National Aeronautics and Space Administration
Goddard Space Flight Center

2004 Technology Transfer Report





Office of Technology Transfer

Technology Transfer's Role in NASA's Space Exploration Vision

On January 14, 2004, President Bush announced a new vision for the nation's Space Exploration program—one designed to advance U.S. scientific, security, and economic interests. Within weeks, the National Aeronautics and Space Administration turned that policy statement into a new, bold framework for exploring our solar system—*The Vision for Space Exploration.*

NASA's Space Exploration missions require advanced systems and capabilities that will accelerate the development of many critical technologies:

- Power
- Computing
- Nanotechnology
- Biotechnology
- Communications
- Networking
- Robotics
- Materials

As articulated in the *Vision*, "These technologies ***underpin*** and ***advance*** the U.S. economy and help ensure national security. NASA plans to work with other government agencies and the private sector to develop space systems that can address national and commercial needs."

Transferring technologies to and from the private sector, universities, and other government laboratories as part of Space Exploration can

- Boost NASA's technical strength via an infusion of external technology solutions
- Enhance U.S. economic strength via new technology, new products, and increased exports

The Office of Technology Transfer (OTT) at NASA Goddard Space Flight Center helps to achieve these goals through ***spin-in*** and ***spin-out*** of technology. In fiscal year 2004, OTT refocused these efforts to begin to address NASA's new Space Exploration goals.

This report summarizes the spin-in partnerships formed in FY04 to accelerate technology development for the Space Exploration program and other NASA missions. It also presents spin-out partnerships that accelerate private sector and university research and development as well as enhance regional economic development (pages 23–24). Also included is a review of how we achieve these and future successes, including new modes of doing business (page 3) and process improvements (page 10).

More information about NASA's *Vision for Space Exploration* is available online:
http://www.nasa.gov/missions/solarsystem/explore_main.html

Contents

Our 2004 Successes

For Goddard's Office of Technology Transfer, success is defined in terms of two types of partnerships:

- ***Spin-in partnerships:*** Industry, academia, and other government labs serve as valuable resources for NASA. Partnerships to use their technologies can help NASA achieve its goals faster and more efficiently. Similarly, technologies developed at one NASA Field Center for a specific project might be applicable to work underway at other Field Centers. This type of technology spin-in helps NASA gain greater returns on its research investments.

- ***Spin-out partnerships:*** Space program technologies often can benefit other industries. Partnerships to find new commercial and academic applications for NASA-developed technologies benefit the U.S. economy, the lives of the citizenry, and the U.S.'s competitiveness in the global marketplace.

These pages summarize Goddard OTT's spin-in and spin-out successes for FY04.

Goddard's Successful HHT Software Benefits NASA and Other Government Labs

SpinIn

The Hilbert-Huang Transform (HHT) technology is an innovative algorithm for analyzing signals from naturally occurring phenomena—that is, nonlinear and nonstationary signals that cannot be processed using the standard Fast Fourier Transform method. Not only has this technology (and its inventor) won several awards, but it also is providing major benefits throughout NASA and U.S. government agencies.

In FY04, Goddard's OTT helped secure the following five spin-in partnerships for the software program that implements the HHT algorithms:

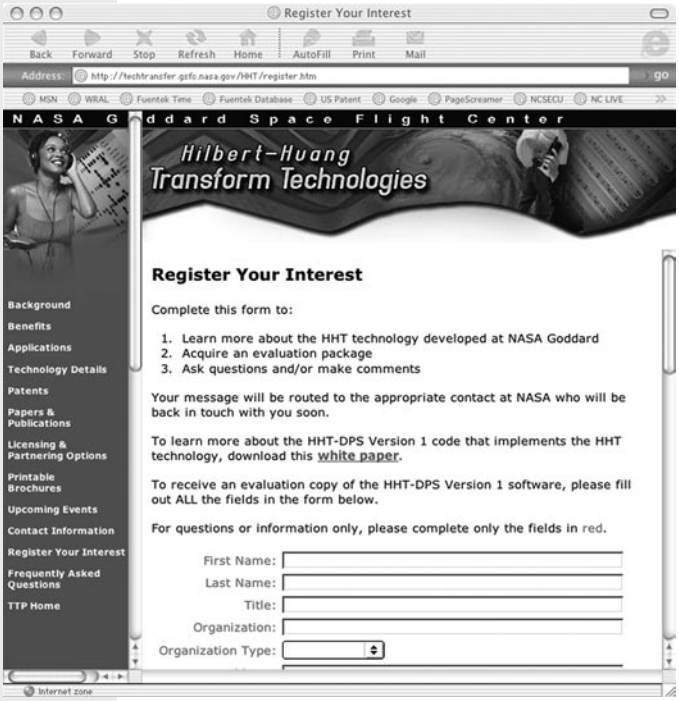
- NASA Ames Research Center will use HHT to analyze data from tests of rotocraft.
- The software provides Goddard's Laboratory for Hydrospheric Processes with a better method for analyzing microwave data related to snowfall on ice sheets.
- As part of a spin-out partnership with Beth Israel Deaconess Medical Center (BIDMC), NASA Dryden Flight Center will use BIDMC's HHT-related findings for air wing flutter analysis.
- The Naval Research Laboratory in Washington, D.C., will apply HHT to (1) analysis of oceanographic and meteorological data and (2) analysis of vegetation data.
- The intelligence community will work collaboratively with Goddard to apply HHT to speech/speaker recognition applications for antiterrorism and crime investigation/prevention work. This effort will benefit NASA also as these advances could be applied to human-robotics interface and systems access control for Space Exploration applications.

As it heads into FY05, Goddard's OTT is pursuing even more spin-in partnerships for this technology as well as spin-out arrangements to benefit the private sector and academia. These partnerships are the result of extensive outreach by OTT. A key tool in OTT's outreach effort is a comprehensive Web site (http://techtransfer.gsfc.nasa.gov/HHT/) that allows those interested in using HHT to download an evaluation copy. (For more information about this innovative approach to transfer NASA software, see page 3.)

New Modes of Doing Business

OTT's New Approach to Software Transfer

To help get Goddard-developed software into the hands—and onto the computers—of other users, OTT is harnessing the power of the Internet. As successfully demonstrated with the pilot effort initiated for Goddard's Hibert-Huang Transform software, this online system dramatically speeds up the technology transfer process.



