithium-Based Batteries**

Baldwin, Richard S.; Bennett, William R.; December 2007; 22 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 083229.04.15.01.01.01

Report No.(s): NASA/TM-2007-214965; E-16129; Copyright; Avail.: CASI: [A03](#), Hardcopy

In fiscal year 2000, The National Aeronautics and Space Administration (NASA) and the Air Force Research Laboratory (AFRL) established a collaborative effort to support the development of polymer-based, lithium-based cell chemistries and battery technologies to address the next generation of aerospace applications and mission needs. The ultimate objective of this development program, which was referred to as the Polymer Energy Rechargeable System (PERS), was to establish a world-class technology capability and U.S. leadership in polymer-based battery technology for aerospace applications. Programmatically, the PERS initiative exploited both interagency collaborations to address common technology and engineering issues and the active participation of academia and private industry. The initial program phases focused on R&D activities to address the critical technical issues and challenges at the cell level. Out of a total of 38 proposals received in

response to a NASA Research Announcement (NRA) solicitation, 18 proposals (13 contracts and 5 grants) were selected for initial award to address these technical challenges. Brief summaries of technical approaches, results and accomplishments of the PERS Program development efforts are presented. With Agency support provided through FY 2004, the PERS Program efforts were concluded in 2005, as internal reorganizations and funding cuts resulted in shifting programmatic priorities within NASA. Technically, the PERS Program participants explored, to various degrees over the lifetime of the formal program, a variety of conceptual approaches for developing and demonstrating performance of a viable advanced solid polymer electrolyte possessing the desired attributes, as well as several participants addressing all components of an integrated cell configuration. Programmatically, the NASA PERS Program was very successful, even though the very challenging technical goals for achieving a viable solid polymer electrolyte material or the overall envisioned long-term, program objectives were not met due to funding reductions. The NASA PERS Program provided research opportunities and generated and disseminated a wealth of new scientific knowledge and technical competencies within the polymer electrolyte area.

Author

*Electrochemical Cells; Energy Storage; Lithium Batteries; Solid Electrolytes; Aerospace Engineering*

**20080008861** NASA Glenn Research Center, Cleveland, OH, USA

**A Synopsis of Interfacial Phenomena in Lithium-Based Polymer Electrolyte Electrochemical Cells**

Baldwin, Richard S.; Bennett, William R.; December 2007; 17 pp.; In English; Original contains black and white illustrations  
Contract(s)/Grant(s): WBS 083229.04.15.01.01.01

Report No.(s): NASA/TM-2007-214946; E-16118; Copyright; Avail.: CASI: [A03](#), Hardcopy

The interfacial regions between electrode materials, electrolytes and other cell components play key roles in the overall performance of lithium-based batteries. For cell chemistries employing lithium metal, lithium alloy or carbonaceous materials (i.e., lithium-ion cells) as anode materials, a 'solid electrolyte interphase' (SEI) layer forms at the anode/electrolyte interface, and the properties of this 'passivating' layer significantly affect the practical cell/battery quality and performance. A thin, ionically-conducting SEI on the electrode surface can beneficially reduce or eliminate undesirable side reactions between the electrode and the electrolyte, which can result in a degradation in cell performance. The properties and phenomena attributable to the interfacial regions existing at both anode and cathode surfaces can be characterized to a large extent by electrochemical impedance spectroscopy (EIS) and related techniques. The intention of the review herewith is to support the future development of lithium-based polymer electrolytes by providing a synopsis of interfacial phenomena that is associated with cell chemistries employing either lithium metal or carbonaceous 'composite' electrode structures which are interfaced with polymer electrolytes (i.e., 'solvent-free' as well as 'plasticized' polymer-binary salt complexes and single ion-conducting polyelectrolytes). Potential approaches to overcoming poor cell performance attributable to interfacial effects are discussed.

Author

*Electrochemistry; Energy Storage; Lithium Batteries; Electrolytic Cells; Carbonaceous Materials; Electrochemical Cells*

## 45

### ENVIRONMENT POLLUTION

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

**20080008850** NASA Stennis Space Center, Stennis Space Center, MS, USA

**Potential of VIIRS Time Series Data for Aiding the USDA Forest Service Early Warning System for Forest Health Threats: A Gypsy Moth Defoliation Case Study**

Spruce, Joseph P.; Ryan, Robert E.; McKellip, Rodney; August 2008; 2 pp.; In English; Original contains color illustrations  
Contract(s)/Grant(s): NNS04AB54T

Report No.(s): SSTI-2220-0117; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008850>

The Healthy Forest Restoration Act of 2003 mandated that a national forest threat Early Warning System (EWS) be developed. The USFS (USDA Forest Service) is currently building this EWS. NASA is helping the USFS to integrate remotely sensed data into the EWS, including MODIS data for monitoring forest disturbance at broad regional scales. This RPC experiment assesses the potential of VIIRS (Visible/Infrared Imager/Radiometer Suite) and MODIS (Moderate Resolution Imaging Spectroradiometer) data for contribution to the EWS. In doing so, the RPC project employed multitemporal simulated VIIRS and MODIS data for detecting and monitoring forest defoliation from the non-native Eurasian gypsy moth (*Lymantria dispar*). Gypsy moth is an invasive species threatening eastern U.S. hardwood forests. It is one of eight major forest insect threats listed in the Healthy Forest Restoration Act of 2003. This RPC experiment is relevant to several nationally important

mapping applications, including carbon management, ecological forecasting, coastal management, and disaster management  
Derived from text

*Early Warning Systems; Forests; Remote Sensing; MODIS (Radiometry); Defoliation; Time Series Analysis; Forecasting*

**20080009431** Texas A&M Univ., College Station, TX USA

**Compositions and methods for removal of toxic metals and radionuclides**

Cuero, Raul G., Inventor; McKay, David S., Inventor; December 18, 2007; 10 pp.; In English

Contract(s)/Grant(s): NAG9-1241

Patent Info.: Filed January 6, 2005; US-Patent-7,309,437; US-Patent-Appl-SN-11/031,088; No Copyright; Avail.: CASI:  
A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009431>

The present invention relates to compositions and methods for the removal of toxic metals or radionuclides from source materials. Toxic metals may be removed from source materials using a clay, such as attapulgite or highly cationic bentonite, and chitin or chitosan. Toxic metals may also be removed using volcanic ash alone or in combination with chitin or chitosan. Radionuclides may be removed using volcanic ash alone or in combination with chitin or chitosan.

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

*Metals; Radioactive Isotopes; Toxicity; Removal; Waste Treatment*

## 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*.

**20080009579** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Ensemble Kalman Filtering of Soil Moisture Observations with Model Bias Correction**

DeLannoy, Gabrielle J. M.; Reichle, Rolf H.; Houser, Paul R.; Pauwels, R. N.; Verhoest, Niko E. C.; [2007]; 51 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): STEREO Proj. SR/00/01; Copyright; Avail.: Other Sources

Land surface models are usually biased in at least a subset of the simulated variables even after calibration. Bias estimation may therefore be needed for data assimilation. Here, in situ soil moisture observations in a small agricultural field were merged with Community Land Model (CLM2.0) simulations using different algorithms for state and bias estimation with and without bias correction feedback. Simple state updating with the conventional ensemble Kalman filter (EnKF) allows for some implicit bias correction. It is possible to estimate the soil moisture bias explicitly and derive superior soil moisture estimates with a generalized EnKF that uses a simple persistence model for the bias and assumes that the a priori bias error covariance is proportional to the a priori state error covariance. Significant improvements, however, are limited to layers for which observations are available. Therefore, it is crucial to measure the state variables of interest. The best variant for state and bias estimation depends on the nature of the model bias. In a biased model, low errors in soil moisture estimates may require large and frequent increments which in turn negatively impact the water balance and output fluxes

Author

*Soil Moisture; Agriculture; Error Analysis; Earth Surface; Kalman Filters; Covariance*

## 47

### METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

**20080009426** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Spatial Interpolation of Precipitation in a Dense Gauge Network for Monsoon Storm Events in the Southwestern U.S.**

Garcia, Matthew; Peters-Lidard, Christa D.; Goodrich, David C.; November 3, 2006; 49 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): 60-5342-3-0363; Copyright; Avail.: Other Sources

The results of this study into the detailed spatial representation of rainfall fields in the occurrence of missing observations indicate that a relatively simple inverse-distance-cubed interpolation method can be just as accurate as the more sophisticated



multiquadric-biharmonic method, which has been compared favorably to geostatistical (kriging) methods. These methods can be used to reproduce missing observations and to infer rainfall values at locations between measurement gauges with an uncertainty that is now better understood. The finding that these two methods produce results superior to the inverse-distance-squared method, a common choice for spatial analyses at the National Weather Service, will be of great interest to the operational weather and hydrological modeling communities.

Author

*Hydrology Models; Rain; Storms; Interpolation; Measuring Instruments; Monsoons*

**20080009531** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Stratospheric Gravity Wave Simulation over Greenland during 24 January 2005**

Limpasuvan, Varavut; Wu, Dong L.; Alexander, M. Joan; Hu, Ming; Xue, Ming; Pawson, Steven; Perkins, James R.; [2007]; 31 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNH04CC54C; NSF ATM-0213248; NSF ATM-0129892; NSF ATM-0530814; Copyright; Avail.:

Other Sources

The Advanced Regional Prediction Systems (ARPS) forecast model is extended up to the stratopause and over the entire hemisphere to simulate gravity waves during 24 January 2005. With a 15-km (0.4-km) horizontal (vertical) resolution, the simulation produces realistic gravity wave features related to geostrophic adjustment of tropospheric jet and topographical flow over the Greenland terrain, when a near-surface high pressure system is present over the North Atlantic. In the stratosphere, wave signatures appear near the region of strongest flow in the polar vortex, where negative vertical flux of horizontal momentum is pronounced. Flux divergence associated with horizontal flow acceleration of 12- 120 m/s/day coincides with areas of depleted stratospheric wind speed, suggesting strong interactions between gravity waves and the polar vortex. Simulated temperature wave perturbations compare favorably with radiance perturbation from NASA AIRS observations. Coarser simulation using 50-km horizontal resolution produces gravity waves of significantly weaker amplitudes.

Author

*Prediction Analysis Techniques; Wind Velocity; Troposphere; Forecasting; Gravity Waves; Jet Flow; Radiance*

**20080009534** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Revisiting a Hydrological Analysis Framework with ISLSCP-2 Rainfall, Net Radiation, and Runoff Fields**

Koster, Randal D.; Fekete, Balazs M.; Huffman, George J.; Stackhouse, Paul W., Jr.; [2007]; 40 pp.; In English; To appear in Journal of Geophysical Research - Atmospheres; Original contains color and black and white illustrations; Copyright;

Avail.: Other Sources

The ISLSCP-2 dataset provides the data needed to characterize the surface water budget across much of the globe in terms of energy availability (net radiation) and water availability (precipitation) controls. The data, on average, are shown to be consistent with Budyko's decades-old framework, thereby demonstrating the continuing relevance of Budyko's semi-empirical relationships. This consistency, however, appears only when a small subset of the data with hydrologically suspicious behavior is removed from the analysis. In general, the precipitation, net radiation, and runoff data also appear consistent in their interannual variability and in the phasing of their seasonal cycles.

Author

*Surface Water; Remote Sensing; Radiation Distribution; Precipitation; Rain*

**20080009536** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Potential Predictability of Long-term Drought and Pluvial Conditions in the USA Great Plains**

Schubert, Siegfried D.; Suarez, Max J.; Pegion, Philip J.; Koster, Randal D.; Bacmeister, Julio T.; October 11, 2006; 44 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

In this study we investigate the reasons for why droughts seem to be less predictable than wet conditions over the USA Great Plains. At least that is what the results of century-long simulations of past climate variability with an atmospheric general circulation model tell us. In particular we find that, in an ensemble of model runs forced with the 20th century observed sea surface temperatures, periods of drought are less reproducible than periods of wet conditions. We examine several possible reasons for this, including the differing impact of El Nino/Southern Oscillation's on the large scale circulation, the possible role of Atlantic sea surface temperatures in forcing changes in the Bermuda high and the associated influx of moisture into the continent, and differences in how soil moisture changes feed back on the atmosphere during wet and dry soil conditions. We find that the changes in predictability are primarily driven by changes in the strength of the land-atmosphere coupling, such

that under dry conditions a given change in soil moisture produces a larger change in evaporation and hence precipitation than the same change in soil moisture would produce under wet soil conditions. The above changes in predictability are associated with a distinctive change in the probability distribution (negative skewness) in the seasonal mean precipitation during the warm season - something that is also found in the observations, though to a lesser degree.

Author

*Drought; Great Plains Corridor (North America); Predictions; Weather Forecasting; Precipitation (Meteorology); Climatology; United States*

**20080009538** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Assimilation of Satellite Cloud Data into the GMAO Finite Volume Data Assimilation System Using a Parameter Estimation Method, Part 1, Motivation and Algorithm Description**

Norris, Peter M.; daSilva, Arlindo M.; June 22, 2006; 52 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

General circulation models are unable to resolve the subgrid-scale moisture variability and associated cloudiness and so must parameterize grid-scale cloud properties. This typically involves various empirical assumptions and a failure to capture the full range (synoptic, geographic, diurnal) of the subgrid-scale variability. We employ a variational parameter estimation technique to adjust empirical model cloud parameters in both space and time, in order to better represent assimilated ISCCP cloud fraction and optical depth and SSM/I liquid water path. The value of these adjustments is verified by much improved cloud radiative forcing and persistent improvement in cloud fraction forecasts.

Author

*Cloud Physics; Clouds (Meteorology); Atmospheric General Circulation Models; Climatology; Remote Sensing; Satellite Observation; Forecasting*

**20080009545** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Assessment of Coupled Chemistry-Climate Models: Evaluation of Dynamics, Transport, and Ozone**

Eyring, V.; Butchart, N.; Waugh, D. W.; Akiyoshi, H.; Austin, J.; Bekki, S.; Bodeker, G. E.; Boville, B. A.; Bruehl, C.; Chipperfield, M. P.; Cordero, E.; Dameris, M.; Deushi, M.; Fioletov, V. E.; Frith, M.; Garcia, R. R.; Gettelman, A.; Giorgetta, M. A.; Grewe, V.; Jourdain, L.; Kinnison, D. E.; Mancini, E.; Manzini, E.; Marchand, M.; Marsh, D. R.; [2006]; 73 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

Simulations of the stratosphere from 1980 to 2000 from thirteen coupled chemistry-climate models (CCMs) are compared with each other and to observations. Comparisons of the temperature fields show that the models reproduce the global, annual mean temperature fairly well, but most CCMs still have a cold bias in winter-spring polar regions in the southern hemisphere. Most display the correct stratospheric response to wave forcing in the northern, but not in the southern hemisphere. Comparisons of simulations of methane, mean age of air, and the so-called water vapor 'tape recorder,' show a wide spread in the results, indicating differences in transport. However, for around half the models there is reasonable agreement with observations. In these models the mean age and tape recorder are generally better than reported in previous model comparisons. Comparisons of the water vapor and inorganic chlorine (Cl(sub y)) fields also show a large inter-model spread. Differences in water vapor are primarily related to biases in the simulated tropical tropopause temperatures, and not transport. The spread in Cl(sub y) which is largest in the polar lower stratosphere, appears to be primarily related to transport differences. In general the amplitude and phase of the annual cycle in total ozone is well simulated apart from the Antarctic, where there are significant differences in the Antarctic ozone hole among the models and in comparison with observations. CCMs show a large range of ozone trends over the past 25 years and large differences in comparisons with observations. Global temperatures trends are in reasonable agreement with satellite and radiosonde observations and compared to the CCM results presented in this study most models that neglect changes in stratospheric ozone generally show significantly less cooling at 50 hPa between 1980 and 2000.

Author

*Climate Models; Atmospheric Composition; Stratosphere; Temperature Distribution; Methane; Water Vapor; Satellite Observation; Chlorine*

**20080009549** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Assimilation of Precipitation Information Using Column Model Physics as a Weak Constraint**

Hou, Arthur Y.; Zhang, Sara Q.; [2006]; 32 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: Other Sources

Currently, operational weather forecasting systems use observations to optimize the initial state of a forecast without

considering possible model deficiencies. For precipitation assimilation, this could be an issue since precipitation observations, unlike conventional data, do not directly provide information on the atmospheric state but are related to the state variables through parameterized moist physics with simplifying assumptions. Precipitation observation operators are comparatively less accurate than those for conventional data or observables in clear-sky regions, which can limit data usage not because of issues with observations but with the model. The challenge lies in exploring new ways to make effective use of precipitation data in the presence of model errors. This study continues the investigation of variational algorithms for precipitation assimilation using column model physics as a weak constraint. The strategy is to develop techniques to make online estimation and correction of model errors to improve the precipitation observation operator during the assimilation cycle. Earlier studies have shown that variational continuous assimilation (VCA) of tropical rainfall using moisture tendency correction can improve GEOS-3 global analyses and forecasts. Here we present results from a four-year GEOS-3 reanalysis assimilating TMI and SSM/I tropical rainfall using the VCA scheme. Comparisons with NCEP operational analysis and ERA-40 reanalysis show that the GEOS-3 reanalysis is significantly better at replicating the intensity and variability of tropical precipitation systems ranging from a few days to interannual time scales. As a further refinement of rainfall assimilation using the VCA scheme, we describe a variational algorithm for assimilating TMI latent heating retrievals using semi-empirical parameters in the model moist physics as control variables and present initial test results.

