

2001

Technology Transfer/Commercialization Report



NASA's Goddard Space Flight Center

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Technology Transfer/Commercialization R E P O R T

Since its inception, NASA's Goddard Space Flight Center has pursued a commitment to technology transfer and commercialization. For every space technology developed, Goddard strives to identify new ways it can be used. Goddard then makes these technologies, as well as its facilities and expertise, available to U.S. companies, universities, and government agencies. These efforts are based in Goddard's Technology Commercialization Office (TCO).

This report presents TCO's activities and accomplishments during calendar year 2001.

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Who We Are

Technology transfer and commercialization are an important part of Goddard Space Flight Center's mission. They enable Goddard's technology, facilities, and expertise—all of which are national assets—to be used in developing new products and processes that benefit the United States. These benefits include enriching the lives of the citizenry, creating new jobs, increasing the Nation's competitiveness in the global market, and improving the balance of trade. To ensure that these benefits are achieved, Goddard established the Technology Commercialization Office.





TCO helps Goddard achieve its technology transfer/commercialization goals by

- ▶ Seeking out new Goddard technologies that might meet industry and national needs
- ▶ Inventorying these newly developed technologies
- ▶ Patenting Goddard-developed technologies
- ▶ Promoting Goddard technologies, facilities, and capabilities to potential partners
- ▶ Negotiating license agreements and partnerships with industry, academia, or government agencies
- ▶ Promoting successful transfer and commercialization efforts

These key activities are performed by four teams that work together to facilitate technology transfer and commercialization.



Commercial Technology Staff

The commercial technology staff works with industry, academia, and other government agencies to transfer Goddard technologies and to help these organizations solve their technical problems within the six areas of Goddard's technology commercialization expertise:

- ▶ Environmental systems
- ▶ Guidance, navigation, and control
- ▶ Information systems
- ▶ Optics
- ▶ Sensors and detectors
- ▶ Thermal and cryogenics

The staff also negotiates licensing or partnership agreements.



Outreach and Integration Staff

The outreach and integration staff markets Goddard-developed technologies that are available for commercialization and publicizes successful commercialization efforts. These outreach efforts are conducted using Technology Opportunity Sheets; *NASA Tech Briefs*; *Commerce Business Daily*; the Internet; press releases; articles in trade and news journals; and presentations at conferences, technology briefings, and trade shows with industry. For more information on these efforts, see pages 15–19.

The staff also works to integrate Goddard researchers into the commercialization process. For more information on these efforts, see pages 7 and 20–22.



Small Business Innovation Research Staff

Extra efforts to involve smaller businesses are made under the auspices of the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs:

- ▶ The SBIR program was established by Congress in 1982 to provide increased opportunities for small businesses to participate in research and development (R&D), to increase employment, and to improve U.S. competitiveness. The program's specific objectives are to stimulate U.S. technological innovation, use small businesses to meet federal R&D needs, increase private-sector commercialization of innovations derived from federal R&D, and foster and encourage participation by socially disadvantaged businesses.
- ▶ The STTR program awards contracts to small business concerns for cooperative research and development with a nonprofit research institution, such as a university. The goal of the STTR program is to facilitate the transfer of technology developed by research institutions through the entrepreneurship of small businesses. The small business and its partnering institution are required to sign an agreement on how intellectual property will be shared between them.



Patent Counsel

Goddard's Office of Patent Counsel prepares patent applications and other patent-related documents, and it reviews Space Act, license, and nondisclosure agreements. Patent counsel also helps determine the patent potential of new Goddard technologies and oversees intellectual property issues.



Activities in 2001

The Technology Commercialization

Office's mission is to introduce

Goddard technologies, capabilities, and

facilities into the commercial, academic,

and government communities. To achieve

this mission, TCO undertakes

many activities:

- ▶ Encouraging researcher involvement in the technology commercialization process
- ▶ Inventorying new technologies developed at Goddard
- ▶ Patenting Goddard technologies
- ▶ Promoting available technologies and facilities
- ▶ Seeking and bestowing awards for Goddard technologies
- ▶ Establishing new agreements with industry, academia, and other government agencies

Encouraging Researcher Involvement

Technology transfer and commercialization would not be possible without the participation of Goddard's scientific and technical staff. Throughout the year, the Technology Commercialization Office encourages researcher participation. For example, in June TCO organized the *Goddard Technology Showcase 2001*, which featured Goddard-developed inventions (see page 18). Events such as this and other TCO efforts encourage civil servant researchers to disclose their new inventions to TCO (see pages 8–13) and to participate in commercialization efforts.

