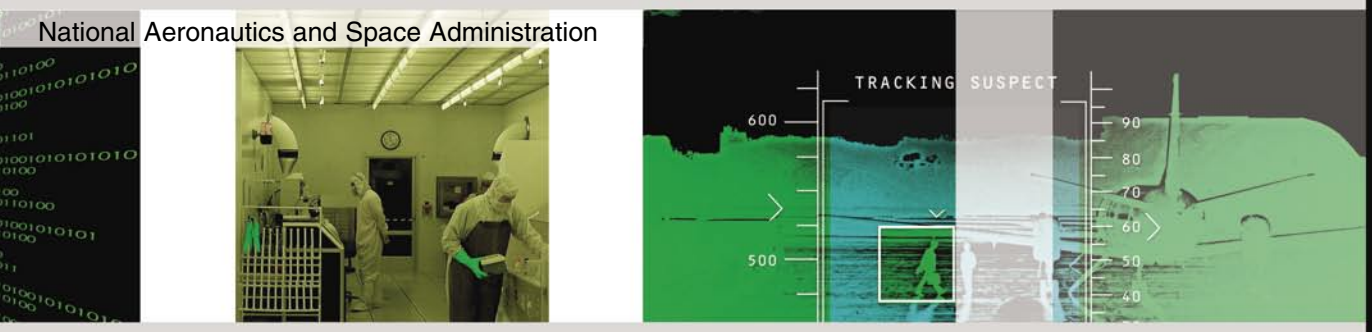
National Aeronautics and Space Administration



accomplishments

NASA Goddard Space Flight Center

Innovative Partnerships Program Office Report | 2006

contents

Special thanks to Chris Gunn for select photos on pages 1, 3, 6-9, 12-13, 15, and 23.

From the Chief |

A Focus on Value

As Chief of the Innovative Partnerships Program (IPP) Office at NASA Goddard Space Flight Center, I am pleased to present this summary of our accomplishments for fiscal year 2006. Previously the Office of Technology Transfer, our office name reflects our alignment with the IPP's goal of promoting and developing innovative technology partnerships among NASA, U.S. industry, and other sectors for the benefit of Agency programs and projects.

Forming partnerships that add value to NASA is essential for the success of the space program. These alliances allow NASA to achieve its space exploration, science, and other mission ambitions faster. Furthermore, by combining our resources with those of our partners, we can more efficiently realize our own goals as well as those of our partners.

The IPP Office also provides value to the Agency by transferring Goddard's technology to external organizations, enabling the development of new applications and products that benefit their processes and their customers—including, in some cases, NASA—as well as the U.S. economy through new business development.

Albert Einstein said that one should strive not to be a success but rather to be of value. For the IPP Office, to add value to NASA ***is*** to be a success at achieving our goals. This report demonstrates how the IPP Office has brought value to our Agency, our innovators, our partners, our economy, and our community—that is to say, our successes.

Nona Minnifield Cheeks
Chief
Innovative Partnerships Program Office
NASA Goddard Space Flight Center

Introduction to the IPP Office

Our Vision

To be recognized as a leading source of value to NASA by creating innovative, mutually beneficial collaborations with industry, academia, and other government agencies that yield positive impacts for the Agency, the U.S. economy, and mankind.

Our Mission

1. To foster strong internal and external relationships by understanding and identifying where technology needs and solutions align.

2. To develop innovative approaches to creating collaborations that leverage each party's resources and strengths while supporting NASA's missions, Goddard's strategic objectives, and the partner's goals.

Our Values

We will continually strive to be...

- Efficient and effective
- Creative and innovative
- Open and insightful
- Honest and ethical
- Professional and friendly

... in everything we do.

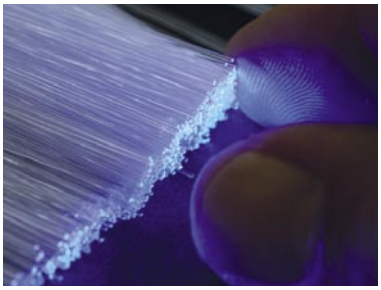
∴ *The mission of NASA Goddard Space Flight Center* is to expand knowledge of the Earth and its environment, the solar system, and the universe through observations from space. To assure that our nation maintains leadership in this endeavor, Goddard is committed to excellence in scientific investigation, in the development and operation of space systems, and in the advancement of essential technologies.

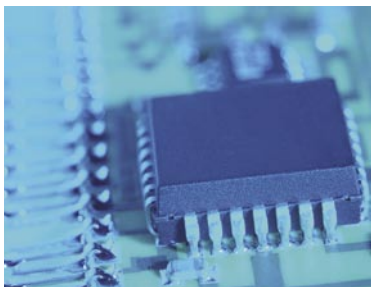
∴ *The IPP Office helps Goddard achieve its mission*—within the context of the Agency-wide mission of pioneering the future in space exploration, scientific discovery, and aeronautics research—by identifying and securing agreements with partners that can positively contribute to NASA's technology developments.

∴ *The IPP Office brings value* to NASA and our partners by:

- Securing partnerships with outside organizations for technology development that will yield future benefits for NASA
- Out-licensing Goddard-developed technologies to benefit NASA, the U.S. economy, and humankind
- Supporting regional economic development by extracting value from NASA technology and expertise
- Protecting NASA intellectual property rights in partnership activities







Our Process: Proactive Partnership Building

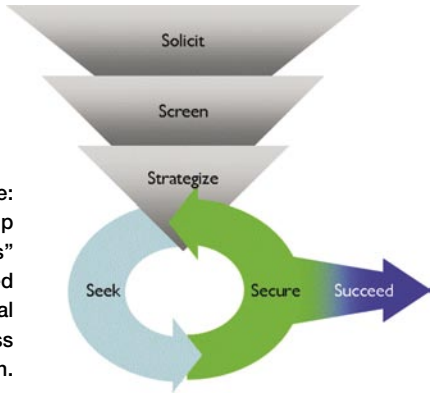
When NASA and external organizations partner for technology development, they reap many benefits:

- Accelerated development of technology for missions/goals
- Efficient use of resources, including laboratories, equipment, and personnel
- Increased return on the investment in research and development (R&D)
- Growth of commercial aerospace and other industries
- More science and engineering breakthroughs

In order to create collaborations that maximize the partnership's value for NASA as well as the partner, Goddard's IPP Office utilizes the following process:

- **Solicit**: We "harvest" the innovations (technologies) developed by and technical challenges (needs) facing Goddard innovators, understanding the full range of partnership opportunities.
- **Screen**: We evaluate these technology/need opportunities, determining which are best positioned for partnership success and prioritizing accordingly.
- **Strategize**: We develop a strategy for effectively and efficiently approaching the appropriate potential partners and communicating the relevant opportunities to them.
- **Seek**: We implement the strategy, actively marketing the technology/need opportunities.
- **Secure**: We facilitate discussions between potential partners and Goddard personnel, developing a partnership that meets the needs of all parties.
- **Succeed**: We ensure the mutually beneficial partnership is successful, actively observing and promoting it.

Note:
This "6-S for Partnership Development Success" process was described at the 2006 International Astronautical Congress in Valencia, Spain.



Spotlight on the Partnership Seed Fund

The Innovative Partnerships Program at NASA Headquarters established the Partnership Seed Fund in late FY06 with the following objectives:

- To support NASA Mission Directorate program/project technology needs
- To provide "bridge" funding to Centers in support of Mission Directorate programs
- To promote partnerships and cost sharing with Mission Directorate programs and industry
- Leverage resources with greater return on investment

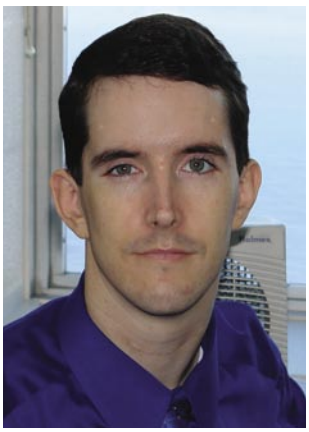
The Seed Fund issued a call for one-year proposals that were scientifically/technically feasible with relevance and value to NASA Mission Directorate programs and that leveraged the strengths and capabilities of an external partner. Each of the ten NASA Centers could submit eight proposals.

Within the six-week timeframe of the call, Goddard's IPP Office received fifty preliminary proposals, selected eight for submission to HQ, and worked closely with the Goddard principal investigators to develop the full proposals. We are pleased to announce that four of the eight Goddard proposals received funding in early FY07.