Author

*Assimilation; Precipitation; Weather Forecasting; Information Systems; Remote Sensing; Error Analysis; GEOS 3 Satellite*

**20080009561** NASA Goddard Space Flight Center, Greenbelt, MD, USA

#### **ENSO and Wintertime Extreme Precipitation Events over the Contiguous USA**

Schubert, Siegfried D.; Chang, Yehui; Suarez, Max; Pegion, Philip; [2007]; 46 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

In this study we examine the impact of El Nino/Southern Oscillation (ENSO) on precipitation events over the continental USA using 49 winters (1949/50- 1997/98) of daily precipitation observations and NCEP/NCAR reanalyses. The results are compared with those from an ensemble of nine atmospheric general circulation model (AGCM) simulations forced with observed SST for the same time period. Empirical orthogonal functions (EOFs) of the daily precipitation fields together with compositing techniques are used to identify and characterize the weather systems that dominant the winter precipitation variability. The time series of the principal components (PCs) associated with the leading EOFs are analyzed using generalized extreme value (GEV) distributions to quantify the impact of ENSO on the intensity of extreme precipitation events. The six leading EOFs of the observations are associated with major winter storm systems and account for more than 50% of the daily precipitation variability along the west coast and over much of the eastern part of the country. Two of the leading EOFs (designated GC for Gulf Coast and EC for East Coast) together represent cyclones that develop in the Gulf of Mexico and occasionally move and/or redevelop along the east coast producing large amounts of precipitation over much of the southern and eastern USA. Three of the leading EOFs represent storms that hit different sections of the west coast (designated SW for Southwest coast, WC for the central west coast, and NW for Northwest coast), while another represents storms that affect the Midwest (designated by MW). The winter maxima of several of the leading PCs are significantly impacted by ENSO such that extreme GC, EC, and SW storms that occur on average only once every 20 years (20-year storms), would occur on average in half that time under sustained El Nino conditions. In contrast, under La Nina conditions, 20-year GC and EC storms would occur on average about once in 30 years, while there is little impact of La Nina on the intensity of the SW storms. The leading EOFs from the model simulations and their connections to ENSO are for the most part quite realistic. The model, in particular, does very well in simulating the impact of ENSO on the intensity of EC and GC storms. The main model discrepancies are the lack of SW storms and an overall underestimate of the daily precipitation variance.

Author

*El Nino; Southern Oscillation; Winter; Precipitation (Meteorology); Storms (Meteorology)*

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*.

**20080009543** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Comparison and Sensitivity of ODASI Ocean Analyses in the Tropical Pacific**

Chaojiao, Sun; Rienecker, Michele M.; Rosati, Tony; Wittenberg, Andrew; Keppenne, Christian; Jacob, Jossy P.; Kovach, Robin; [2007]; 59 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): RTOP 622-24-47; No Copyright; Avail.: Other Sources

Two global ocean analyses from 1993 to 2001 have been generated by the GMAO (Global Modeling and Assimilation Office) and GFDL (Geophysical Fluid Dynamics Laboratory), as part of the ODASI (Ocean Data Assimilation for Seasonal-to-Interannual prediction) consortium efforts. The ocean general circulation models (OGCM) and assimilation methods in the analyses are different, but the forcing and observations are the same as designed for ODASI experiments. Global XBT and TAO temperature profile observations are assimilated. The GMAO analysis also assimilates synthetic salinity profiles based on climatological T-S relationships from observations (denoted TS-scheme). The quality of the two ocean analyses in the tropical Pacific is examined here. We address questions such as: How do different assimilation methods impact the analyses, including ancillary fields such as salinity and currents? Is there a significant difference in interpretation of the variability from different analyses? How does the treatment of salinity impact the analyses? Both GMAO and GFDL analyses reproduce the time mean and variability of the temperature field compared with assimilated TAO temperature data, taking into account the natural variability and representation errors of the assimilated temperature observations. Surface zonal currents at 15 m from the two analyses generally agree with observed climatology from Reverdin et al. (1994) and Bonjean and Lagerloef (2002). Zonal current profiles from the analyses capture the intensity and variability of the equatorial undercurrent (EUC) displayed in the independent ADCP data at three TAO moorings across the equatorial Pacific basin. Compared with independent data from TAO servicing cruises, the results show that (1) temperature errors are reduced below the thermocline in both analyses; (2) salinity errors are considerably reduced below the thermocline in the GMAO analysis; and (3) errors in zonal currents from both analyses are comparable.

Author

*Ocean Currents; Ocean Models; Tropical Regions; Pacific Ocean; Temperature Profiles; Temperature Distribution; Oceans; Fluid Dynamics; Geophysics*

**20080009544** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Assimilation of SeaWiFS Data into a Global Ocean-Biogeochemical Model Using a Local SEIK Filter**

Nerger, Lars; Gregg, Watson W.; [2006]; 29 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): RTOP 621-30-39; No Copyright; Avail.: Other Sources

Chlorophyll data from the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) is assimilated into the three-dimensional global NASA Ocean Biogeochemical Model (NOBM) for the period 1998-2004. The assimilation is performed by the SEIK filter which is based on the Kalman filter algorithm. A localized filter analysis is used and the filter is simplified by using a static state error covariance matrix. The assimilation improves the chlorophyll estimates relative to a model simulation without assimilation. The comparison with independent in situ data over the seven years also shows a significant improvement of the chlorophyll estimate. For the free model run without assimilation, the global RMS log error of total chlorophyll is 0.43, while it is reduced to 0.32 by the assimilation. The RMS log error of SeaWiFS data is slightly smaller at 0.28 for the in-situ data considered. Thus, the global RMS log error of the model is reduced by the assimilation from 53% to 13% above the error of SeaWiFS. Regionally, the assimilation estimate exhibits smaller errors than SeaWiFS data in several oceanic basins.

Author

*Sea-Viewing Wide Field-of-View Sensor; Ocean Models; Kalman Filters; Structural Basins; Biogeochemistry; Chlorophylls; Error Analysis; In Situ Measurement*

**20080009555** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**The Sensitivity of Assimilation Implementations on Ocean Analyses: Comparisons and Evaluations of ODASI**

Sun, Chaojiao; Rienecker, Michele M.; Rosati, Anthony; Harrison, Matthew; Wittenberg, Andrew; Keppenne, Christian L.; Jacob, Jossy P.; Kovach, Robin M.; [2006]; 56 pp.; In English; Original contains color and black and white illustrations;

Copyright; Avail.: Other Sources

The performance of two different ocean data assimilation systems is examined here. We address questions such as: How



do different assimilation methods impact the analyses, including ancillary fields such as salinity and currents? Is there a significant difference in interpretation of the variability from different analyses? How does the treatment of salinity impact the analyses? Two ocean analyses over a nine-year period (1993-2001) are evaluated and validated with independent data. These analyses are generated by the GMAO (Global Modeling and Assimilation Office) and the GFDL (Geophysical Fluid Dynamics Laboratory). The same observation and forcing data sets are used in these two analyses. However, the ocean global circulation models (Poseidon and MOM3, respectively) and data assimilation methods (OI and 3D-VAR, respectively) are different. The GMAO analysis assimilates synthetic salinity profiles, based on climatological T-S relationships, in addition to observed temperature profiles (denoted by TS-scheme ). The GFDL analysis assimilates the temperature profiles only, with the salinity field unchanged. Compared with the TAO temperature data that have been included in the assimilation procedure, both analyses are superior to the GMAO control run (CTL; no assimilation), with the GFDL analysis having smaller bias than the GMAO analysis. Even though zonal current and salinity observations are not assimilated, they are impacted by temperature observation assimilation. Some aspects of zonal current variations are improved by the analyses. For example, compared with the TAO ADCP data, the analyses are generally closer to the observation than the CTL above the equatorial undercurrent core. However, below the undercurrent core, the CTL current is 2 often closer to observations. Salinity bias is considerably reduced below the thermocline in the GMAO analysis, compared with the independent salinity data from the TAO servicing cruises. The salinity near the surface in the GMAO analysis is degraded due to the inappropriate use of the synthetic salinity data within the mixed layer. The GFDL analysis, which does not update salinity, has large salinity errors with peak RMSD close to 1.0 psu. To discern the impact of the forcing and different methods of updating salinity, a sensitivity study is also undertaken with the GMAO assimilation system. An additional forcing dataset are used, and another scheme to modify the salinity field is tested. This salinity update scheme was developed by Troccoli and Haines 1999 (denoted by Tscheme'). Our results show that both forcing and assimilation scheme impact the ocean analysis. Both assimilated field (i.e., temperature) and fields that are not directly observed and assimilated (i.e., salinity and currents) are impacted. Forcing appears to have more impact near the surface (above the core of the equatorial undercurrent), while the salinity treatment is more important below the surface that is directly influenced by forcing. Overall, the TS-scheme is most effective in correcting model bias in salinity and improving the current structure.

Author

*Ocean Data Acquisitions Systems; Sensitivity; Ocean Models; Geophysics; Weather*

## 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*.

**20080008719** California Inst. of Tech., Pasadena, CA USA

#### **Bacillus pumilus SAFR-032 isolate**

Venkateswaran, Kasthuri J., Inventor; August 28, 2007; 9 pp.; In English

Patent Info.: Filed May 6, 2005; US-Patent-7,262,047; US-Patent-Appl-SN-11/124,414; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008719>

The present invention relates to discovery and isolation of a biologically pure culture of a *Bacillus pumilus* SAFR-032 isolate with UV sterilization resistant properties. This novel strain has been characterized on the basis of phenotypic traits, 16S rDNA sequence analysis and DNA-DNA hybridization. According to the results of these analyses, this strain belongs to the genus *Bacillus*. The GenBank accession number for the 16S rDNA sequence of the *Bacillus pumilus* SAFR-032 isolate is AY167879.

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

*Bacillus; Deoxyribonucleic Acid; Isolation; Sterilization; Ultraviolet Radiation*

**20080008848** Science Systems and Applications, Inc., Bay Saint Louis, MS, USA

#### **Quantifying Airborne Allergen Levels Before and After Rain Events Using TRMM/GPM and Ground-Sampled Data**

Stewart, Randy M.; December 21, 2006; 4 pp.; In English

Contract(s)/Grant(s): NNS01AB54T

Report No.(s): SSTI-2220-0148; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008848>

Allergies affect millions of Americans, increasing health risks and also increasing absenteeism and reducing productivity



in the workplace. Outdoor allergens, such as airborne pollens and mold spores, commonly trigger respiratory distress symptoms, but rainfall reduces the quantity of allergens in the air (EPA, 2003). The current NASA Tropical Rainfall Measuring Mission provides accurate information related to rain events. These capabilities will be further enhanced with the future Global Precipitation Measurement mission. This report examines the effectiveness of combining these NASA resources with established ground-based allergen/spore sampling systems to better understand the benefits that rain provides in removing allergens and spores from the air.

Author

*Allergic Diseases; Ground Tests; Precipitation (Meteorology); Rain; Pollen; Actuators*

**20080009434** California Inst. of Tech., Pasadena, CA USA

**Method bacterial endospore quantification using lanthanide dipicolinate luminescence**

Ponce, Adrian, Inventor; Venkateswaran, Kasthuri J., Inventor; Kirby, James Patrick, Inventor; December 11, 2007; 12 pp.; In English

Contract(s)/Grant(s): NAS7-1407

Patent Info.: Filed November 27, 2002; US-Patent-7,306,930; US-Patent-Appl-SN-10/306,331; No Copyright; Avail.:

CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009434>

A lanthanide is combined with a medium to be tested for endospores. The dipicolinic acid released from the endospores binds the lanthanides, which have distinctive emission (i.e., luminescence) spectra, and are detected using photoluminescence. The concentration of spores is determined by preparing a calibration curve generated from photoluminescence spectra of lanthanide complex mixed with spores of a known concentration. A lanthanide complex is used as the analysis reagent, and is comprised of lanthanide ions bound to multidentate ligands that increase the dipicolinic acid binding constant through a cooperative binding effect with respect to lanthanide chloride. The resulting combined effect of increasing the binding constant and eliminating coordinated water and multiple equilibria increase the sensitivity of the endospore assay by an estimated three to four orders of magnitude over prior art of endospore detection based on lanthanide luminescence.

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

*Rare Earth Elements; Luminescence; Bacteria; Spores; Detection; Sterilization*

**20080009466** Wyoming Univ., Laramie, WY USA

**Template reporter bacteriophage platform and multiple bacterial detection assays based thereon**

Goodridge, Lawrence, Inventor; July 17, 2007; 9 pp.; In English

Contract(s)/Grant(s): NCC5-578

Patent Info.: Filed October 7, 2005; US-Patent-7,244,612; US-Patent-Appl-SN-11/246,779; No Copyright; Avail.: CASI:

[A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009466>

The invention is a method for the development of assays for the simultaneous detection of multiple bacteria. A bacteria of interest is selected. A host bacteria containing plasmid DNA from a T even bacteriophage that infects the bacteria of interest is infected with T4 reporter bacteriophage. After infection, the progeny bacteriophage are plating onto the bacteria of interest. The invention also includes single-tube, fast and sensitive assays which utilize the novel method.

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

*Bacteria; Bacteriophages; Templates*

**20080009496** California Inst. of Tech., Pasadena, CA USA

**Bacillus odysseyi isolate**

Venkateswaran, Kasthuri, Inventor; La Duc, Myron Thomas, Inventor; March 13, 2007; 11 pp.; In English

Contract(s)/Grant(s): NAS7-1407

Patent Info.: Filed January 17, 2004; US-Patent-7,189,556; US-Patent-Appl-SN-10/759,327; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009496>

The present invention relates to discovery and isolation of a biologically pure culture of a *Bacillus odysseyi* isolate with high adherence and sterilization resistant properties. *B. odysseyi* is a round spore forming *Bacillus* species that produces an exosporium. This novel species has been characterized on the basis of phenotypic traits, 16S rDNA sequence analysis and DNA-DNA hybridization. According to the results of these analyses, this strain belongs to the genus *Bacillus* and the type

strain is 34hs-1.sup.T (=ATCC PTA-4993.sup.T=NRRL B-30641.sup.T=NBRC 100172.sup.T). The GenBank accession number for the 16S rDNA sequence of strain 34hs-1.sup.T is AF526913.

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

*Bacillus; Isolation; Cell Culturing*

**20080009498** Wisconsin Alumni Research Foundation, Madison, WI USA

**Struvite crystallization**

Barak, Phillip W., Inventor; Tabanpour, Menachem E., Inventor; Avila-Segura, Mauricio, Inventor; Meyer, Juliane M., Inventor; February 27, 2007; 28 pp.; In English

Patent Info.: Filed July 28, 2004; US-Patent-7,182,872; US-Patent-Appl-SN-10/710,686; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009498>

The present invention provides a method and apparatus for removing phosphorus from phosphorus containing waste. In one embodiment, the method is preferably carried out by contacting the phosphorus containing waste with a non-cellular membrane and precipitating phosphorus from the waste as struvite. Another aspect of the invention includes a method of removing phosphorus from phosphorus containing sewage comprising filtrates and biosolids. The removal of phosphorus as struvite occurs in two stages as primary and secondary removal. In the primary removal process, the sewage from a dewatering unit is contacted with a first polymeric membrane reactor and the phosphorus is removed as primary struvite. Subsequently Mg is added so as to promote struvite formation and the secondary removal process of struvite. In the secondary removal process, the sewage from GBT Filtrate well or Centrifuge Liquor well is contacted with a second monomolecular membrane and the phosphorus is removed as secondary struvite.

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

*Crystallization; Phosphorus; Wastes*

**20080009499** Vermont Univ., Burlington, VT USA

**Whole-body mathematical model for simulating intracranial pressure dynamics**

Lakin, William D., Inventor; Penar, Paul L., Inventor; Stevens, Scott A., Inventor; Tranmer, Bruce I., Inventor; February 27, 2007; 29 pp.; In English

Contract(s)/Grant(s): NGT5-40110; NCC5-581

Patent Info.: Filed September 9, 2003; US-Patent-7,182,602; US-Patent-Appl-SN-10/658,638; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009499>

A whole-body mathematical model (10) for simulating intracranial pressure dynamics. In one embodiment, model (10) includes 17 interacting compartments, of which nine lie entirely outside of intracranial vault (14). Compartments (F) and (T) are defined to distinguish ventricular from extraventricular CSF. The vasculature of the intracranial system within cranial vault (14) is also subdivided into five compartments (A, C, P, V, and S, respectively) representing the intracranial arteries, capillaries, choroid plexus, veins, and venous sinus. The body's extracranial systemic vasculature is divided into six compartments (I, J, O, Z, D, and X, respectively) representing the arteries, capillaries, and veins of the central body and the lower body. Compartments (G) and (B) include tissue and the associated interstitial fluid in the intracranial and lower regions. Compartment (Y) is a composite involving the tissues, organs, and pulmonary circulation of the central body and compartment (M) represents the external environment.