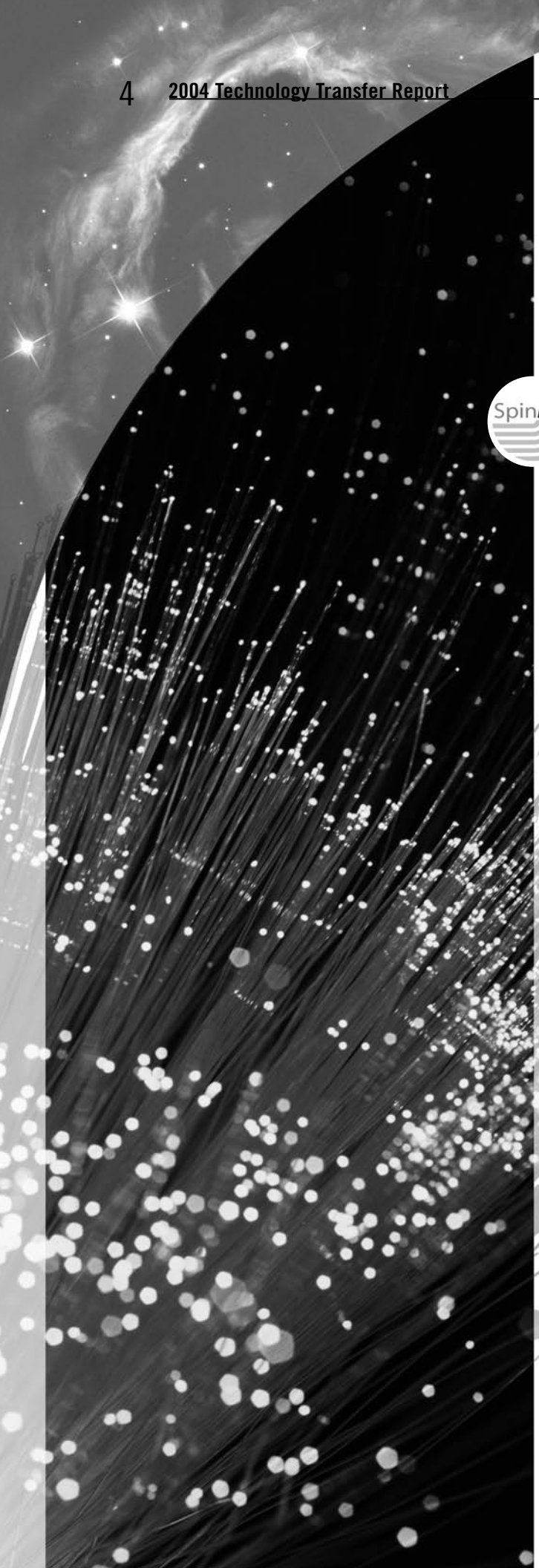
http://techtransfer.gsfc.nasa.gov/HHT/register.htm

The online process involves the following steps:

- Individuals register their interest in the software via an online form on the technology's Web site, which includes detailed information about the software and how it can be used. In registering their interest, potential users indicate their intentions for the software—whether it is to be used for internal research, collaboration, licensing, government use, or other applications.
- Upon verification, OTT e-mails the requestor a formal Evaluation Software Usage Agreement to be signed and faxed back to Goddard.
- Once Goddard receives the signed form, OTT provides a Web address for downloading an evaluation copy of the software.
- At the end of the evaluation period, the requestor can apply for a license for long-term use of the software.

Given the success of this approach with HHT—approximately 270 individuals have used the online system to register their interest in the software—OTT is initiating such an effort for other Goddard-developed software programs, such as the Hierarchical Segmentation (HSEG) software (see pages 12 and 15).

Goddard's OTT also is considering other ways the Internet might be useful in speeding up technology transfer of its patented, nonsoftware technologies.



A University Partnership for Fiber Optics Development

In July 2004, Goddard signed an agreement with Syracuse University to jointly produce and evaluate the performance of an innovative fiber optic technology. This technology is expected to offer significant benefits to aerospace and telecommunications applications.

This cooperative work involves optical fiber sensors that have a thin film of lithium niobate ($LiNbO_3$) deposited between their glass core and cladding. Preliminary tests show that the thin film acts as a highly sensitive photoelastic and electrooptic boundary layer that responds readily to external strain. Researchers' next step is to make an optical fiber modulator in the form of a D-shaped fiber with metal electrodes on the flat surface.

Goddard and Syracuse have agreed to pursue this step together. By combining Goddard's expertise in fiber optic technology with the full electrooptic lab in Syracuse's Electrical and Computer Engineering Department, researchers will prepare and manufacture the $LiNbO_3$ optical fibers. These fibers then will be tested in Goddard's photonics laboratory. By pooling their resources, both Goddard and Syracuse can advance their understanding of this innovative technology and its potential applications while expediting the development and testing process.

Company Makes Dramatic Progress by Licensing Goddard Technology

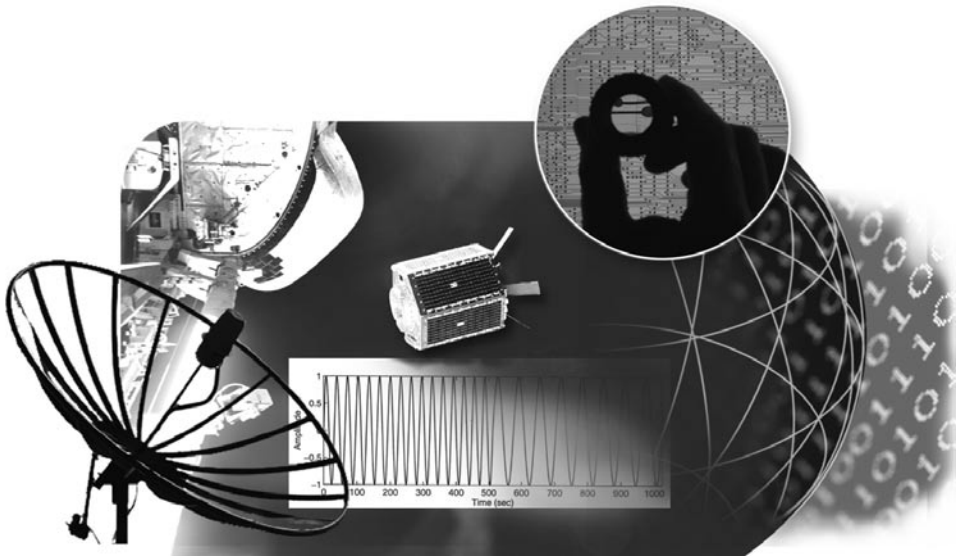
When the company Titus Group began to look for technical solutions to its processes for manufacturing high-pressure fittings, automotive components, bearings, and other products, NASA did not immediately come to mind. But, in fact, working with NASA technology gave the company insights into a solution.

Researchers at Goddard had developed a process for coating substrates with a rapidly solidifying metal. This process uses a high-velocity spray that causes a metal powder and small peening particles to react during impact with a substrate surface, causing the metal powder to become solid quickly and bond to the substrate. If the substrate is also metallic, this process favorably affects its mechanical characteristics.

Titus licensed this technology from Goddard in January 2004. By March, the company had made a significant leap forward with its processes and products. For example, the coefficient of friction and corrosion protection of Titus's products were significantly improved.

These advances positioned Titus to merge with another company, and it is now called Integrated Micrometallurgical Systems (IMS). The merger provided access to more equipment, enabled a large market study to be conducted, and provided access to new potential customers in various industries. For example, IMS's new automotive components might be of interest to Formula 1 racecar manufacturers.

The advances the company has made may come back to NASA to further benefit the space program. OTT facilitated such discussions between IMS and Goddard researchers as well as other Field Centers.



