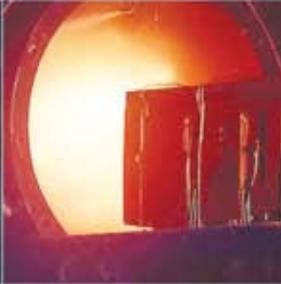




2008



Technology Transfer and Partnership Office's  
**Accomplishments  
Summary**

at NASA's  
Glenn Research  
Center



summary

# Partnerships Power Progress



Kathleen K. Needham, Chief

The ultimate goal of the Technology Transfer and Partnership Office (TTPO) is to provide tangible benefits to both the U.S. taxpayer and NASA by maximizing the value of the technology developed at NASA's Glenn Research Center. Our accomplishments for 2008, detailed in this report, demonstrate significant, measurable outputs resulting from the leveraging of the outstanding capabilities and accomplishments of our coworkers at Glenn.

Using the full arsenal of tools available to us, we have helped attract additional research contracts, leveraged corporate internal research and development (IR&D) funds to help achieve NASA missions, ensured recognition and compensation for the outstanding accomplishments of Glenn researchers, managed the intellectual property of the center, and documented the impact of our programs on the economy.

We expect to report even greater results in 2009, thanks to our innovative activities. For example, we are launching a new, easy-to-navigate Web site and implementing numerous internal process improvements. We are actively encouraging Glenn employees to report new technologies. We are mining and distributing Glenn-developed software as well as exploring new techniques for technology transfer.

We are a customer service organization and welcome comments and suggestions. Please give us a call to share your thoughts.

Kathleen K. Needham, Chief  
Technology Transfer and Partnership Office

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## An Introduction to **Glenn's Technology Transfer and Partnership Office**

At NASA's Glenn Research Center, we value our partnerships with industry, academia, and other government laboratories in the Ohio community, across the nation, and around the world. To achieve NASA's science and exploration goals and contribute to making Earth a better place, the Technology Transfer and Partnership Office (TTPO) pursues infusion and technology transfer, recognition for our innovators and technologies, and sharing what we've learned with the public.

We tap into the technologies and expertise of commercial companies, negotiating Space Act Agreements to infuse their knowledge and products into our missions, to apply our specialized knowledge to their problems, and to provide access to our facility and test capabilities. Space Act Agreements are flexible contracts that allow NASA to work cooperatively with industry on either a reimbursable or nonreimbursable basis.

When Glenn innovators create a technology that can be put to use in the wider world, we help facilitate the patent process and pursue license agreements and other partnerships that result in "spinoff" products.

Part of achieving our goals is to ensure that potential partners and licensees know what Glenn has to offer. We do this through outreach, inviting the public to information-sharing seminars and events. We also achieve our goals by securing recognition for Glenn inventors and their technologies through awards.

In these pages, we've shared many of our accomplishments from 2008. We look forward to what we can achieve together in 2009.

### **Innovation: Creating Value Through Research**

New Technologies Reported: 116 • Patents Issued: 14 • Patent Applications Filed: 8

See our Web site for a listing of these innovative technologies:

<http://technology.grc.nasa.gov/>

### **Space Act Agreements**

Space Act Agreements can greatly benefit the advancements of research and development efforts. These flexible arrangements allow NASA to work cooperatively with industry, academia, and other government agencies on either a reimbursable or nonreimbursable basis. The TTPO pursues technology-based partnerships that result in Space Act Agreements, and negotiates them on behalf of the rest of the center.

In 2008, Glenn signed 104 Space Act Agreements with a face value of over \$21 million.

## Small Business Innovation Research



Gynelle C. Steele

Thanks to an outstanding relationship with the Aeronautics Research Mission Directorate (ARMD) and the hard work of many on our team, the Small Business Innovation Research/ Small Business Technology Transfer (SBIR/STTR) program has enjoyed a very successful year. I would especially like to acknowledge Glenn personnel for their work in developing topics and subtopics and evaluating proposals, and the efforts by the contracting officers technical representatives (COTRs) to infuse technologies into NASA missions, programs, and projects. Jay Dryer and the SBIR/STTR technology infusion managers (STIMs) kept the program relevant to NASA. And we continue to lead the agency in the number of SBIR Phase 3 awards, which we credit in part to our infusion pilot with Dawnbreaker.