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

*Intracranial Pressure; Mathematical Models; Simulation*

**20080009501** Regenetech, Inc., Sugar Land, TX USA

**Apparatus for enhancing tissue repair in mammals**

Goodwin, Thomas J., Inventor; Parker, Clayton R., Inventor; February 20, 2007; 6 pp.; In English

Patent Info.: Filed June 29, 2005; US-Patent-7,179,217; US-Patent-Appl-SN-11/169,614; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009501>

An apparatus is disclosed for enhancing tissue repair in mammals, with the apparatus comprising: a sleeve for encircling a portion of a mammalian body part, said sleeve comprising an electrically conductive coil capable of generating an electromagnetic field when an electrical current is applied thereto, means for supporting the sleeve on the mammalian body

part; and means for supplying the electrically conductive coil with a square wave time varying electrical current sufficient to create a time varying electromagnetic force of from approximately 0.05 gauss to 0.05 gauss within the interior of the coil in order that when the sleeve is placed on a mammalian body part and the time varying electromagnetic force of from approximately 0.05 gauss to 0.05 gauss is generated on the mammalian body part for an extended period of time, tissue regeneration within the mammalian body part is increased to a rate in excess of the normal tissue regeneration rate that would occur without application of the time varying electromagnetic force.

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

*Tissues (Biology); Mammals*

**20080009513** Space Hardware Optimization Technology, Inc., Greenville, IN USA

**Apparatus and method for centrifugation and robotic manipulation of samples**

Vellinger, John C., Inventor; Ormsby, Rachel A., Inventor; Kennedy, David J., Inventor; Thomas, Nathan A., Inventor; Shulthise, Leo A., Inventor; Kurk, Michael A., Inventor; Metz, George W., Inventor; August 28, 2007; 33 pp.; In English  
Contract(s)/Grant(s): NAS2-96022

Patent Info.: Filed October 15, 2002; US-Patent-7,261,860; US-Patent-Appl-SN-10/270,977; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009513>

A device for centrifugation and robotic manipulation of specimen samples, including incubating eggs, and uses thereof are provided. The device may advantageously be used for the incubation of avian, reptilian or any type of vertebrate eggs. The apparatus comprises a mechanism for holding samples individually, rotating them individually, rotating them on a centrifuge collectively, injecting them individually with a fixative or other chemical reagent, and maintaining them at controlled temperature, relative humidity and atmospheric composition. The device is applicable to experiments involving entities other than eggs, such as invertebrate specimens, plants, microorganisms and molecular systems.

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

*Centrifuging; Robotics; Microorganisms; Vertebrates*

**20080009524** NASA, Washington, DC USA

**Production of functional proteins: balance of shear stress and gravity**

Goodwin, Thomas John, Inventor; Hammond, Timothy Grant, Inventor; Kaysen, James Howard, Inventor; April 3, 2007; 30 pp.; In English

Patent Info.: Filed December 11, 2003; US-Patent-7,198,947; US-Patent-Appl-SN-10/734,759; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009524>

The present invention provides a method for production of functional proteins including hormones by renal cells in a three dimensional co-culture process responsive to shear stress using a rotating wall vessel. Natural mixture of renal cells expresses the enzyme 1- $\alpha$ -hydroxylase which can be used to generate the active form of vitamin D: 1,25-diOH vitamin D<sub>3</sub>. The fibroblast cultures and co-culture of renal cortical cells express the gene for erythropoietin and secrete erythropoietin into the culture supernatant. Other shear stress response genes are also modulated by shear stress, such as toxin receptors megalin and cubulin (gp280). Also provided is a method of treating in-need individual with the functional proteins produced in a three dimensional co-culture process responsive to shear stress using a rotating wall vessel.

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

*Protein Synthesis; Gravitation; Shear Stress*

**20080009557** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Examining Meteorological and Environmental Dependency of Malaria Transmissions in Thailand Provinces Using Neural Network**

Kiang, Richard; Adimi, Arida; Soika, Valerii; Nigro, Joseph; Singhasivanon, Pratap; Sirichaisinthop, Jeeraphat; Leemingsawat, Somjai; Apiwathnasorn, Chamnarn; Looareesuwan, Sornchai; [2006]; 18 pp.; In English; Copyright;

Avail.: Other Sources

Human experiences have shown that meteorological conditions are important factors for malaria outbreaks and epidemics. For example, in many malarious regions malaria transmission roughly coincide with rainy seasons, which provide for more abundant larval habitats. In addition to precipitation, other meteorological and environmental factors, may also influence malaria transmission. These factors can be remotely sensed and estimated with seasonal climate forecast. Remote sensing

usage as an early warning for malaria epidemics have been broadly studied in recent years, especially for Africa, where the majority of world's malaria occurs. Although the Greater Mekong Subregion (GMS), which includes Thailand and the surrounding countries, is an epicenter of multidrug resistant falciparum malaria, the meteorological and environmental factors affecting malaria transmissions in the GMS have not been examined in details. In this study, we used the monthly malaria epidemiology data at provincial level compiled by the Thai Ministry of Public Health. Precipitation, temperature, relative humidity, and vegetation index obtained from both climate time series and satellite measurements were used as independent variables to model malaria cases. We used neural network methods, an artificial intelligence technique, to model the dependency of malaria transmission on these variables. The average training accuracy for the 3 most endemic provinces - Kanchanaburi, Mae Hong Son, and Tak - is 72.8% and the average testing accuracy is 62.9% based on the 1994-1999 data. More complex neural network architecture resulted in higher training accuracy and also lower testing accuracy. Taking into account of the uncertainty in the reported malaria cases, we divided the malaria cases into bands to compute training accuracy. Using the same neural network architecture on the 19 most endemic provinces for years 1994 to 2000, the mean training accuracy weighted by provincial malaria cases is 73%.

Author

*Meteorological Parameters; Parasitic Diseases; Time Series Analysis; Early Warning Systems; Forecasting; Neural Nets; Public Health*

## 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*.

**20080008858** NASA Glenn Research Center, Cleveland, OH, USA

#### **Physical Laws for Mechanobiology**

Freed, Alan D.; December 2007; 29 pp.; In English

Report No.(s): NASA/TM-2007-214827; E-16019; SAA 3-731; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008858>

Higher-level physical laws applicable to biological tissues are presented that will permit the modeling of metabolic activity at the cellular level, including variations in the mass of a tissue. Here the tissue is represented as a fluid/solid mixture, wherein molecular solutes transport within the fluid, and cells can migrate throughout the porous solid. Variations in mass can arise via exchanges in mass between the constituent phases within a control volume such that mass is conserved in the tissue overall. The governing balance laws for mass, momentum, energy, and entropy are a special case of those describing a chemically reacting mixture with diffusion. Thermodynamic constraints on the constitutive structure are addressed. Biophysics; Biomechanics; Brownian motion; Cell migration; Mixture theory; Thermodynamic laws; Tissue mechanics

Author

*Biophysics; Brownian Movements; Tissues (Biology); Thermodynamics; Metabolism; Biodynamics*

**20080009021** NASA Johnson Space Center, Houston, TX, USA

#### **Supine Lower Body Negative Pressure Exercise Maintains Upright Exercise Capacity in Male Twins during 30 Days of Bed Rest**

Lee, Stuart M. C.; Schneider, Suzanne M.; Boda, Wanda L.; Watenpaugh, Donald E.; Macias, Brandon R.; Meyer, R. Scott; Hagens, Alan R.; [2006]; 9 pp.; In English

Contract(s)/Grant(s): NAS9-02078; 199-26-12-34; Copyright; Avail.: CASI: [A02](#), Hardcopy

Exercise capacity is reduced following both short and long duration exposures to microgravity. We have shown previously that supine lower body negative pressure with exercise (LBNP(sub ex)) maintains upright exercise capacity in men after 5d and 15d bed rest, as a simulation of microgravity. We hypothesized that LBNP(sub ex) would protect upright exercise capacity (VO<sub>2</sub>pk) and sprint performance in eight sets of identical male twins during a 30-d bed rest. Twins within each set were randomly assigned to either a control group (CON) who performed no exercise or to an exercise group (EX) who performed a 40-min interval (40-80% pre-BR VO<sub>2</sub>pk) LBNP(sub ex) (55+/-4 mmHg) exercise protocol, plus 5 min of resting LBNP, 6 d/wk. LBNP produced footward force equivalent to 1.0- 1.2 times body weight. Pre- and post-bed rest, subjects completed an upright graded exercise test to volitional fatigue and sprint test of 30.5 m. After bed rest, VO<sub>2</sub>pk was maintained in the EX subjects (-3+/-3%), but was significantly decreased in the CON subjects (-24+/-4%). Sprint time also was increased in the

CON subjects (24+/-8%), but maintained in the EX group (8+/-2%). The performance of a supine, interval exercise protocol with LBNP maintains upright exercise capacity and sprint performance during 30 d of bed rest. This exercise countermeasure protocol may help prevent microgravity-induced deconditioning during long duration space flight.

Author

*Lower Body Negative Pressure; Body Weight; Bed Rest; Fatigue Tests; Physical Exercise; Microgravity; Long Duration Space Flight; Deconditioning*

**20080009022** NASA Johnson Space Center, Houston, TX, USA

**Twins Bed Rest Project: LBNP/Exercise Minimizes Changes in Lean Leg Mass, Strength and Endurance**

Amorim, Fabiano T.; Schneider, Suzanne M.; Lee, Stuart M. C.; Boda, Wanda L.; Watenpugh, Donald E.; Hargens, Alan R.; May 31, 2006; 1 pp.; In English; American College of Sports Medicine Annual Meeting, 31 May - 3 Jun. 2006, Denver, CO, USA

Contract(s)/Grant(s): NAS9-02078; NAG9-1425; NIH-MO1-RR00827; Copyright; Avail.: CASI: A01, Hardcopy

Decreases in muscle strength and endurance frequently are observed in non-weightbearing conditions such as bed rest (BR), spaceflight or limb immobilization. Purpose: Our purpose was to determine if supine treadmill exercise against simulated gravity, by application of lower body negative pressure (LBNP), prevents loss of lean leg mass, strength and endurance during 30 d of 6deg head-down bed rest (BR). Methods: Fifteen pairs of monozygous twins (8 male, 7 female pairs; 26+/-4 yrs; 170+/-12 cm; 62.6+/-11.3 kg; mean+/-SD) were subjects in the present study. One sibling of each pair of twins was randomly assigned to either an exercise (EX) or non-exercise (CON) group. The EX twin walked/jogged on a vertical treadmill within LBNP chamber 6 d/wk using a 40-min interval exercise protocol at 40-80% of pre-BR VO(sub 2peak). LBNP was adjusted individually for each subject such that footward force was between 1.0 and 1.2 times body weight (-53+/-5 mmHg LBNP). The CON twin performed no exercise during BR. Subjects performed isokinetic knee (60 and 120deg/s) and ankle (60deg/s) testing to assess strength and endurance (End) before and after BR. They also had their lean leg mass (L(sub mass)) evaluated by DEXA before and after BR. Results: Changes in peak torque (T(sub pk)) were smaller for flexion (flex) than for extension (ext) after BR and did not differ between groups. The CON group had larger decreases (P<0.05) in L(sub mass), knee and ankle ext T(sub pk), and knee ext End.

Author

*Lower Body Negative Pressure; Body Weight; Bed Rest; Physical Exercise; Immobilization; Muscles; Gravitation*

**20080009588** NASA Johnson Space Center, Houston, TX, USA

**Effects of 21 Days of Bed Rest, With or Without Artificial Gravity, on Nutritional Status of Humans**

Smith, Scott M.; Zwart, S. R.; Crawford, G. E.; Gillman, P. R.; Kala, G.; Rodgers, A. S.; Rogers, A.; Inniss, A. M.; Rice, B. L.; Ericson, K.; Coburn, S.; Bourbeau, Y.; Hudson, E.; Booth, S. L.; DeKerlegand, D. E.; Sams, C. F.; Heer, M. A.; Smith, S. M.; January 2008; 35 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Spaceflight and bed rest models of microgravity have profound effects on physiological systems, including the cardiovascular, musculoskeletal, and immune systems. These effects can be exacerbated by sub-optimal nutrient status, and therefore it is critical to monitor nutritional status when evaluating countermeasures to mitigate negative effects of spaceflight. As part of a larger study to investigate the usefulness of artificial gravity as a countermeasure for musculoskeletal and cardiovascular deficits during bed rest, we tested the hypothesis that artificial gravity would have a negative effect on some aspects of nutritional status. Dietary intake was recorded daily before, during, and after 21 days of bed rest with artificial gravity (n=8) or bed rest alone (n=7). We examined body composition, hematology, general blood chemistry, markers of oxidative damage, and blood levels of selected vitamins and minerals before, during, and after the bed rest period. Several indicators of vitamin status changed in response to diet changes: serum - and -tocopherol decreased (P < 0.001), and plasma -carotene increased (P < 0.001), and urinary 4-pyridoxic acid decreased (P < 0.001) in both groups during bed rest compared to before bed rest. Hematocrit decreased (P < 0.001) in response to bed rest, and this was accompanied by a decrease in transferrin (P < 0.001), but transferrin receptors were not changed. Urinary 4-pyridoxic acid decreased (P < 0.001) in response to bed rest and diet changes. Group differences were not significant for any of the variables measured, and many of the changes in nutritional status reflected changes in dietary intake in a similar direction. These data provide evidence that artificial gravity itself does not negatively affect nutritional status during bed rest. Key words: microgravity; countermeasure; vitamin E; beta-carotene; vitamin B6

Author

*Bed Rest; Microgravity; Cardiovascular System; Countermeasures; Musculoskeletal System; Immune Systems; Hematology; Chemical Composition; Artificial Gravity*



**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*.

**20080008837** NASA Langley Research Center, Hampton, VA, USA

**Advanced Control Algorithms for Compensating the Phase Distortion Due to Transport Delay in Human-Machine Systems**

Guo, Liwen; Cardullo, Frank M.; Kelly, Lon C.; December 2007; 180 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNL06AA74T; WBS 160961.01.01.01

Report No.(s): NASA/CR-2007-215095; Copyright; Avail.: CASI: [A09](#), Hardcopy

The desire to create more complex visual scenes in modern flight simulators outpaces recent increases in processor speed. As a result, simulation transport delay remains a problem. New approaches for compensating the transport delay in a flight simulator have been developed and are presented in this report. The lead/lag filter, the McFarland compensator and the Sobiski/Cardullo state space filter are three prominent compensators. The lead/lag filter provides some phase lead, while introducing significant gain distortion in the same frequency interval. The McFarland predictor can compensate for much longer delay and cause smaller gain error in low frequencies than the lead/lag filter, but the gain distortion beyond the design frequency interval is still significant, and it also causes large spikes in prediction. Though, theoretically, the Sobiski/Cardullo predictor, a state space filter, can compensate the longest delay with the least gain distortion among the three, it has remained in laboratory use due to several limitations. The first novel compensator is an adaptive predictor that makes use of the Kalman filter algorithm in a unique manner. In this manner the predictor can accurately provide the desired amount of prediction, while significantly reducing the large spikes caused by the McFarland predictor. Among several simplified online adaptive predictors, this report illustrates mathematically why the stochastic approximation algorithm achieves the best compensation results. A second novel approach employed a reference aircraft dynamics model to implement a state space predictor on a flight simulator. The practical implementation formed the filter state vector from the operator's control input and the aircraft states. The relationship between the reference model and the compensator performance was investigated in great detail, and the best performing reference model was selected for implementation in the final tests. Theoretical analyses of data from offline simulations with time delay compensation show that both novel predictors effectively suppress the large spikes caused by the McFarland compensator. The phase errors of the three predictors are not significant. The adaptive predictor yields greater gain errors than the McFarland predictor for short delays (96 and 138 ms), but shows smaller errors for long delays (186 and 282 ms). The advantage of the adaptive predictor becomes more obvious for a longer time delay. Conversely, the state space predictor results in substantially smaller gain error than the other two predictors for all four delay cases.

Author

*Algorithms; Flight Simulators; Man Machine Systems; Time Lag; In-Flight Simulation; Compensators*

**20080008838** NASA Langley Research Center, Hampton, VA, USA

**Advanced Transport Delay Compensation Algorithms: Results of Delay Measurement and Piloted Performance Tests**

Guo, Liwen; Cardullo, Frank M.; Kelly, Lon C.; December 2007; 196 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNL06AA74T; WBS 160961.01.01.01

Report No.(s): NASA/CR-2007-215096; Copyright; Avail.: CASI: [A09](#), Hardcopy

This report summarizes the results of delay measurement and piloted performance tests that were conducted to assess the effectiveness of the adaptive compensator and the state space compensator for alleviating the phase distortion of transport delay in the visual system in the VMS at the NASA Langley Research Center. Piloted simulation tests were conducted to assess the effectiveness of two novel compensators in comparison to the McFarland predictor and the baseline system with no compensation. Thirteen pilots with heterogeneous flight experience executed straight-in and offset approaches, at various delay configurations, on a flight simulator where different predictors were applied to compensate for transport delay. The glideslope and touchdown errors, power spectral density of the pilot control inputs, NASA Task Load Index, and Cooper-Harper rating of the handling qualities were employed for the analyses. The overall analyses show that the adaptive predictor results in

slightly poorer compensation for short added delay (up to 48 ms) and better compensation for long added delay (up to 192 ms) than the McFarland compensator. The analyses also show that the state space predictor is fairly superior for short delay and significantly superior for long delay than the McFarland compensator.