Goddard Technology Goes International and Enhances U.S. Economic Strength

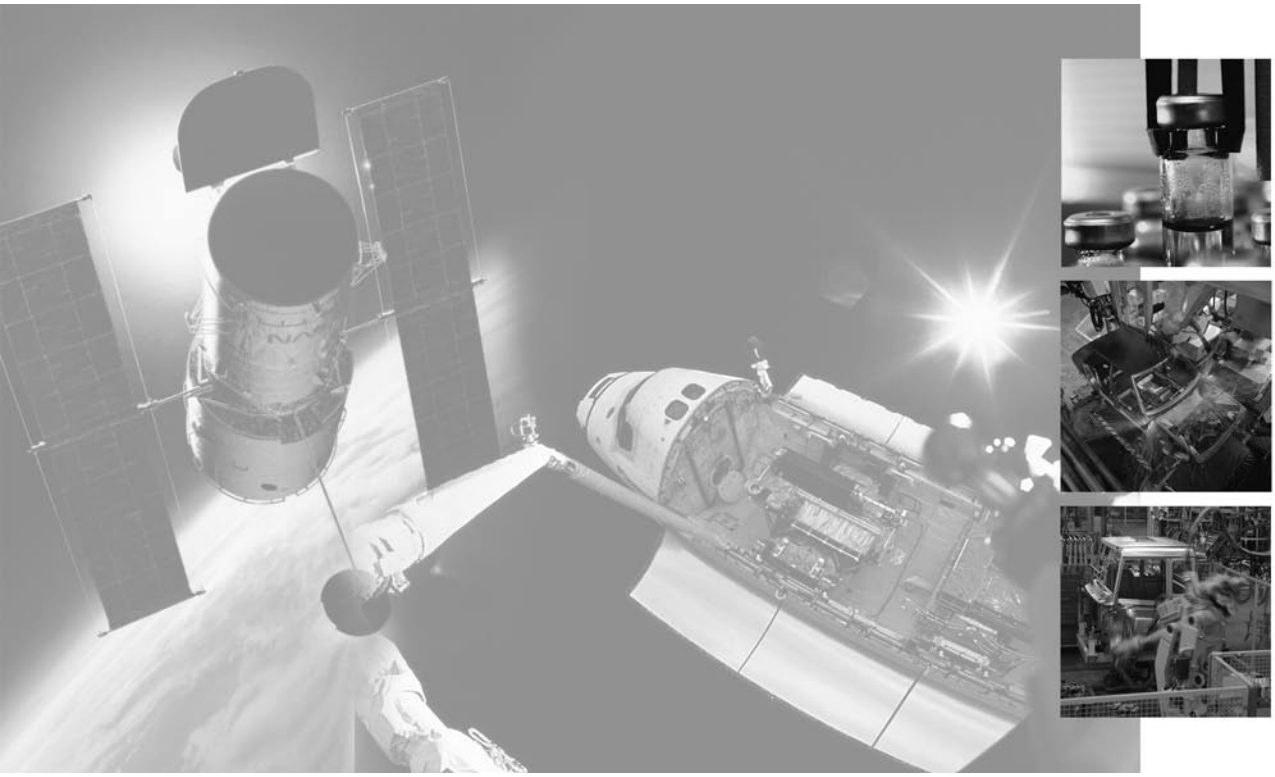
SpinIn

In order to build improved data-recovery systems for ground support of Earth observation satellites, the Norway-based company Kongsberg Spacetec licensed Goddard's high-rate digital demodulator (HRDD) technology in March 2004.

SpinOut

Goddard's HRDD technology is a receiver that enables incredibly fast—up to 600 million bits per second (Mbps)—digital demodulation and bit synchronization using dual-ASIC circuitry. This circuitry enables the use of complementary metal-oxide semiconductor (CMOS) technology rather than gallium arsenide (GaAs), allowing for a more compact design and lower power requirements at a lower cost. The HRDD receiver can process highly synchronized data transmissions—either quadrature phase shift keying (QPSK) or binary PSK modulated data streams—from orbital satellites.

By licensing Goddard's technology, Kongsberg Spacetec will make HRDD receivers using chips purchased from a U.S. manufacturer, thus providing benefits to the national economy. Kongsberg's HRDD receivers then can be used to recover telemetry data, providing NASA with integrated and reliable systems at a low cost.



Nytec Providing Capaciflector Prototypes for Various Applications

SpinOut

Based in Seattle, Washington, Nytec provides engineering services to companies in various industries. And now Nytec provides Goddard technology as well. In May 2004, Goddard signed an agreement allowing Nytec to develop application-specific prototypes of Goddard's patented capaciflector technology.

This highly versatile technology is a capacitive element that can be used in sensing distance between objects. The technology is highly precise. For instance, when used in the robot operating materials processing system aboard the Space Shuttle in 1994, the capaciflector enabled precision alignment of less than 0.004 inches—a NASA record. The capaciflector also is rugged and durable, as demonstrated by its flawless performance during the Dante robot mission in an Antarctic volcano. These and other features of the capaciflector technology make it useful in a wide range of industries, including automotive, industrial robotics, and security. NASA is also considering its use in the Hubble Space Telescope robotic servicing mission.

Under the license, Nytec is authorized to make prototype capaciflectors for its customers' applications, such as collision avoidance and "smart" valves, airbags, and other devices. If those customers find that the technology meets their needs, they license it directly from Goddard. (See page 20 for more information about this and other types of partnership and licensing agreements.)

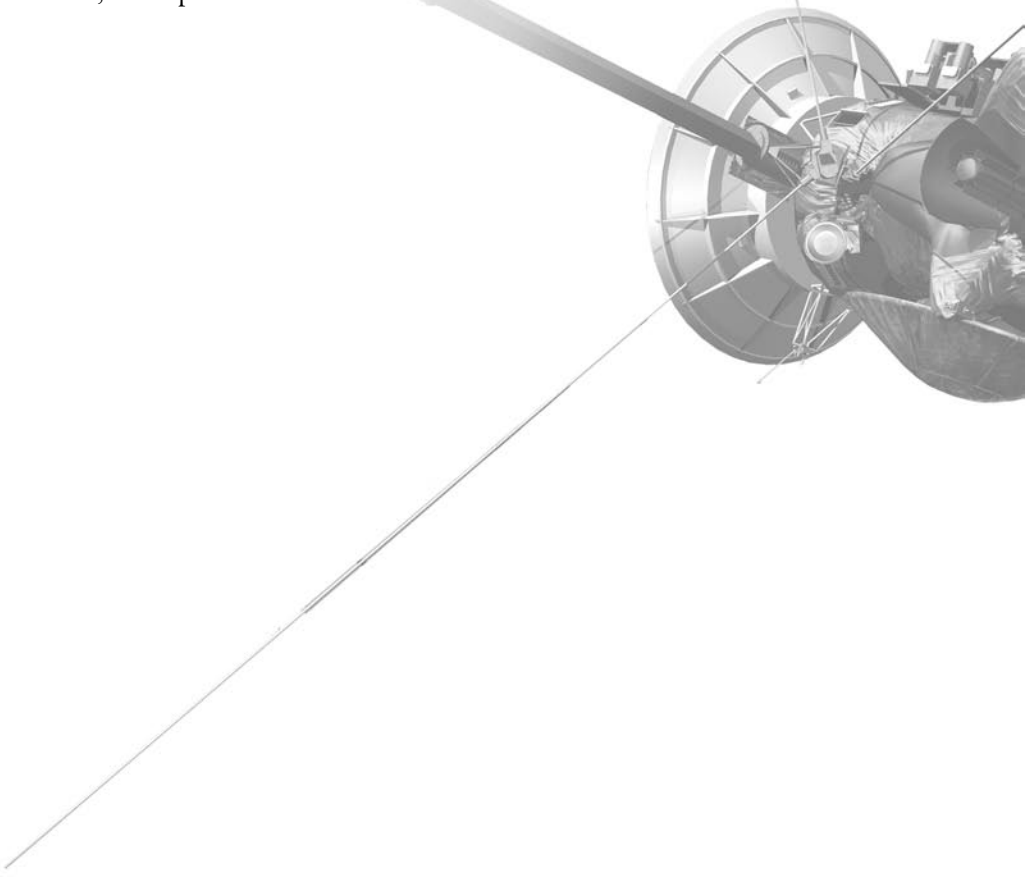
a.i. solutions Turns Attitude Determination System into Commercial Product