As a result of TCO's efforts, the following civil servant researchers participated in the technology transfer/commercialization process:

Wes Alexander	Norden Huang	Lorraine Remer
Steven Bailey	Jeremy Jones	John Riley
Jeannette Benavides	Yoram Kaufman	Aaron Roberts
Geoffrey Bland	Michael King	David Robinson
Gregory Boegner	Todd King	Adan Rodriguez-Arroyo
Gregory Clarke	Semion Kizhner	Kurt Rush
Michael Comberiate	John Kolasinski	Angela Russo
Julie Crooke	Brook Lakew	Vincent Salomonson
Jeff de La Beaujardiere	Jim Lanzi	Peter Shirron
Michael Delmont	Michael Lee	Joel Simpson
Julie Deutschmann	Henning Leidecker	James Tilton
Jeffrey Didion	Jesse Leitner	David Tracewell
Michael Dipirro	Donald Lokerson	Tina Tsui
Nga Doan	Philip Luers	Dana Uehling
John Donohue	Mark Lupisella	John VanSant
Warren Dufrene	Richard Luquette	John Vranish
Chris Durachka	Christopher Lynnes	Eugene Waluschka
Bernard Edwards	Lori Maks	Evan Webb
Howard Eiserike	Ted Miles	Miriam Wennersten
Wayne Esaias	Dwayne Morgan	David Whiteman
Nelson Ferragut	Steve Naus	Edward Wollack
Thomas Flatley	Brian Ottens	Eve Wooldridge
Bo-Cai Gao	Barbara Pfarr	Pen-Shu Yeh
Regina Gernatt	Robin Pfister	
Dorothy Hall	Jay Pittman	
Prasad Hanagud	William Potter	
Richard Harman	Charles Powers	
Amri Hernandez-Pellerano	Lloyd Purves	
Ellen Herring	Glenn Rakow	
Frank Hoge		

Inventorizing New Technologies

One of the primary ways that Goddard researchers participate in the technology transfer process is by identifying, documenting, and reporting their new technologies to the Technology Commercialization Office. TCO then maintains an inventory of these reported technologies. Pages 8–13 list all of the technologies reported in 2001, categorized according to Goddard’s areas of technical expertise. For more information about these technologies, please contact the commercial technology staff member for the corresponding technical area (see page 24).



Sensors and Detectors

- A Very Low Power, Highly Integrated Multichannel Scaler (USB)
- Area of Interest Selection Circuit for Image Sensor and/or Position Sensing Detector
- C8051 Resynthesis
- Electrical Resistivity Measurements on Conductive Spacecraft Films
- Field-Programmable Analog Array (FPAA) Architecture
- Generic High Side Solid-State Switch
- Germanium Strip Detector System for X-ray and Gamma Ray Spectrometry and Imaging
- High-Density Passive Component Arrays
- Improved Reducing Gas Detector for Carbon Monoxide and Other Reducing Gases
- Instrument Synthesis and Analysis Laboratory (ISAL)
- Magnetohydrodynamic Stable Reference (MSTAR)
- Micro Sun Sensor Using Hologram
- Resynthesis
- Self-Assembled Silicon Nanostructures by Magnetron Sputtering
- VLf Lightning Location System
- X-Band Solid State Power Amplifier (SSPA)



Environmental Systems

Ancillary Data Preprocessing Software for Moderate Resolution Imaging Spectroradiometer (MODIS) Ocean Product Generation

Anemometer for Low Velocity Wind Measurements

Digital Earth Web Map Viewer

Enhanced Land Cover and Land Cover Change Products from MODIS

Estimating Global Vegetation Production: Algorithms MOD17A1 and MOD17A2

Flight Modem

Large Format X-Ray Magnetic Calorimeters with Multiplexed SQUID Readouts

Level 1A and Geolocation Software for MODIS

Level 1B (Calibrated Radiances) Software for MODIS Data Processing

Level 2G Gridding Software for MODIS Land Product Generation

Method for Efficient Parallel Execution of Finite Element Analyses

MODIS Aerosols Over Land And Ocean

MODIS Atmosphere Level-3 Algorithm Software

MODIS Cloud Optical Properties Algorithm (MOD_PR06OD)