Author

*Algorithms; Compensators; Flight Simulators; Cooper-Harper Ratings; Pilot Performance; Performance Tests*

**20080008853** NASA Ames Research Center, Moffett Field, CA, USA; San Jose State Univ., San Jose, CA, USA

**Improved Linear Algebra Methods for Redshift Computation from Limited Spectrum Data - II**

Foster, Leslie; Waagen, Alex; Aijaz, Nabella; Hurley, Michael; Luis, Apolo; Rinsky, Joel; Satyavolu, Chandrika; Gazis, Paul; Srivastava, Ashok; Way, Michael; January 2008; 53 pp.; In English; Original contains color and black and white illustrations Report No.(s): NASA/TM-2008-214571; 18-01-2008; Copyright; Avail.: CASI: [A04](#), Hardcopy

Given photometric broadband measurements of a galaxy, Gaussian processes may be used with a training set to solve the regression problem of approximating the redshift of this galaxy. However, in practice solving the traditional Gaussian processes equation is too slow and requires too much memory. We employed several methods to avoid this difficulty using algebraic manipulation and low-rank approximation, and were able to quickly approximate the redshifts in our testing data within 17 percent of the known true values using limited computational resources. The accuracy of one method, the V Formulation, is comparable to the accuracy of the best methods currently used for this problem.

Author

*Algebra; Red Shift; Computation; Photometry; Spectra; Broadband*

**20080009469** Advanced Fuel Research, Inc., East Hartford, CT USA

**Pyrolysis process for producing fuel gas**

Serio, Michael A., Inventor; Kroo, Erik, Inventor; Wojtowicz, Marek A., Inventor; Suuberg, Eric M., Inventor; July 10, 2007; 13 pp.; In English

Contract(s)/Grant(s): NAS2-99001; NAS2-00007

Patent Info.: Filed January 10, 2006; US-Patent-7,241,323; US-Patent-Appl-SN-11/328,921; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009469>

Solid waste resource recovery in space is effected by pyrolysis processing, to produce light gases as the main products (CH<sub>4</sub>, H<sub>2</sub>, CO<sub>2</sub>, CO, H<sub>2</sub>O, NH<sub>3</sub>) and a reactive carbon-rich char as the main byproduct. Significant amounts of liquid products are formed under less severe pyrolysis conditions, and are cracked almost completely to gases as the temperature is raised. A primary pyrolysis model for the composite mixture is based on an existing model for whole biomass materials, and an artificial neural network models the changes in gas composition with the severity of pyrolysis conditions.

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

*Gas Recovery; Pyrolysis; Solid Wastes; Biomass Energy Production; Neural Nets*

**20080009582** Engineering and Science Contract Group, Houston, TX, USA

**Test Analysis Guidelines**

Jeng, Frank F.; November 15, 2007; 8 pp.; In English

Report No.(s): ESCG-4470-07-TEAN-DOC-0173; Copyright; Avail.: CASI: [A02](#), Hardcopy

Development of analysis guidelines for Exploration Life Support (ELS) technology tests was completed. The guidelines were developed based on analysis experiences gained from supporting Environmental Control and Life Support System (ECLSS) technology development in air revitalization systems and water recovery systems. Analyses are vital during all three phases of the ELS technology test: pre-test, during test and post test. Pre-test analyses of a test system help define hardware components, predict system and component performances, required test duration, sampling frequencies of operation parameters, etc. Analyses conducted during tests could verify the consistency of all the measurements and the performance of the test system. Post test analyses are an essential part of the test task. Results of post test analyses are an important factor in judging whether the technology development is a successful one. In addition, development of a rigorous model for a test system is an important objective of any new technology development. Test data analyses, especially post test data analyses, serve to verify the model. Test analyses have supported development of many ECLSS technologies. Some test analysis tasks in ECLSS technology development are listed in the Appendix. To have effective analysis support for ECLSS technology tests, analysis guidelines would be a useful tool. These test guidelines were developed based on experiences gained through previous

analysis support of various ECLSS technology tests. A comment on analysis from an experienced NASA ECLSS manager (1) follows: 'Bad analysis was one that bent the test to prove that the analysis was right to begin with. Good analysis was one that directed where the testing should go and also bridged the gap between the reality of the test facility and what was expected on orbit.'

Derived from text

*Life Support Systems; Environmental Control; Water Reclamation; Data Reduction; Data Processing*

## 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*.

**20080008582** IPSI BgD Internet Research Society, New York, NY, USA

#### **The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2**

Milutinovic, Veljko, Editor; Adell, Hojjat, Editor; Blaisten-Barojas, Estela, Editor; Crips, Bob, Editor; Domenici, Andrea, Editor; Flynn, Michael, Editor; Fujii, Hironori, Editor; Ganascia, Jean-Luc, Editor; Gonzaloz, Victor, Editor; Janicic, Predrag, Editor, et al.; July 2006; ISSN 1820-4511; 80 pp.; In English; See also 20080008583 - 20080008591; Original contains black and white illustrations; Copyright; Avail.: CASI: [A05](#), Hardcopy

Topics covered include: Knowledge Markets: More than Providers and Users; A Brain Programmer for Increasing Human Information Processing; A Hybrid DCT-SVD Video Compression Technique HDCTSVD Building Secure Network Infrastructure for LANs; Development of Methodology for E-materials Making and Integration as Support to E-Education; Power Loading in MIMO Multicarrier Transmission Systems for Multi-Pair Cables; A Large Scale, Distributed, Iterated Prisoner's Dilemma Simulation; Business Oriented OSS for NGN; and A Hybrid DWTSVD Image-Coding System.

Derived from text

*Local Area Networks; Coding; MIMO (Control Systems); Video Compression; Education; Programmers*

**20080008583** Sheffield Hallam Univ., Sheffield, UK

#### **Business Oriented OSS for NGN**

Akhgar, B.; Munoz, M. G. Juan; Lopez, A. L. Jose; Siddiqi, J.; Shah, H. Nazaraf; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2; July 2006, pp. 64-71; In English; See also [20080008582](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

The Operations Support Systems (OSS) of Telco service providers have proven to be a critical success factor for businesses as well as a key differentiator between competitive systems providers. Currently, several standards bodies, initiatives and projects attempt to deal with OSS issues concerning Next Generation Network (NGN). Unfortunately there is no coordinated view and actions in the Telco community that can influence these players in terms of participation, liaisons or partnerships issues- Moreover no common understanding exists amongst the Telco service providers of technological issues involved in NGN-OSS. This paper provides a comprehensive discussion and reports on the analysis of key topics that are crucial to meet the OSS requirements in order to address the challenges offered by NGN. These challenges include the use of Commercial off the Shelf components for process automation and systems development and a business view of operational issues.

Author

*Systems Engineering; Support Systems; Commercial Off-the-Shelf Products; Commerce*

**20080008584** Exxon Corp., Houston, TX, USA

#### **A Large Scale, Distributed, Iterated Prisoner's Dilemma Simulation**

Townsley, Michael B.; Weeks, Michael C.; Ragade, Rammohan K.; Kumar, Anup; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2; July 2006, pp. 58-63; In English; See also [20080008582](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

The Iterated Prisoner's Dilemma (IPD) is a classic construct, used to explain the nature of cooperative/noncooperative behavior in society. One way to simulate the iterated prisoner's dilemma is with a genetic algorithm to evolve the population

of prisoner s dilemma players to their maximum potential. However, the limitations of computational power are a large factor in the ability to run very large simulations, and gather accurate and useful statistics. This simulation is an obvious candidate for addressing problems in parallel and distributed computing. This paper will first demonstrate that a population of IPD players will develop cooperation over successive generations. This work is concerned with implementing a large simulation of mobile IPD players, across a network of machines. We present implementation considerations for such simulations and the resulting impacts of parallelizing on the simulation. Index Terms - distributed computing, genetic algorithm, iterated prisoner s dilemma

Author

*Parallel Processing (Computers); Genetic Algorithms; Populations; Distributed Parameter Systems*

**20080008585** Texas Univ., Arlington, TX, USA

#### **A Hybrid DCT-SVD Video Compression Technique HDCTSVD**

Tong, Lin; Rao, K. R.; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2; July 2006, pp. 27-31; In English; See also [20080008582](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

A new hybrid DCT-SVD (HDCTSVD) video compression technique is proposed in this paper. Discrete cosine transform (DCT) is widely used in video coding due to its high energy compaction and efficient computation complexity, singular value decomposition (SVD) is a transform that provides optimal energy compaction for any data. DCT and SVD are combined to achieve optimal performance of the transform part in the proposed video compression technique. SVD is used only for the blocks for which DCT cannot provide good compression. The decision criterion is set in the DCT domain. By dropping a certain number of coefficients in the DCT domain, the energy loss is calculated. Whether or not sending the block to SVD domain is based on the energy loss. The simulation shows that the proposed Hybrid DCT-SVD system provides good performance for both intra frame coding and inter frame coding.

Author

*Video Compression; Discrete Cosine Transform; Coding; Vector Quantization; Frames (Data Processing); Computation*

**20080008586** Belgrade Univ., Serbia

#### **A Brain Programmer for Increasing Human Information Processing**

Chai, Songhai; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2; July 2006, pp. 15-20; In English; See also [20080008582](#)

Contract(s)/Grant(s): NIH-AG-09282-S1; Copyright; Avail.: CASI: [A02](#), Hardcopy

Brain programming has been used to increase human working memory capacity, also called processing resources, a major determinant of information processing efficiency. Previously only methods for decreasing working memory capacity existed. Brain programming increased the amount of information that could be handled by a person simultaneously or within a certain period of time, and resulted in improved accuracy or speed in processing of images (pattern recognition), words and math problems. Analyses of variance of error rate and response time revealed a significant effect of the brain programmer, as compared with music used as a control. The pattern of the effects of the brain programmer on error rate and response time was consistent with an increase in the capacity of working memory. This research shows that the capacity of working memory, acting as information processing resources, plays an important part in ordinary cognitive performances, and can be improved by brain programming.

Author

*Pattern Recognition; Data Processing; Image Processing; Human Performance; Programmers*

**20080008587** Hong Kong Univ., Hong Kong

#### **Building Secure Network Infrastructure for LANs**

Yeung, K. Hau; Leung, T. Chuen; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2; July 2006, pp. 32-37; In English; See also [20080008582](#); Original contains black and white illustrations

Contract(s)/Grant(s): 7001764; Copyright; Avail.: CASI: [A02](#), Hardcopy

This paper discusses the building of secure network infrastructure for local area networks. It first gives the main reason why by nature today s network infrastructure is insecure. A new kind of Ethernet switches, called Network Infrastructure Switches (NI-Switches), is then proposed for building secure network infrastructure for LANs. NI-Switches effectively isolate important network signaling from being accessed by unauthorized end computers of a network. To study the feasibility of the

proposed techniques, a prototype of NI-Switch was developed by using a Linksys broadband router. Experiments on the NI-Switch were carried out under different networking situations. The results show that without disturbing the normal network operations, the NCSwitch can effectively filter out network infrastructure signals. The results also show that although most signaling protocols (like Hot Standby Router Protocol) were designed with the inband assumption, NI-Switches can still effectively isolate them from being access by end Computers.

Author

*Local Area Networks; Broadband; Protocol (Computers); Switches; Ethernet; Computers*

**20080008589** Natural Resources Canada, Canada

**Knowledge Markets: More than Providers and Users**

Simard, Albert; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2; July 2006, pp. 3-9; In English; See also [20080008582](#); Copyright; Avail.:

CASI: [A02](#), Hardcopy

This paper describes a knowledge-market model intended to facilitate transforming science-based departments to a service perspective. Existing provider/user models mask the true complexity of knowledge services. The proposed model comprises nine stages that embed, advance, or extract value. Model design criteria include independence from content, an organizational focus, scalability, two drivers, and two levels of resolution. A task group, combining 190 years of scientific experience and tacit knowledge, explored the nature of knowledge services and discovered patterns to understand underlying processes. The paper concludes that a cyclic value-chain-based knowledge-market model is richer than existing models, it supports both supply and demand approaches to knowledge markets, and it describes knowledge services adequately to enable eventual measurement and management. index Terms- knowledge Organization, knowledge services, knowledge markets, knowledge transfer, value chains, providers, users

Author

*Market Research; Embedding; Extraction; Models; Design Analysis*

**20080008590** Belgrade Univ., Serbia

**Development of Methodology for E-materials Making and Integration as Support to E-Education**

Despotovic, S. Marijana; Savic, M. Ana; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2; July 2006; 6 pp.; In English; See also [20080008582](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

This paper deals with the problems related to process of preparation and making of ematerials for needs of remote education and integration of educational processes and appropriate software applications, through organization of studies, realization of educational and research processes and content management. The paper describes the process of preparation and development of e-materials for needs of remote education, as well as the e-materials distribution management system, that is, the system for management of the entire learning process. Information technology development enables more efficient teaching through orientation on knowledge transfer instead of presentation, and more efficient studying using students' services subsystem and LMS. Paper considers an example of implementing this concept through the realization of faculty intranet and using LMS. An example of e-education process analysis and software components integration at the Faculty of Organizational Sciences, University of Belgrade, is given, too.

Author

*Education; Management Systems*

**20080008591** Ciudad Univ., Juarez, Mexico City, Mexico

**A Hybrid DWTSVD Image-Coding System**

Ochoa, Humberto; Rao, K. R.; Mireles, Jose; Hinostraza, Victor; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2; July 2006, pp. 72-77; In English; See also [20080008582](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

A system that combines techniques of DWT and SVD to encode images is presented. A successive approximations quantizer is used to encode the subbands and vector quantization/scalar quantization to encode the SVD eigenvectors/eigenvalues respectively. For coding color images, the RGB components are transformed into YCbCr before encoding in 4:2:0 format. Results show that the proposed system outperforms the JPEG and approaches JPEG2000. Index Terms- Wavelet



Transform, Singular Value Decomposition, HC-RIOT, SPIHT, Scalar Quantization, Vector Quantization, Image Coding, HDCTSVD.

Author

*Coding; Vector Quantization; Eigenvalues; Eigenvectors; Wavelet Analysis; Approximation*

**20080008592** Belgrade Univ., Serbia

**The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia)**

Milutinovic, Veljko, Editor; Hojjat, Adeli, Editor; Blaisten-Barojas, Estela, Editor; Crisp, Bob, Editor; Domenici, Andrea, Editor; Flynn, Michael, Editor; Fujii, Hironori, Editor; Ganascla, Jean-Luc, Editor; Gonzalez, Victor, Editor; Janicic, Predrag, Editor, et al.; July 2006; ISSN 1820-4503; 68 pp.; In English; See also 20080008593 - 20080008604; Original contains black and white illustrations; Copyright; Avail.: CASI: [A04](#), Hardcopy

Topics covered include: A Proposed Hybrid Approach for Patent Modeling; A Reflective Memory System for Personal Computers; Assembly Language in Modern Technologies still Faster than HLL: Myth or Reality; One Approach of Efficient Management of Zillion Signatures; Cache Clearing System; Data Assurance in a Conventional File System; Data Mining: A Brief Overview and Recent IPSI Research; Internet Application Testing; Patent Maps: A Simpler Way to Search Patents in the Light of Prior Art; SwanLink: Mobile P2P Environment for Graphical Content Management System; New Modifications of Selection Operator in Genetic Algorithms for the Traveling Salesman Problem; and Designing of an XPath Engine for P2P XML Store.

Derived from text

*Document Markup Languages; Genetic Algorithms; Memory (Computers); Patents; Assembly Language; Internets; Electrical Engineering*

**20080008593** Belgrade Univ., Serbia; Belgrade Univ., Serbia

**SwanLink: Mobile P2P Environment for Graphical Content Management System**

Bosnjakovic, Andrija; Minic, Predrag; Korolija, Nenad; Milutinovic, Veljko; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 47-52; In English; See also [20080008592](#); Copyright; Avail.: CASI: [A02](#), Hardcopy

This account describes major trends in the present, and what authors reckon as the future of distributed computing and on-line collaboration. It considers topology and communication protocols which will be used as standard in future distributed application. Analysis of everything that has spawned from Fred B. Holt and Virgil Bourassa original idea concerning methods for on-line collaboration based on regular graph topology is presented. After introductory part on current implementation and techniques related in this field, our solution is presented through the project which is a practical implementation of the ideas presented in this paper. Facts and dogma about modern computer infrastructure, communication protocols, and its reliability and scalability are discussed here. Author's point of view and vision of future work in this field of distributed application is also included.

Author

*On-Line Systems; Protocol (Computers); Trends; Communication Networks; Management Systems; Topology*

**20080008594** Belgrade Univ., Serbia

**New Modifications of Selection Operator in Genetic Algorithms for the Traveling Salesman Problem**

Radovic, Marija; Veljio, Miltinovic; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 53-58; In English; See also [20080008592](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

One of the algorithms used for solving Traveling Salesman Problem is the genetic algorithm. It consists of three important parts: Selection, Crossover, and Mutation. In this paper some of the important concepts and methods of Selection are described. The paper is divided in two sections. In the first one, some of the most popular selection methods are described and in the second one, some new ideas about improving selection methods using the Internet knowledge are presented.

Author

*Genetic Algorithms; Traveling Salesman Problem; Data Mining; Selection*

**20080008595** Belgrade Univ., Serbia

**Designing of an XPath Engine for P2P XML Store**

Jovic, Darko; Milutinovic, Veljko; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 59-62; In English; See also [20080008592](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

In the introductory part, this paper defines the general environment for this research and defines the terms of interest. Then we define the research problem: How to perform distributed XPath query execution in a P2P environment. Existing solutions to the problem are briefly surveyed, and their drawbacks are underlined; each surveyed piece of research is analyzed according to the same template. Then, the essence of the proposed solution is presented: implementation of an XPath engine which works in a P2P environment and performs distributed query execution. The conclusion is from the point of view of performance/complexity ratio.