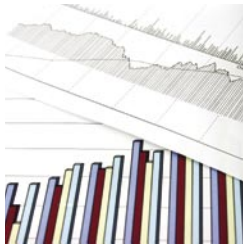
project title	partner(s)
Development of a Continuous Adiabatic Demagnetization Refrigerator and Integrated Control Electronics	Lake Shore Cryotronics Lockheed Martin ATC
Infusing Environmental Knowledge into Decision Support and Planning Tools for Exploration Mission Operations	United Space Alliance
Large Focal Plane Technology for Simultaneous Imaging and Guiding	Lockheed Martin Teledyne Scientific and Imaging Conceptual Analytics
Lightweight, Cryostable, Low-Cost Mirrors for the Next Generation of Space Telescopes	ITT Space Systems

Goddard's IPP Offce is further enhancing the value of the Partnership Seed Fund. Active efforts to develop the partnerships identified in the four other proposals are underway. And the Office will be re-examining the more than forty preliminary proposals originally received, working with the principal investigators to more fully develop their ideas as mutually beneficial projects for partnership development and/or future Seed Fund opportunities.

"The IPP Office's assistance with the Seed Fund proposal really helped get me thinking clearly about the work... I don't think I could have done it without them. And even though we did not receive the funding from HQ, we're using what we came up with to 'tell our story' as we pursue other funding possibilities."



Dan Powell, Goddard's Lead Nanotechnologist


Looking Ahead to FY07

As we enter 2007, we move forward eagerly within the context of several changes to the Innovative Partnerships Program:

- **New Director**: Douglas A. Comstock assumed the leadership of the Innovative Partnerships Program at NASA Headquarters on October 30, 2006. Formerly the NASA comptroller, Mr. Comstock also has a technical background in aeronautics and astronautics, technology and policy, and mechanical engineering.
- **SBIR/STTR Consolidation**: The Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) programs have been restructured and consolidated to be more cost-efficient and ensure that outside technologies with benefits for space program missions are infused into NASA. Now part of the IPP Office, SBIR/STTR personnel will provide guidance for the technical aspects of proposals related to Goddard-based research.
- **Partnership Seed Fund**: To further facilitate the infusion of non-NASA technology into the space program, the IPP established the Partnership Seed Fund in late FY06 to address barriers and initiate cost-shared, joint-development partnerships, providing "bridge funding" to enable larger partnerships and development efforts to occur. (See page 4 for more information.)

Given these changes, Goddard's IPP Office will direct our efforts in FY07 toward partnering with innovators in commercial, academic, and other government labs to develop NASA's technology and capability portfolios. We will do this by:

- Efficiently and effectively identifying new technologies and sources of technology that can benefit NASA missions
- Engaging organizations that are qualified potential partners for NASA
- Connecting with communities of innovators that complement Goddard's capabilities
- Bringing the parties together to identify and build productive collaborations
- Leveraging NASA's and our partners' resources for the mutual benefit of all parties

A Year in Review

Partnerships with...

Awards from...

Contributions to...

Bringing Value to NASA

Goddard's IPP Office is committed to bringing value to NASA, striving to benefit the Agency and its innovators in every activity—from establishing NASA as a leader in technology transfer and partnering at national and international conferences (see page 12) to identifying, developing, and negotiating agreements that maximize the value for NASA as well as its partner.

"Thanks for hooking us up with CMU, following through with great drive and initiative to be sure that something came of the connection, and helping out with many details including technical publications, input on infusion, and helping us to look for other applications and funding sources for the proposed technology."

Julie Loftis, Assistant Chief for Information Systems Technology, Information Systems Division, and Goddard's Exploration Technology Lead

Value to the Agency

Our accomplishments for FY06 include six agreements that directly impact NASA in the near term as well as activities that lay the groundwork for successes in the long term.

photo credit: Gregg Podnar, Carnegie Mellon University

Accessing Leading Robotics Expertise

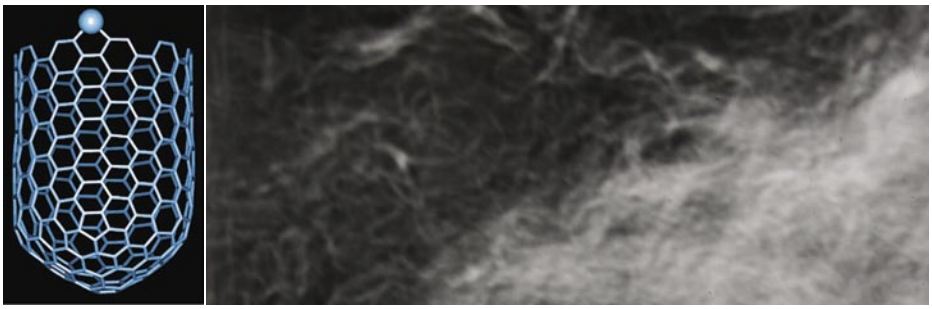
The IPP Office was pleased to assist in the formation of a partnership with Carnegie Mellon University's (CMU's) Robotics Institute. The Office identified CMU as an ideal partner for Goddard and arranged for several meetings between researchers from both organizations. After helping identify a research project well-suited for collaboration, the Office provided guidance as the researchers developed a proposal to secure funding for this research. The funded project, which also involves NASA's Wallops Flight Facility and Jet Propulsion Laboratory, joins Goddard's Adaptive Sensor Fleet and Instrument Remote Control software with CMU's innovative techniques for "telesupervision" to drive a fleet of autonomous boats to study harmful algae blooms in the Chesapeake Bay estuary, advancing the technology readiness level (TRL) of the new system's various innovations. These TRL advancements will benefit NASA's Exploration Systems Mission Directorate, which could eventually use this system for lunar, orbital, or planetary construction and inspection; lunar and planetary *in situ* resource utilization; and prospecting, mining, transport, and construction.

NIST's Nanofabrication Facility © Robert Rathe

© Robert Rathe

Accessing Cutting-Edge Facilities

The IPP Office negotiated a memorandum of understanding with the National Institute of Standards and Technology (NIST) to further advances in nanotechnology. By collaborating on nanotechnology research, Goddard and NIST can further advance both organizations' missions. In addition, Goddard now has access to NIST's Advanced Measurement Laboratory and its state-of-the-art tools for making, testing, and characterizing prototype nanoscale devices and materials, thereby eliminating the need to duplicate facilities. Through this collaborative research, advances in chemical sensors, biosensors, electronic devices and circuits, and architectures for electronics, health care, and other fields are possible.



Facilitating Cross-Center Collaboration

Nanotechnology researchers at Goddard and NASA Ames Research Center in California have established a long-term relationship to make advancements that can be leveraged for the benefit of NASA's missions and objectives. Pairing Ames's expertise and capabilities in early-stage nanotechnology with Goddard's systems and missions expertise and capabilities will greatly facilitate the strategic development of new technologies and systems. As noted by Harry Partridge, Chief of Ames's Nanotechnology Branch, "Collaboration between the research Centers and the engineering Centers is essential to ensure that innovative technology makes it into NASA missions. The Ames-Goddard agreement makes that collaboration easier, enabling the Agency to reap the significant impacts of our nanotechnology innovations." These developments will include multifunctional materials, sensors and detectors, scientific instruments, and radiation-tolerant nanoelectronics.

"By having access to these state-of-the-art facilities and capabilities at NIST, Goddard can focus its resources on the validation of these miniaturized technologies to accelerate their maturity for space flight applications supporting scientific research and NASA's vision for space exploration."

Peter Hughes, Goddard's Chief Technologist

Accessing Technologies at a Lower Cost

The IPP Office out-licensed two Goddard-developed innovations that will make technologies needed for the space program available for purchase by NASA at a much lower cost than through in-house production:

- **Carbon Nanotube (CNT) Manufacturing:** Goddard's simpler, safer, and much less expensive manufacturing process for single-walled CNTs was licensed to Idaho Space Materials, which was founded in December 2005 as a manufacturer of advanced materials based on existing patents. The company has scaled-up and commercialized Goddard's process and is now selling CNTs as its NOMEC 1556 product, which is available at a reduced price to educational/research organizations.
- **Adiabatic Demagnetization Refrigerator:** Goddard's continuous Adiabatic Demagnetization Refrigerator (CADR)—a revolutionary cryogenic cooling technology—will soon be available for commercial applications and research thanks to a license to Lake Shore Cryotronics. Out-licensing this revolutionary technology to Lake Shore, which is uniquely positioned to manufacture and market the hardware, offers tremendous value NASA. In particular, the company's development of control electronics for the CADR will put NASA one step closer to developing a fully space-qualified cryogenic cooling system. (Note: Additional research will continue under the Partnership Seed Fund, as listed on page 4.)

"This success would not have been possible without the expertise and dedication of the Innovative Partnerships Program Office. And I'm very excited to see that this agreement is now making CNTs more readily available, particularly for academic and other research programs. The fact that they now have access to lower cost CNTs bodes well for the future of nano-technology."

Jeannette Benavides, Goddard inventor of the CNT manufacturing process

"The IPP Office was extremely helpful in identifying companies interested in licensing the ADR and then negotiating patent rights and other issues that allowed the licensing to go forward."