SpinOut

In April 2004, the Maryland-based company a.i. solutions signed a nonexclusive copyright-patent license agreement for Goddard's Multimission Attitude Determination System (ADS-MATLAB). The company will integrate the software into its premier mission-planning product, FreeFlyer.

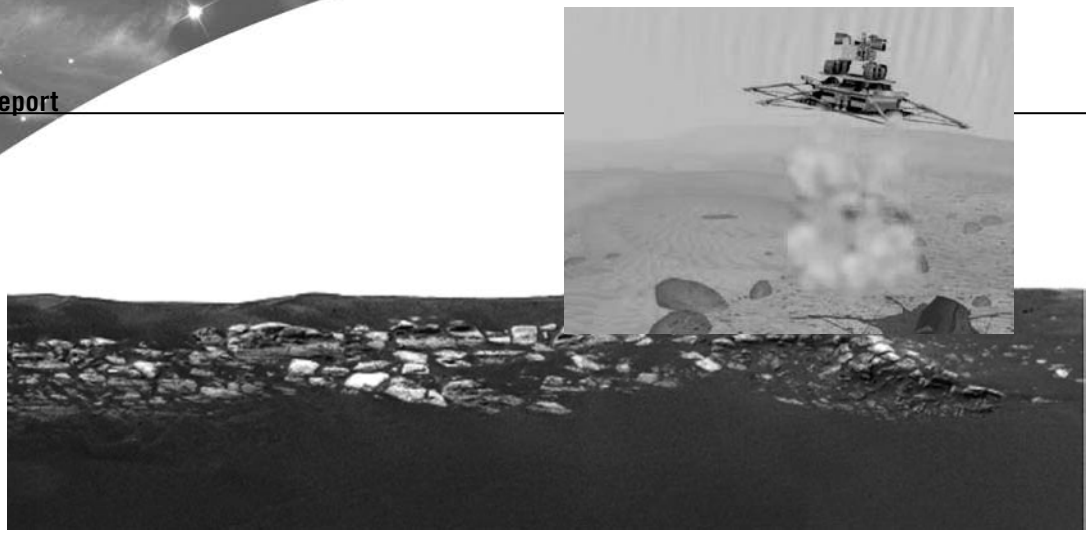
Developed by Goddard's Flight Dynamics Analysis Branch, ADS-MATLAB is a unique software system for analyzing and processing spacecraft attitude sensor and actuator data. It provides a complete set of portable tools that can be applied to most spacecraft, and its highly adaptable architecture allows it to conform to specific mission configuration requirements. The use of MATLAB allows for graphic user interfaces to be easily created and adapted for individual mission needs. a.i. solutions recognized the value of this and the software's many other innovations.

In providing ADS-MATLAB as a commercial product, a.i. solutions will make it user-friendly; develop full documentation; and provide customer support, maintenance, and updates.



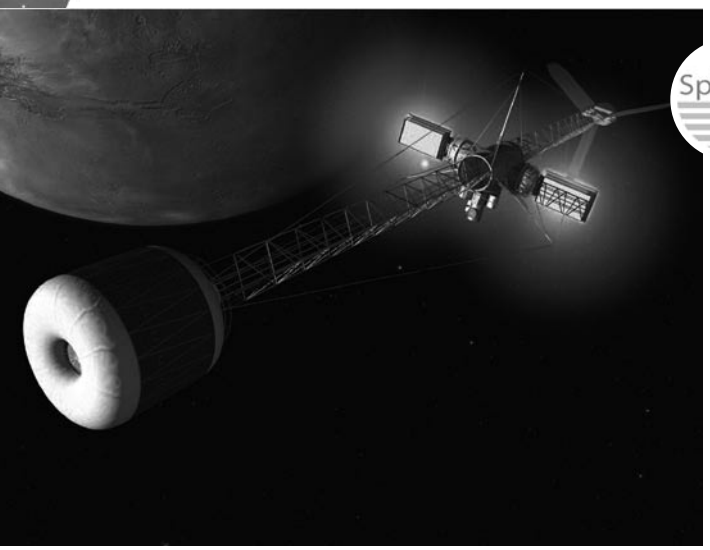
Achieving Our Success

Goddard's Office of Technology Transfer is proud of its achievements in fiscal year 2004. And we look forward to creating even more spin-in and spin-out success stories in 2005. We achieve these successes via two paths: involving innovators and outreach to potential partners. This section describes the activities along these two paths.



Process Improvements

Spotlight on Spin-In

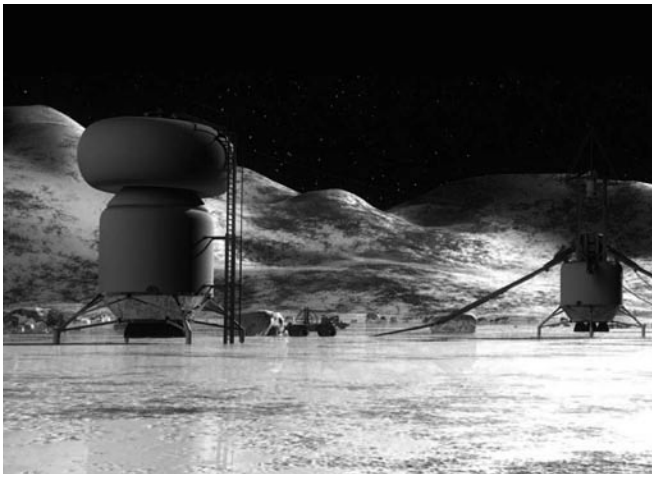


With the new *Vision for Space Exploration* and the challenging mission goals it established, Goddard's Office of Technology Transfer is redoubling its efforts to infuse NASA with established technologies (i.e., spin-in). One way that OTT is seeking to foster these spin-in successes is by streamlining its process.

A key aspect of spin-in is needs identification: What problems are NASA scientists trying to solve? OTT is in the process of building a systematic process for gathering these needs from Goddard researchers and project managers. This process will include a Web-based system for information gathering, which is expected to go online in early FY05.