Author

*Document Markup Languages; Query Languages; Templates; Distributed Parameter Systems*

**20080008596** Belgrade Univ., Serbia

**Data Mining: A Brief Overview and Recent IPSI Research**

Radiojevic, Zaharije; Cvetanovic, Milos; Milutinovic, Veljko; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 32-37; In English; See also [20080008592](#); Copyright; Avail.: CASI: [A02](#), Hardcopy

In the introductory part, this paper defines the general environment for this research and defines the terms of interest. Then we define the research problem: Information extraction from large amount of data. Efficient usage of data mining models and algorithms will be presented using the recent IPSI research as a case study. Existing solutions to the problem are briefly surveyed in the third part, and their drawbacks are underlined; each surveyed piece of research is analysed according to the same template. Then, the essence of the proposed solution is presented: a novel algorithm based on the K-nearest neighbor model has been developed. The algorithm is general enough to be considered as a common solution for a group of similar problems. On the other side, it is a good example on how data mining techniques could be efficiently used for reverse engineering problem types. The conclusion is from the point of view of performance/complexity ratio.

Author

*Data Mining; Data Retrieval; Reverse Engineering*

**20080008597** Belgrade Univ., Serbia

**Internet Application Testing**

Prijic, Aleksandar; Jovic, Darko; Milutinovic, Veljko; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 38-42; In English; See also [20080008592](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

In the introductory part, this paper defines the general environment for this research and defines the terms of interest. Then we define the research problem: How to find a proper testing solution that will guarantee debugging errors, which will give us reliable software product: this problem is important because it enables us to recognize some errors, which we are not conscious of. Existing solutions to the problem are briefly surveyed in the third part, and their drawbacks are underlined: each surveyed piece of research is analysed according to the same template. Then, the essence of the proposed solution is presented: As our proposal, we have developed a specific test framework, which as a result, brings significant improvement and speedup of the process of online game system functional testing. The main idea is to run tests from test environment JUnit. It is explained, on a concrete situation, which tests to perform, so we can be sure that the system works properly. The conclusion is from the point of view of performance/complexity ratio.

Author

*Applications Programs (Computers); Program Verification (Computers); On-Line Systems; Internets*

**20080008598** IPSI Belgrade, Belgrade, Serbia

**Assembly Language in Modern Technologies Still Faster than HLL: Myth or Reality**

Micic, Milos; Etinski, Maja; Milutinovic, Veljko; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results

from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 13-16; In English; See also [20080008592](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

When technologies change, realities change, as well. Many believe that advances in the technology of optimizing compilers cause the programming in a high-level language to create a faster code (compared to assembly language programming), due to the fact that individual programmers can never optimize their handwritten code as successfully as the optimizing compilers do it. This paper demonstrates that it is not always the case, and clarifies the issue for the case of a selected algorithm of importance for a number of modern applications. Architectural changes demonstrate how powerful can be the usage of advanced assembly instructions.

Author

*Assembly Language; High Level Languages; Compilers*

**20080008599** Belgrade Univ., Serbia

### **Data Assurance in a Conventional File System**

Rudan, Sasa; Kovacevic, Aleksandra; Milligan, Charles; Milutinovic, Veljko; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 27-31; In English; See also [20080008592](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

In the introductory part, this paper defines the general environment for this research and defines the terms of interest. Then we define the research problem: How to find a mechanism that guarantees that a file stored in a conventional file system, on disk, has not been modified; this problem is important because it enables security of the imperceptible changing of data which is the main problem with digital data acquisition. Existing solutions to the problem are briefly surveyed in the third part, and their drawbacks are underlined; each surveyed piece of research is analysed according to the same template. Then, the essence of the proposed solution is presented: our proposal is a smart card based Digital Sealed File System (DSFS). The conclusion is from the point of view of performance/complexity ratio.

Author

*Computer Information Security; Digital Data; Digital Systems*

**20080008600** Belgrade Univ., Serbia

### **A Reflective Memory System for Personal Computers**

Tomasevic, Milo; Protic, Jelica; Savic, Savo; Jovanovic, Milan; Grujic, Aleksandra; Milutinovic, Veljko; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 7-12; In English; See also [20080008592](#); Copyright; Avail.: CASI: [A02](#), Hardcopy

In the introductory part, this paper defines the general environment for this research and defines the terms of interest. Then we define the research problem: how to design a cost-effective board that connects a personal computer as a node in an RMS system and how to increase the efficiency of the basic RMS solution. Existing solutions to the problem are briefly surveyed, and their drawbacks are underlined. Then, the essence of the proposed solution is presented: designing a board that interfaces a personal computer to the RM bus. The fifth part defines conditions and assumptions of the analysis to follow. Elements of a simulation study are presented in part six. The conclusion, as a summary of new ideas, acquired during this project is presented in the part seven.

Author

*Memory (Computers); Cost Effectiveness; Personal Computers*

**20080008601** Belgrade Univ., Serbia

### **Cache Clearing System**

Babovic, Zoran; Jovic, Darko; Cakarevic, Vladimir; Milosavljevic, Ivan; Stevanovic, Marija; Minic, Predrag; Milutinovic, Veljko; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 22-26; In English; See also [20080008592](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

In the introductory part, this paper defines the general environment for this research and defines the terms of interest. Then we define the research problem: How to implement a system which clears the cached content from the production web sites. The essence of the proposed solution is presented in the part three: The main part of the system, CacheBot, consists of two

multithreaded applications, called Hard Daemon and Soft Daemon, which are in charge of actually deleting or updating the contents on the web servers. The fourth part defines advantages that we made compared to an existing solution, as well as the conclusion.

Author

*Memory (Computers); Websites; Architecture (Computers); Deletion*

**20080008602** Belgrade Univ., Serbia

### **A Proposed Hybrid Approach for Patent Modeling**

Scekic, Ognjen; Popovic, Djordje; Miltutinovic, Veljko; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 3-6; In English; See also [20080008592](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

In an effort to find a general model which could capture the essence of any concept, we chose to narrow down the first part of our research to patents only. Patents can be considered as adequate first-step substitutes for concepts in general, because of their diversity and the precision of their descriptions. Our aim is to define a model which could allow detection of individual concepts and relationships among them, both within and across patent boundaries. The approach is based on a hybrid solution - employing existing conceptual indexing techniques for extraction and hierarchical organization of individual concepts, and RDF/OWL descriptions for application-specific data.

Author

*Patents; Artificial Intelligence; Indexing (Information Science)*

**20080008603** Belgrade Univ., Serbia

### **One Approach of Efficient Management of Zillion Signatures**

Rudan, Sasa; Kovacevic, Aleksandra; Babovic, Zoran; Jovic, Darko; Milutinovic, Veljko; Milligan, Charles; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 17-21; In English; See also [20080008592](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

In the introductory part, this paper defines the general environment for this research and defines the terms of interest. Then we define the research problem: How to manage efficiently billion file signatures from a specially introduced new file signature management layer; this problem is important because it enables the files signatures to be handled in a fast way. Existing solutions to the problem are briefly surveyed in the third part, and their drawbacks are underlined; each surveyed piece of research is analysed according to the same template. Then, the essence of the proposed solution is presented: Efficient storage of 1 billion 20-byte digital signatures, their fast lookup, insert and delete, fast rebuild of the storage digital signature index; it also includes primitives that can be directly ported into hash functions and other appropriate mechanisms used for management of file signatures; this idea has several versions. The fifth part defines conditions and assumptions of the analysis to follow. Analytical analysis of all above is presented next. Elements of a simulation study, to compare performance, are presented in part seven. The conclusion is presented in the part eight.

Author

*Signatures; Data Retrieval; Data Storage*

**20080008604** Belgrade Univ., Serbia

### **Patent Maps: A Simpler Way to Search Patents in the Light of Prior Art**

Micanovic, Mina; Milutinovic, Veljko; Milligan, Charles; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering; Volume 2, No. 2 (Special Issue: Selected Research Results from the School of Electrical Engineering, Belgrade Univ. Serbia); July 2006, pp. 43-46; In English; See also [20080008592](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

A patent represents an exclusive right to make, use and sell an invention in a country. In order to make it valid, it is necessary to go through a series of verifications among which there is a search to establish if there is any public document which fully or partly describes the invention which is being patented. If such a document exists, it is called prior art. The search, whose purpose is finding of prior art for the patent in question, is not in the least simple. Patent Maps, presented in this work, can significantly facilitate the process of search for prior art among the patent archive.

Author

*Patents; Inventions; Proving*

**20080009509** Intellectual Assets. LLC, Lake Tahoe, NV USA

**Asset surveillance system: apparatus and method**

Bickford, Randall L., Inventor; January 2, 2007; 45 pp.; In English

Contract(s)/Grant(s): NAS8-98027; NAS4-99012; NAS13-01001

Patent Info.: Filed March 5, 2005; US-Patent-7,158,917; US-Patent-Appl-SN-11/073,161; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009509>

System and method for providing surveillance of an asset comprised of numerically fitting at least one mathematical model to obtained residual data correlative to asset operation; storing at least one mathematical model in a memory; obtaining a current set of signal data from the asset; retrieving at least one mathematical model from the memory, using the retrieved mathematical model in a sequential hypothesis test for determining if the current set of signal data is indicative of a fault condition; determining an asset fault cause correlative to a determined indication of a fault condition; providing an indication correlative to a determined fault cause, and an action when warranted. The residual data can be mode partitioned, a current mode of operation can be determined from the asset, and at least one mathematical model can be retrieved from the memory as a function of the determined mode of operation.

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

*Mathematical Models; Surveillance*

## 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*.

**20080008722** NASA, Washington, DC USA

**Nonvolatile analog memory**

MacLeod, Todd C., Inventor; August 21, 2007; 5 pp.; In English

Patent Info.: Filed November 29, 2005; US-Patent-7,259,981; US-Patent-Appl-SN-11/296,719; No Copyright; Avail.:

CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008722>

A nonvolatile analog memory uses pairs of ferroelectric field effect transistors (FFETs). Each pair is defined by a first FFET and a second FFET. When an analog value is to be stored in one of the pairs, the first FFET has a saturation voltage applied thereto, and the second FFET has a storage voltage applied thereto that is indicative of the analog value. The saturation and storage voltages decay over time in accordance with a known decay function that is used to recover the original analog value when the pair of FFETs is read.

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

*Analog Computers; Ferroelectricity; Field Effect Transistors; Memory (Computers)*

## 61

### COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

**20080009446** NASA, Washington, DC USA

**System and method of designing a load bearing layer of an inflatable vessel**

Spexarth, Gary R., Inventor; November 13, 2007; 25 pp.; In English

Patent Info.: Filed June 20, 2005; US-Patent-7,295,884; US-Patent-Appl-SN-11/158,354; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009446>

A computer-implemented method is provided for designing a restraint layer of an inflatable vessel. The restraint layer is inflatable from an initial uninflated configuration to an inflated configuration and is constructed from a plurality of interfacing longitudinal straps and hoop straps. The method involves providing computer processing means (e.g., to receive user inputs, perform calculations, and output results) and utilizing this computer processing means to implement a plurality of subsequent



design steps. The computer processing means is utilized to input the load requirements of the inflated restraint layer and to specify an inflated configuration of the restraint layer. This includes specifying a desired design gap between pairs of adjacent longitudinal or hoop straps, whereby the adjacent straps interface with a plurality of transversely extending hoop or longitudinal straps at a plurality of intersections. Furthermore, an initial uninflated configuration of the restraint layer that is inflatable to achieve the specified inflated configuration is determined. This includes calculating a manufacturing gap between pairs of adjacent longitudinal or hoop straps that correspond to the specified desired gap in the inflated configuration of the restraint layer.

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

*Load Carrying Capacity; Inflatable Structures; Computer Aided Design*

**20080009460** Johns Hopkins Univ., Baltimore, MD USA

**Data compression using Chebyshev transform**

Cheng, Andrew F., Inventor; Hawkins, III, S. Edward, Inventor; Nguyen, Lillian, Inventor; Monaco, Christopher A., Inventor; Seagrave, Gordon G., Inventor; July 24, 2007; 13 pp.; In English

Contract(s)/Grant(s): NAG5-8688

Patent Info.: Filed August 1, 2003; US-Patent-7,249,153; US-Patent-Appl-SN-10/633,447; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009460>

The present invention is a method, system, and computer program product for implementation of a capable, general purpose compression algorithm that can be engaged on the fly. This invention has particular practical application with time-series data, and more particularly, time-series data obtained from a spacecraft, or similar situations where cost, size and/or power limitations are prevalent, although it is not limited to such applications. It is also particularly applicable to the compression of serial data streams and works in one, two, or three dimensions. The original input data is approximated by Chebyshev polynomials, achieving very high compression ratios on serial data streams with minimal loss of scientific information.

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

*Algorithms; Chebyshev Approximation; Computer Programs; Data Compression*

**20080009468** California Inst. of Tech., Pasadena, CA USA

**Serial turbo trellis coded modulation using a serially concatenated coder**

Divsalar, Dariush, Inventor; Dolinar, Sam, Inventor; Pollara, Fabrizio, Inventor; July 10, 2007; 12 pp.; In English

Patent Info.: Filed January 11, 2001; US-Patent-7,243,294; US-Patent-Appl-SN-09/760,514; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009468>

A coding system uses a serially concatenated coder driving an interleaver, which drives a trellis coder. This combination, while similar to a turbo coder, produces certain different characteristics.

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

*Coders; Coding; Concatenated Codes; Modulation*

## 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.

**20080009026** NASA Langley Research Center, Hampton, VA, USA

**A Primer on Architectural Level Fault Tolerance**

Butler, Ricky W.; February 2008; 53 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 604746.02.06.08.04

Report No.(s): NASA/TM-2008-215108; L-19403; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009026>

This paper introduces the fundamental concepts of fault tolerant computing. Key topics covered are voting, fault detection, clock synchronization, Byzantine Agreement, diagnosis, and reliability analysis. Low level mechanisms such as

Hamming codes or low level communications protocols are not covered. The paper is tutorial in nature and does not cover any topic in detail. The focus is on rationale and approach rather than detailed exposition.

Author

*Computer Systems Design; Fault Tolerance; Reliability Analysis; Redundancy; Architecture (Computers); Reliability Engineering*

## 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*.

**20080009472** NASA, Washington, DC USA

#### **Hypothesis support mechanism for mid-level visual pattern recognition**

Amador, Jose J, Inventor; July 3, 2007; 20 pp.; In English

Patent Info.: Filed December 18, 2003; US-Patent-7,239,751; US-Patent-Appl-SN-10/750,629; No Copyright; Avail.:

CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009472>

A method of mid-level pattern recognition provides for a pose invariant Hough Transform by parametrizing pairs of points in a pattern with respect to at least two reference points, thereby providing a parameter table that is scale- or rotation-invariant. A corresponding inverse transform may be applied to test hypothesized matches in an image and a distance transform utilized to quantify the level of match.

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

*Hypotheses; Pattern Recognition; Transformations (Mathematics)*

**20080009510** NASA, Washington, DC USA

#### **Hybrid neural network and support vector machine method for optimization**

Rai, Man Mohan, Inventor; November 6, 2007; 24 pp.; In English

Patent Info.: Filed November 14, 2005; US-Patent-7,293,001; US-Patent-Appl-SN-11/274,744; No Copyright; Avail.:

CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009510>

System and method for optimization of a design associated with a response function, using a hybrid neural net and support vector machine (NN/SVM) analysis to minimize or maximize an objective function, optionally subject to one or more constraints. As a first example, the NN/SVM analysis is applied iteratively to design of an aerodynamic component, such as an airfoil shape, where the objective function measures deviation from a target pressure distribution on the perimeter of the aerodynamic component. As a second example, the NN/SVM analysis is applied to data classification of a sequence of data points in a multidimensional space. The NN/SVM analysis is also applied to data regression.

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

*Neural Nets; Optimization; Vector Analysis*

**20080009520** Georgia Inst. of Tech., Atlanta, GA USA

#### **Adaptive control system having hedge unit and related apparatus and methods**

Johnson, Eric Norman, Inventor; Calise, Anthony J., Inventor; May 15, 2007; 22 pp.; In English

Contract(s)/Grant(s): NAG8-1638

Patent Info.: Filed June 23, 2003; US-Patent-7,218,973; US-Patent-Appl-SN-10/602,458; No Copyright; Avail.:

CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009520>

The invention includes an adaptive control system used to control a plant. The adaptive control system includes a hedge unit that receives at least one control signal and a plant state signal. The hedge unit generates a hedge signal based on the control signal, the plant state signal, and a hedge model including a first model having one or more characteristics to which the adaptive control system is not to adapt, and a second model not having the characteristic(s) to which the adaptive control system is not to adapt. The hedge signal is used in the adaptive control system to remove the effect of the characteristic from

a signal supplied to an adaptation law unit of the adaptive control system so that the adaptive control system does not adapt to the characteristic in controlling the plant.

