2003 Technology Transfer Report

Office of Technology Transfer

NASA Goddard

Space Flight Center

2003's New Focus: ***Spin-In and Spin-Out***

As Chief of Goddard's Office of Technology Transfer, I would like to thank you for reading this report on our 2003 successes and how we achieved them.

As you might know, 2003 has been a year of exciting change for NASA's technology transfer efforts. We refocused our goals and set new standards for excellence in evaluating our performance. Our goals now are stated as:

- To form partnerships with industry and academia to develop new technology that supports Enterprise programs
- To commercialize and transfer NASA technology to U.S. industry, enhancing NASA's technology and commercial objectives

These ambitions might be summarized as our "spin-in" and "spin-out" goals.

- ***Spin-in:*** Industry, academia, and other government labs serve as valuable resources for NASA Enterprise programs. Often their technologies can be adapted to address space mission needs, allowing NASA to achieve its goals faster and more efficiently. Similarly, technologies developed at one NASA Field Center for a specific project might be widely applicable to other Enterprise programs.
- ***Spin-out:*** Space program technologies often can benefit other industries and play an important role in the U.S. economy. Although the structure of our economy has changed dramatically since NASA's founding in 1958, the value and applicability of our R&D activities to the economy have remained constant. Whether NASA works in tandem with private industry or the commercial sector turns to NASA for technological assistance, aerospace technologies have found their way into new products and services.

As you will see in this report, Goddard's Office of Technology Transfer already is working toward—and achieving—spin-in as well as spin-out successes. And in 2004 we expect these successes to increase further. For more information on how to participate in our success, please see the contact information on page 26.

Sincerely,

Nona Cheeks
Chief, Office of Technology Transfer
NASA Goddard Space Flight Center

Technology Transfer Report

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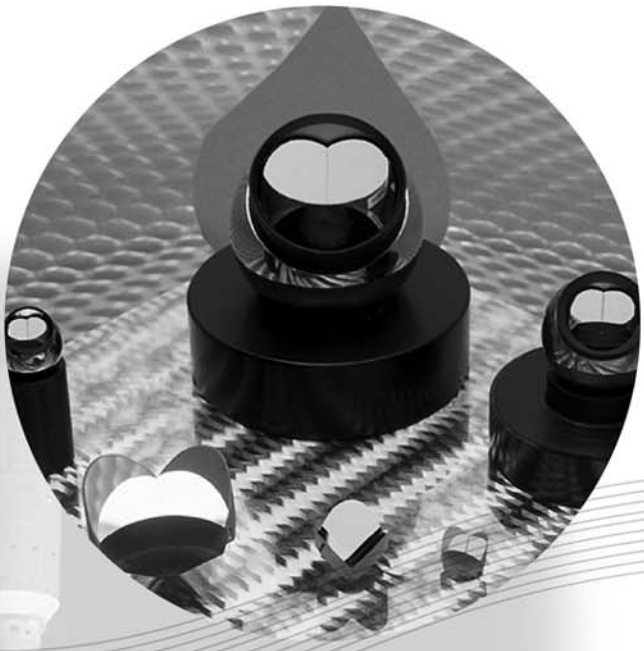
Successes

Our 2003 Successes

At Goddard's Office of Technology Transfer, we have been focused on achieving ***spin-out*** success for many years. Finding commercial, academic, and other government applications for space program innovations—and making that transfer a success—benefits the U.S. economy, the lives of the citizenry, and the U.S.'s competitiveness in the global marketplace.

We also recognize the value of ***spin-in*** to NASA and its Enterprise programs. By ensuring that Goddard's innovations make their way into other Field Centers as well as by accessing technologies in the commercial, academic, and government sectors, we advance NASA research and accelerate the achievement of NASA missions.

These pages summarize Goddard's ***spin-in*** and ***spin-out*** successes for 2003.



SpinIn

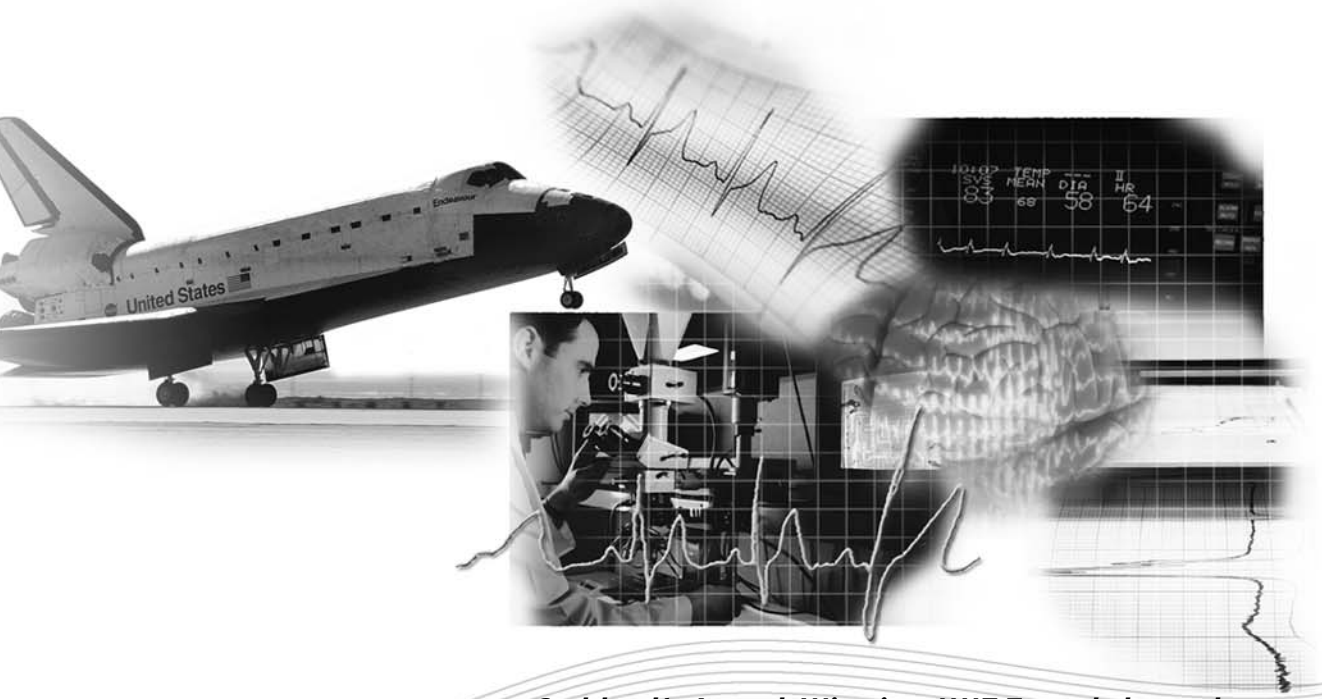
Commercialized Retroreflectors Make Their Way Back to NASA