MODIS Near-IR Water Vapor Algorithm, and MODIS Thin Cirrus Reflectance Algorithm

MODIS Ocean Primary Production

MODIS Reprojection Tool

MODIS Snow and Ice Maps

MODIS Vegetation Index Algorithms

Multi-Application Gbit/sec Real-Time Data Recording/Playback System

Ocean Processing Software for NASA's MODIS

Product Distribution System (PDS) Integration with Earth Observing System Data and Information System (EOSDIS) Core System (ECS)

Sea Surface Salinity for Autonomous Systems

Simple Scalable Script-Based Science Processor for Direct Broadcast (S4P-DB)

Skymap Sky2000 Master Star Catalog Dump Utility MCDUMP

Software for Atmospheric Correction of MODIS Visible: Shortwave Infrared Data

Software for Fire Monitoring from MODIS

Software to Calculate Phytoplankton Fluorescence Properties from MODIS Data

Software to Estimate Vegetation Canopy Leaf Index (LAI)

Surface Albedo, Bidirectional Reflectance, and Land Cover Type Derived from MODIS Data

Ultrastable Radiometer for Sea Surface Salinity Sensing

Wireless Information Peer Relay System



Information Systems

Action Item System

Adaptation of Ethernet Network Technology for Low-Power, Radiation Tolerant Spaceborne Use

Analog Artificial Neural Network

Anomaly Reporting and Tracking Tool

CHDL

Computer Program for Automatic Code Generation and Documentation of Dynamic System Models

Depletion Mux

Distributed Beowulf System for Low-Cost, Massively Parallel Processing

Hazard Free Standard Cell Pass Transistor Networks

High Bandwidth Network Router for Local Area Network Using SpaceWire

Huang-Hilbert Transform Data Processing System

Independent Verification and Validation (IV&V) Tools Including the TestManager 2000 (TM2000), Project Issue Tracking System (PITTS), and Risk Management

Infrared for Intra-Satellite Communications for Space Applications

Kernel Cell Layouts for Assembly into Standard Cells

Knowledge System for COTS/GOTS Ground System

Knowledge-Based Architecture for Distributed Modeling and Simulation of Spacecraft

Mercury-A Web-Based Metadata Search and Data Retrieval System

Method for Lossless Compression of Real or Complex Valued Scientific Data

Method for Recursive Hierarchical Segmentation Combining Greedy and Hierarchical Stepwise Optimal Approaches and Region Splitting

Mux-Based Logic Optimization Programs

Mux-based ROM Using N-Bit Subfunction Encoding

Mux-Based Standard Cell Library Assembly Program

MyISC/My Goddard

NASA Property Disposal Management System

Partitioned VLSI Layout

Prototype Video-Indexing System

QDoc: A Documentation and Presentation Tool for the FORTRAN Programming Language

REACH: Realtime Evaluation and Analysis of Consolidated Health

Satellite Supported Voting System (SVS)

Software for the 3-D Display of Spacecraft and Other Time Series Data, Using Java3D

SWARM: Sensor Web Adaptive Resource Management

Synthesizable VHDL Modules

Time-Modulated Ultra-Wideband Interspacecraft Communication

U8 Layouts
Universal Logic Gate Algebra
Universal Logic Gate Library
User Interface Component Broker Software
Visual Observation Layout Tool (VOLT)
Wearable Voice-Activated Computers



Guidance, Navigation, and Control

Adaptive Beamforming on Spacecraft to Improve Global Positioning System (GPS)
Autonomous Low-Power Datalogger Package with 24 Bit A/D's, GPS, Rate Sensors, 12 Bit A/D, Serial Lines and Sensor Integration Capability
Autonomous Navigation System Based on GPS and Magnetometer Data (GPS-MAGNAV)
Bistatic Delay Doppler Radar Altimeter
Closed-Loop Automated Ground Data System for Support of the MMS (STP) Constellations
Compact Scalable Navigation and Stabilization System for Spectral Imagers
Crosslink Transceiver for Integrated Navigation and Communication among Multiple, Distributed Spacecraft
Distributed Spacecraft Modeling and Simulation Testbed
FlightLinux Software
Formation Flying Testbed System Architecture
Global Positioning System Software Receiver
Hardware and Software Implementation of Noncoherent Navigation for Low Frame Rate Telemetry Applications
Low-Power Balloon-Gondola Solar Pointing System
Multimission Attitude Determination System (ADS-MATLAB)
Open GIS Consortium (OGC) Catalog Prototype
Radiation Hard CMOS APS Circuits for Star Tracker
Single Event Latchup Mitigation in Commercial Microelectronics
ST-5 Quadrifiler Helical Antenna
X-Band Transponder For Microsatellites