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

*Adaptive Control; Control Systems Design*

## SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

**20080008876** NASA Ames Research Center, Moffett Field, CA, USA

### **Advanced Diagnostic and Prognostic Testbed (ADAPT) Testability Analysis Report**

Ossenfort, John; January 2008; 21 pp.; In English; Original contains color illustrations

Report No.(s): NASA/TM 2008-214569; Copyright; Avail.: CASI: [A03](#), Hardcopy

As system designs become more complex, determining the best locations to add sensors and test points for the purpose of testing and monitoring these designs becomes more difficult. Not only must the designer take into consideration all real and potential faults of the system, he or she must also find efficient ways of detecting and isolating those faults. Because sensors and cabling take up valuable space and weight on a system, and given constraints on bandwidth and power, it is even more difficult to add sensors into these complex designs after the design has been completed. As a result, a number of software tools have been developed to assist the system designer in proper placement of these sensors during the system design phase of a project. One of the key functions provided by many of these software programs is a testability analysis of the system essentially an evaluation of how observable the system behavior is using available tests. During the design phase, testability metrics can help guide the designer in improving the inherent testability of the design. This may include adding, removing, or modifying tests; breaking up feedback loops, or changing the system to reduce fault propagation. Given a set of test requirements, the analysis can also help to verify that the system will meet those requirements. Of course, a testability analysis requires that a software model of the physical system is available. For the analysis to be most effective in guiding system design, this model should ideally be constructed in parallel with these efforts. The purpose of this paper is to present the final testability results of the Advanced Diagnostic and Prognostic Testbed (ADAPT) after the system model was completed. The tool chosen to build the model and to perform the testability analysis with is the Testability Engineering and Maintenance System Designer (TEAMS-Designer). The TEAMS toolset is intended to be a solution to span all phases of the system, from design and development through health management and maintenance. TEAMS-Designer is the model-building and testability analysis software in that suite.

Author

*Systems Analysis; Systems Engineering; Performance Tests; Systems Integration; Systems Health Monitoring*

**20080009461** California Inst. of Tech., Pasadena, CA USA

### **System for solving diagnosis and hitting set problems**

Fijany, Amir, Inventor; Vatan, Farrokh, Inventor; July 24, 2007; 26 pp.; In English

Patent Info.: Filed February 13, 2006; US-Patent-7,249,003; US-Patent-Appl-SN-11/353,673; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009461>

The diagnosis problem arises when a system's actual behavior contradicts the expected behavior, thereby exhibiting symptoms (a collection of conflict sets). System diagnosis is then the task of identifying faulty components that are responsible for anomalous behavior. To solve the diagnosis problem, the present invention describes a method for finding the minimal set of faulty components (minimal diagnosis set) that explain the conflict sets. The method includes acts of creating a matrix of the collection of conflict sets, and then creating nodes from the matrix such that each node is a node in a search tree. A determination is made as to whether each node is a leaf node or has any children nodes. If any given node has children nodes, then the node is split until all nodes are leaf nodes. Information gathered from the leaf nodes is used to determine the minimal diagnosis set.

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

*Diagnosis; Signs and Symptoms; Systems Health Monitoring; Systems Analysis; Problem Solving*

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*.

**20080009589** NASA Langley Research Center, Hampton, VA, USA

**Coupling of Multiple Coulomb Scattering with Energy Loss and Straggling in HZETRN**

Mertens, Christopher J.; Wilson, John W.; Walker, Steven A.; Tweed, John; October 2007; 26 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 562889.01.04; Copyright; Avail.: CASI: [A03](#), Hardcopy

The new version of the HZETRN deterministic transport code based on Green's function methods, and the incorporation of ground-based laboratory boundary conditions, has led to the development of analytical and numerical procedures to include off-axis dispersion of primary ion beams due to small-angle multiple Coulomb scattering. In this paper we present the theoretical formulation and computational procedures to compute ion beam broadening and a methodology towards achieving a self-consistent approach to coupling multiple scattering interactions with ionization energy loss and straggling. Our initial benchmark case is a 60 MeV proton beam on muscle tissue, for which we can compare various attributes of beam broadening with Monte Carlo simulations reported in the open literature.

Author

*Coulomb Collisions; Energy Dissipation; Transport Theory; Elastic Scattering; Coupling*

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*.

**20080009533** NASA Johnson Space Center, Houston, TX, USA

**Noise Control Design**

Goodman, Jerry R.; Grosveld, Ferdinand; [2007]; 21 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

The acoustics environment during space operations was characterized in the segment on Acoustics in the Space Environment Chapter. Limiting the acoustic exposure levels in the crew compartment/habitat to the defined requirements was deemed essential to achieve a safe, functional, effective, and comfortable acoustic environment for the crew. A noise control plan is necessary to define and layout the plans and efforts required to achieve compliance with the acoustic requirements. The status and progress of the noise control plan needs to be actively monitored, to ensure good communications on efforts, to identify the areas of emphasis and/or concerns early in the design process, and to allow timely remedial actions. A detailed discussion of the noise control plan and its major components are presented followed by various applications of successful noise control design in habitable space environments.

Derived from text

*Aerospace Environments; Noise Reduction; Spacecraft Cabins; Space Habitats; Spacecraft Environments; Noise (Sound); Acoustics*

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*.

**20080009523** Systems and Processes Engineering Corp., Austin, TX USA

**Signal generation and mixing electronics for frequency-domain lifetime and spectral fluorometry**

Cruce, Tommy Clay, Inventor; Hallidy, William H., Inventor; Chin, Robert C., Inventor; April 3, 2007; 18 pp.; In English  
Contract(s)/Grant(s): NAS1-20426; NAS1-20162

Patent Info.: Filed November 9, 2001; US-Patent-RE39,537; US-Patent-Appl-SN-10/035,461; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009523>

The present invention additionally comprises a method and apparatus for generating and mixing signals for

frequency-domain lifetime and spectral fluorometry. The present invention comprises a plurality of signal generators that generate a plurality of signals where the signal generators modulate the amplitude and/or the frequency of the signals. The present invention uses one of these signals to drive an excitation signal that the present invention then directs and transmits at a target mixture, which absorbs the energy from the excitation signal. The property of fluorescence causes the target mixture to emit an emitted signal that the present invention detects with a signal detector. The present invention uses a plurality of mixers to produce a processor reference signal and a data signal. The present invention then uses a processor to compare the processor reference signal with the data signal by analyzing the differences in the phase and the differences in the amplitude between the two signals. The processor then extracts the fluorescence lifetime and fluorescence spectrum of the emitted signal from the phase and amplitude information using a chemometric analysis.

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

*Signal Generators; Signal Mixing; Fluorescence; Signal Detectors*

## 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*.

**20080009432** NASA, Washington, DC USA

### **Method for texturing surfaces of optical fiber sensors used for blood glucose monitoring**

Banks, Bruce A., Inventor; December 11, 2007; 12 pp.; In English

Patent Info.: Filed March 30, 2006; US-Patent-7,308,164; US-Patent-Appl-SN-11/398,734; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009432>

Disclosed is a method and the resulting product thereof comprising a solid light-conducting fiber with a point of attachment and having a textured surface site consisting a textured distal end prepared by being placed in a vacuum and then subjected to directed hyperthermal beams comprising oxygen ions or atoms. The textured distal end comprises cones or pillars that are spaced upon from each other by less than 1 micron and are extremely suitable to prevent cellular components of blood from entering the valleys between the cones or pillars so as to effectively separate the cellular components in the blood from interfering with optical sensing of the glucose concentration for diabetic patients.

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

*Blood; Glucose; Optical Fibers; Sensors; Diabetes Mellitus*

**20080009433** Southwest Sciences, Inc., Santa Fe, NM USA

### **Near re-entrant dense pattern optical multipass cell**

Silver, Joel A., Inventor; December 11, 2007; 18 pp.; In English

Patent Info.: Filed September 22, 2004; US-Patent-7,307,716; US-Patent-Appl-SN-10/948,660; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009433>

A multiple pass optical cell and method comprising providing a pair of opposed mirrors, one cylindrical and one spherical, introducing light into the cell via an entrance mechanism, and extracting light from the cell via an exit mechanism, wherein the entrance mechanism and exit mechanism are coextensive or non-coextensive.

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

*Mirrors; Optical Paths; Spectroscopy*

**20080009436** NASA, Washington, DC USA

### **Energetic atomic and ionic oxygen textured optical surfaces for blood glucose monitoring**

Banks, Bruce A., Inventor; December 4, 2007; 13 pp.; In English

Patent Info.: Filed July 10, 2006; US-Patent-7,305,154; US-Patent-Appl-SN-11/483,887; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009436>

Disclosed is a method and the resulting product thereof comprising a solid light-conducting fiber with a point of attachment and having a textured surface site consisting a textured distal end prepared by being placed in a vacuum and then subjected to directed hyperthermal beams comprising oxygen ions or atoms. The textured distal end comprises cones or pillars



that are spaced upon from each other by less than 1 micron and are extremely suitable to prevent cellular components of blood from entering the valleys between the cones or pillars so as to effectively separate the cellular components in the blood from interfering with optical sensing of the glucose concentration for diabetic patients.

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

*Blood; Glucose; Oxygen Atoms; Optical Fibers; Diabetes Mellitus; Sensors*

**20080009442** NP Photonic Technologies, LLC, Tucson, AZ USA

**2-.mu.m fiber amplified spontaneous emission (ASE) source**

Jiang, Shibin, Inventor; Wu, Jianfeng, Inventor; Geng, Jihong, Inventor; November 20, 2007; 11 pp.; In English

Patent Info.: Filed September 7, 2006; US-Patent-7,298,547; US-Patent-Appl-SN-11/517,164; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009442>

A 2-.mu.m fiber Amplified Spontaneous Emission (ASE) source provides a wide emission bandwidth and improved spectral stability/purity for a given output power. The fiber ASE source is formed from a heavy metal oxide multicomponent glass selected from germanate, tellurite and bismuth oxides and doped with high concentrations, 0.5-15 wt. %, thulium oxides (Tm.sub.2O.sub.3) or 0.1-5 wt% holmium oxides (Ho.sub.2O.sub.3) or mixtures thereof. The high concentration of thulium dopants provide highly efficient pump absorption and high quantum efficiency. Co-doping of Tm and Ho can broaden the ASE spectrum.

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

*Spontaneous Emission; Optical Fibers; Bandwidth; Stability; Light Sources*

**20080009451** NASA, Washington, DC USA

**System and method for determining gas optical density changes in a non-linear measurement regime**

Sachse, Glen W., Inventor; Rana, Mauro, Inventor; August 7, 2007; 7 pp.; In English

Patent Info.: Filed December 29, 2004; US-Patent-7,253,903; US-Patent-Appl-SN-11/027,930; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009451>

Each of two sensors, positioned to simultaneously detect electromagnetic radiation absorption along a path, is calibrated to define a unique response curve associated therewith that relates a change in voltage output for each sensor to a change in optical density. A ratio-of-responses curve is defined by a ratio of the response curve associated with the first sensor to the response curve associated with the second sensor. A ratio of sensor output changes is generated using outputs from the sensors. An operating point on the ratio-of-responses curve is established using the ratio of sensor output changes. The established operating point is indicative of an optical density. When the operating point is in the non-linear response region of at least one of the sensors, the operating point and optical density corresponding thereto can be used to establish an actual response of at least one of the sensors whereby the actual sensor output can be used in determining changes in the optical density.

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

*Absorption Spectra; Electromagnetic Radiation; Gas Density; Nonlinearity; Optical Density; Radiation Absorption*

**20080009454** NASA, Washington, DC USA

**Cathode luminescence light source for broadband applications in the visible spectrum**

Foster, John E., Inventor; July 31, 2007; 14 pp.; In English

Patent Info.: Filed December 21, 2004; US-Patent-7,250,723; US-Patent-Appl-SN-11/016,735; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009454>

A device and method for generating cathode luminescence is provided. The device and method generate broad spectrum electromagnetic radiation in the visible. A layer of particles, such as quartz or alumina powder, is exposed to electrons in a plasma discharge. Surface excitation of these particles or the generations/excitation of F-center sites give rise to luminescence.

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

*Broadband; Cathodes; Light Sources; Luminescence; Visible Spectrum; Electromagnetic Radiation*

**20080009462** NASA, Washington, DC USA

**Three-dimension imaging lidar**

Degnan, John J., Inventor; July 24, 2007; 14 pp.; In English

Patent Info.: Filed December 5, 2003; US-Patent-7,248,342; US-Patent-Appl-SN-10/730,195; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009462>

This invention is directed to a 3-dimensional imaging lidar, which utilizes modest power kHz rate lasers, array detectors, photon-counting multi-channel timing receivers, and dual wedge optical scanners with transmitter point-ahead correction to provide contiguous high spatial resolution mapping of surface features including ground, water, man-made objects, vegetation and submerged surfaces from an aircraft or a spacecraft.

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

*Imaging Techniques; Optical Radar; Timing Devices; Three Dimensional Motion*

**20080009465** Massachusetts Univ., Boston, MA USA

**Spectrometer system for optical reflectance measurements**

Soller, Babs R., Inventor; Phillipps, Patrick G., Inventor; Parker, Michael S., Inventor; July 17, 2007; 26 pp.; In English

Contract(s)/Grant(s): NCC9-58

Patent Info.: Filed April 25, 2005; US-Patent-7,245,373; US-Patent-Appl-SN-11/113,347; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009465>

A spectrometer system includes a thermal light source for illuminating a sample, where the thermal light source includes a filament that emits light when heated. The system additionally includes a spectrograph for measuring a light spectrum from the sample and an electrical circuit for supplying electrical current to the filament to heat the filament and for controlling a resistance of the filament. The electrical circuit includes a power supply that supplies current to the filament, first electrical components that sense a current through the filament, second electrical components that sense a voltage drop across the filament, third electrical components that compare a ratio of the sensed voltage drop and the sensed current with a predetermined value, and fourth electrical components that control the current through the filament or the voltage drop across the filament to cause the ratio to equal substantially the predetermined value.

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

*Reflectance; Light Sources; Optical Measurement; Spectrometers; Filaments; Electric Current*

**20080009470** Massachusetts Inst. of Tech., Cambridge, MA USA

**Terahertz lasers and amplifiers based on resonant optical phonon scattering to achieve population inversion**

Hu, Qing, Inventor; Williams, Benjamin S., Inventor; January 2, 2007; 20 pp.; In English

Contract(s)/Grant(s): NAG5-9080

Patent Info.: Filed September 12, 2003; US-Patent-7,158,545; US-Patent-Appl-SN-10/661,831; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009470>

The present invention provides quantum cascade lasers and amplifier that operate in a frequency range of about 1 Terahertz to about 10 Terahertz. In one aspect, a quantum cascade laser of the invention includes a semiconductor heterostructure that provides a plurality of lasing modules connected in series. Each lasing module includes a plurality of quantum well structure that collectively generate at least an upper lasing state, a lower lasing state, and a relaxation state such that the upper and the lower lasing states are separated by an energy corresponding to an optical frequency in a range of about 1 to about 10 Terahertz. The lower lasing state is selectively depopulated via resonant LO-phonon scattering of electrons into the relaxation state.

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

*Frequency Ranges; Optical Properties; Phonons; Physical Optics; Quantum Cascade Lasers; Lasing*

**20080009477** California Inst. of Tech., Pasadena, CA USA

**Two-photon or higher-order absorbing optical materials for generation of reactive species**

Cumpston, Brian, Inventor; Lipson, Matthew, Inventor; Marder, Seth R, Inventor; Perry, Joseph W, Inventor; June 26, 2007; 33 pp.; In English

Patent Info.: Filed May 20, 2003; US-Patent-7,235,194; US-Patent-Appl-SN-10/442,431; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009477>

Disclosed are highly efficient multiphoton absorbing compounds and methods of their use. The compounds generally include a bridge of pi-conjugated bonds connecting electron donating groups or electron accepting groups. The bridge may be substituted with a variety of substituents as well. Solubility, lipophilicity, absorption maxima and other characteristics of the compounds may be tailored by changing the electron donating groups or electron accepting groups, the substituents attached to or the length of the pi-conjugated bridge. Numerous photophysical and photochemical methods are enabled by converting these compounds to electronically excited states upon simultaneous absorption of at least two photons of radiation. The compounds have large two-photon or higher-order absorptivities such that upon absorption, one or more Lewis acidic species, Lewis basic species, radical species or ionic species are formed.

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

*Absorbents; Absorbers (Materials); Optical Materials; Photons*

**20080009493** Arizona Univ., Phoenix, AZ USA

**Sub-diffraction limit resolution in microscopy**

Cheng, Ming, Inventor; Chen, Weinong, Inventor; March 20, 2007; 13 pp.; In English

Contract(s)/Grant(s): NAG8-1469

Patent Info.: Filed December 1, 2004; US-Patent-7,193,774; US-Patent-Appl-SN-11/001,104; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009493>

A method and apparatus for visualizing sub-micron size particles employs a polarizing microscope wherein a focused beam of polarized light is projected onto a target, and a portion of the illuminating light is blocked from reaching the specimen, whereby to produce a shadow region, and projecting diffracted light from the target onto the shadow region.

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

*Diffraction; Illuminating; Microscopy; Polarized Light*

**20080009495** California Inst. of Tech., Pasadena, CA USA

**Image sensor with high dynamic range linear output**

Yadid-Pecht, Orly, Inventor; Fossum, Eric R., Inventor; March 13, 2007; 13 pp.; In English

Patent Info.: Filed September 5, 2000; US-Patent-7,190,398; US-Patent-Appl-SN-09/654,922; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009495>

Designs and operational methods to increase the dynamic range of image sensors and APS devices in particular by achieving more than one integration times for each pixel thereof. An APS system with more than one column-parallel signal chains for readout are described for maintaining a high frame rate in readout. Each active pixel is sampled for multiple times during a single frame readout, thus resulting in multiple integration times. The operation methods can also be used to obtain multiple integration times for each pixel with an APS design having a single column-parallel signal chain for readout. Furthermore, analog-to-digital conversion of high speed and high resolution can be implemented.