Peter Shirron, Goddard inventor of the continuous ADR technology



Identifying Partners, Funding Sources

In a time of bold exploration and science goals and limited resources, it is crucial that NASA leverage the resources of other organizations. Therefore, the IPP Office takes an active role in helping Goddard personnel identify collaborators—such as universities (see page 6) and commercial entities—and pursue opportunities from federal agencies. The nearly two dozen agencies with such opportunities have included the Defense Advanced Research Projects Agency (DARPA); the Departments of Commerce, Energy, and Veterans Affairs; the Environmental Protection Agency (EPA); and the National Science Foundation.

The IPP Office's efforts include:

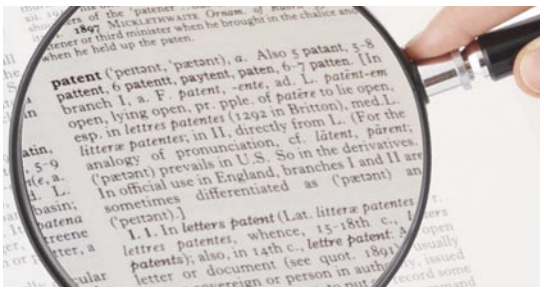
- Assisting technical personnel in identifying potential partners and facilitating discussions to define precise areas for and means of collaboration
- Identifing open solicitations, focusing on calls aligned with Goddard's capabilities, and communicating these funding opportunities to key Goddard personnel
- Serving as an internal reviewer for Goddard researchers' white papers and proposals in response to these solicitations
- Establishing dialogue with the funding agencies and conducting research to better position Goddard for future opportunities
- Providing strategic, communications, and other guidance to Goddard researchers

For example, the IPP Office assisted Goddard researchers developing a project to benefit lunar exploration—an effort that helped lead to the partnership with United Space Alliance (see page 4).

The IPP Office's efforts in this area help Goddard to fulfill NASA's technology-development needs as well as the complementary goals of other government agencies.

"In these times of shrinking R&D funding from NASA HQ, Goddard is looking to improve its track record in technology partnering with other government agencies to the benefit of both NASA and the partner agency. The IPP Office provides a valuable service in seeking out these partnering opportunities and then following through with agreements, often bringing new and unique collaborations to Goddard."

Tupper Hyde, Chief Technologist, Goddard's Applied Engineering and Technology Directorate



Protecting NASA's Intellectual Property (IP)

The IPP Office and Goddard's Office of Patent Counsel work together to ensure that the many innovations developed for the space program are appropriately protected from unauthorized use.

Patenting NASA's novel, innovative, and useful IP allows for the generation of royalties through out-licensing to commercial entities. More importantly, however, it allows Goddard to offer its partners unique access to NASA's cutting-edge technologies as well as the innovators who developed them.

In FY06, the U.S. Patent and Trademark Office (USPTO) issued six patents for Goddard-developed technologies:

U.S. patent no.	title
6,959,554	Passive Gas-Gap Heat Switch for Adiabatic Demagnetization Refrigerator
6,963,993	Fail-Over File Transfer Process
6,966,820	High-Quality Optically Polished Aluminum Mirror and Process for Producing
6,990,436	Computing Frequency by Using Generalized Zero-Crossing Applied to Intrinsic Mode Functions
7,060,968	Method and Apparatus for Optical Encoding with Compressible Imaging
7,008,605	Method for Manufacturing High Quality Carbon Nanotubes

Two types of patent applications can be filed with the USPTO: provisional and nonprovisional applications. A full, nonprovisional patent application is a relatively complicated document to prepare with a significant filing fee, while provisional applications are less complicated to prepare and give the applicant an additional year to file the full application without compromising its IP protection rights.

In FY06, Goddard's Office of Patent Counsel filed 23 nonprovisional and 15 provisional patent applications. The resulting additions of IP-protected innovations to Goddard's technology portfolio are as follows:

Nonprovisional Patent Applications

Conduit Purging Device and Method

Device, System, and Method for Miniaturized Radiation Spectrometer

Device, System, and Method for a Sensing Electrical Circuit

Gear Bearings

Hybrid Diversity Method Utilizing Adaptive Diversity Function

Interferometric Polarization Control

Method of Forming Pointed Structures

Modular Gear Bearings

Noise-Assisted Data Analysis, Method, System, and Program Product Therefor

Optical Source and Apparatus for Remote Sensing

Optical System for Inducing Focus Diversity

Solid-State Laser Gain Module

Stepping Flexures

System and Method of Self-Properties for an Autonomous and Automatic Computer Environment

Systems, Methods, and Apparatus for Pattern Matching in Procedure Development and Verification

Systems, Methods, and Apparatus for Flash Drive

Systems, Methods, and Apparatus for Developing and Maintaining Evolving Systems with Software Product Lines

Systems, Methods, and Apparatus for Generation and Verification of Policies in Autonomic Computing Systems

Systems, Methods, and Apparatus for Procedure Development and Verification

Systems, Methods, and Apparatus for Quiescence of Autonomic Systems

Systems, Methods, and Apparatus for Automata Learning in Generation of Scenario-Based Requirements in System Development

Systems, Methods, and Apparatus for Autonomic Safety Devices

Systems, Methods, and Apparatus for Modeling, Specifying, and Deploying Policies in Autonomous and Autonomic Systems Using Agent-Oriented Software Engineering

Provisional Patent Applications

Adaptive Sensor Fleet (ASF)

Automated Infrared Image Damage Detection Algorithm with Quantitative Error Threshold

Broadband High Spurious-Suppression Microwave Waveguide Filter for Polarization-Preserving and Transformer

Design of a Lightweight, Low-Power Magnetometer Based on a Single-Walled Carbon Nanotube Mat

Monolithic Large Format Infrared Bolometer Arrays with Integrated Optically Reflective Backshorts

Multipurpose Fiber Injected Micro-Spherical Lidar System

Otoacoustic Protection in Biologically-Inspired Systems

Space Plasma Alleviation of Regolith Concentrations in Lunar Environments (SPARCLE)

Systems and Method for Delivery of Information

Outreach

Identifying and creating opportunities for key Goddard personnel to interact with potential partners and other organizations can be an important step in the IPP Office's successfully achieving its goals. These interactions might occur within the context of an industry conference or at an event organized by the IPP Office. The table below presents the events that the IPP Office hosted or otherwise participated in during FY06, indicating how NASA benefits from such involvement.

event	involvement	value to NASA
International Astronautical Congress October 17–21, 2005 Fukuoka, Japan	Chief and other IPP Office personnel presented papers on NASA's partnering mechanisms, the social benefits of space spinoffs, and using tech transfer principles to guide R&D	Establishes NASA as a leader in technology transfer and enables networking with potential partners
***NASA Tech Briefs* Nano Conference 2005** November 10–11, 2005 Boston, Mass.	IPP Office hosted booth to present (and view) the latest in nanotechnology	Establishes preliminary relationships with potential partners
Joint Venture Workshop November 15, 2005 Cambridge, Mass.	IPP Office hosted event to present Goddard's R&D needs to Northeast/New England organizations	Enables early discussions with potential partners
Sensors Government Expo & Conference Dec. 6–8, 2005 Virginia Beach, Va.	IPP Office hosted booth to present (and view) the latest in sensors and detectors	Establishes preliminary relationships with potential partners
Annual NTR Program April 6, 2006 Greenbelt, Md.	IPP Office hosted event to recognize innovators who filed new technology reports or otherwise participated in the program during 2005	Reinforces the importance of innovator involvement in partnerships and technology transfer
Technology Innovation Information[1] annual meeting April 26–28, 2006 Gateshead, UK	Chief presented how the results of space-related research and development can bring spinoff benefits to business and society	Ensures international community recognizes NASA as a leader in technology transfer and innovation
Federal Laboratory Consortium for Technology Transfer (FLC) national meeting May 1–4, 2006 Minneapolis, Minn.	Office of Patent Counsel presented Goddard's bold strides in the area of open source software	Establishes Goddard as a leader in innovative approaches to making government-funded technology available
NBC4 Connected Expo September 16–17, 2006 Washington, D.C.	IPP Office personnel attended and coordinated involvement of Goddard researchers active in technology transfer	Shares Goddard's latest technology and details the ways NASA enriches lives through technology transfer
FLC Mid-Atlantic Region annual meeting[2] September 19–21, 2006 Cumberland, Md.	Chief presented case studies demonstrating how IP rights can be lost through interagency sharing and/or collaborative research with commercial contractors	Establishes Goddard's IPP Office as an industry leader in partnership development and technology transfer while providing insights to (and hearing best practices from) other federal agencies

1. European independent association, including technology transfer and innovation support professionals

2. Goddard also received two awards at this meeting (see page 14)

Photo credit: Tom Grayson, FLC; all rights reserved

Early FY07 Technology Partnering Showcase

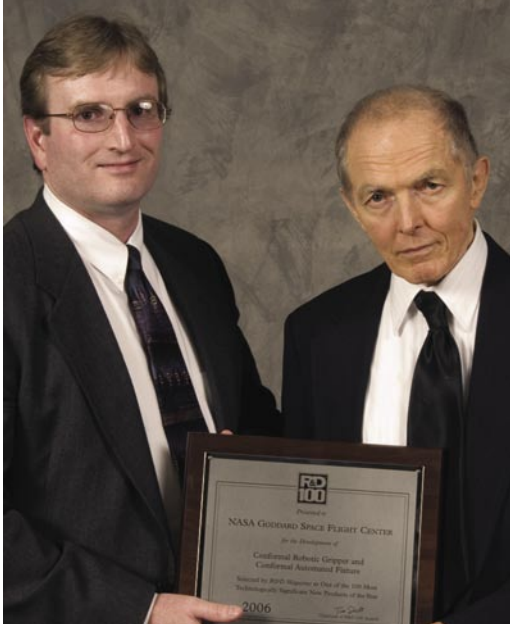
Under the auspices of an agreement signed between Goddard and the Maryland Technology Development Corporation (see page 23), the IPP Office began plans for a Technology Partnering Showcase. The Office identified a dozen technologies and two state-of-the-art facilities that would be of interest to the attendees from companies, universities, and government organizations. Assisting with the development of formal presentations as well as posters to facilitate informal networking sessions, the Office ensured that researchers' time with attendees would be productive.