In 1997, the Cassini spacecraft was sent to Saturn. On board was the Composite Infrared Spectrometer (CIRS), an imaging instrument that used an innovative retroreflector technology developed at NASA Goddard. In 1999, Goddard inventor James Lyons spun-out his retroreflector technology, creating a new company called PROSystems (***http://www.retros.com***/), which is short for Perfect Return Optical Systems.

In 2003, PROSystems sold its precision hollow retroreflectors and hollow roof mirrors to NASA Field Centers (as well as several commercial companies):

- Researchers at Langley Research Center are using PROSystems retroreflectors to advance lidar technology, which is one of the critical technologies that help NASA with its Earth Science and Space Science strategic missions.
- Researchers at the Jet Propulsion Laboratory purchased PROSystem's small hollow reflectors for various white light interferometer experiments. The devices simplify the experiments by eliminating the dispersion normally seen in solid retroreflectors.

As this spin-in success story demonstrates, the commercial sector often is well positioned to turn a NASA technology into a commercial a product. Then, not only is NASA able to focus on its space missions, but it also benefits by being able to easily purchase a quality product that advances those missions.



Goddard's Award-Winning HHT Tested throughout NASA as well as in Business, Academia, Other Government

SpinIn

SpinOut

Officially called the Computer Implemented Empirical Mode Decomposition Method, the Hilbert Huang Transformation (HHT) technology provides more precise analysis of natural processes than traditional data analysis methods, such as the Fast Fourier Transform (FFT) method. HHT can be applied to diverse areas, such as earthquakes, surface temperatures, speech/sound/ noise, and heartbeats. Recognized by the NASA Inventions and Contributions Board as "one of the most important applied mathematical methods in NASA history," HHT has won five awards, including the prestigious NASA Government Invention of the Year Award (see page 12).

HHT is playing a valuable role in advancing NASA's "Return to Flight" mission. Goddard has provided HHT to Kennedy Space Center as part of its nondestructive evaluation analysis for the composite heat shield—reinforced carbon-carbon (RCC)—that is expected to be used on future Space Shuttle missions.

At the same time, to ensure that the value of HHT would be disseminated throughout academia, industry, and government labs, Goddard's Office of Technology Transfer created a comprehensive Web site (***http://techtransfer.gsfc.nasa.gov/ HHT/HHT.htm***). Using this site, researchers and developers can register their interest and—pending approval from NASA—receive limited license to download the HHT software for evaluation and testing. As of December 31, 2003, more than 120 parties had requested the HHT software, including the Universities of Oklahoma, Delaware, and Vermont; government agencies such as the Federal Bureau of Investigation, the Federal Highway Administration, and the National Centers for Environmental Prediction of the National Weather Service; and more than 20 companies.

Innovative Earth Science Image Processing SoftwareAdvances Space Science and Dental Research

SpinIn

SpinOut

In developing the Hierarchical Segmentation Software (HSEG), Goddard researchers provided a new approach to image analysis. Rather than focusing on individual pixels, HSEG focuses on image regions—and how they change from a coarse-to-fine perspective. The software automatically organizes an image's pixels into regions based on their spectral similarity. Pixels that are not adjacent still might belong to the same region type if they share a similar spectral value (e.g., lakes separated by land). More information about HSEG is available online (***http://techtransfer.gsfc.nasa.gov/hseg/ index.cfm***).

Although originally developed for NASA's remote-sensing applications, HSEG has proven its value well beyond the realm of Earth science. Within NASA, HSEG is being used to help identify and extract magnetospheric radio-echo and natural plasma-wave signals recorded by the Radio Plasma Imager (RPI) on the NASA IMAGE mission—that is, the Imager for Magnetopause-to-Aurora Global Exploration—which was launched in March 2000 and still sends back valuable data. Other uses within NASA are being explored.

HSEG also has been licensed to Bartron Medical Imaging (***http://www.bartron.ws***) of New Haven, Connecticut. In July 2003, Bartron sold its first Med-Seg device—an advanced biological imaging unit—to the University of Connecticut School of Dental Medicine (SDM). Within the context of the Med-Seg device, HSEG reduces distortion and provides better resolution, assisting in the diagnosis and management of diseases that are imaged using digital X-rays. Researchers at the SDM will use Med-Seg to advance their understanding of tooth decay, periodontal disease, and conditions causing bone demineralization. Bartron's future development for Med-Seg will focus on cancer as well as neurological and cardiovascular diseases.

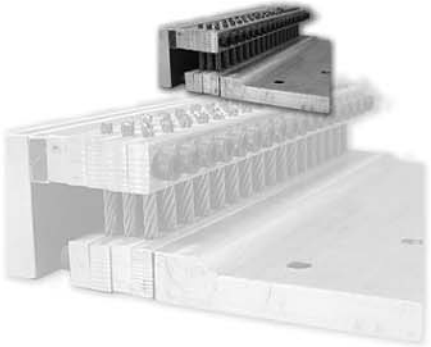
New Walker—Based on Goddard Technology—Revolutionizes Physical Therapy

SpinOut

In March 2003, Enduro Medical Technology launched a new rehabilitative device that helps patients with degenerative illness, traumatic injuries, or other afflictions to participate in standing and gait therapy in a safe, secure, fall-free environment. What made the East Hartford, Connecticut, company's introduction of this product—the Secure Ambulation Module (SAM)—so exciting was that its origins were at NASA.

The SAM walker consists of a wheeled apparatus with a pelvic harness that bears some or all of the patient's body weight and controls the pelvis without impeding hip movement during ambulation therapy. The harness is dynamically connected to cable-compliant wire joints, which were invented at Goddard for use in sounding rocket assemblies and robotics. Goddard's cable-compliant mechanisms are a highly effective alternative to rigid connections, providing customized structural stiffness, facilitating coupling operations, and mitigating shock and vibration damage. Technology details are available online (***http://techtransfer.gsfc.nasa.gov/compliantcable/index.cfm***).