Thermal and Cryogenics

Cryogenic Advanced Loop Heat Pipe in Temperature Range of 20–30 K

Electrohydrodynamic Microscale Pump

Mixed Conductor Electrodes for Alkali Metal Thermal-to-Electric Converters

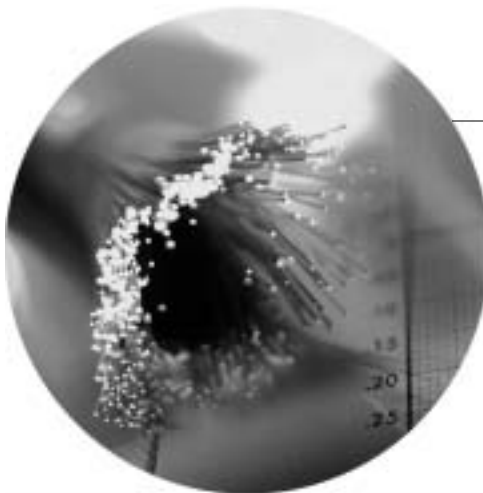
Oxide Conversion Joints for Alkali Metal Thermal-to-Electric Converters

Passive Gas-Gap Heat Switches for Use with Adiabatic Demagnetization Refrigerators

Rare-Earth Garnets for Space-Based ADR Cooling at High Temperature ($4\text{K} < T < 30\text{K}$) and Low Magnetic Fields ($H < 4\text{T}$)

Switched Emissivity Changes via Electrostatic Attraction

Using Incremental Vacuum Lifts Payloads



Optics

A Novel Pupil for Detecting Faint Objects in the Presence of a Bright Source

Bragg Mirrors for Long Wavelength VCSEL A

Eye Safety Camera Attached to Theodolite to Obtain Boresight Pointing of High Intensity Visible Lasers and/or Invisible Infrared Lasers

Group-Velocity Mismatching Compensation for Optical Signal Processing

High-Resolution X-ray Collimators

Holographic Plossl Retroreflector

In Situ Monitoring Method and Apparatus for Fabricating Doubly Multi-plexed Holograms in the Same Photopolymer Films

Laser Power Stabilization Feedback System

Multi-Point *In Situ* Profiler for Large Aspheric Optics

Multispot Beam Steering System and Applications Thereof

Rugged Iris Mechanism

Scientific Method to Coat High Magnesium Aluminum Alloys Simple

Structure with High Number Density of Carbon Nanotubes and 3-Dimensional Distribution

Stripping Fixture for Wire Ribbon Cables

Waveguide Structure for Efficient Difference-Frequency Generation

X-ray Mirror Replicas from Structural Nanolaminate Composites



Other Technologies

Anti-Backlash Gear-Bearings

Finite Rotation Analysis of Highly Thin and Flexible Structures

Half-Tooth Gear Bearings

Magnetic Bearing Structure and Control for Low Power Consumption,
Low Weight and Fault Detection and Tolerant Operation

Membrane Technology for Gossamer Spacecraft Structures

Method of Making Multi-Stub Data Busses Such as the
MIL-STD-1553B Very Compact and Other Embodiments
That Can Use This New Perspective

Method for Manufacturing High-Quality Carbon Nanotubes

Methods to Maximize Microgravity Time on Parabolic
Aircraft Flights

Miniature Sample Acquisition and Handling Mechanism

New Method for Synthesizing Cubic Boron Nitride Films

Nitrous Oxide/Organic Liquid Monopropellant (NOMR)

Oxide Barrier Varactor

Phase-Tuned Gears

Rotating Pair Programming Desk

Screw-Locking Wrench

Shaftless Maglev Flywheel Energy Storage System

Stepping Flexures

Use of a Scanning Probe Microscopy (SPM) Height Assay to Detect
Protein:DNA and Protein:Protein Interactions on Compositionally
Patterned Surfaces



Patenting Goddard Technologies

A key activity of the Technology Commercialization Office's Patent Counsel team is protecting Goddard's intellectual property (IP). Because filing for and maintaining a patent can be costly, counsel carefully evaluate new technologies to ensure that filing for a patent is appropriate. During 2001, the Patent Counsel team filed 23 patent applications, 16 of which were provisional patents. Provisional patents provide temporary patent protection for 1 year. They are useful for protecting patent rights while decisions are made about whether to file for full patent protection. They also are useful for protecting IP rights while allowing the inventors to disclose the technology at a conference or other event.