If a solution is not readily available within NASA, OTT will conduct rapid research to determine whether an outside source can provide a solution. If so, OTT will help foster Goddard's relationship with that organization—be it a private company, university, or government lab.

OTT's efforts will help NASA achieve its Space Exploration goals. We look forward to working with Goddard innovators and external organizations to make spin-in happen quickly, allowing all parties—and the American people—to benefit.



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 to ensure successful NASA missions—that is, they recognize opportunities for a spin-in of outside technology. They also are intimately familiar with Goddard's technical strengths and technology portfolio. These technologies may be transferred to other NASA Field Centers or government labs to maximize the return on the nation's R&D investment—achieving additional spin-in successes—or spun-out to private businesses or universities and colleges to benefit the nation's economy and technical edge.

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 in FY04.

Robert Abell
Eliezer Ahronovich
Eddie Akpan
Wes Alexander
Jeannette Benavides
Michael Beamesderfer
Karen Blank
Jonathan Bryson
Richard Burg
Steven Cagiano
Edgar Canavan
Rene Carlos
Cynthia Cheung
Charles Clagett
David Clark
Barry Coyle
Alan Cudmore
Steven Curtis
Milton Davis
Bruce Dean
Michael DiPirro
John Dorband
Johnny Erickson
David Everett
Lee Feinberg
Tom Flatley
Kathy Fontaine
James Geiger
John Hagopian
Ellen Herring
Mike Hinchey
Paul Houser
Norden Huang
Mindy Jacobson
Tracee Jamison
Donald Jennings
Noble Jones
John Keller
Ritva Keski-Kuha
Semion Kizhner
Doug Leviton
Luther Lighty
Julia Loftis
Christopher Lynnes
Walt Moleski
Ross Nelson
Stephanie Nickens
Raymond Ohl
Brian Ottens
Bradford Parker
Robin Pfister
Andrea Poulin
W. Dan Powell
Diane Pugel
Glenn Rakow
James Rash
Russell Roder
Jacob Rosenberg
Peter Rossoni
Henry Sampler
Peter Shirron
Carl Strojny
James Sturm
Joseph Swinski
Farhad Tahmasebi
James Tilton
Bruce Vollmer
John Vranish
Melissa Webb
Michael White
David Whiteman
Said Zewari

This section describes OTT's FY04 efforts to involve Goddard innovators in technology transfer.

The NTR Program

The New Technology Reports (NTRs) that Goddard researchers submit concerning their technological developments are a key element of Goddard's technology transfer success. Not only do they help Goddard understand its technology assets available for spin-out to the private sector and academia, but NTRs also help Goddard in its strategic planning for spin-in. In addition to representing Goddard's strengths, areas of excellence, and expertise, NTRs help indicate gaps that need to be filled or where Goddard's capabilities must be complemented by what the private sector, academia, and other government labs can offer.

Because of the importance of NTRs, the Office of Technology Transfer hosts a formal "NTR Program" every year to recognize those who submitted NTRs. More than 100 people attended this year's NTR Program, which was hosted by Clay Anderson, meteorologist for NEWS4 (pictured lower left).

In addition to bestowing several awards (see pages 13–14), OTT uses the NTR Program to present a particularly significant technology transfer success story. This year's event featured the Hierarchical Segmentation (HSEG) Software, which is being used by multiple NASA programs as well as in industry and academia, making it a spin-in and spin-out success. Bartron Medical Imaging used HSEG and other NASA technology to manufacture Med-Seg, a device for analyzing medical X-rays. Med-Seg is being used by researchers at the School of Dental Medicine at the University of Connecticut. Med-Seg also might be used to further benefit NASA, as Bartron works with a Goddard researcher to apply the device in improving fiber optic assemblies.

Awards

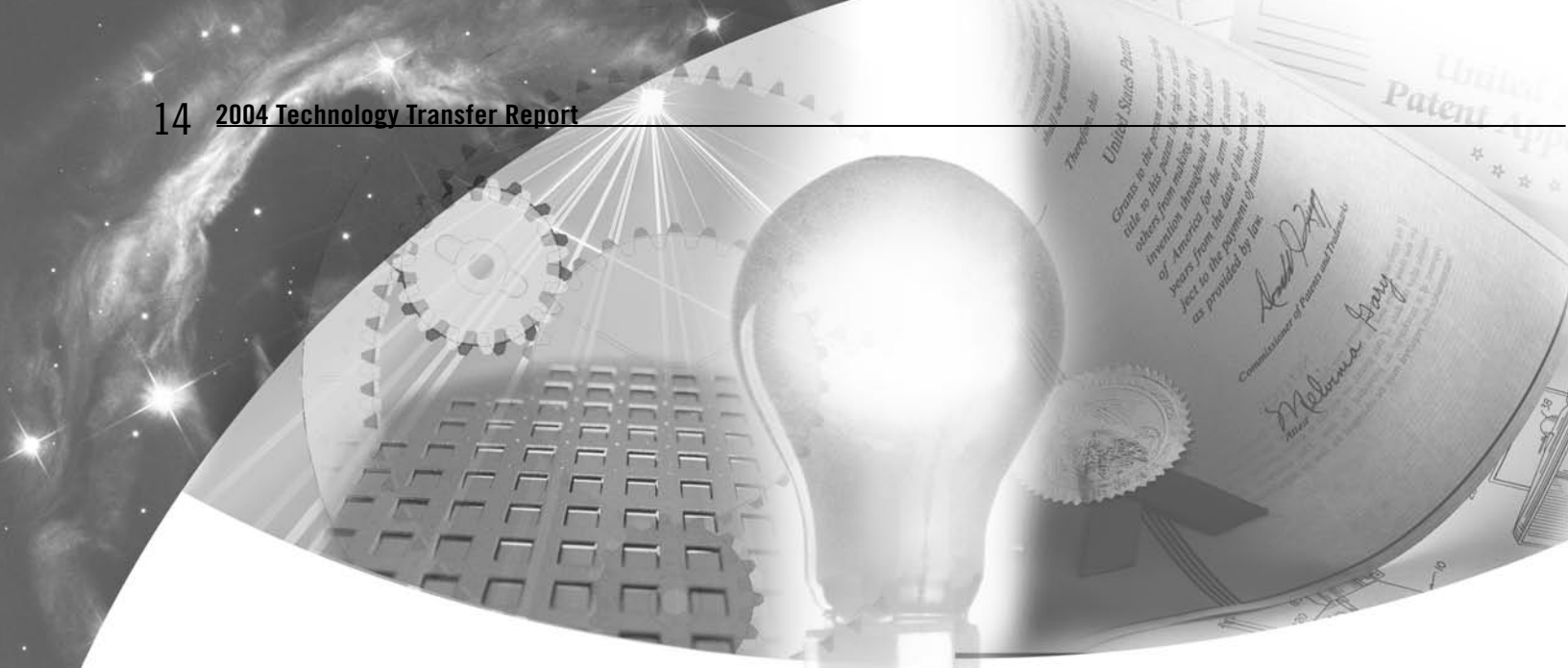
Awards encourage Goddard's innovators to participate in technology transfer as well as promote Goddard technologies to potential partners. The Office of Technology Transfer submits Goddard inventions for awards bestowed by outside organizations as well as awards given by NASA's Inventions and Contributions Board (http://icb.nasa.gov). In addition, OTT created the Kerley Award to recognize an innovator demonstrating significant commitment to technology transfer.