Clinical tests of SAM in 2003 demonstrated its effectiveness, and Enduro received valuable design feedback. Newly updated SAM devices will be delivered to therapy facilities in Florida and Connecticut early in 2004.



Goddard Software Launched into Space in 1995 and Commercially in 2003

At the 2003 International Telemetering Conference, DesignAmerica debuted its newest product: the Advanced Spacecraft Integration and System Test (ASIST) software. ASIST originated at Goddard as a real-time command-and-control system for spacecraft development, integration, and operations. It was included on various spacecraft—the X-Ray Timing Explorer 1995), the Tropical Rainforest Measurement Mission (1997), the Far Ultraviolet Spectroscopic Explorer (1999), and the Microwave Anisotropy Probe (2001)—as well as specific instruments, such as the Composite Infrared Spectrometer used aboard the Cassini spacecraft to Saturn and its largest moon, Titan.

SpinIn

SpinOut ASIST clearly proved its value throughout NASA. However, further development and support of the ASIST software was best handled by the private sector. DesignAmerica of Annapolis, Maryland had been a key developer of the ASIST development team. As a result, ASIST was licensed to DesignAmerica in October 2003. DesignAmerica now strives to ensure that ASIST fully benefits the government and aerospace communities.

Other Spin-Out Successes

SpinOut The Office of Technology Transfer achieved additional spin-out successes by licensing several Goddard technologies to commercial companies and academic institutions:

Technology	*Licenses*	
Process for Producing High-Quality Optically Polished Surfaces on Bare Aluminum Substrates	Nu-tek	Aberdeen, Maryland
Gear Bearings	Advanced CAD ACM Service Corp.	Peoria, Illinois
Regional Applications Center Software: RODIN	Global Science and Technology	Greenbelt, Maryland

Technology	*Space Act Agreements*	
Process for Producing High-Quality Optically Polished Surfaces on Bare Aluminum Substrates	University of Arizona	Tucson, Arizona
The Turbotrap: A Method for Containing a Gas in an Open Container	Global Systems & Technologies	Oxon Hill, Maryland

Processes

SpinIn SpinOut

Achieving Our Success

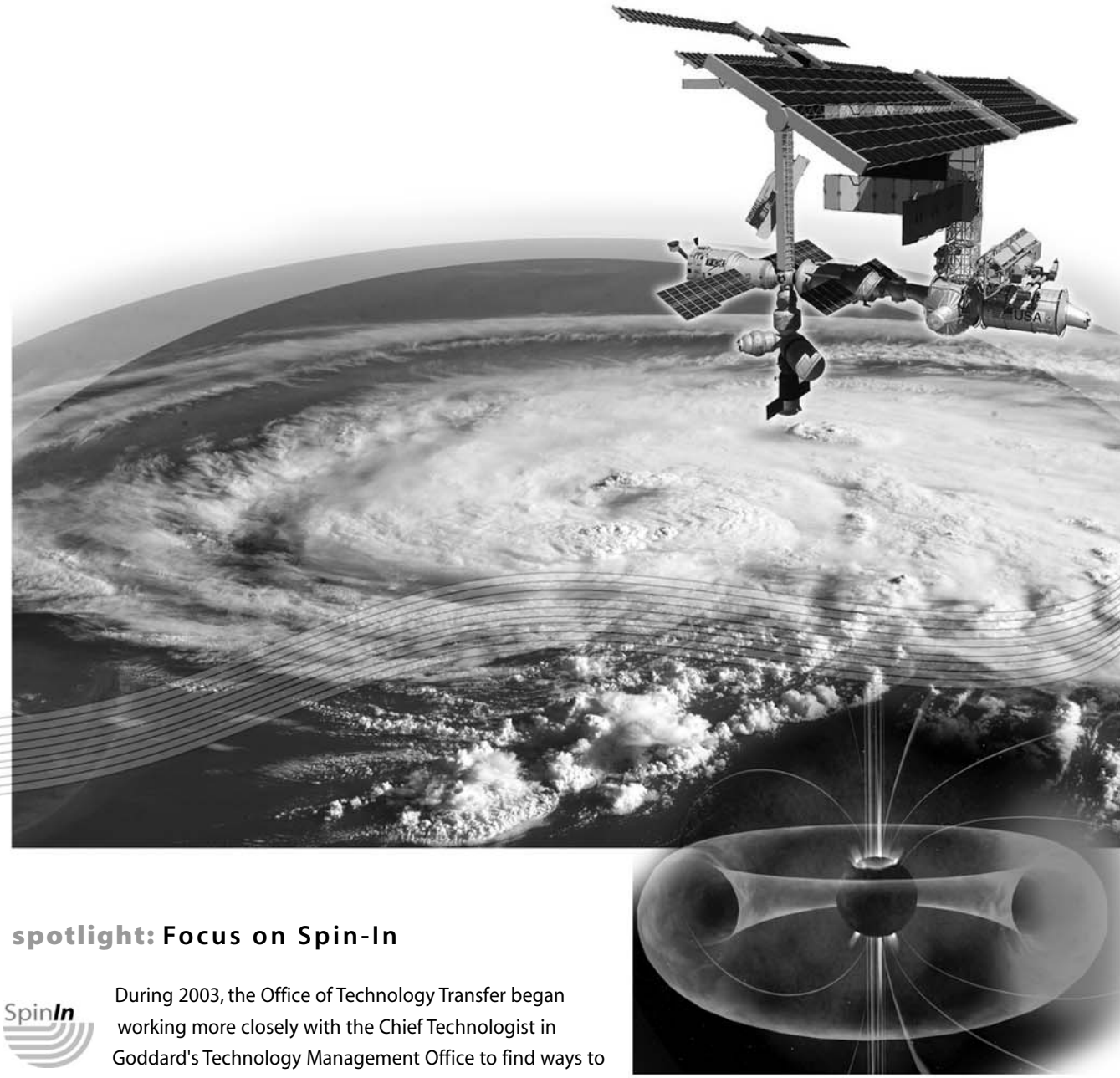
Goddard's Office of Technology Transfer is proud of its achievements in 2003. And we look forward to creating even more spin-in and spin-out success stories in 2004. We achieve these successes via two paths: involving innovators and outreach to potential partners. This section describes the activities along these two paths.