In addition to the patent filings, 12 Goddard technologies received patents in 2001:

U.S. Patent No.	Technology Name
6,287,404	Adhesive Bubble Removal Technique and Fixture for Fiber Optic Applications
6,178,470	Chip for CCSDS-Compatible Serial Data Streams
6,188,705	Fiber Grating Couple Light Source Capable of Tunable Single Frequency Operations
6,278,404	Global Positioning System Satellite Selection Method
6,313,908	Holographic Circle-to-Point Converter
6,313,555	Low Loss Pole Configuration for Multi-Pole Homopolar Magnetic Bearings
6,182,011	Method and Apparatus for Determining Position Using Global Positioning Satellites
6,177,835	Method and Apparatus for High Data Rate Demodulation
6,223,143	Quantitative Risk Assessment Software (QRAS) System
6,177,997	Shaft Position Optical Sensor
6,211,822	Spaceborne Global Positioning System for Spacecraft
6,311,130	Two-Dimensional Empirical Mode Decomposition and Hilbert Spectral Analysis for Image Processing

Promoting Goddard Technologies

The Technology Commercialization Office promotes Goddard's innovative technologies and unique facilities through publications and conferences, briefings, and trade shows with industry.

Technology Opportunity Sheets

These one-page announcements succinctly summarize a Goddard-developed technology, focusing on its potential commercial applications and benefits. The Technology Commercialization Office prepares these sheets and distributes them through targeted mailings, at trade shows, and via TCO's Web site.

<http://techtransfer.gsfc.nasa.gov>

TECHNOLOGY Opportunity

MAPPING TECHNOLOGY

New Photo-Counting Microaltimeter

NASA offers companies the opportunity to license this innovative mapping technology.

Developed at NASA Goddard Space Flight Center, the photon-counting microaltimeter technology offers a smaller, better, less expensive, more reliable, and more power-efficient alternative to current laser altimeter systems. The advanced signal processing software is NASA Goddard's technology allows users to create rapid, three-dimensional topographic maps of various types of terrain on Earth from conventional aircraft platforms flying at cruise altitudes and of surfaces of celestial bodies from satellites in low orbit.

Benefits

- **Small:** Size of the telescope and laser is dramatically reduced.
- **Light:** Microaltimeter weighs less than existing state of the art.
- **Rapid:** Technology has scanning capability and multi-kilohertz sampling rates, generating maps immediately.
- **Inexpensive:** Off-the-shelf, simplified components ensure low cost.
- **Reliable:** Technology has a high life cycle with repeatable results.
- **Power efficient:** Microaltimeter has up to two orders of magnitude greater sampling rates for a given laser power.
- **Versatile:** Maps can be created in both daytime and nighttime conditions at normal aircraft cruise altitudes.
- **High resolution:** Photon counting combined with multi-element detectors provides high spatial resolution and improved scene registration.

NASA
National
Aeronautics and
Space
Administration

NASA Tech Briefs

This monthly periodical helps NASA achieve its technology transfer goals by reporting new, commercially significant NASA technologies. *NASA Tech Briefs* subscribers—industry engineers, managers, and scientists—thus learn about opportunities to license, transfer, and/or commercialize NASA technologies or to partner with NASA on joint research. Goddard's Technology Commercialization Office wrote 15 articles for *NASA Tech Briefs* in 2001:

- ▶ **Broad-Band, Noninvasive Radio-Frequency Current Probe** (GSC-13985): This circuit responds in approximately constant proportion to current over a wide frequency range.
- ▶ **Double-Parallelogram Carriage for Spectrometer Mirrors** (GSC-14297): Linear motion is derived from motions of coupled, pivoted arms.
- ▶ **Flex Wedges** (GSC-14006): Brakes and clutches could perform more reliably and predictably.
- ▶ **Fourth-Generation Software for SEU Testing** (GSC-14399): This computer program tests electronic components for single-event upsets.
- ▶ **Holographic Circle-to-Point Converter** (GSC-13869): Fabry-Perot interference fringes are focused to points for efficient detection.
- ▶ **Improved Automated System for Transferring Liquid Helium** (GSC-14106): Consumption of liquid helium would be reduced by optimizing use of vapor for precooling.
- ▶ **Improving Thin Foil X-Ray Mirrors** (GSC-14043): Resolution and diameter would be increased.
- ▶ **Low-Power Shutter Mechanism for a Cryogenic Infrared Camera** (GSC-14341): The time-averaged power dissipation is less than 5 megawatts.
- ▶ **Miniature Proportional Temperature Controllers** (GSC-14315): These would be smaller and lighter than their commercial predecessors.
- ▶ **Process for Polishing Bare Aluminum to High Optical Quality** (GSC-14147): India-ink polishing following single-point diamond turning yields superior aluminum optics.
- ▶ **Shared-Aperture Multiplexed Holographic Scanning Telescopes** (GSC-14240): This technology achieves full-aperture scanning without moving parts.
- ▶ **Software for Rapid Processing and Display of Earth Data** (GSC-14263): This program facilitates retrieval and viewing of Earth-related imagery on computer screens or virtual-reality displays.
- ▶ **Spin Bearings** (GSC-13679): These bearings offer advantages with respect to load-bearing capacity, retention of alignment, and size.
- ▶ **Tailoring Cores of Optical Fibers by a Sol-Gel Method** (GSC-13913): Core dopants can be tailored for specific photonic applications.
- ▶ **Thermal-Stress Technique for Cutting Thin Glass Sheets** (GSC-14364): Highly localized heating generates highly localized stresses.

NASA Tech Briefs is available on the Internet.

<http://www.nasatech.com>



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Tech Briefs, Volume #25, Nos. 1, 6, 7, & 9.

Conferences, Briefings, and Trade Shows with Industry

The Technology Commercialization Office also disseminates information about its inventions and their potential commercial applications by hosting and attending conferences, briefings, and trade shows with industry. At these events, staff demonstrate technologies, distribute informative literature, and offer one-on-one counseling to industry about partnership and commercialization opportunities at Goddard. Through these events, TCO successfully reached many small and large companies, academic institutions, and trade and professional organizations during 2001.



Air and Space

International Space Symposium

Education and Environment

Association of University Technology Managers Annual Meeting

NASA Awareness Days at Cheyney and Lincoln Universities

Steamtown Memorial Day Celebration

Engineering and Manufacturing

National Design and Engineering Show

Medicine

New Partnerships in Medical Diagnostic Imaging Workshop: A NASA Advanced Technology Workshop (see page 19)

Sensors

Instrumentation, Systems, and Automation Conference and Exhibition

Sensors Expo

Small Business and Economic Development

Emerging Business Forum

Goddard's Annual Small and Small Disadvantaged Business Conference

Technology in the Zone Commercialization Training

Technology Expos and Conferences

Goddard Technology Showcase 2001 (see page 18)

Nanotechnology Research in Maryland (Maryland Technology Showcase)

NASA's 10th Annual Business and Technology Conference

Prince George's County (Maryland) Chamber of Commerce Showcase 2001

Tech Trends 2001

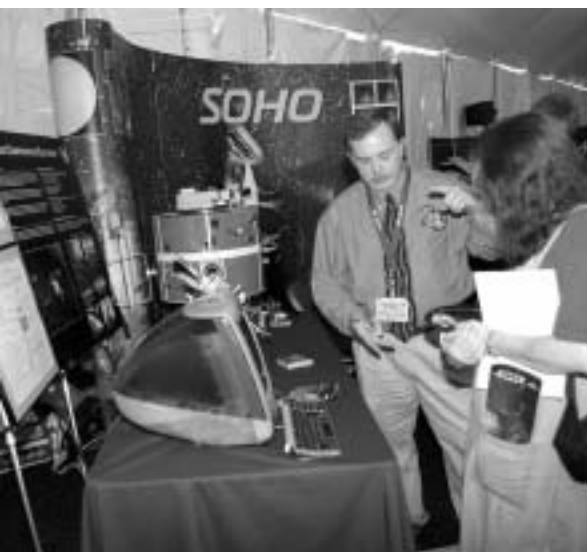
Technology Council of Maryland Annual Dinner and Technology Awards



Spotlight: Goddard Technology Showcase 2001

Held June 14–15, *Goddard Technology Showcase 2001* focused on expanding scientific discovery through innovation:

- ▶ Discussion forums focusing on Earth sciences, space sciences, and working with NASA in creative teaming arrangements
- ▶ SBIR presentations from the federal and state perspective
- ▶ An exploration of Goddard and industry R&D business-to-business opportunities
- ▶ A keynote address by Michael Clayton, chief technology officer for the commercial and government systems division of Eastman Kodak Company
- ▶ A session with industry leaders focusing on technology trends related to space travel, including miniaturization, reduced weight, and increased power
- ▶ Exhibitions of more than 100 Goddard technologies in a variety of scientific areas
- ▶ Presentations of Goddard’s award-winning technologies



– Dr. Norden Huang’s Hilbert-Huang Transform Technology, which won the 2000 Excellence in Technology Transfer Award from the Federal Laboratory Consortium and an R&D 100 Award for 2001 from *R&D Magazine* (see page 21)

– Dr. Murzy Jhabvala’s Quantum Well Infrared Photodetectors technology, which was inducted into the U.S. Space Foundation’s Space Technology Hall of Fame in 2001 (see page 20)

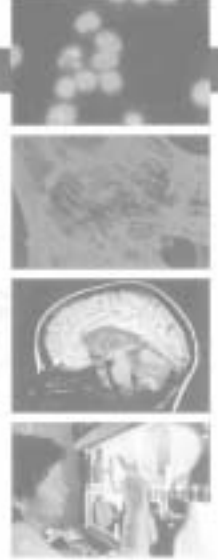
– Mr. John Kolasinski’s Fiber Optic Stripping Technology, which won the 2000 NASA Government Invention of the Year Award (see page 21)

– Mr. Douglas Leviton’s Absolute Optical Encoders Technology, which won the 1999 NASA Government Invention of the Year Award

you are invited to ...

New Partnerships in
**Medical Diagnostic
Imaging**

july 17-18 2001



Spotlight:

New Partnerships in Medical Diagnostic Imaging: A NASA Advanced Technology Workshop

NASA's Commercial Technology Program launched its Medical Imaging Initiative to create partnerships between NASA and companies in the medical imaging industry. The goals of the initiative are to identify opportunities for product development under licensing or other partnership agreements, leverage resources through cofunding and cooperative development, and gain insight into new projects and approaches to solve challenging problems.

The "New Partnerships in Medical Diagnostic Imaging" workshop, which was held July 17-18, 2001, provided a forum for companies to learn about opportunities for partnership and the latest NASA technologies related to medical imaging:

- ▶ Hard X-ray detectors based on cadmium-zinc-telluride (CdZnTe)*
- ▶ Imaging micro-well detectors for X-ray and gamma-ray applications*
- ▶ Thin foil multilayer X-ray mirror assemblies for hard X-ray imaging*
- ▶ Recursive hierarchical image segmentation and its potential application to medical imagery*
- ▶ Specialty high-performance computing using Beowulf-distributed computing and field programmable gate-arrays (FPGAs)
- ▶ A low-complexity adaptable entropy coding technique that improves data compression encoding and decoding speeds
- ▶ Retinex image enhancement

Nearly 100 people attended, including industry leaders and large and small innovative medical imaging companies. Follow-up discussions with potential industry partners are ongoing. Similar activities are planned for the upcoming year.

* Technology developed at NASA Goddard Space Flight Center

**More information about this
initiative is available online.**

<http://tco.gsfc.nasa.gov/estci>



Pictured left to right. Dr. Norden E. Huang, Mr. John R. Kolasinski, and Dr. Murzy D. Jhabvala

Seeking and Bestowing Awards

Awards provide an excellent medium for promoting Goddard technologies to the public and potential partners and for encouraging researcher participation in commercialization. The Technology Commercialization Office submits Goddard inventions for awards bestowed by outside organizations such as the Federal Laboratory Consortium for Technology Transfer (FLC), U.S. Space Technology, and *R&D Magazine*. NASA also has established yearly awards to recognize innovations developed by researchers at the various Field Centers. TCO identifies promising technologies and submits them for these awards.

Quantum Well Infrared Photodetectors Wins U.S. Space Foundation's Space Technology Hall of Fame Award

The U.S. Space Foundation created its Space Technology Hall of Fame to honor innovators who have transformed technology originally developed for space use into commercial products. In 2001, Goddard's Dr. Murzy Jhabvala was inducted into the Hall of Fame for his Quantum Well Infrared Photodetectors (QWIP) technology. QWIP is a complicated solid-state detector that sandwiches gallium-arsenide chips between silicon wafers and connects them with indium connectors. These photodetectors are superior to any existing technology because they can operate at longer infrared wavelengths and can be produced at lower costs.