Held on October 12th, the Showcase was a rousing success with more than 130 organizations in attendance and many leads on potential partnerships and other arrangements.

Value to Innovators

Goddard's innovators—the scientific and technical staff working toward NASA mission goals—are key to the success of the IPP Office. They know the technical challenges that must be overcome to ensure successful NASA missions, and they understand Goddard's strengths and the technologies in its portfolio. Their participation in partnership development and technology transfer is essential. Therefore, the IPP Office works to ensure that Goddard innovators benefit from their participation.

photo credit: Sam Kittner



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Awards and Recognition

Goddard's IPP Office works to recognize Goddard innovators' scientific and engineering achievements as well as their participation in partnership development and technology transfer activities. Doing so further inspires them toward R&D excellence, which benefits NASA, as well as promotes the Innovative Partnerships Program, encouraging other Goddard researchers to participate in the IPP Office's activities.

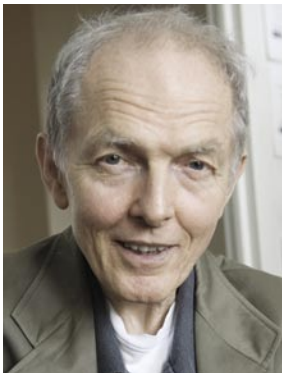
External Awards

- **Service to America Medal:** The IPP Office nominated Norden Huang (retired) for the Service to America Medal, which Dr. Huang received in the Science and Environment category on September 27, 2006. Known as "The Sammies," the awards pay tribute to America's dedicated federal workforce, highlighting those who have made significant contributions to the country. Dr. Huang was recognized for his discovery of the Hilbert-Huang Transform (HHT) technology, one of the most important discoveries in the field of applied mathematics in NASA history. More information on HHT is available online (http://ipp.gsfc.nasa.gov/HHT/index.html).
- **R&D 100 Award:** The IPP Office nominated the Conformal Gripper technology for the award known as "the Oscars of invention." Developed by Goddard's John Vranish (retired), this unique gripping mechanism has the potential to revolutionize robotics by eliminating the need for specialized end effectors and grippers. More information is available online (http://ipp.gsfc.nasa.gov/NWS-RD100.html).
- **Awards for Excellence in Technology Transfer:** The IPP Office applied for and received two awards from the Mid-Atlantic Region of the Federal Laboratory Consortium for Technology Transfer:
  - Transfer of a compliant cable mechanism and walker technology to Enduro Medical Technology, which has commercialized the technologies into the Secure Ambulation Module (see page 25)
  - Transfer of the HHT technology to Beth Israel Deaconess Medical Center to enhance monitoring patients at risk for sudden cardiac failure, stroke, depression, other neurological disorders (see page 26)

NASA Awards

- **The Kerley Award:** The IPP Office annually bestows this award to a Goddard researcher who has greatly contributed to its technology transfer efforts over the course of the year. The 2006 Kerley Award was given to James Tilton for his efforts to transfer his Recursive Hierarchical Segmentation (RHSEG) software (http://ipp.gsfc.nasa.gov/RHSEG/index.html). RHSEG is being used in Batron Medical Imaging's (http://www.bartron.ws) Med-Seg™ device to bring more precise imaging to the health care system.
- **Inventions and Contributions Board (ICB) Awards:** The IPP Office coordinates the application efforts for various awards from NASA's ICB. In FY06, these efforts resulted in the following:
  - **Space Act Awards** for 5 technologies (16 innovators), which recognize exceptional scientific and technical contributions to NASA's mission
  - **Patent Application Awards** for 10 technologies (29 innovators), which honor researchers whose inventions have received approval for patent application by NASA
  - **Software Release Awards** for 22 technologies (62 innovators), which are given to developers of software that has been approved for release by NASA to qualified users
  - **Tech Brief Awards** for 46 technologies (72 innovators), which are presented to researchers whose innovations have been published in *NASA Tech Briefs*.

"It is a true honor to have this technology recognized by *R&D,* and I appreciate the efforts of everyone who supported and assisted in its development."

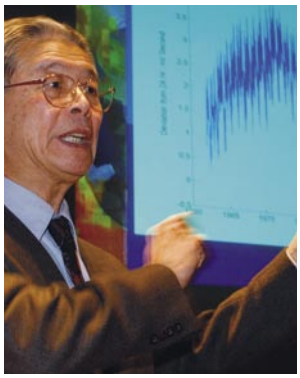


John Vranish, Goddard inventor of the Conformal Gripper technology

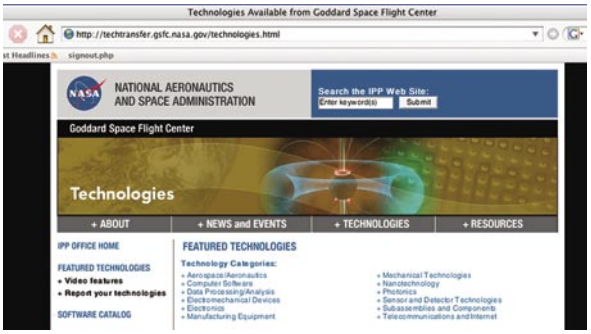
"I want to thank [the IPP Office] for the ongoing help and support... in moving RHSEG outside of NASA's walls. I am particularly excited by prospects of the utilization of the three-dimensional version of RHSEG to medical image analysis applications and other applications in and outside of NASA."

James Tilton, Goddard inventor of the RHSEG technology

"All of these collaborations were made possible by the hard work of [the IPP Office] and your team. You continuously pursued the agreements and made them happen. I also want to express my appreciation for all of the awards for which you have nominated me and my technology. I am quite sure that I would not have so many awards to my name had it not been for you and your team."



Norden Huang, Goddard inventor of the HHT technology



Access to Information

In FY06, the IPP Office redesigned its quarterly publication—*Goddard Tech Transfer News*—which is distributed to civil servants and contractors at Goddard. The new magazine takes a targeted focus on:

- **Education**: Readers are reminded of the requirement to file new technology reports (NTRs). They also have the opportunity to increase their understanding of NASA's technology transfer program through a quiz, brief summaries of IPP Office activities, and descriptions of newly signed partnerships and spinoff successes.
- **Innovator Recognition**: Each issue provides an in-depth interview with a civil servant active in technology transfer. Lists of awards bestowed by NASA's Inventions and Contributions Board (see page 15) and other organizations, NTRs, and patenting activities further recognize innovators' achievements.
- **Research, Funding, and Publishing Opportunities**: Calls for proposals and other funding opportunities from non–Mission and even non–NASA sources are listed, allowing Goddard innovators' R&D to have a greater impact for the Agency and for the nation. Also included is information on submitting papers to relevant upcoming conferences.

Royalties

Royalties are another way in which technology transfer benefits Goddard's innovators. Once an NTR has been filed, the IPP Office evaluates whether there is potential for commercial interest in the technology. If such potential is sufficient, a patent application is filed (see page 11) and the technology is made available for licensing. The IPP Office lists the technology on its Web site and in some cases actively markets the technology to potential licensees.

If a commercial entity licenses Goddard's patented technologies and software, the innovator and NASA receive payments for this use. These payments can include an upfront licensing fee as well as either a "running" royalty (e.g., a percentage of net sales) or a minimum royalty payment. (Note: Actual royalty payment values are confidential.)

Bringing Value to the External Community

In addition to the numerous ways that NASA benefits from the work of the IPP Office, a true partnership yields benefits for all parties. Therefore, the IPP Office ensures that the partnerships it pursues are truly win-win agreements.

Value to Our Partners

Companies, universities, and other government labs have much to gain in collaborating with Goddard—well beyond simply the name recognition of NASA as a partner. Goddard has world-class expertise, unique facilities, and cutting-edge technologies that can augment our partners' own capabilities, allowing them to take a giant leap forward in their R&D and strategic plans.