Involving Innovators

Goddard's innovators—the scientific and technical staff working toward NASA mission goals every day—are a key starting point for technology transfer. They know the technical challenges that must be overcome for NASA missions to be successful—that is, the opportunities for a spin-in of outside technology. They also are intimately familiar with Goddard's technical strengths and technology portfolio, having developed these innovations themselves. These technologies may be transferred to other Field Centers to maximize the return on NASA's R&D investment—achieving additional spin-in successes—or spun-out to private businesses, universities and colleges, and other government labs.

Without the participation of Goddard's scientific and technical staff, the Office of Technology Transfer could not achieve its goals. We thank these innovators for their involvement.

Michael Barthelmy
Michael Beamesderfer
Jeannette Benavides
Thomas Bialas
Gregory Boegner
Clifford Brambora
Kristi Brown
Jason Budinoff
Robert Candey
Victor Chambers
Reine Chimiak
Gregory Clarke
Carmel Conaty
Donald Coyle
Steven Curtis
Keith Deweese
Terence Doiron
Denise Duignan
Amy Fedorchak
Gene Feldman
Jeffrey Ferrara
Yury Flom
Samuel Floyd
David Folta
Edward Gaddy
Parminder Ghuman
Rene Gosselin
Gregory S. Greer
Thomas Grubb
Bernard Harris
Jessica Hauss
Edward Hicks
Jeffrey Hosler
Carl Hostetter
Connie Houchens
Norden Huang
Steven Hughes
Brian Jamieson
Cameron Jerry
Murzy Jhabvala
Jeremy Jones
Hollis Jones
Virginia Kalb
Richard Katz
Daniel Kaufman
Edward Kim
David Le Vine
Douglas Leviton
Donald Lokerson
Richard Lyon
David Mangus
Mark Matsumura
Andrew Maynard
Charles McClain
Timothy McClanahan
Johnny Medina
Ronald Mink
James Morrissey
Gary Mosier
Raymond Ohl
Sharon Orsborne
Fernando Pellerano
Thomas Perricone
David Petrick
Robin Pfister
Jeffrey Piepmeier
Samuel Placanica
Paul Racette
Glenn Rakow
John Riley
Nelson Rubin
Arthur Ruitberg
Richard Schnurr
Rajeev Sharma
Harry Shaw
Salman Sheikh
Eric Stoneking
Wesley Sweetser
Ronald Toland
Jacob Trombka
George Voellmer
John Vranish
Philip Ward
Thomas Winkert
Luke Winternitz
John Wood
Mark Woodard
Said Zewari



spotlight: Focus on Spin-In

During 2003, the Office of Technology Transfer began working more closely with the Chief Technologist in Goddard's Technology Management Office to find ways to effectively achieve their mutually compatible goals. With its new focus on spin-in, the Office of Technology Transfer helps ensure that Goddard and the other NASA Field Centers get the technologies they need, either from within NASA or from outside labs and companies. This spin-in emphasis fits perfectly with the Chief Technologist's goals.

Goddard's Chief Technologist develops the Center's roadmap for technologies as applied to NASA missions, sponsoring early R&D activities as appropriate. In addition, the Chief Technologist coordinates with the R&D chiefs from other NASA Centers and other government laboratories, looking for opportunities to partner and collaborate. Sponsoring and helping set up the exchange fellowship program further benefits research and technology knowledge sharing within Goddard.

New Technology Reporting Program

Every year, the Office of Technology Transfer hosts its New Technology Reporting (NTR) Program to recognize the contributions of Goddard innovators to technology transfer. More than 100 people attended the April 9th event.

In addition to bestowing several awards (see pages 12 and 15), the Office takes this opportunity to elaborate on a particularly significant technology transfer success story. In 2003, the success story was the launch of the Secure Ambulation Module (SAM) by Enduro Medical Technology (see page 6). A video documenting this success story in detail is available online (***http://techtransfer.gsfc.nasa.gov***) as well as via CD-ROM from the Office of Technology Transfer.

Awards

Awards provide an excellent medium for encouraging Goddard's innovators to participate in technology transfer as well as promoting Goddard technologies to potential partners. The Office of Technology Transfer submits Goddard inventions for awards bestowed by outside organizations as well as awards given by NASA's Inventions and Contributions Board (***http://icb.nasa.gov***). In addition, the Office created its own award to recognize an innovator active in technology transfer: the Kerley Award.

Peter Hildebrand, Chief of the Laboratory for Hydrospheric Processes, accepts the Kerley Award on behalf of Norden Huang, who was unable to attend the event. Also pictured (left to right) are Veronica Johnson, meteorologist for NEWS4; Alison McNally, Associate Center Director; and Nona Cheeks, Chief of Goddard's Office of Technology Transfer.