Hilbert-Huang Transform Technology Wins Two Awards

Goddard's Dr. Norden E. Huang won the Federal Laboratory Consortium for Technology Transfer Award for Excellence in Technology Transfer and *R&D Magazine's* R&D 100 Award for his Hilbert-Huang Transform (HHT) technology. HHT allows users to conduct more precise analysis of signal data that can be obtained from conventional Fourier-based methods. Designed specifically for processing nonlinear and nonstationary signals, HHT also can be used to analyze linear and stationary signals.

The FLC Award recognizes individuals within federal laboratories who have done outstanding work in transferring technology. The annual R&D 100 Award recognizes the 100 most technologically significant new products of the year and their inventors.

Optical Fiber Cable Chemical Stripping Fixture Wins NASA Government Invention of the Year Award

Goddard's John Kolasinski and Alexander Coleman were honored with the prestigious NASA Government Invention of the Year Award for their Optical Fiber Cable Chemical Stripping Fixture. This technology consists of a method and apparatus for chemically stripping an optical fiber cable of its coating without damaging the glass fibers inside. This is particularly useful for removing the hard, thin polyimide coatings that cannot be removed mechanically or thermally.



The NASA Government Invention of the Year Award recognizes a technology that has provided a significant and identifiable benefit to a NASA project or program, such as improving mission safety or saving significant time and money.



Dr. Norden E. Huang accepts the R&D 100 Award from Al Diaz, Director, Goddard Space Flight Center.



***Scientist's Expert Assistant
Receives Honorable Mention
for NASA Software of the
Year Award***

In 2001, Goddard's Scientist's Expert Assistant (SEA) earned an honorable mention for the NASA Software Invention of the Year Award. SEA enables scientists to develop valid observation proposals for use with the Hubble Space Telescope (HST). Using cutting-edge software technologies, SEA provides astronomers with an enormous increase in capability—both for specifying observations and for general science exploration. SEA provides these capabilities within a generic infrastructure that can be easily applied to any observatory. SEA is already demonstrating its significance to the astronomical community in several areas, and it has potential for substantially greater impact.

The NASA Software Invention of the Year Award honors NASA-developed software that has significantly enhanced the agency's performance of its mission and helped American industry maintain its world-class technology status.



Establishing New Agreements

All of these efforts by the Technology Commercialization Office lead to the signing of various agreements. License agreements allow an outside organization to use a Goddard technology, often while paying a licensing fee and/or a royalty. Space Act Agreements are established to jointly develop Goddard technologies while sharing costs.

During 2001, TCO established 12 licenses or other agreements for 11 technologies:



Technology	Licenses
Three-Dimensional Roller Locking Sprags	Honeybee Robotics (New York, New York) IntelliTECH (Westminister, Maryland)
Capaciflector	Honeybee Robotics (New York, New York)
Three-Dimensional Sprag	Honeybee Robotics (New York, New York)
Sprag Ratcheting Tool	IntelliTECH (Westminister, Maryland)

Technology	Space Act or Other Agreements
Optical Fiber Cable Chemical Stripping Fixture	Harris Corporation (Palm Bay, Florida)
Adhesive Bubble Removal Technique and Fixture	Harris Corporation (Palm Bay, Florida)
Universal Fiber Optic Connector Polishing Fixture	Harris Corporation (Palm Bay, Florida)
Continuous-Duty Multi-Stage Adiabatic Demagnetization Refrigerator	Janis Research (Wilmington, Massachusetts)
Holographic Circle-to-Point Converter	Sigma Research and Engineering Corp. (Lanham, Maryland)
Acousto-Optic Imaging Spectropolarimetry	Swales Aerospace (Beltsville, Maryland)
Rotary and Linear Optical Encoding	Private company (Idaho)

How to Reach Goddard's Technology Commercialization Office



The staff of the Technology Commercialization Office welcomes calls and e-mails from industry, academia, government, and the general public interested in learning more about Goddard technologies and partnership opportunities.

Commercial Technology Staff

For information on Goddard inventions in a specific technical field, please contact the staff member in your area of interest:

Environmental Systems

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Outreach and Integration Staff

For information about how to partner with NASA's Goddard Space Flight Center, contact:
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For information about patents associated with Goddard technologies, contact:
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Small Business Innovative Research Staff

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**NASA's Commercial
Technology Network**
<http://nctn.hq.nasa.gov>

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