Growth Opportunities

Since 2002, Vexcel Corp. has been developing a wireless sensor network technology for use in NASA's Earth science research under several Goddard-issued Small Business Technology Transfer (STTR) contracts. In May 2006, Vexcel was acquired by the Virtual Earth business unit of Microsoft Corp. Vexcel's technology portfolio—including the results of the STTR research—is being integrated into Microsoft's Windows Live™ Local and the Virtual Earth™ platform offerings. (For more information about STTR, see page 5.)

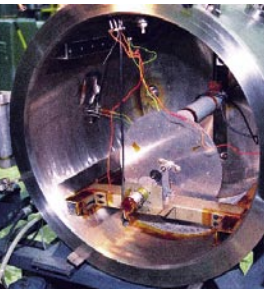
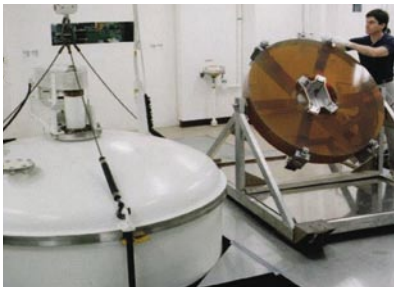
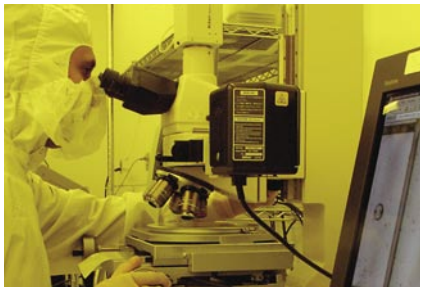
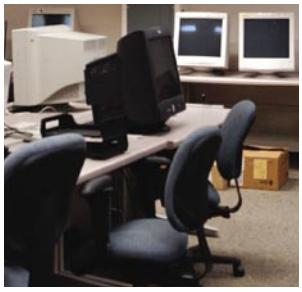
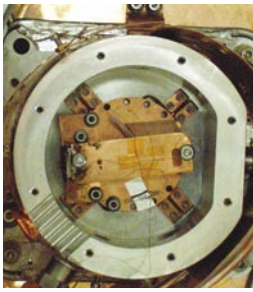
Expertise

The personnel at NASA Goddard Space Flight Center are leaders in the fields of electronics, guidance and navigation, information technology, optics, sensors, and scientific analysis. In most partnership or other technology transfer agreements, developers of Goddard technologies are available to help guide new implementations of those innovations. As a result, organizations that partner with us gain access to unique expertise.

For example, the IPP Office helped develop two agreements with U.S. companies needing assistance with SpaceWire—a network fabric used to move information defined in packets, providing flexibility, modularity, and reusability. Goddard will be providing Aeroflex, Inc., and Harris Corporation guidance as they develop SpaceWire technologies or build their knowledge of and skill with the SpaceWire standard. As a result, these companies will be better able to respond to future needs for SpaceWire-based communication devices at NASA and within the rest of the aerospace market.

"NASA's support for this STTR permitted me to work on the problem of data acquisition and recovery from harsh environments, which benefits not only NASA's Earth sciences and interplanetary exploration goals but also our research partner Penn State and, by extension, the geoscience research community... Microsoft's interest in Vexcel confirms the potential for this technology and increases the return on NASA's investment."

Robert Fatland, Geophysicist, Vexcel Corporation

Facilities

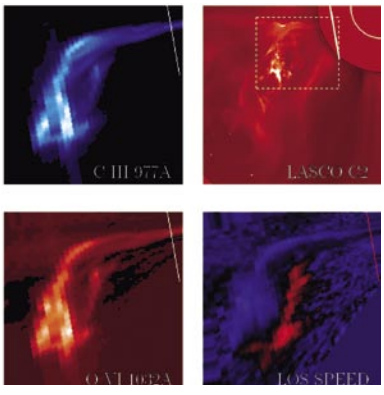
The equipment, laboratories, and other capabilities needed to pursue NASA's goals are a significant asset that can be accessed by outside organizations. For example:

- **Radiation Effects Facility (REF)**: Goddard established the REF to study ionization and displacement damage of electronics and materials as well as instrument calibration requirements for devices in space, including electronics, microcircuits, sensors, couplings, lenses, and filters as well as paints, coatings, and aircraft structural materials. In FY06, Texas Instruments signed an agreement to use the REF in testing and reengineering radiation-tolerant electronics.
- **Integrated Design Capability (IDC)**: Goddard uses the IDC to conduct rapid space system analysis and develop conceptual designs. IDC's collaborative process and sophisticated tools can be used to produce detailed space mission, remote sensing instrument, and/or technology applications design concepts.
- **Thin-Film Coating Facility**: Goddard researchers used this facility and an innovative coating to provide the Smithsonian Astrophysical Observatory (SAO) with optics that reflect light over a wide range of wavelengths, dramatically increasing the efficiency of SAO's solar-laboratory experiments.
- **Detector Systems Facility**: Goddard's capabilities include detector development and characterization laboratories as well as a superconducting detector test facility and MEMS and nanotechnology facilities. This facility was featured at the October 12th Showcase (see page 13).
- **Goddard Mission Services Evolution Center (GMSEC)**: This facility was created to reduce the costs of mission development, operations, and maintenance; to accelerate the advancement of new capabilities and technologies; and to better utilize commercial software products. This facility was featured at the October 12th Showcase (see page 13).
- **Cryogenic High Accuracy Refraction Measuring System (CHARMS)**: The CHARMS facility surpasses other refractometer facilities in its versatility—providing measurements at cryogenic temperatures and over a wide range of wavelengths—and its unsurpassed accuracy. The IPP Office developed an agreement for the University of Oxford to access this facility in early FY07.

More information about Goddard's unique facilities is available online (http://ipp.gsfc.nasa.gov/facility-tours.html).

"Goddard is the only place in the country that does this kind of coating. We could have tried to make do with a commercial coating, but they're significantly less efficient. If we weren't able to access Goddard's facilities, it would have taken us four times as long to get the data we need. It has a big impact on our ability to do the experiments."

Larry D. Gardner, Physicist, Smithsonian Astrophysical Observatory



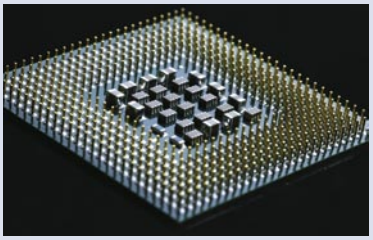
Technologies

Every Goddard-developed innovation is made available to the nation's companies, universities, and other government laboratories through the IPP Office's Web site (http://ipp.gsfc.nasa.gov), articles in *NASA Tech Briefs,* and listings in the Agency-wide NASA Tech Finder (http://technology.nasa.gov/). The technologies made available in FY06 are listed on pages 20–22.

These technologies can provide our partners with significant strategic advantages. For example, in FY06 the IPP Office successfully out-licensed the Hilbert-Huang Transform technology to BCG Wireless. The small business in suburban Washington, D.C., is working to use HHT to help improve signal reception capability in radio frequency (RF) communications. If BCG Wireless is successful in its use of HHT, then the company will be able to offer software and hardware that improve the usability of existing RF systems and thereby gain a competitive position.

"This license agreement is a key asset to BCG Wireless, and our relationship with Goddard's IPP Office has developed into a true partnership. From the earliest days of our work together, they invested the time and energy to get to know us and to thoroughly understand our strategy. One of the barriers that small companies face is forging a solid working relationship with larger organizations. Not only do they understand that dilemma but they find creative ways to solve it. I can say with complete candor that without the IPP Office we would not be on the threshold of our own commercial success."

Jack Barse, Chief Executive Officer, BCG Wireless


The following lists FY06's technology opportunities, including new technology reports (* indicates software approved for public release), technologies published in *NASA Tech Briefs* (†), and innovations featured on the IPP Office's Web site (‡).