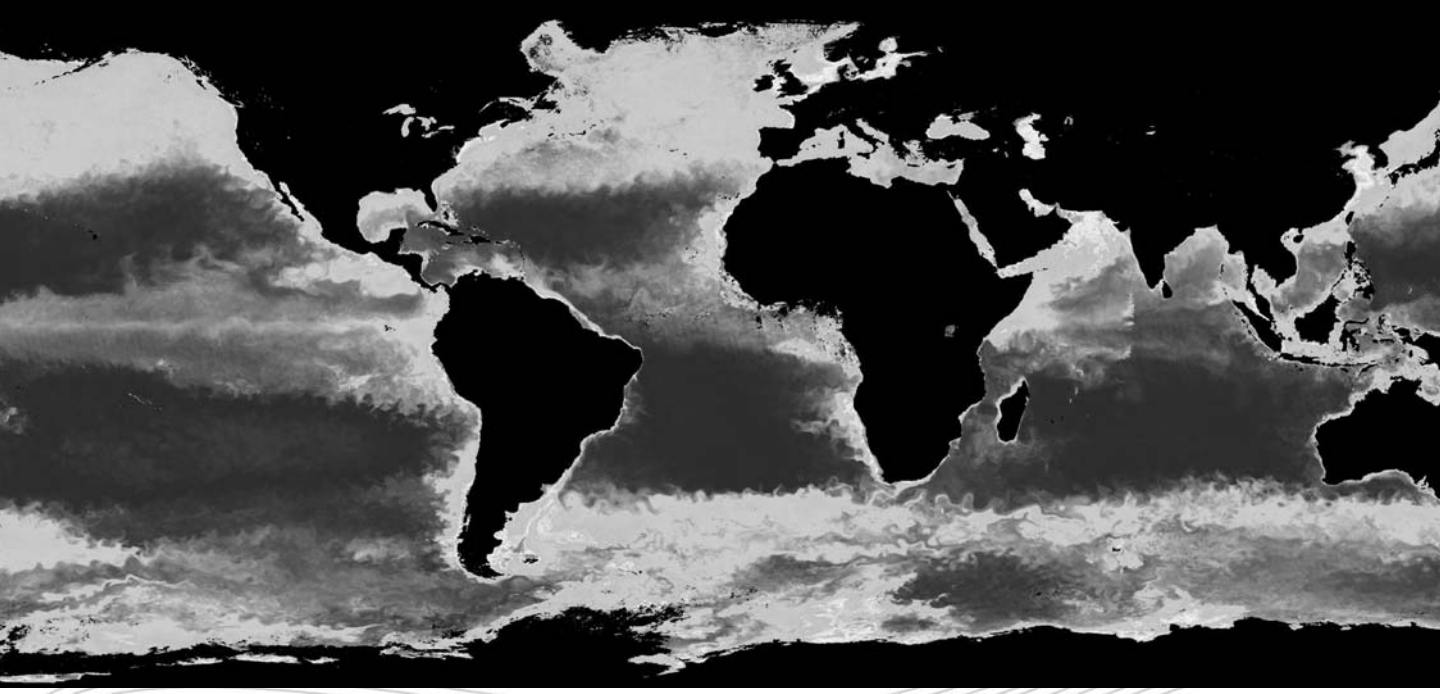
HHT Wins Kerley Award and NASA's Government Invention of the Year

Named after the late James Kerley, a Goddard scientist who championed technology transfer, the Kerley Award is presented annually to recognize a Goddard researcher's commitment to new technology reporting and the technology transfer process. The winner for 2003 was Norden Huang, who has been exceptionally active in the transfer of his Hilbert-Huang Transformation (HHT) technology (see page 4). Huang's award was announced in April at the 11th annual New Technology Reporting Program (see page 11).

Two months later, Dr. Huang and his HHT technology were honored with the prestigious NASA Government Invention of the Year Award. This award recognizes government employees who have developed a technology that has provided a significant and identifiable benefit to a NASA project or program, such as improving mission safety or saving significant time and money. NASA's ICB called HHT "one of the most important applied mathematical methods in NASA's history."

"I am gratified to learn that Dr. Huang is working on algorithms that are going to allow us to conduct nondestructive testing of the Shuttle orbiters, [a key need identified by the Columbia Accident Investigation Board]. His method is going to help advance that particular objective in ways that we could not have imagined just six months ago. It now has tremendous capacity for immediate application for which we are most grateful."

Sean O'Keefe, NASA Administrator



SeaDAS Wins NASA's Software Invention of the Year Award

Goddard was gratified to be a winner of another prestigious NASA award in 2003. The ICB presented NASA's Software of the Year Award to the SeaWiFS Data Analysis System (SeaDAS). SeaWiFS is the Sea-Viewing Wide Field-of-View Sensor, an Earth-orbiting ocean color sensor gathering quantitative data on global ocean bio-optical properties to monitor various types and quantities of marine phytoplankton (microscopic marine plants).

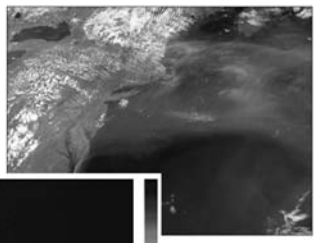
Since the beginning of the SeaWiFS project in 1991, a primary objective has been to provide the Earth science community with rapid and easy access to the sensor's data as well as the tools to work with the data. The SeaDAS software package provides essential processing, display, analysis, and quality control functions for the data users.

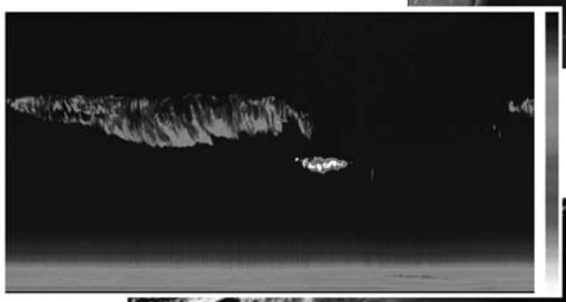
Feedback from the research community on SeaDAS's performance has been extremely favorable. It has been accepted as the standard ocean color satellite analysis system by the international research community (over 500 user sites in nearly 50 countries) and other space agencies. The software also has been used by many commercial entities, including ORBIMAGE, which is developing commercial products from SeaWiFS data, and SeaSpace and Integral System, Inc., which use SeaDAS as part of their direct-broadcast ground stations.

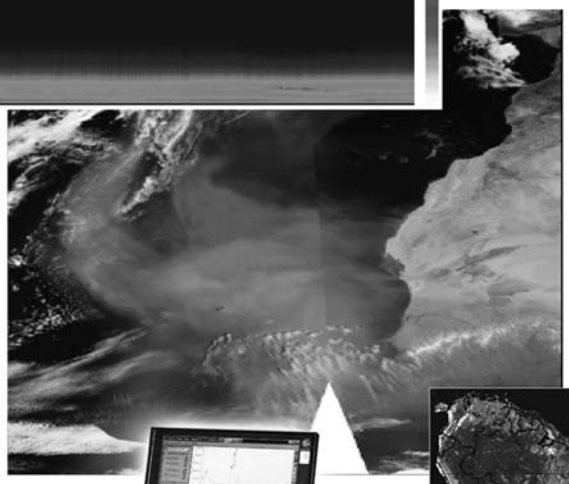
Goddard Researcher Selected as Tech Museum Laureate

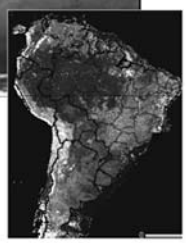
In 2003, Goddard's James D. Spinhirne (pictured to the right) was selected as one of 25 laureates for The Tech Museum Awards: Technology Benefiting Humanity. Chosen as one of five finalists (out of 96 nominations) in the "Environment" category for his Micro Pulse Lidar (MPL), Dr. Spinhirne attended the October 15th awards gala hosted by Al Roker of NBC's *Today* show in San Jose, California.