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

*Dynamic Range; Imaging Techniques; Sensors*

**20080009504** California Inst. of Tech., Pasadena, CA USA

**Opto-electronic feedback for stabilizing oscillators**

Maleki, Lutfoallah, Inventor; Ilchenko, Vladimir, Inventor; February 6, 2007; 11 pp.; In English

Contract(s)/Grant(s): NAS7-1407

Patent Info.: Filed August 4, 2004; US-Patent-7,173,749; US-Patent-Appl-SN-10/911,401; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009504>

This application describes use of an opto-electronic feedback in oscillators to suppress phase noise based on the high Q factor of the opto-electronic feedback.

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

*Feedback; Oscillators; Q Factors; Stabilization*

**20080009517** NASA, Washington, DC USA

**Mechanisms and methods for selective wavelength filtering**

Tuma, Margaret, Inventor; Brown, Thomas G., Inventor; Gruhlke, Russell, Inventor; March 6, 2007; 9 pp.; In English

Patent Info.: Filed January 28, 2005; US-Patent-7,187,835; US-Patent-Appl-SN-11/044,063; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009517>

An optical filter includes a dielectric waveguide layer, supporting waveguide modes at specific wavelengths and receiving incident light, a corrugated film layer, composed of one of a metal and a semiconductor and positioned adjacent to a second surface of the waveguide layer and a sensor layer, wherein the sensor layer is capable of absorbing optical energy and generating a corresponding electrical signal. The metal film layer supports a plurality of plasmons, the plurality of plasmons producing a first field and is excited by a transverse mode of the waveguide modes at a wavelength interval. The first field penetrates the sensor layer and the sensor layer generates an electrical signal corresponding to an intensity of received incident light within the wavelength interval.

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

*Optical Filters; Semiconductors (Materials); Dielectric Waveguides*

**20080009548** NASA Glenn Research Center, Cleveland, OH, USA

**Quantitative Rainbow Schlieren Deflectometry as a Temperature Diagnostic for Spherical Flames**

Feikema, Douglas A.; [2006]; 21 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 519205.02.02; No Copyright; Avail.: Other Sources

Numerical analysis and experimental results are presented to define a method for quantitatively measuring the temperature distribution of a spherical diffusion flame using Rainbow Schlieren Deflectometry in microgravity. The method employed in this paper illustrates the necessary steps for the preliminary design of a Rainbow Schlieren system. The largest deflections for the normal gravity flame considered in this paper are  $7.4 \times 10^{-4}$  radians which can be accurately measured with 2 meter focal length collimating and decollimating optics. The experimental uncertainty of deflection is less than  $5 \times 10^{-5}$  radians.

Author

*Flames; Numerical Analysis; Temperature Measurement*

**20080009554** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Development of Ground-testable Phase Fresnel Lenses in Silicon**

Krizmanic, John; Morgan, Brian; Streitmatter, Robert; Gehrels, Neil; Gendreau, Keith; Arzoumanian, Zaven; Ghodssi, Reza; Skinner, Gerry; [2006]; 8 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): APRA04-0000-0087; Copyright; Avail.: Other Sources

Diffraction/refractive optics, such as Phase Fresnel Lenses (PFL's), offer the potential to achieve excellent imaging performance in the x-ray and gamma-ray photon regimes. In principle, the angular resolution obtained with these devices can be diffraction limited. Furthermore, improvements in signal sensitivity can be achieved as virtually the entire flux incident on a lens can be concentrated onto a small detector area. In order to verify experimentally the imaging performance, we have fabricated PFL's in silicon using gray-scale lithography to produce the required Fresnel profile. These devices are to be evaluated in the recently constructed 600-meter x-ray interferometry testbed at NASA/GSFC. Profile measurements of the

Fresnel structures in fabricated PFL's have been performed and have been used to obtain initial characterization of the expected PFL imaging efficiencies.

Author

*Fresnel Lenses; Silicon; Diffractive Optics; Angular Resolution; Imaging Techniques*

## 75

### PLASMA PHYSICS

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

**20080009435** NASA, Washington, DC USA

#### **Slotted antenna waveguide plasma source**

Foster, John, Inventor; December 11, 2007; 12 pp.; In English

Patent Info.: Filed August 25, 2004; US-Patent-7,305,935; US-Patent-Appl-SN-10/925,499; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009435>

A high density plasma generated by microwave injection using a windowless electrodeless rectangular slotted antenna waveguide plasma source has been demonstrated. Plasma probe measurements indicate that the source could be applicable for low power ion thruster applications, ion implantation, and related applications. This slotted antenna plasma source invention operates on the principle of electron cyclotron resonance (ECR). It employs no window and it is completely electrodeless and therefore its operation lifetime is long, being limited only by either the microwave generator itself or charged particle extraction grids if used. The high density plasma source can also be used to extract an electron beam that can be used as a plasma cathode neutralizer for ion source beam neutralization applications.

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

*Ion Injection; Microwaves; Plasma Density; Plasmas (Physics); Rectangular Waveguides; Slot Antennas; Waveguides*

## 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*.

**20080008717** Cornell Univ., Ithaca, NY USA

#### **Sample mounts for microcrystal crystallography**

Thorne, Robert E., Inventor; Stum, Zachary, Inventor; O'Neill, Kevin, Inventor; Kmetko, Jan, Inventor; August 28, 2007; 11 pp.; In English

Contract(s)/Grant(s): NAG8-1831

Patent Info.: Filed September 19, 2005; US-Patent-7,263,162; US-Patent-Appl-SN-11/228,455; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008717>

Sample mounts (10) for mounting microcrystals of biological macromolecules for X-ray crystallography are prepared by using patterned thin polyimide films (12) that have curvature imparted thereto, for example, by being attached to a curved outer surface of a small metal rod (16). The patterned film (12) preferably includes a tapered tip end (24) for holding a crystal. Preferably, a small sample aperture is disposed in the film for reception of the crystal. A second, larger aperture can also be provided that is connected to the sample aperture by a drainage channel, allowing removal of excess liquid and easier manipulation in viscous solutions. The curvature imparted to the film (12) increases the film's rigidity and allows a convenient scoop-like action for retrieving crystals. The polyimide contributes minimally to background and absorption, and can be treated to obtain desired hydrophobicity or hydrophilicity.

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

*Crystallography; Curvature; Macromolecules; Microcrystals; Mounting; Polyimides; Supports; Thin Films; X Rays*



**20080008718** NASA, Washington, DC USA

**System and method for monitoring piezoelectric material performance**

Moses, Robert W., Inventor; Fox, Christopher L., Inventor; Fox, Melanie L., Inventor; Chattin, Richard L., Inventor; Shams, Qamar A., Inventor; Fox, Robert L., Inventor; August 28, 2007; 9 pp.; In English

Patent Info.: Filed September 8, 2004; US-Patent-7,262,543; US-Patent-Appl-SN-10/943,655; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008718>

A system and method are provided for monitoring performance capacity of a piezoelectric material that may form part of an actuator or sensor device. A switch is used to selectively electrically couple an inductor to the piezoelectric material to form an inductor-capacitor circuit. Resonance is induced in the inductor-capacitor circuit when the switch is operated to create the circuit. The resonance of the inductor-capacitor circuit is monitored with the frequency of the resonance being indicative of performance capacity of the device's piezoelectric material.

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

*Actuators; Piezoelectricity; Capacitance Switches*

**20080008724** Massachusetts Inst. of Tech., Cambridge, MA USA

**Methods for synthesis of semiconductor nanocrystals and thermoelectric compositions**

Ren, Zhifeng, Inventor; Chen, Gang, Inventor; Poudel, Bed, Inventor; Kumar, Shankar, Inventor; Wang, Wenzhong, Inventor; Dresselhaus, Mildred, Inventor; August 14, 2007; 36 pp.; In English

Contract(s)/Grant(s): NAS3-03108

Patent Info.: Filed May 3, 2005; US-Patent-7,255,846; US-Patent-Appl-SN-11/120,725; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008724>

The present invention provides methods for synthesis of IV VI nanostructures, and thermoelectric compositions formed of such structures. In one aspect, the method includes forming a solution of a Group IV reagent, a Group VI reagent and a surfactant. A reducing agent can be added to the solution, and the resultant solution can be maintained at an elevated temperature, e.g., in a range of about 20.degree. C. to about 360.degree. C., for a duration sufficient for generating nanoparticles as binary alloys of the IV VI elements.

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

*Nanocrystals; Nanostructures (Devices); Semiconductors (Materials); Thermoelectricity*

**20080009455** Alabama Univ., Birmingham, AL USA

**Use of dye to distinguish salt and protein crystals under microcrystallization conditions**

Cosenza, Larry, Inventor; Bray, Terry L., Inventor; DeLucas, Lawrence J., Inventor; Gester, Thomas E., Inventor; Hamrick, David T., Inventor; July 31, 2007; 33 pp.; In English

Contract(s)/Grant(s): NCC8-246

Patent Info.: Filed July 30, 2002; US-Patent-7,250,305; US-Patent-Appl-SN-10/208,576; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009455>

An improved method of screening crystal growth conditions is provided wherein molecules are crystallized from solutions containing dyes. These dyes are selectively incorporated or associated with crystals of particular character thereby rendering crystals of particular character colored and improving detection of the dyed crystals. A preferred method involves use of dyes in protein solutions overlaid by oil. Use of oil allows the use of small volumes of solution and facilitates the screening of large numbers of crystallization conditions in arrays using automated devices that dispense appropriate solutions to generate crystallization trials, overlay crystallization trials with an oil, provide appropriate conditions conducive to crystallization and enhance detection of dyed (colored) or undyed (uncolored) crystals that result.

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

*Crystal Growth; Crystallization; Crystals; Dyes; Proteins*

## PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics*, *73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

**20080009503** Ionfinity, LLC, Pasadena, CA USA

### Ion thrusting system

Hartley, Frank T., Inventor; February 13, 2007; 9 pp.; In English

Contract(s)/Grant(s): NAS7-1407

Patent Info.: Filed February 26, 2004; US-Patent-7,174,703; US-Patent-Appl-SN-10/786,230; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009503>

An ion thrusting system is disclosed comprising an ionization membrane having at least one area through which a gas is passed, and which ionizes the gas molecules passing therethrough to form ions and electrons, and an accelerator element which accelerates the ions to form thrust. In some variations, a potential is applied to the ionization membrane may be reversed to thrust ions in an opposite direction. The ionization membrane may also include an opening with electrodes that are located closer than a mean free path of the gas being ionized. Methods of manufacture and use are also provided.

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

*Gas Ionization; Ions; Electrodes*

**20080009507** NASA, Washington, DC USA

### Solid freeform fabrication apparatus and methods

Taminger, Karen M., Inventor; Watson, J. Kevin, Inventor; Hafley, Robert A., Inventor; Petersen, Daniel D., Inventor; January 30, 2007; 15 pp.; In English

Patent Info.: Filed August 1, 2003; US-Patent-7,168,935; US-Patent-Appl-SN-10/637,086; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009507>

An apparatus for formation of a three dimensional object comprising a sealed container; an electron beam subsystem capable of directing energy within said container; a positioning subsystem contained within said container; a wire feed subsystem contained within said container; an instrumentation subsystem electronically connected to said electron beam subsystem, positioning subsystem, and wire feed subsystem; and a power distribution subsystem electrically connected to said electron beam subsystem, positioning subsystem, wire feed subsystem, and said instrumentation subsystem.

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

*Electron Beams; Fabrication; Solids*

## ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

**20080008844** Research and Technology Organization, Neuilly-sur-Seine, France

### Recruiting and Retention of Military Personnel

October 2007; 516 pp.; In English; Original contains color and black and white illustrations

Report No.(s): RTO-TR-HFM-107; AC/323(HFM-107)TP/71; Copyright; Avail.: CASI: [C01](#), CD-ROM: [A22](#), Hardcopy

The objective of the Task Group (TG) on Recruiting and Retention (R&R) of Military Personnel was to foster a comprehensive understanding of the mechanisms that influence military recruitment and retention outcomes. The TG produced papers with respect to information on national R&R strategies, chapters on 10 R&R topic areas and developed conceptual models on military R&R. Additionally, a database of R&R research was created and a R&R-workshop was held.

Author

*Military Personnel; Personnel Selection; Personnel Management*

## 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*.

**20080009447** United Space Alliance, Houston, TX USA

**Image and information management system**

Robertson, Tina L., Inventor; Raney, Michael C., Inventor; Dougherty, Dennis M., Inventor; Kent, Peter C., Inventor; Brucker, Russell X., Inventor; Lampert, Daryl A., Inventor; November 13, 2007; 23 pp.; In English

Contract(s)/Grant(s): NAS9-20000

Patent Info.: Filed August 23, 2006; US-Patent-7,295,719; US-Patent-Appl-SN-11/466,508; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009447>

A system and methods through which pictorial views of an object's configuration, arranged in a hierarchical fashion, are navigated by a person to establish a visual context within the configuration. The visual context is automatically translated by the system into a set of search parameters driving retrieval of structured data and content (images, documents, multimedia, etc.) associated with the specific context. The system places hot spots, or actionable regions, on various portions of the pictorials representing the object. When a user interacts with an actionable region, a more detailed pictorial from the hierarchy is presented representing that portion of the object, along with real-time feedback in the form of a popup pane containing information about that region, and counts-by-type reflecting the number of items that are available within the system associated with the specific context and search filters established at that point in time.

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

*Image Classification; Information Management; Information Retrieval*

**20080009481** Johns Hopkins Univ., Baltimore, MD USA

**Definition and maintenance of a telemetry database dictionary**

Knopf, William P., Inventor; May 22, 2007; 8 pp.; In English

Contract(s)/Grant(s): NAS5-97179

Patent Info.: Filed August 15, 2003; US-Patent-7,222,115; US-Patent-Appl-SN-10/641,463; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009481>

A telemetry dictionary database includes a component for receiving spreadsheet workbooks of telemetry data over a web-based interface from other computer devices. Another component routes the spreadsheet workbooks to a specified directory on the host processing device. A process then checks the received spreadsheet workbooks for errors, and if no errors are detected the spreadsheet workbooks are routed to another directory to await initiation of a remote database loading process. The loading process first converts the spreadsheet workbooks to comma separated value (CSV) files. Next, a network connection with the computer system that hosts the telemetry dictionary database is established and the CSV files are ported to the computer system that hosts the telemetry dictionary database. This is followed by a remote initiation of a database loading program. Upon completion of loading a flatfile generation program is manually initiated to generate a flatfile to be used in a mission operations environment by the core ground system.

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

*Data Bases; Dictionaries; Spreadsheets; Telemetry*

**20080009581** NASA Langley Research Center, Hampton, VA, USA

**Technical Information**

Steeman, Gerald A.; Lucas-Stannard, Paige C.; December 2007; 2 pp.; In English

Contract(s)/Grant(s): WBS 869933.01.07.01; No Copyright; Avail.: Other Sources

Web 2.0 technologies and concepts have really taken root this year in communicating technical information. A great example of this is SciVee. Hailed as the 'YouTube for scientists,' the site boasted 40,000 unique visitors within the first 10 days of its August launch. Contributors upload video lectures with associated research papers, synch the two media, then post the resulting products as a 'pubcasts.' A partnership of the Public Library of Science, National Science Foundation, and San Diego Supercomputer Center, SciVee seeks to move 'science beyond the printed word and lecture theater, taking advantage

of the Internet as a communication medium where scientists young and old have a place and a voice.’

Derived from text

*Communicating; World Wide Web; Web Services; Internet Resources*

## 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*.

**20080009556** NASA Goddard Space Flight Center, Greenbelt, MD, USA

#### **Simulation Studies of Delta-ray Backgrounds in a Compton-Scatter Transition Radiation Detector**

Krizmanic, John F.; Cherry, Michael L.; Streitmatter, Robert E.; December 16, 2005; 4 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

In order to evaluate the response to cosmic-ray nuclei of a Compton-Scatter Transition Radiation Detector in the proposed ACCESS space-based mission, a hybrid Monte Carlo simulation using GEANT3 and an external transition radiation (TR) generator routine was constructed. This simulation was employed to study the effects of delta-ray production induced by high-energy nuclei and to maximize the ratio of TR to delta ray background. The results demonstrate the ability of a Compton-Scatter Transition Radiation Detector to measure nuclei from boron to iron up to Lorentz factors  $\gamma \sim 10(\text{exp } 5)$  taking into account the steeply falling power-law cosmic ray spectra.

Author

*Computerized Simulation; Cosmic Rays; Aerospace Sciences; Power Spectra; Nuclei (Nuclear Physics)*

## 89

### ASTRONOMY

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

**20080009023** NASA Marshall Space Flight Center, Huntsville, AL, USA

#### **Optical Spectroscopy of the Environment of a ULX in NGC 7331**

Abolmasov, Pavel K.; Swartz, Douglas A.; Fabrika, Sergei N.; Ghosh, Kajal K.; Sholukhova, N.; Tennant, Allyn F.; January 1999; 7 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG04GC86G; RFBR N-06-02-168165; RFBR/JSPS N-05-02-12710; Copyright; Avail.: Other Sources

Optical photometric and spectroscopic data are presented that show an association of an ultraluminous X-ray source in NGC 7331 with a young star cluster of mass  $M = (1.1 \pm 0.2) \times 10(\text{exp } 5) M(\text{sub solar})$ , and age  $t(\text{sub c}) = 4.25 \pm 0.25$  Myr. If the ULX is part of the bright stellar cluster, then the progenitor of the compact accretor must have been approximately 40-50 Ma in order to already have evolved through the supernova stage to a compact object. The companion star is also likely an evolved massive star. The emission line spectrum of the nebula surrounding the cluster can be interpreted as a result of photoionization by the cluster OB stars with an additional source of shock excitation producing strong [S II], [O I] and N 11 lines. This additional source appears to be about 5 times more powerful than the supernovae and stellar winds in the cluster can provide. Additional mechanical energy input connected with the ULX itself can help explain the residual shock excited line luminosities of the emission region.