Advanced Materials

Fluorinated Suspension Medium and Propellant Based Thereon

Gellant for HAN Oxidizer

Improved Holographically Formed Polymer Dispersed Liquid Crystal Materials†

Mercuric Iodide Anti-Coincidence Shield for Gamma-Ray Spectrometer

Multiple Material Insert for Composite Sandwich Panels

Nanophase Dispersion Strengthened Invar 36

Pre-Injection Mixing of Gelled Propellants

Process for Cleaning and Treating Aluminum to Produce Highly Wettable Surfaces for Water and Hydrazine

Selective Plasma Deposition of Fluorcarbon Film on Self-Assembled Monolayers†

SMART Solar Sail†

Electrical Systems and Electronics

Coating Process for Silicon Carbide Fibers

General EQFlux†

Integrated Antenna Array with Individual MEMS Switch Based Modulation

Low-Power Intelligent Tool Environment (LITE) for FPGAs

MEMS-Scale Power System for Microsatallites

Method for Controlled Adhesive Attachment Using an Electrically Activated Viscoelastic Semiconductor

Micron and Submicron Pointed Structures‡

Novel Electronic Component Mounting to Achieve High Board Density

Novel FPGA Readout Integrated Circuit (ROIC) Architecture for Geiger Photodiode Arrays

Novel Method and Device for Stroke Prediction

Radiation-Tolerant, SpaceWire-Compatible Switching Fabric

Safe to Mate

Spaceflight Ka-Band High-Rate Rad-Hard Modulator

Guidance, Navigation, and Control

Aerodynamic Design of a Propeller for High-Altitude Balloon Trajectory Control

Autonomous Navigation System Based On GPS and Magnetometer Data (GPS-MAGNAV)‡

Coarse Alignment Technology of a Large Segmented Mirror

Crossed Beam Roof Target Six-Degree-of-Freedom Tracking System

Demiseable Reaction Wheel Assembly‡

Development of an Improved Upper Stage Ignition System†

Frequency Diversity Doppler Processing

GPS-Enhanced Onboard Navigation System‡

Mercury Laser Altimeter Onboard Science Algorithms†

Minimum Cycle Slip Airborne Differential Carrier Phase GPS Antenna‡

Pivot 2.0: Radiation Hardened Fast Acquisition/Weak Signal Tracking GPS Receiver (Navigator)‡

Recent Developments in Hardware-in-the-Loop Formation Navigation and Control

Reconfigurable, Decentralized Framework for Formation Flying Control†

Rover Radar for Surface Navigation, Hazard Detection, and Negative Obstacle Avoidance

Superpressure Tow Balloon for Extending Durations and Modifying Trajectories of High Altitude Balloon Systems

Three-Dimensional Antenna Array and GPS Receiver for Combined Navigation/Attitude Determination Phase II

Trajectory and Performance Models for Earth and Planetary Balloons

Using the Global Positioning Satellite System to Determine Attitude Rates Using Doppler Effects†‡

Information Systems

Advanced Land Image Assessment System (ALIAS)

Advanced Solid State Recorder Scheduling Tool (ASSET)

Application of SAE Architecture Analysis & Design Language (AADL) to IV&V of NASA Flight Projects

Approach for Autonomy: A Collaborative Communication Framework for Multi-Agent Systems

Astronomer Proposal Tool†

AutoChem†

Automated Vortex Detection

Autonomic Quiescence

CCSDS Image Data Transcoding

Commercial GIS Extension for Visualization of Large Unstructured Geospatial Data

Common Data Format

Computer Code to Model Loop Heat Pipe Transients

Contamination Mass Transport Analysis Software

Control Center in the Classroom (CCC)

Cool-RAD™ Ultra Low Power Cache Random Access Memory Structure with Enhanced Single Event Radiation Tolerance

Core Command and Data Handling Library

Core Flight Executive (cFE)

cFE Application Program Interface

D-Dimensional Formulation and Implementation of Recursive Hierarchical Segmentation

DocBUILDERsolo

Empirical Assurance of Embedded Software Using Realistic Simulated Failure Modes

Enhancing R2D2C Requirements Based Programming With Automata Learning

Estimated Spectrum Adaptive Postfilter (ESAP) and the Iterative Prepost Filtering (IPF) Algorithms‡

Extendable USB Drive

F Unit

General Mission Analysis Tool

Giovanni: GES-DISC Interactive Online Visualization and Analysis Infrastructure

Global Alert Resolution Network‡

Goddard Mission Services Evolution Center (GMSEC) Architecture

GMSEC Architecture Application Programming Interface

GMSEC Message Bus

Grants Document Generation System

Hilbert-Huang Transform‡

Innovative Utilization of the Heap Data Structure for Efficient Determination of Best Merges for Hierarchical Segmentation†

InSpec: Automated Review System

Integrated Modeling Environment†

Integrated Structural Analysis and Test Program‡

IV&V Technique for Object Oriented Software Systems

Java Application Shell†

Land Information System Software, Ver. 4.2

Lightwire†

LTM - LACE Task Manager*

Magic Bullet: Real-Time Anytime Treatment Learning

Matlab-CodeV Toolkit

Matlab-OSLO Toolkit

Matlab-Zemax Toolkit

Memory Efficient Serial Implementation of Recursive Hierarchical Segmentation

Method for Developing and Maintaining Evolving Systems with Software Product Lines

Method for Recursive Hierarchical Segmentation which Eliminates Processing Window Artifacts†‡

Methodology for Fixed-Point Computational Data Path Optimization

Mirador: A Fast, Minimalist Search Tool for Remote Sensing Data

Modeling, Specifying, and Deploying Policies in Autonomous and Autonomic Systems Using an AOSE Methodology

NASA Forecast Model Web Map Service

NUB: NPOESS User Block Tool

OASIS: A Reusable, Autonomous Ocean-Atmosphere Sensor Integration System

Otoacoustic Protection in Biologically Inspired Systems

Parameterization of the POD-Based Dynamical System Coefficients

Personalization and Flexible Rich Media Content Amalgamation to Existing Streaming Infrastructures

Pixelized Device Control

Practical Model Checking to Enforce Domain Specific Interfaces

Predictive Model for Return on Investment of Independent Verification and Validation

Programmable Digital Controller

Reusable Object-Oriented Software Package that Implements Instrument Command Building and Argument Validation

SLE Forward CLTU Service (User Side)

Space Operations Learning Center Website

Space-Based Ethernet Protocol Embedded in an IPDR Modular Avionics Architecture

SpaceWire Link and Switch Implementation‡

SpaceWire PCI Card Windows Driver Software

SpaceWire Test FPGA Design

SpaceWire Transport Layer‡

Spatial and Temporal Low-Dimensional Models for Fluid Flow

Specialized Color Function for Display of Signed Data

Split-Remerge Method for Eliminating Processing Window Artifacts in Recursive Hierarchical Segmentation†

Stabilization of a POD-Based Dynamical System

Standard Autonomous File Server‡

Swift Burst Alert Telescope (BAT) Engineering Flight Software

Systems Engineering Process Realization Toolkit

Tandem Experiments in Finding Faults during Model-Based Development

TARA: Toolbox for Automated Registration and Analysis

Tool to Facilitate CMMI appraisals†

Ultra-Compact High-Definition Hyperspectral Imaging System

Virtual Satellite Platform (VirtualSat Pro)†

Wireless Sensor Network Node

Mechanical Systems

Annular Ring Premix Injector with Bladder Attachment

Apparatus for Providing Torque and Storing Momentum Energy‡

Compliant Mount for Umbilical Separation Connector

Dual Concentric Bladders for Positive Expulsion of Gelled Propellant

Gear Bearings‡

Hard Seat Isolation Valve for Spacecraft Applications

Hardware and Technique for Dead-End Welding of All Types of Tubing‡

Integrated Hydrostatic Journal Bearing

Method and Apparatus for Controlling a Tool‡

Miniature Pump for Long-Life Biomedical Application‡

Multiple Purpose Gas Generator

Ninety-Degree Close Quarters Facing Tool

One-Way Bearing‡

Passive Non-Rocking Vibration Isolation System

Phase-Oriented Gears†

Reversible Robotic Coaxial Connector

Robustness of Favorite Controllers

Rollatruss: Flexure-Hinged Optimized Ultralight Deployable Truss Boom with Flattenable Constituent Truss Elements

Space Robotic Tug System to Transport Cargo in Space, to Assemble and Repair Satellites, and to Dispose of Depleted Cargo

Synergistic Habitation System for Artificially Derived Forces from Directed Fluid Flow

Tetrahedral Exoskeleton for Segmented Struts

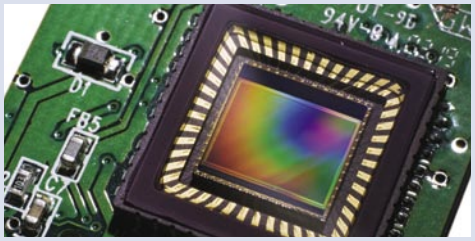
Three Degree-of-Freedom Parallel Manipulator with Three Inextensible Limbs and Base-Mounted Actuators†

Three-Dimensional Roller Locking Sprags‡

Tightly Packaged Integral Flexure Mount Design for Cryogenic, Metal Mirrors for Astronomy Instruments†

Toroidal Vortex Combustion

Virtual Feel Capaciflectors†


Photonics

Absolute Cartesian Encoder‡

Active, Solid-State, 3-Dimensional Range Imaging System

Adhesive Bubble Remover‡

Aluminum Super Polishing Process‡

Automated Infrared Image Damage Detection Algorithm with Quantitative Error Threshold

Cartesian Electronic Absolute Autocollimator†

Cartesian Electronic Absolute Autocollimator‡

Chemical Stripping of Optical Fibers‡

Circuit for Real-Time Enhancement of GaN UV Photodetector Quantum Efficiency

Device for Live-Axis Turning for the Fabrication of Non-Rotationally Symmetric Optics

Fabry-Perot Double-Cavity Optically Controlled Narrow Tunable Bandpass Filter

Fast Picometer Mirror Mount

Fiber-Optic Shape Sensing for Intelligent Solar Sail Deployment

Full-Disk Rationing Radiometer to Augment Calibration of the Advanced Baseline Imager