MPL is a ground-based lidar system that enables autonomous monitoring of atmospheric clouds and aerosol scattering. Unlike previous lidar systems, MPL is an eye-safe, small, simple, reliable, long-range system that operates unattended and is significantly enhancing atmospheric research. For more information on MPL and its use, see ***http://mplnet.gsfc.nasa.gov***/.









To be selected as a Tech Museum finalist, applicants must demonstrate:

- That the use of technology significantly improves the human condition in one of five universal areas: economic development, education, environment, equality, and health
- Evidence that a serious problem or challenge with broad significance is addressed
- A noteworthy contribution that surpasses previous or current solutions
- A novel application that represents a breakthrough or a creative adaptation of an existing technology
- Its potential to serve as an inspiration or model for others

More information about The Tech Museum is available online (***http://www.thetech.org/techawards/index.cfm***).

Patent Awards

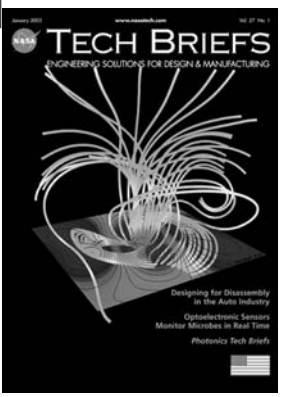
At the New Technology Reporting Program in April (see page 11), Goddard's Office of Patent Counsel presented Patent Awards—including plaques and checks for $500 to $1,000—to six innovators, who had U.S. patents issued for their Goddard technologies in 2002:

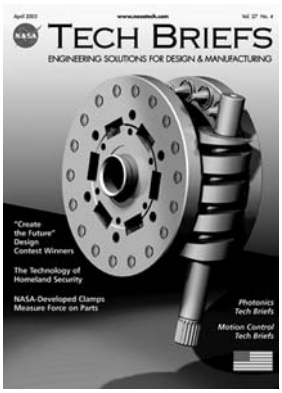
- Kenneth Blumenstock
- Edward Cheung
- Norden Huang
- Michele Manuel
- Geary Schwemmer
- Harry Shaw

In 2003, nine Goddard technologies received U.S. patents:

U.S. Patent No.	*Technology Name*
6,538,796	MEMS Devices for Spacecraft Thermal Control Applications
6,566,854	Apparatus for Measuring High-Frequency Currents
6,584,874	3-D Sprag Ratcheting Tool
6,593,879	Using the Global Positioning Satellite System to Determine Attitude Rates Using Doppler Effects
6,594,582	GPS Compound Eye Attitude and Navigation Sensor and Method
6,626,792	Gear Bearings
6,631,325	Computer Implemented Empirical Mode Decomposition Method Apparatus, and Article of Manufacture Utilizing Curvature Extrema
6,640,949	1-Way Bearing
6,648,522	Fiber Optic Connector Polishing Fixture Assembly

Goddard also submitted 8 patent applications and 11 provisional patent applications in 2003. It is expected that patents will be issued to these technologies in the coming years.





NASA Tech Briefs *Awards*

NASA Tech Briefs is a monthly publication reporting new, commercially significant NASA technologies. To encourage Goddard innovators to publish their technologies, the Office of Technology Transfer provides cash awards for publishing in *NASA Tech Briefs*.

In 2003, the following technologies were published in *NASA Tech Briefs:*

- ***Eye Safety Camera Attached to a Theodolite to Obtain Boresight Pointing of High-Intensity Visible Lasers and/or Invisible Infrared Lasers*** (GSC-14469-1) The simple addition of a charge-coupled-device (CCD) camera to a theodolite makes it safe to measure the pointing direction of a laser beam. (January 2003)
- ***Mechanical Tube Bending Tool for Precise Bends*** (GSC-14412-1) This relatively simple, manually operated tool enables precise bending—typically, within ±0.5° of the specified bend angle—of a metal tube located in a confined space, with a minimum of flattening of the tube and without significant gouging of the tube surface. (April 2003)
- ***Neutral Axis Spring Concept for Providing Torque Margin to Composite Thin-Wall Integral Boom Hinges*** (GSC-14640-1) Neutral-axis springs could be used to augment the unfolding torques of hinges that are integral parts of thin-wall composite-material booms used to deploy scientific instruments from spacecraft. (September 2003)

NASA Tech Briefs is available online at: ***http://www.nasatech.com***

Attendance at Conferences

Presenting their technologies at regional or national conference is an excellent professional opportunity for Goddard's scientific and technical staff. Because of the value these presentations also offer in terms of outreach to potential partners (see page 19), the Office of Technology Transfer helps arrange innovator participation at these events.

In 2003, the Office of Technology Transfer helped 7 Goddard innovators present 10 technologies at 4 professional conferences. For more information on the Office's participation in technology conferences, see page 25.


goddard tech transfer news

Spring: Time for a Fresh Start

Awards at 2003 NTR Program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Huang Wins NASA Government Invention of the Year Award

Innovators Advance R&D via Commercial Technology Development Program


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HQ Names a New Director for Technology Transfer

Goddard Researchers Receive Software of Year Award


goddard tech transfer news

Spinhire Selected as Tech Museum Laureate

Goddard's Tech Management Work toward Common Goals

Goddard Tech Transfer News

In Spring 2003, the Office of Technology Transfer redesigned, renamed, and refocused its quarterly periodical distributed to Goddard's management and scientific and technical staff. *Goddard Tech Transfer News* provides information of interest to Goddard innovators:

- Explanations of each step of the technology transfer process
- Awards, upcoming conferences, and other opportunities to gain recognition for their innovations
- Programs that provide funding for research projects
- Profiles of researchers active in technology transfer

By understanding that their innovations and expertise are national assets that can be used to achieve NASA's space program goals as well as to develop new products and processes that benefit the U.S. in other ways, Goddard's innovators will more actively participate in the technology transfer activities that make these potential benefits a reality.