Nanotechnology Researcher Wins Kerley Award

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 2004 Kerley Award was given to Jeannette B. Benavides for her outstanding help to OTT in its efforts to transfer her manufacturing process for single-walled carbon nanotubes (SWCNTs).

Dr. Benavides's technology uses a helium arc welding process to vaporize an amorphous carbon rod. The vapor deposits onto a water-cooled carbon cathode, forming the SWCNTs. By avoiding the use of a metal catalyst, this production process is simpler, safer, and much less expensive than other forms of CNT manufacturing. Dramatically lowering the cost enables SWCNTs to reach their full potential. They can be used in medicine, microelectronics, scanning force/tunneling microscopy, materials, and molecular containment.

The 10th recipient of the Kerley Award, Dr. Benavides was honored at the annual NTR Program (see page 12).



Patent Awards

At the NTR Program in April (see page 12), Goddard's Office of Patent Counsel presented Patent Awards—including plaques and cash rewards—to nine innovators, who had U.S. patents issued for their Goddard technologies last year:

- Charles Campbell
- Norden Huang
- John Kolasinski
- James Poland, Jr.
- David Quinn
- John Sutton
- Theodore Swanson
- John Vranish
- Michael Wade

Since January 1, 2004, 12 Goddard technologies received U.S. patents:

U.S. Patent No.	Technology Name
6,691,033	System and Method for Calibrating Inter-Star-Tracker Misalignments in a Stellar Inertial Attitude Determination System
6,697,818	Methods and Apparatus for Constructing and Implementing a Universal Extension Module for Processing Objects in a Database
6,734,602	Linear Magnetostrictive Actuator
6,738,734	Empirical Mode Decomposition Apparatus, Method and Article of Manufacture for Analyzing Biological Signals and Performing Curve Fitting
6,740,224	Method of Manufacturing Carbon Nanotubes
6,742,761	Miniature Latching Valve
6,744,470	Synchronization of Video Recording and Laser Pulses Including Background Light Suppression
6,760,487	Estimated Spectrum Adaptive Postfilter and the Iterative Prepost Filtering Algorithms
6,760,664	Autonomous Navigation System Based on GPS and Magnetometer Data
6,765,195	Method and Apparatus for Two-Dimensional Absolute Optical Encoding
6,775,600	Systems and Methods for Determining Spacecraft Orientation
6,782,124	Three-Dimensional Empirical Mode Decomposition Analysis Apparatus and Method

Goddard also submitted 7 patent applications and 18 provisional patent applications. It is expected that patents will be issued to these technologies in the coming years.

Mid-Atlantic FLC Recognizes Two Goddard Technologies

The Mid-Atlantic chapter of the Federal Laboratory Consortium for Technology Transfer (FLC) bestowed its Regional Excellence in Technology Transfer Award to two Goddard innovators at its September 16, 2004, meeting. This prestigious award recognizes laboratory employees who have accomplished outstanding work in the process of transferring a technology developed by a federal laboratory to the commercial marketplace.

One winner was James C. Tilton for his Hierarchical Segmentation (HSEG) software technology. Also featured at the 2004 NTR Program (see page 12), the HSEG technology provides a new approach to image analysis, focusing on image regions—and how they change depending on how fine the resolution is—rather than just pixels.

Goddard researcher Russell Carpenter and his colleagues developed the second Mid-Atlantic FLC Award winner: the GPS-Enhanced Onboard Navigation System. This technology is a flight software package that provides onboard orbit determination and control in real time, with higher accuracy, and without human intervention while working within limited computing resources.

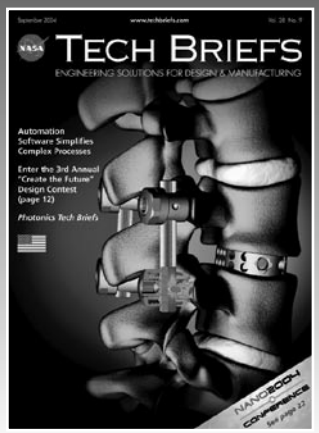
These technologies also will be submitted for national-level FLC awards, which will be given at the May 2005 meeting in Orlando, Florida.

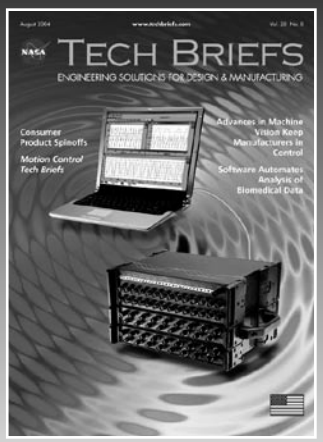
Eight Goddard Technologies Receive Space Act Board Awards

In fiscal year 2004, eight Goddard technologies were recognized by NASA for their significant scientific and technical contributions. The applications for the Space Act Board Awards were prepared by OTT and submitted to NASA's Innovations and Contributions Board. Not only do Space Act Board Awards represent recognition by NASA, but the innovators also receive a cash award for their exceptional efforts.

The recipients of Space Act Board Awards in FY04 were the following:

- **Adhesive Bubble Removal Technique and Fixture for Fiber Optic Applications**, developed by John Kolasinksi
- **Gear Bearings**, developed by John Vranish
- **GPS "Compound Eye" Navigation and Attitude Sensor**, developed by David Quinn
- **Heat-Driven Pulse Pump**, developed by Steve Benner and Mario Martins
- **Hilbert-Huang Transform Data Processing System**, developed by Norden Huang, Karin Blank, Thomas Flatley, Semion Kizhner, and Darrell Smith
- **Holographic Circle-to-Point Converter**, developed by Matthew McGill, Vibart Scott, and Marzouk Marzouk
- **Microlaser Altimeter**, developed by John Degnan
- **SHARM—Software Solving the Monochromatic Radiation Transfer Problem in Planetary Atmosphere Using Spherical Harmonic Methods**, developed by Alexei Lyapustin





NASA Tech Briefs Awards

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

In FY04, the following eight technologies were published in *NASA Tech Briefs*:

- **Pseudoslit Spectrometer** (GSC-13806-1): Functioning similarly to a slit spectrometer, this instrument is optomechanically simpler. (April 2004)
- **Analyzing Dynamics of Cooperating Spacecraft** (GSC-14735-1): This software library enables high-fidelity computational simulation of the dynamics of multiple spacecraft distributed over a region of outer space and acting with a common purpose. (June 2004)
- **Charge-Dissipative Electrical Cables** (GSC-14648-1): In addition to performing their main functions of conducting signals, these electrical cables dissipate spurious static electric charges. (June 2004)
- **Improved Nutation Damper for a Spin-Stabilized Spacecraft** (GSC-14733-1): This technology would address the problem of accommodating thermal expansion of the damping liquid in spin-stabilized spacecraft. (June 2004)
- **Arc-Second Pointer for Balloon-Borne Astronomical Instrument** (GSC-14715-1): This notable innovation eliminates the effects of static friction in bearings. (June 2004).
- **Improving Control of Two Motor Controllers** (GSC-14744-1): This computer program controls motors that drive translation stages in a metrology system that consists of a pair of two-axis cathetometers. This program is specific to Compumotor Gemini motors and the Compumotor 6K-series motor controller (or their equivalents). (June 2004)
- **Ultralow-Power Digital Correlator for Microwave Polarimetry** (GSC-14746-1): This high-speed digital correlator is especially well suited for processing readings of a passive microwave polarimeter. (August 2004)
- **Manufacturing High-Quality Carbon Nanotubes at Lower Cost** (GSC-14601-1): This modified electric-arc welding process can be used to manufacture high-quality batches of carbon nanotubes at relatively low cost—about $^{1}/_{20}$ that of other processes. (September 2004)

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 FY04, the Office of Technology Transfer helped seven Goddard innovators present eleven technologies at three professional conferences. For more information on the Office's participation in technology conferences, see page 26.