High Power Electro-Optic Modulator for Space-Based Applications

High-Resolution X-Ray Collimators

High-Speed Magnetostrictive MEMS Actuated Mirror Deflectors

Holographic Circle-to-Point Converter‡

Improvement to Fine-Alignment Technology of a Large Segmented Mirror

In Situ Lidar for Cloud and Aerosol Radiation Sciences

Instrument and Method for X-Ray Diffraction, Fluorescence, and Crystal Texture Analysis without Sample Preparation

Integration of Garnets and Magnets for Waveguide Isolators

Investigation of Helioseismic Waves and Magnetic Variations Associated with Solar Flares†

Large Depth-of-Field Particle Image Velocimeter

Lightweight Optic Mirror Single Crystal Silicon‡

Linear and Rotary Absolute Optical Encoders with Ultra-high Resolution†‡

Magneto-Optic and Electro-Optic Heterostructures

Magneto-Optic Garnet Films

Modulated X-ray Source

Natural Light Polarimeter

Novel Tunable Dye Laser for Lidar Detection

One-Dimensional Synthetic Aperture Microwave System Using Parabolic Cylinder Reflector†

Portable Airborne Laser System†

Portable Rugged Low Powered X-Ray Fluorescent Using Machined Sources‡

Simple, Compact, and Robust Optical Reference System for Lasers with Narrow Linewidth

Solid-State Spectral Light Source System

Spaceflight X-Band Hybrid Phase-Locked Oscillator

Spectral-Ratio Biospheric Lidar‡

Theodolite Ring Light†

Tunable, High-Power Fiber-Optic Laser for Lidar Applications

Ultra-Stable Miniature Seed Laser for High Power Nd:YAG Lasers

Sensors and Detectors

4x4 Individually Addressable InGaAs APD Arrays Optimized for Photon-Counting Applications

AlGaN Ultraviolet Detectors for Dual-Band UV Detection

Analog Radio Interference Suppression System

Analytical Particle Biogeochemical Sensor

Autonomic Smoke Detector

Blocking Contacts for N-Type Cadmium Zinc Cadmium Zinc Telluride

Cloud Micro-Sensors for Application on Small UAVs and Balloons†

Demonstration of 4H-SiC Visible Blind EUV and UV Detectors with Large Detection Area

Development of Ultra High Sensitivity UV SiC Detectors

Direct Solve Image Based Wavefront Sensing

Dual-Order Common Path Spectrometer

Extended Range Displacement Sensor

Field Programmable Processor Array

Horizon Sensor Microsystem with MEMS Linear Scanner

InGaAsP Avalanche Photodetectors for Non-Gated 1.06-μm Single Photon Counting

Interferometer for Low Uncertainty Vector Metrology†

Low-Power Mass Spectrometer Employing TOF

Microwave Rain Gauge

Miniaturized Instrument to Obtain Atmospheric Profiles of NO, NOx, and NOy

Miniaturized Radiation Spectrometer Development

Real-Time Parylene Thickness Monitoring Optical Sensor System‡

Remote Sensing Analysis of Forest Disturbances

Thermal and Cryogenic Systems

Advanced Adiabatic Demagnetization Refrigerator Integrated Controller

Bi-Propellant for Thermal Mechanical Chemical Induction of Vaporization and Combustion

Cryogenic Frost Point Hygrometer

Cryogenic Hydrogen Radiation Shield

Cryogenic Loop Heat Pipe for Large-Area Cryocooling

Gas Generator Propellant for Thermal Mechanical Chemical Induction of Vaporization and Combustion

Helium Loop Heat Pipe for Large-Area Cryocooling

Lightweight Cryogenic Radiator

Low-Cost Al/Diamond Composites for Thermal Management Applications

Low-Cost and Lightweight Three-Stage Radiative Cooler for Cooling Focal Plane Array or CCD to 140 K or Colder

Micro-Channel Embedded Pulsating Heat Pipes (ME-PHPs)

Microchip Cooling Device with Diamond Heat Sink

Miniature Loop Heat Pipe with Multiple Evaporators and Condenser

Solvent-Free Batch Process for the Manufacture of a New Generation of Highly Efficient Thermoelectric Coolers†

Sub-Kelvin Helium-4 Joule-Thomson Refrigerator

Tangential Jet Evaporator for Two-Phase Cooling of High Flux over Large Areas

Thermal Mechanical Chemical Induction of Vaporization and Combustion



Value to the Regional Economy

NASA Goddard Space Flight Center is uniquely poised to contribute to Maryland's regional economy. By working with economic development agencies, area universities, and other organizations, the IPP Office helps to enhance companies and the workforce in the region, which in the long term can help NASA achieve its objectives.

Agreement with TEDCO

The mission of the Maryland Technology Development Corp. (TEDCO) is to facilitate the creation of businesses and foster their growth in all regions of the state through the commercialization of technology. This mission is closely aligned with the goals of the IPP Office. By working together, the IPP Office can leverage Maryland's investment in technology-based economic development for the benefit of NASA as well as the state. The agreement with TEDCO is designed to serve as a valuable link between Maryland companies looking to benefit from Goddard's capabilities and technologies. The agreement enables local industry and universities both to utilize Goddard R&D and to help achieve NASA missions faster and more cost-effectively. The first activity under this agreement is for both organizations to hold a Technology Partnering Showcase (see page 13).

"Through TEDCO and NASA's formal partnership, technology transfer will continue to grow and serve as a way to advance Maryland's promising technology economy. [Goddard's innovations] provide the state's technology companies and entrepreneurs opportunities to conduct further research and development in order to develop products that can enter the public marketplace."

Renée Winsky, Interim Executive Director, TEDCO (with Orlando Figueroa, Director of Goddard's Applied Engineering and Technology Directorate)



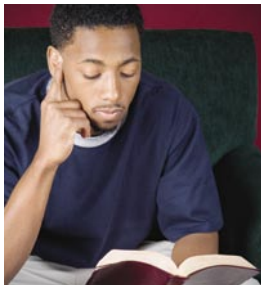
Agreement with DBED

In FY06, the IPP Office developed an agreement with the Maryland Department of Business and Economic Development (DBED) to attract high-technology companies to the state and to foster growth of new technology start-up companies with skills specific to NASA's technology needs. The agreement enables collaboration between Goddard and DBED, facilitating technical exchanges related to new aerospace trends, methods, and challenges that may benefit NASA missions. DBED also can leverage collaboration with Goddard to demonstrate educational, financial, and business resources that technology companies require. In short, the agreement is mutually beneficial, bolstering economic growth in Maryland while helping to support NASA's numerous missions.

"Goddard is a critical component of Maryland's internationally recognized technology- and space-based industry. This agreement will help to ensure that NASA and the Goddard Space Flight Center will continue to be one of the state's most important scientific, technological, and economic partners."

Chris Foster, Deputy Secretary, DBED





Agreements with Local Universities

In FY06, the IPP Office entered into agreements with the University of Baltimore and Howard Community College that are designed to enhance NASA's strategic technology objectives. Under these agreements, students will have the opportunity to gain real-world technology experience as they assess Goddard technologies and collaborate with faculty, Goddard researchers, and local mentors to develop commercialization plans and potential licensing opportunities. These agreements provide Goddard with assessment information about potential applications and licensing opportunities for possible technology transfer efforts.

"In particular, [the IPP Office] has been instrumental in identifying ideal projects and researchers for our students to work with to gain real, hands-on experience. This help has been invaluable to position this year's Lab to Market program for success."

Michael Laric, Professor of Marketing, University of Baltimore



Value to Humanity

One of the sometimes surprising benefits of technology transfer is how NASA technologies provide advances in nonaerospace fields, such as medicine, the environment, transportation, consumer products, and more. These advances are sometimes years in the making, so the IPP Office monitors the progress of previously signed agreements to help the partner overcome any obstacles and to promote their successes. The pages that follow offer a few such successes from FY06.