Outreach to Potential Partners

In order to be successful in achieving our spin-in and spin-out objectives, the Office of Technology Transfer must conduct extensive outreach to potential partners in industry and academia as well as at other government laboratories and NASA Field Centers. Through this outreach, the Office can convey:

- Goddard's needs for technology or guidance on achieving NASA mission goals – ***spin-in***
- Goddard innovations and expertise that are available to solve their technical challenges – ***spin-out***

The Office of Technology Transfer undertakes a variety of outreach activities to communicate effectively with potential partners. This section describes these activities in 2003.

Agreements for Use of Goddard Technologies and Facilities

The Office of Technology Transfer uses several vehicles to make Goddard innovations available for use by outside organizations:

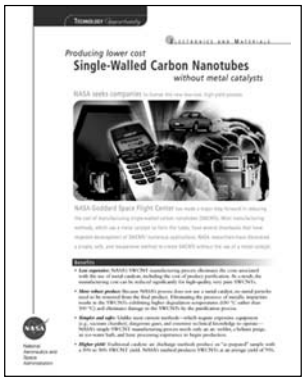
- ***Space Act Agreement (SAA)***
  Under an SAA, the external partner and Goddard work together on joint research that meets the technical needs of both parties. For instance, a private company might work with Goddard to integrate a NASA technology into its existing product line while providing expertise on how the original technology can be improved to benefit NASA.
- ***Software Use Agreement (SUA)***
  This agreement allows Goddard-developed software to be used by other parties for specific purposes. In some cases, the duration of the agreement is limited so that the user can test it on a preliminary basis, followed by a license agreement for longer term access to the software. In 2003, the Office of Technology Transfer began coordinating SUAs via online processing, as part of its efforts to transfer the Hierarchical Segmentation (see page 5) and Hilbert-Huang Transformation software (see page 4).
- ***Prototyping License***
  The prototype licensee develops application-specific prototypes of a patented Goddard invention for other organizations wanting to evaluate the technology for their own use. If the technology meets their needs, those organizations sign a license with Goddard to use it on a more ongoing basis. The prototype licensee helps to reduce time to market for the potential licensee while improving Goddard's opportunities for licensing.
- ***Exclusive/Nonexclusive License***
  An organization may apply for an exclusive, an exclusive in a field of use, a co-exclusive, or a nonexclusive license to use or manufacture a Goddard technology. In most cases, royalties (e.g., a percentage of sales) are paid to Goddard.

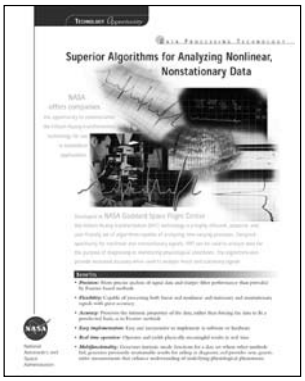
Making Goddard Technologies Available

Potential partners can find out about available Goddard technologies and expertise via various sources:

- ***Technology Opportunity Sheets***
  The Office publishes these one-page descriptions of available Goddard technologies throughout the year.
- ***Goddard's Office of Technology Transfer Web Site***
  The Office's online offerings include featured technologies, virtual tours of Goddard facilities, and access to other NASA technology sources (***http://techtransfer.gsfc.nasa.gov***).
- ***NASA TechFinder***
  This is an online clearinghouse for technologies available from any NASA Field Center (***http://technology.nasa.gov/***).
- **NASA Tech Briefs**
  The Office helps Goddard innovators publish their technologies in this monthly periodical read by original equipment manufacturer (OEM) design/development engineers and managers (***http://www.nasatech.com***).
- **Nanotech Briefs**
  In 2003, the Office prepared an article on nanotechnology research at Goddard—and the collaborations related to it—for the inaugural issue of this new electronic periodical.

The Office of Technology Transfer also hosts and attends events where potential partners can hear more about available Goddard technologies (see page 22).





Hosting and Attending Events

In addition to attending professional conferences, Goddard's Office of Technology Transfer hosts a variety of events to disseminate information about available Goddard technologies—as well as NASA's scientific and technical needs—to potential partners. In 2003, the Office hosted or helped organize five such events.

NASA Medical Technology Summit

On February 11–13, 2003, NASA hosted nearly 200 attendees from industry, academia, and government agencies at the NASA Medical Technology Summit: Forging Partnerships to Commercialize Emerging Medical Technologies. By introducing industry leaders to NASA's most exciting and innovative medical technologies, the summit sought to stimulate joint development and licensing partnerships with industry.

Among the more than 20 NASA technologies featured at the summit were 3 developed at Goddard:

- The Hilbert-Huang Transformation method (see page 4), which can be used to analyze heart rate, blood pressure, and other biological signals
- Single-walled carbon nanotubes, which can be used in pacemakers, implantable biosensors, hearing aids, and other medical devices
- Sol-gel filled fiber optics, which can be used in biosensors

In addition to hearing presentations on these and other NASA technologies, attendees were able to meet one-on-one with inventors and technology transfer staff. Goddard inventors participated in eight such meetings. The Office of Technology Transfer is following up with the National Institutes of Health and companies that expressed interest in Goddard's inventions.

Technology Briefing on the Hilbert-Huang Transformation (HHT) Method

The Office of Technology Transfer hosted a briefing on Goddard's HHT Advanced Analysis Software in March 2003. Attended by 50 representatives from companies, universities, and government agencies, the briefing included presentations exploring the potential applications for the HHT technology:

- Biomedical signal analysis
- Speech analysis
- Machine tool fault detection
- Vibrometers
- Data processing