Venture Capital Project Workshop

To build inventor interest in technology transfer partnerships, Goddard hosted a Venture Capital Project Workshop on June 29, 2004. The event gave the nearly 50 Goddard researchers attending an opportunity to learn about the issues involved when partnering with a start-up company. For more information about this event, see page 24.




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 specialized expertise to achieve 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 FY04.

Agreements for Use of Goddard Technologies and Facilities

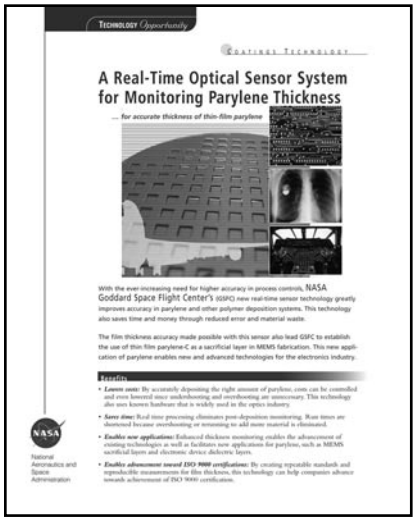
The Office of Technology Transfer uses several vehicles to make Goddard innovations available for use by outside organizations:

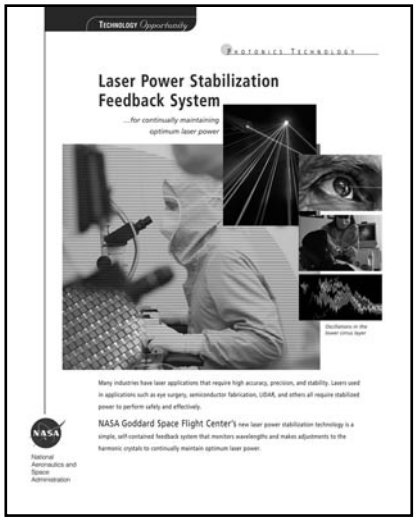
Space Act Agreement (SAA): Under an SAA, the external partner and Goddard work together on joint research that meets the technical needs of both parties. For instance, a private company might work with Goddard to integrate a NASA technology into its existing product line while providing expertise on how the original technology can be improved to benefit NASA.

Software Usage 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. For more information on OTT's online approach to SUAs, see page 3.

Prototyping License: The 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 prototyping licensee helps to reduce time to market for the potential user 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 (see page 17).

The Office of Technology Transfer also hosts and attends events where potential partners can hear more about available Goddard technologies (see pages 22–26).

Hosting and Attending Events

Goddard's Office of Technology Transfer hosts and attends a variety of events to disseminate information about available Goddard technologies—as well as NASA's scientific and technical needs—to potential partners. In FY04, the Office hosted or helped organize four such events and attended several technology conferences (see page 26).

Joint Venture Opportunity Workshops

In order to achieve its formidable Space Exploration goals in the coming years, NASA must work cooperatively with industry and academia through joint research and technology spin-in. Goddard's OTT hosted two workshops in 2004 specifically designed to facilitate these cooperative relationships.

Held in Boston, Massachusetts, in February and in Rochester, New York, in April, the Joint Venture Opportunity Workshops featured several senior technologists from Goddard. These researchers provided an overview of Goddard's many programs and technology needs. After these presentations, attendees could meet individually with Goddard staff to explore possible partnering opportunities.

These events had excellent attendance, with nearly 50 individuals attending in Boston and nearly 90 people in Rochester. Goddard's OTT is now pursuing opportunities with more than a dozen potential partners.

Utica Business Forum

On April 6, 2004, Goddard OTT staff joined about 100 other attendees at "Making Connections: Federal Funding, Partnership and Technology Opportunities." Sponsored by the State University of New York's Institute of Technology (SUNY-IT), the forum was designed to connect NASA with business and academia in Central New York.

Events such as this achieve two goals. First, they teach companies and universities about working with NASA in an effort to build regional economic development. Second, they help identify new sources for technology and expertise that complement the skills available at Goddard (i.e., spin-in partnerships).

At the SUNY-IT event, Goddard personnel participated in a panel discussion of NASA's future technology needs. The discussion proved valuable for the participants and the presenters, as many attendees stayed on to participate in individual discussions with the Goddard representatives.

Venture Capital Project Workshop

On June 29, 2004, Goddard's OTT and the University of Maryland (UMD) cosponsored the Venture Capital Project Workshop—the first of a series of events designed to boost regional economic development (see below). UMD participants came from its Office of Technology Commercialization and the R.H. Smith School of Business.

The event featured speakers from three venture capital companies: Novak Biddle Venture Partners, SpaceVest, and New Markets Growth Fund. Also presenting were NASA technology transfer staff as well as the Maryland Technology Development Corporation and the Baltimore Development Corporation's Emerging Technology Center incubator.

OTT Works toward Regional Economic Development Goals

Goddard's Office of Technology Transfer is participating in an initiative to enhance economic development in the Greater Potomac region. By meeting regularly with regional economic development organizations, venture capital groups, incubators, other government agencies, corporations, and university representatives, OTT is exploring how Goddard's technology spin-in and spin-out efforts can boost the region's economic standing.

The group is developing a targeted economic development agenda and implementation plan. In addition, the series of innovator workshops that began on June 29th will continue into FY05, further stimulating interactions between Goddard researchers and regional businesses. The ultimate goal is to ensure that the preliminary positive outcomes of research make it through the "Valley of Death"—that is, the period of technology incubation and acceleration—and achieve successful product development and commercial introduction.

As an additional benefit, these meetings will provide OTT with ideas for opportunities to improve its spin-in and spin-out processes by changing its infrastructure and activities and becoming a best-practice leader in technology transfer.

Assistive Technology Exhibit and Forum

Hosted annually by the U.S. Department of Commerce's Office of Technology Policy, this event commemorates the Americans with Disabilities Act, which was signed into law 14 years ago. Held July 27, 2004, this event promoted and provided information about assistive technology and its recent advances.