Goddard Technology Gets Patients Up and Walking

In 2003, Enduro Medical Technology introduced the Secure Ambulation Module (SAM). Based on Goddard's cable-compliant joint technology and compliant walker, SAM is a revolutionary rehabilitative device that enables patients to stand and ambulate without the aid of a physical therapist. The company made bold strides with this product during FY06:

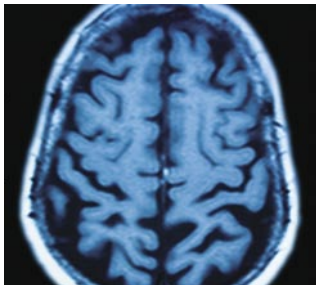
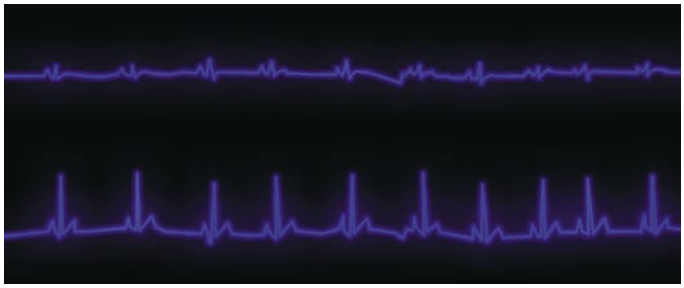
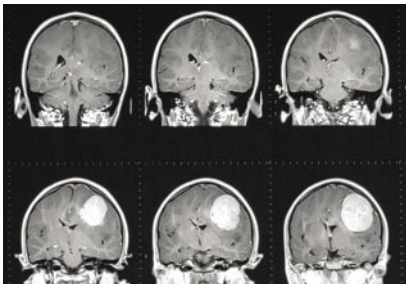
- Enduro donated a SAM unit to Walter Reed Army Medical Center in Washington, D.C., to help rehabilitate military patients with spinal cord or traumatic brain injuries.
- Kindred Hospital in Greensboro, North Carolina, is using SAM in its therapy for bariatric (extremely overweight) patients, who benefit from the device's ability to help them support their body weight during exercise programs.
- Enduro introduced a youth model called SAM-Y, which can be used within or outside the therapy setting.

"Bariatric patients in long-term acute facilities like ours are bedridden and have not used their legs for quite some time. Their legs cannot support their body weight. SAM helps us to help them strengthen their whole lower body. The technology has a lot of promise."

Mark Castleberry, Director of Rehabilitation Services, Kindred Hospital

"I think there's a change in confidence and almost like a change in hope for someone who hasn't been able to walk for a long time and—with the assistance of SAM—is actually able to get up and ambulate and propel themselves on their own."

Anne Moore, Licensed Physical Therapist Assistant, Walter Reed Army Medical Center

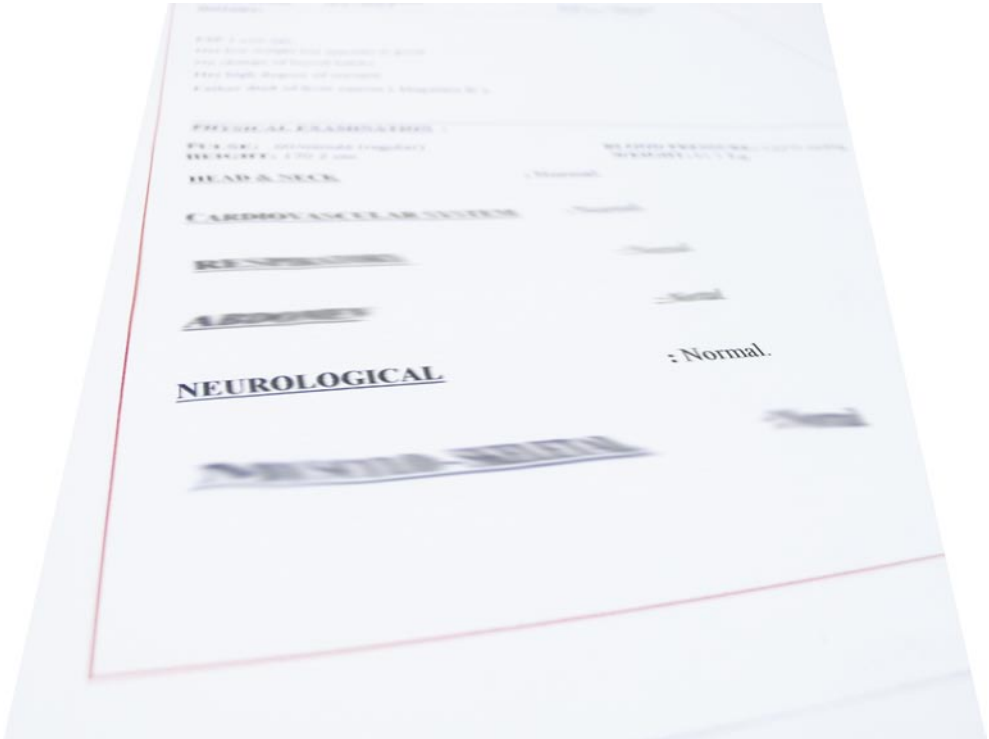




Advancing Medical Research

Under an agreement signed in FY04, Harvard University's Beth Israel Deaconess Medical Center (BIDMC) is working toward the goal of refining the use of Goddard's Hilbert-Huang Transform technology for a variety of medical advancements. The collaborative effort is expected to enhance monitoring of patients at risk for sudden cardiac failure and stroke as well as diagnosis and treatment of depression and other neurological disorders. The research was also designed to use HHT to analyze physiological signals in order to measure the vitality of various systems within the body. During FY06, BIDMC scientists worked directly with Dr. Huang to understand the HHT algorithms and to apply them to analyses of physiological signals, enabling better monitoring of cardiac and neurological diseases.

"In collaboration with Dr. Huang, [our] researchers were able to explore several exciting new applications of the HHT algorithm with major public health implications, including sleep apnea detection and the quantification of cerebral blood flow and blood pressure dynamics in elderly people at risk of stroke."

Ary Goldberger, Associate Professor of Medicine, Harvard University's BIDMC

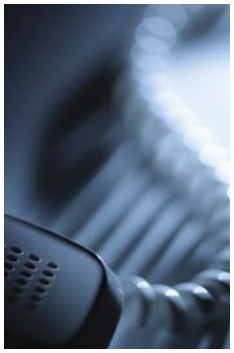


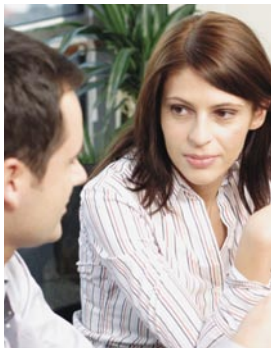
The Nation's Highways

Under a three-year agreement completed this year, Turner-Fairbank Highway Research Center (TFHRC) scientists learned how to apply Goddard's Hilbert-Huang Transform technology to analyses of traffic flow data, wind and traffic interaction with bridges, and damage detection in pavement and bridges. These analyses are the basis of TFHRC's Digital Highway Measurement (DHM) Project and are the first steps in a dramatic shift in the way state departments of transportation will be able to improve the safety and performance of the nation's highway infrastructure.

"The HHT has been a critical element for accurate analysis of data from some of the sensors on board the DHM van. The capability being created in the van represents the beginning of a paradigm shift in the way states will view and be able to carryout their stewardship of the nation's highway infrastructure."

Morton Oskard, Structural Research Engineer, Turner-Fairbank Highway Research Center

Contact Us

We encourage companies, universities, government labs, and other organizations interested in joining NASA in going to the Moon, Mars, and Beyond to contact us today.

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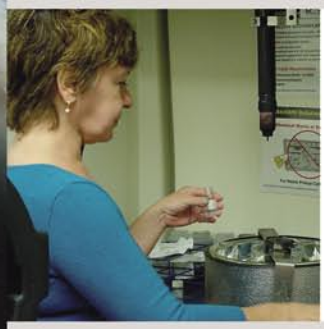
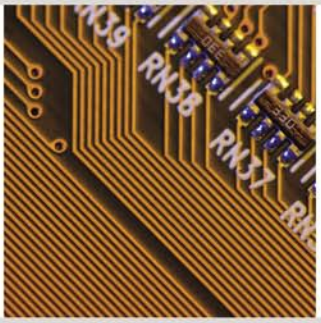
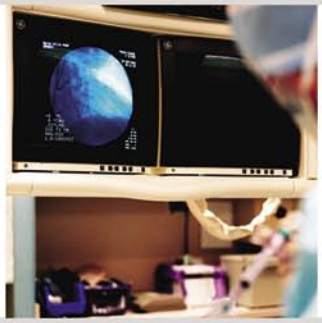
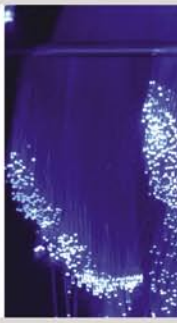
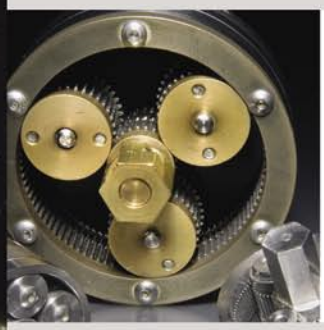


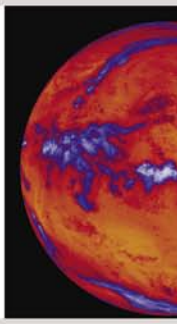

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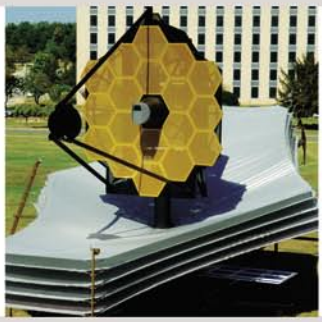


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