Author

*Luminosity; Star Clusters; X Ray Sources; Galaxies; Galactic Evolution; X Ray Binaries; X Ray Stars; X Ray Astronomy*

**20080009532** NASA Marshall Space Flight Center, Huntsville, AL, USA

#### **Discovery of a Transient X-Ray Source in the Compact Stellar Nucleus of NGC 2403**

Yukita, Mihoko; Swartz, Douglas A.; Soria, Roberto; Tennant, Allyn F.; [1999]; 7 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

We report the discovery of an X-ray source coincident with the nuclear star cluster at the dynamical center of the nearby late-type spiral galaxy NGC 2403. The X-ray luminosity of this source varies from below detection levels, approximately  $10(\text{exp } 35) \text{ erg / s}$  in the 0.5 - 8.0 keV band, to  $7 \times 10(\text{exp } 38) \text{ erg / s}$  on timescales between observations of <2 months. The

X-ray spectrum is well-fit by an accretion disk model consisting of multiple blackbody components and corresponding physically to a compact object mass of approximately greater than 5 Solar Mass. No pulsations nor aperiodic behavior is evident in its X-ray light curve on the short timescales of the individual observations. The X-ray properties of the source are more similar to those of the nuclear source X-8 in M33, believed to be a low-mass X-ray binary, than to those of the low-luminosity active galactic nucleus in NGC 4395. The brightness of the nuclear star cluster,  $M(\text{sub I})$  is approximately -11.8 mag, is typical of clusters in late-type spirals but its effective radius,  $r(\text{sub e})$  is approximately 12 pc, is several times larger than average indicating a relatively relaxed cluster and a low probability of a central massive object. The cluster has a mass approximately greater than  $10 \text{ (exp } 6.5)$  solar  $M$  and an age of approximately 1.4 Gyr estimating from its observed colors and brightness.

Author

*Spiral Galaxies; Star Clusters; X Ray Sources; Galactic Evolution*

**20080009546** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Optical, Infrared, and Ultraviolet Observations of the X-Ray Flash GRB 050416A**

Holland, S. T.; Boyd, P. T.; Gorosabel, J.; Hjorth, J.; Schady, P.; Thomsen, B.; Augusteijn, T.; Blustin, A. J.; Breeveld, A.; DePasquale, M.; Flynn, J. P. U.; Gehrels, N.; Gronwall, C.; Hunsberger, S.; Ivanushkina, M.; Landsman, W.; Laursen, P.; McGowan, K.; Mangano, V.; Markwardt, C. B.; Marshall, F.; Mason, K. O.; Moretti, A.; Page, M. J.; Poole, T.; [2006]; 23 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS5-00136; Copyright; Avail.: Other Sources

We present ultraviolet, optical, and infrared photometry of the optical afterglow of the X-ray flash GRB 050416A taken between approximately 100 seconds and 36 days after the burst. We find an intrinsic spectral slope between 1930 Ang. and 22200 Ang of  $\beta = -1.14 \pm 0.20$  and a decay rate of  $\alpha = -0.86 \pm 0.15$ . There is no evidence for a change in the decay rate between approximately 0.7 and 4.7 days after the burst. Our data implies that there is no spectral break between the optical and X-ray bands between 0.7 and 4.7 days after the burst, and is consistent with the cooling break being redward of the  $K(\text{sub s})$  band (22 200 Ang) at 0.7 days. The combined ultraviolet/optical/infrared spectral energy distribution shows no evidence for a significant amount of extinction in the host galaxy along the line of sight to GRB 050416A. Our data suggest that the extragalactic extinction along the line of sight to the burst is only approximately  $A(\text{sub v}) = 0.2$  mag, which is significantly less than the extinction expected from the hydrogen column density inferred from X-ray observations of GRB 050416A assuming a dust-to-gas ratio similar to what is found for the Milky Way. The observed extinction, however, is consistent with the dust-to-gas ratio seen in the Small Magellanic Cloud. We postulate that GRB 050416A may have a two-component jet similar to what has been proposed for GRB 030329. If this is the case the lack of an observed jet break between 0.7 and 42 days is an illusion due to emission from the wide jet dominating the afterglow after approximately 1.5 days.

Author

*Afterglows; Cosmic Dust; Extinction; Infrared Astronomy; Ultraviolet Astronomy; Gamma Ray Bursts*

**20080009551** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**The UV Scattering Halo of the Central Source Associated with Eta Carinae**

Hillier, John; Gull, T.; Nielsen, K.; Sonneborn, G.; Iping, R.; Smith, Mathan; Corcoran, M.; Damineli, A.; Hamann, F. W.; Martin, J. M.; Weis, K.; [2007]; 55 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS5-2655; NAS5-26555; NAG5-12347; GO-9420; GO-9973; Copyright; Avail.: Other Sources

We have made an extensive study of the UV spectrum of Eta Carinae, and find that we do not directly observe the star and its wind in the UV. Because of dust along our line of sight, the UV light that we observe arises from bound-bound scattering at large impact parameters (e.g.,  $0.033'$ ). We obtain a reasonable fit to the UV spectrum by using only the flux that originates outside  $0.03'$ . This explains why we can still observe Eta(A) in the UV despite the large optical extinction - it is due to the presence of an intrinsic coronagraph in the Eta Carinae system, and to the extension of the UV emitting region. It is not due to peculiar dust properties alone. We have computed the spectrum of the purported companion star, and show that it could only be directly detected in the UV spectrum preferentially in the FUSE spectral region (912-1175 Ang.). However, we find no direct evidence for a companion star, with the properties indicated by X-ray studies, in UV spectra. This might be due to reprocessing of the companion's light by the dense stellar wind of the primary. FUSE observations, at epochs when (and if) the opening of the bow shock is along our sightline, should have a better chance of detecting the companion spectrum. The UV spectrum is dominated by low ionization lines, many exhibiting P Cygni profiles. Some of the strongest lines that can be readily identified include C II  $\lambda$  1335 (UVI), Si II  $\lambda$  1304, 1309 (UV3);  $\lambda$  1264 (UV4),  $\lambda$  1527, 1533 (UV 2);  $\lambda$  1808, 1817 (UV1), S II  $\lambda$  1250, 1253 (UV1), Al II  $\lambda$  1671, N I  $\lambda$  1493, 1495 (UV4), Mg II  $\lambda$  2796, 2803, as well as numerous Fe II lines. Higher excitation



lines due to A1 III  $\lambda\lambda$ 1855, 1863 and Si IV  $\lambda\lambda$ 1394, 1403 can be identified. A previous identification of C IV  $\lambda\lambda$ 1548,1552 must, because of severe blending, be considered as uncertain. The terminal velocity, as derived from numerous emission lines, is less than 600km/s, with preferred values around 520 km/s. This value is consistent with that seen in optical spectra. Broad Fe II and [Fe II] emission lines are detected in spectra taken in the SE lobe, 0.2' from the central star. These lines arise in the stellar wind - thus the STIS and HST are resolving, at some wavelengths, the stellar wind of Eta Carinae. The wind spectrum shows some similarities to the spectra of the B & D Weigelt blobs, but also shows some marked differences in that high excitation lines, and lines pumped by Ly alpha, are not seen. The resolution of the stellar wind at optical wavelengths, and the detection of the broad lines, lends support to our interpretation of the UV spectrum, and to our model for Eta Carinae.

Author

*Stellar Winds; Companion Stars; Massive Stars; Cosmic Dust; Halos; Stellar Coronas; Stellar Mass; Stellar Atmospheres*

## 90

### ASTROPHYSICS

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

**20080009550** NASA Goddard Space Flight Center, Greenbelt, MD, USA

#### **Eta Carinae across the 2003.5 Minimum: The Character and Variability of the Ejecta Absorption in the Near Ultraviolet**

Gull, T. R.; Kober, G. Vieira; Nielsen, K. E.; [2006]; 71 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS5-26555; Copyright; Avail.: Other Sources

We present Hubble Space Telescope (HST)/Space Telescope Imaging Spectrograph (STIS) high resolution near ultraviolet (NUV) spectra of nu Car's central source recorded before, during and after the 2003.5 spectroscopic minimum. Our focus is on the narrow absorption lines formed in multiple circumstellar shells, superimposed on the broad P-Cygni stellar wind features, and how they respond to the flux variations of nu Car across the minimum. Over thirty separate narrow-line velocity components are identified: three around -146 km/s, many between -323 and -587 km/s, and a few exceeding -1000 km/s. In general, excitation decreases with increasing velocity indicating that the primary excitation is by UV stellar photons and that the slower shells are located closer to the central source. Two well-isolated velocity systems at -146 and -513 km/s display very different spectral characteristics regarding ionization/excitation and respond differently to 7 Car's spectroscopic minimum. The -146 km/s shell, associated with the (internal) Little Homunculus, is ionized across the broad spectroscopic maximum but relaxes during the few months long minimum. The -146 km/s component is joined by adjacent velocity components in lines of singly ionized iron-group elements. Ti II and V II absorptions appear during the minimum, most likely caused by a decrease in Lyman-ionizing flux. The -513 km/s component, part of the (outer) Homunculus, does not show significant changes in atomic absorptions, but intermediate velocity components between -369 and -503 km/s vary during the minimum. We present the NUV spectrum, describe its general characteristics, but focus on identifications of the nebular absorption lines and their variations across the 2003.5 minimum. The complete spectrum between 2380 and 3160 Å with line identifications is available in the electronic edition of this paper.

Author

*Ultraviolet Spectra; Ejecta; Hubble Space Telescope; Spaceborne Telescopes; Spectrographs; Line Spectra; Imaging Techniques*

**20080009553** NASA Goddard Space Flight Center, Greenbelt, MD, USA

#### **Formation Flying for a Fresnel Lens Observatory Mission**

Krizmanic, John; Skinner, Gerry; Gehrels, Neil; [2006]; 7 pp.; In English; Copyright; Avail.: Other Sources

The employment of a large area Phase Fresnel Lens (PFL) in a gamma-ray telescope offers the potential to image astrophysical phenomena with microarcsecond ( $\mu$ ) angular resolution. In order to assess the feasibility of this concept, two detailed studies have been conducted of formation flying missions in which a Fresnel lens capable of focussing gamma-rays and the associated detector are carried on two spacecraft separated by up to 10(exp 6) km. These studies were performed at the NASA Goddard Space Flight Center Integrated Mission Design Center (IMDC) which developed spacecraft, orbital dynamics, and mission profiles. The results of the studies indicated that the missions are challenging but could be

accomplished with technologies available currently or in the near term. The findings of the original studies have been updated taking account of recent advances in ion thruster propulsion technology.

Author

*Fresnel Lenses; Formation Flying; Angular Resolution; Gamma Rays; Astrophysics*

## 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*.

**20080008607** NASA Johnson Space Center, Houston, TX, USA

### **DPT Mars Long-Stay Mission Architecture Status**

Drake, Bret G.; Decadal Planning Team Mars Mission Analysis Summary; July 2007, pp. 44-95; In English; See also [20080008605](#); Original contains color illustrations; No Copyright; Avail.: CASI: [A04](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080008607>

This viewgraph presentation reviews the mission architecture for the long stay mission to Mars. Two options are investigated: Nuclear Thermal Propulsion (NTP) and Solar Electric Propulsion (SEP) System Options. The presentation contains an Architecture Overview, Ground Rules and Assumptions, Detailed Mission by Phase, Capability Evolution, Systems, Transit Habitat, Surface Habitat, Descent / Ascent Vehicle, Interplanetary Transportation, Launch Vehicle, Technology Needs Architecture Features and Architecture Summary.

CASI

*Nuclear Propulsion; Solar Electric Propulsion; Manned Mars Missions; Mars Exploration; Mission Planning; Mars Bases; Space Habitats*

**20080009573** NASA Johnson Space Center, Houston, TX, USA

### **Desert Research and Technology Studies (RATS) 2007 Field Campaign Objectives and Results**

Kosmo, Joseph; Romig, Barbara; February 10, 2008; 1 pp.; In English; Space Technology and Applications International Forum, 10-14 Feb. 2008, Albuquerque, NM, USA; No Copyright; Avail.: Other Sources; Abstract Only

Desert 'RATS' (Research and Technology Studies) is a combined, multi-discipline group of inter-NASA center scientists and engineers, net-working and collaborating with representatives of industry and academia, for the purpose of conducting planetary surface exploration-focused remote field exercises. These integrated testing exercises conducted under representative analog Lunar and Mars surface terrain conditions, provide NASA the capability to validate experimental prototype hardware and software systems as well as to evaluate and develop mission operational techniques in order to identify and establish technical requirements and identify potential technology 'gaps' applicable for future planetary human exploration. The 2007 D-RATS field campaign test activities were initiated based on the major themes and objectives of a notional 5-year plan developed for conducting relative analog test activities in support of the engineering evaluation and assessment of various system architectural requirements, conceptual prototype support equipment and selected technologies necessary for the establishment of a lunar outpost. Specifically, the major objectives included measuring task efficiency during robot, human, and human-robot interactive tasks associated with lunar outpost site surveying and reconnaissance activities and deployment of a representative solar panel power and distribution system. In addition, technology demonstrations were conducted with a new Lithium-ion battery and autonomous software to coordinate multiple robot activities. Secondary objectives were evaluating airlock concept mockups and prototype removable space suit over-garment elements for dust mitigation, and upgrades to the prototype extravehicular activities (EVA) communication and information system. Dry run test activities, prior to testing at a designated remote field site location, were initially conducted at the Johnson Space Center (JSC) Remote Field Demonstration Test Site. This is a multi-acre external test site located at JSC and has detailed representative terrain features simulating both Lunar and Mars surface characteristics. Both the local JSC and remote field test sites have terrain conditions that are representative and characteristic of both the Moon and Mars, such as strewn rock and volcanic ash fields, craters, rolling plains, hills, gullies, slopes, and outcrops. The D-RATS 2007 field campaign, representing the completion of its tenth year of analog testing, was conducted at the large Cinder Lake volcanic ash bed area adjacent to Flagstaff, Arizona.

Author

*Deserts; Dust; Extravehicular Activity; Field Tests; Lunar Bases; Lunar Surface; Mars Surface; Analogs; Models; Simulators*

**20080009586** NASA Johnson Space Center, Houston, TX, USA

**Autonomous Landing and Hazard Avoidance Technology (ALHAT)**

Epp, Chirold; February 10, 2007; 22 pp.; In English; STAIF 2008 Space Technology and Applications Conference, 10-14 Feb. 2007, Albuquerque, NM, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): ALHAT 079749.01.10; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080009586>

This viewgraph presentation reviews the work towards technology that will result in an autonomous landing on the lunar surface, that will avoid the hazards of lunar landing. In October 2005, the Exploration Systems Mission Directorate at NASA Headquarters assigned the development of new technologies to support the return to the moon. One of these was Autonomous Precision Landing and Hazard Detection and Avoidance Technology now known as ALHAT ALHAT is a lunar descent and landing GNC technology development project led by Johnson Space Center (JSC) with team members from Langley Research Center (LaRC), Jet Propulsion Laboratory (JPL), Draper Laboratories (CSDL) and the Applied Physics Laboratory (APL) CASI

*Autonomy; Hazards; Lunar Landing; Lunar Surface; Optical Radar*

**92**

**SOLAR PHYSICS**

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

**20080009530** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Understanding Interplanetary Coronal Mass Ejection Signatures**

Wimmer-Schweingruber, R. F.; Crooker, N. U.; Balogh, A.; Forsyth, R. J.; Gazis, P.; Gosling, J. T.; Horbury, T.; Kilchenmann, A.; Richardson, I. G.; Richardson, J. D.; Riley, P.; Rodriguez, L.; VonSteiger, R.; Wurz, P.; Zurbuchen, T. H.; [2006]; 44 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

While interplanetary coronal mass ejections (ICMEs) are understood to be the heliospheric counterparts of CMEs, with signatures undeniably linked to the CME process, the variability of these signatures and questions about mapping to observed CME features raise issues that remain on the cutting edge of ICME research. These issues are discussed in the context of traditional understanding, and recent results using innovative analysis techniques are reviewed.

Author

*Coronal Mass Ejection; Interplanetary Space; Signatures; Solar Activity; Interplanetary Medium; Solar Corona*

**20080009541** NASA Glenn Research Center, Cleveland, OH, USA

**Apparent Relations between Solar Activity and Solar Tides Caused by the Planets**

Hung, Ching-cheh; [2007]; 21 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 843515.01.15.03; No Copyright; Avail.: Other Sources

Twenty-one of the thirty-four largest known solar flares happened near ( $<10^\circ$ ) the high-tide longitude of at least one of the four tide producing planets (Mercury, Venus, Earth, and Jupiter). The probability of this to happen at random is 0.36%. Separately, the alignment of Earth, Venus, and Jupiter is observed to have an 11-year cycle, which could resonate with the solar activity. This supports a hypothesis that the Sun's tides affect its activity by causing variation of plasma pressure and magnetic fields in regions from tachocline (where magnetic fields are generated) to corona (where magnetic fields generate flares).

Author

*Solar Activity; Tides; Solar Flares; Planets; Coronas; Mercury (Planet); Magnetic Fields*

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