OTT was one of 40 exhibitors from leading companies, government agencies, and associations advocating for persons with disabilities. Goddard's compliant cable mechanisms, which were originally developed for the mechanical isolation of sounding rocket assemblies, have several applications to assistive technology:

- **Secure Ambulation Module (SAM):** Manufactured by Enduro Medical Technology, SAM is a rehabilitative device that helps patients with degenerative illness, traumatic injuries, or other afflictions to participate in standing and gait therapy in a safe, stable position. Goddard's technology is a key element of SAM.
- **Joints in Prosthetic Devices:** Goddard's technology provides a simple design at low cost, natural joint movement, realistic resistance, and excellent shock absorption.

Technology Conferences

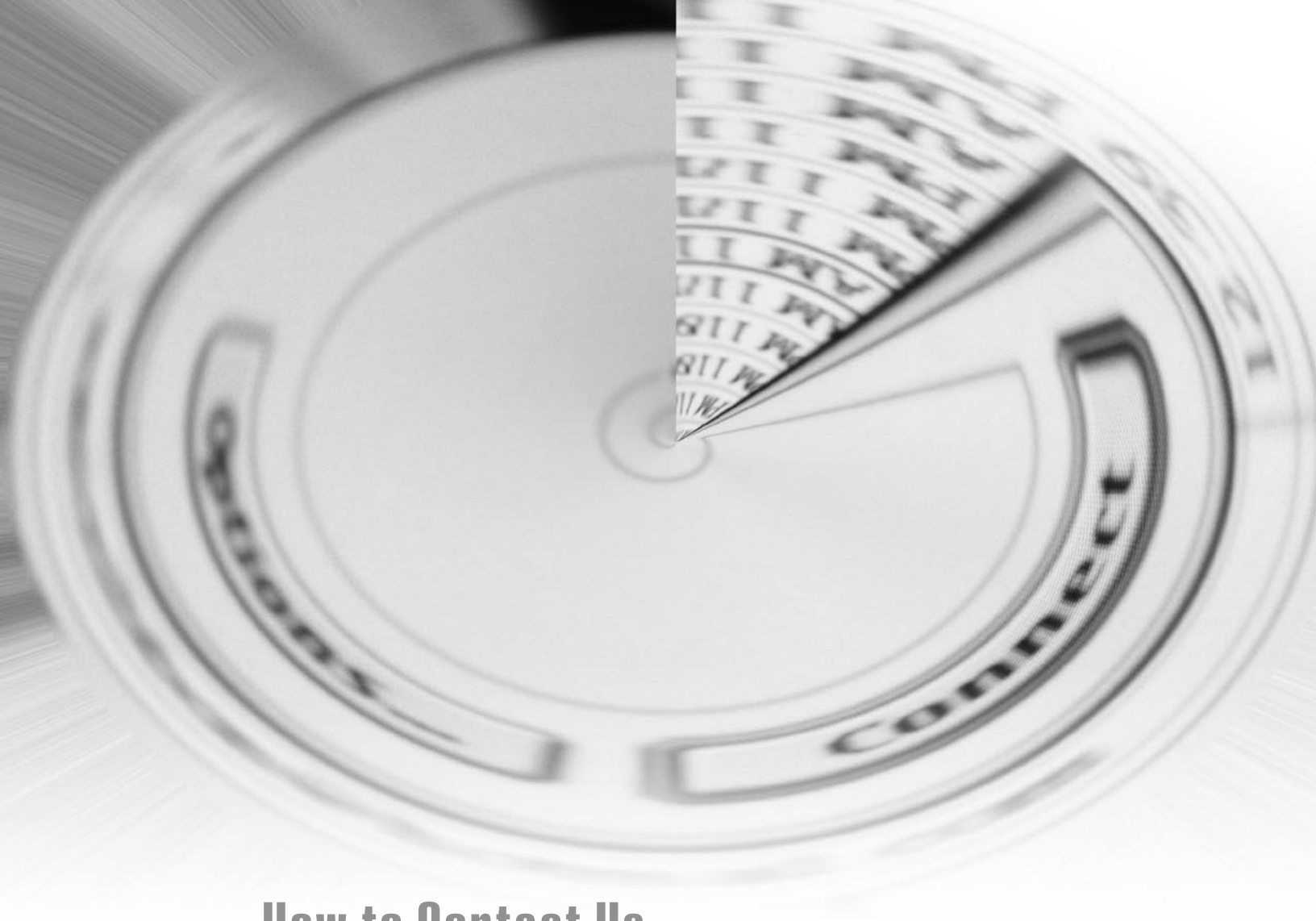
As discussed on page 18, the Office of Technology Transfer helps coordinate the participation of Goddard researchers at various conferences. Not only does this provide a valuable professional benefit to the researchers—and thus encourage them to participate in technology transfer—but it also is an excellent 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.

This year the following Goddard technologies were presented at three professional conferences:

Technology	Event
Adiabatic Demagnetization Refrigerator	SAMPE
Capaciflector-Based Technologies	SMART Tech Trends 2004
Cartesian and Optical Encoders	SMART Tech Trends 2004
Gear Bearings	SMART Tech Trends 2004 NDES
Laser Power Stabilization Feedback System	NDES
Passive Gas-Gap Heat Switch	SAMPE
Rapid Prototypes	NDES
Salt Pill Growth Process	SAMPE
SMART Materials	SAMPE
Specifications and Code Derivation Technology	NDES
Steel Bearings	NDES
Thin Film Parylene-C Real Time Sensor	SMART Tech Trends 2004 NDES SAMPE

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.

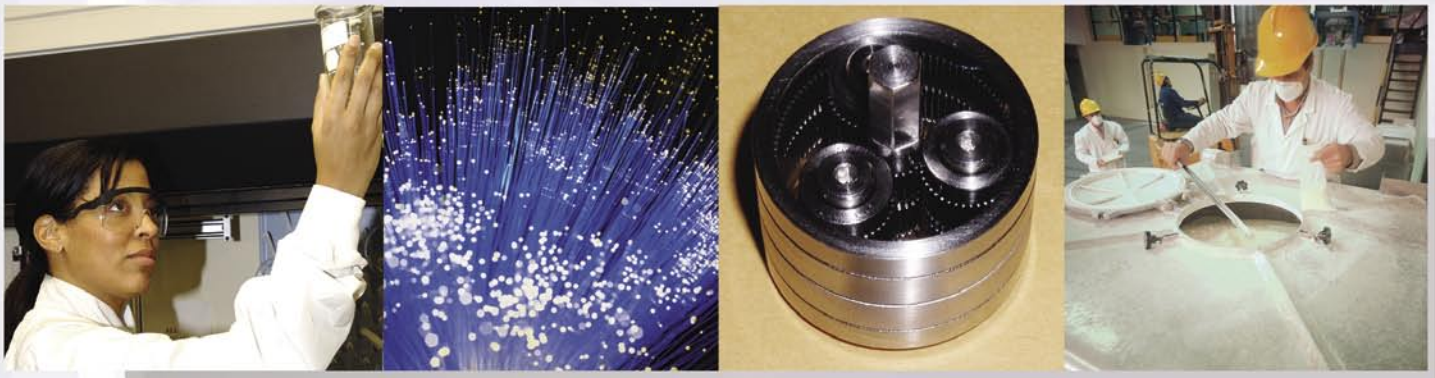
Telephone: (301) 286-5810

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



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