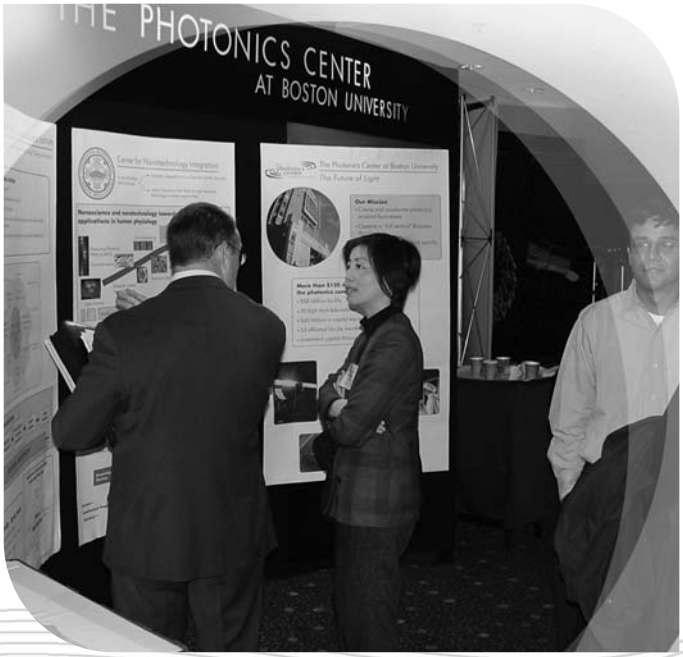
These presentations were followed by one-on-one meetings, where seven organizations discussed possible partnerships with the inventor and Goddard technology transfer staff. Now, the Office of Technology Transfer is exploring possible partnership opportunities with the FBI, the Federal Highway Administration, and Bartron Medical Imaging, which has already successfully spun-out another Goddard technology (see page 5).

National Association of Seed and Venture Funds (NASVF) Conference

In November 2003, NASA was a co-sponsor for the NASVF conference in Baltimore, Maryland. In keeping with the theme of the event—Innovations in Early-Stage Investing—NASA explored ways to foster ventures and collaborations to capitalize on the enhanced economic growth, competitiveness, and quality of life opportunities created by NASA's cutting-edge research and technological innovation. Investment by seed and venture funds accelerates the R&D that leads to commercial products—products that might be procured to advance government missions (i.e., spin-in).

Goddard played an active role in this event, presenting the Hilbert-Huang Transformation (HHT) method to tech-savvy investors, who then evaluated it as an investment opportunity. Several suggestions were made on positioning the technology in a start-up environment, and potentially interested companies were identified. The Office of Technology Transfer is pursuing these leads.

NASA Tech Briefs *Nanotech 2003 Conference*



Goddard's Office of Technology Transfer played a leading role in helping organize the *NASA Tech Briefs* Nanotech 2003 Conference held in Boston in late October 2003. Originally conceived as an opportunity to feature a single Goddard technology, the event grew into a 2-day conference. Staff in the Office of Technology Transfer designed the content of the program and found more than 40 speakers from government, academia, and industry. Six of these speakers were from Goddard, and three of these were innovators discussing their technologies and NASA's nanotech goals (see page 25). In addition, Goddard previewed a 10-minute video being prepared by the Office of Technology Transfer on various nanotechnology research projects underway at NASA. That video will be completed in 2004.

Greater Washington Nanotechnology Alliance Special Topics Symposium

The Office of Technology Transfer and Goddard researcher Dan Powell attended the first special topics symposium of the Greater Washington Nanotechnology Alliance. Held on November 25th in Laurel, Maryland, this day-long event was filled with presentations on topics ranging from public interest issues to technical practices, research, and potential/developing applications. The event—as well as the Alliance itself—is mainly a knowledge-sharing and networking opportunity. By knowing the key players and what they are researching, the Office of Technology Transfer can identify opportunities for combined research efforts that benefit NASA as well as the partner.

NASA Technology & Business Conference

On August 25–26, the Chief of the Office of Technology Transfer participated in a presentation at the 12th Annual NASA Technology & Business Conference in Albany, New York. Attendees of this small business networking, training, and education conference met with NASA, contractors, and other government agencies to discuss possible business opportunities. In her presentation, the Office Chief outlined a step-by-step process for the public and private sectors to participate in NASA's technology transfer activities through licensing or joint R&D opportunities.

Federal Laboratory Consortium for Technology Transfer (FLC) Annual Conference

The 2003 FLC national meeting was held May 5–9 in Tucson, Arizona. In pursuing the theme of "Adding Value to the T2 Frontier," the week included advanced training on intellectual property management and licensing as well as sessions on leveraging technologies for economic development. The FLC meetings allow Goddard's Office of Technology Transfer to share best practices with other research labs.

Technology Conferences

As discussed on page 17, the Office of Technology Transfer helps coordinate the participation of Goddard researchers at various professional conferences. Not only does this provide a valuable professional benefit to the researchers—and thus encourage them to participate in technology transfer—but it also is an excellent venue for presenting Goddard technologies to targeted potential partners. Similarly, NASA's technical and research needs can be presented in the hopes of generating spin-in partnerships.

In 2003, the following Goddard presentations were made at professional conferences:

Technology/Presentation	***Event***
Aluminum super polishing technique	SAMPE (Long Beach, CA)
"Application of Nanotech to Spacecraft and Scientific Instruments"	*NASA Tech Briefs* Nanotech 2003 (Boston, MA)
"Applied Nanotechnology in Space"	Nanotech 2003 (Boston, MA)
Encoder technologies	NDES (Chicago, IL)
Gear bearings	NDES (Chicago, IL)
Hilbert-Huang Transformation method	NASVF (Baltimore, MD)
Multi-stage adiabatic demagnetization refrigerator	SAMPE (Long Beach, CA)
Noncatalytic manufacturing method for carbon nanotubes	Nanotech 2003 Conference (Boston, MA) NDES (Chicago, IL) SAMPE (Long Beach, CA)
"Oriented Nanocomposite Extrusion"	Nanotech 2003 (Boston, MA)
Passive gas-gap heat switch	SAMPE (Long Beach, CA)

NASVF = National Association of Seed and Venture Funds

NDES = National Design and Engineering Show

SAMPE = Society for the Advancement of Material and Process Engineering

How to Contact Us

The staff of the Office of Technology Transfer welcome calls and e-mails from industry, academia, government labs, and the general public interested in learning more about partnership opportunities with Goddard.

telephone: **(301) 286-5810**

e-mail: **techtransfer@gsfc.nasa.gov**

internet: **http://techtransfer.gsfc.nasa.gov**

Other Web Sites

NASA Goddard Space Flight Center	**http://www.gsfc.nasa.gov**
NASA's Commercial Technology Network	**http://nctn.hq.nasa.gov**
NASA TechFinder	**http://technology.nasa.gov**

Office of Technology Transfer

NASA Goddard Space Flight Center

Greenbelt, Maryland 20771

phone: ***(301) 286-5810***

fax: ***(301) 286-0301***

e-mail: ***techtransfer@gsfc.nasa.gov***

web: ***http://techtransfer.gsfc.nasa.gov***

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