—Gynelle C. Steele, SBIR/STTR Program Manager

### Dawnbreaker: An Innovative Infusion Initiative

In 2007, Glenn Innovative Partnerships Program (IPP) entered into an interagency agreement with the Navy to conduct a pilot program to accelerate infusion and commercialization of SBIR/STTR technologies funded by Glenn in the Aeronautics Research Mission Directorate (ARMD) and Space Operations Mission Directorate (SOMD). As part of the services offered under this agreement, Dawnbreaker, a professional services firm and recognized leader in the commercialization of advanced technology, is working with SBIR companies to transition NASA SBIR technologies back into the government as well as support their commercialization efforts.

**First Round:** The first round of the Glenn pilot transition assistance program involved 16 SBIR companies in the ARMD and SOMD to provide transition assistance for the 19 technologies they are developing under their 2005 SBIR Phase 2 contracts. Dawnbreaker assisted the companies in preparing various tools to facilitate NASA infusion and the commercialization of NASA technology into other markets. Dawnbreaker provided the companies with market research and assistance in developing a business plan or licensing package. The program culminated in a NASA Showcase at the 8th Navy Opportunity Forum, held June 2–4, 2008, in Crystal City, Virginia. At the Showcase, the companies presented their technologies to over 1,000 high-level government and industry decision makers. Several of the companies are now actively pursuing infusion and commercialization opportunities for their technologies.

**Second Round:** The kickoff of the second round of assistance was designated the Infusion Assistance Program and was held July 29, 2008, at the Ohio Aerospace Institute. The 22 projects invited to participate included the 2006 Phase 2 awardees from ARMD's Aviation Safety, Fundamental Aeronautics, Airspace Systems, and Aeronautics Test Technologies programs as well as SOMD's Space Communication and Space Transportation programs. Again, Dawnbreaker is assisting the 21 companies working on 22 projects in preparing various tools to facilitate NASA infusion and the commercialization of NASA technology into other markets. Dawnbreaker is providing the companies with market research and assistance in developing a business plan or licensing package. Companies also are receiving the opportunity to present their technologies to NASA program managers, government representatives, industry prime contractors, and other private sector representatives. Finalists will be given the opportunity to exhibit and present at the NASA Showcase to be held at the next Navy Opportunity Forum, June 8–10, 2009, in Crystal City, Virginia.



## SBIR Phases 1, 2, and 3

The Small Business Innovation Research program successfully shepherds technology from the conceptual stage through infusion into NASA missions. Phase 1 contracts of up to \$100,000 over a period of 6 months allow innovators to explore the concept of a technology solution. Phase 2 contracts provide a maximum of \$600,000 over 2 years for the company to develop a prototype of the technology.

For instance, ZIN Technologies of Cleveland was awarded a \$600,000 SBIR Phase 2 contract to build a novel passive pneumatic subject load device (PP-SLD) developed during the Phase 1 project as a part of a foldable mini-treadmill. With additional matching Human Research Program funds, ZIN designed and built a flight version of the PP-SLD for integration into the International Space Station Treadmill project (ISS T2). The system tethers the crew member to a treadmill and provides adjustable loading during

exercise sessions while in microgravity for improved musculoskeletal health. ZIN will aid Glenn as it launches an array of projects over the next 5 years, from researching fluid physics aboard the ISS to gauging the effect of exercise in space.

The award amounts of Phase 3 contracts vary but support the production of technology that will be infused back into NASA missions. Makel Engineering, for example, was awarded a Phase 3 contract to advance a technology that detects leaks for crew launch vehicle (CLV) applications and provide combustion/precombustion product monitoring for crew exploration vehicle (CEV) fire and environmental monitoring applications.

The 2008 SBIR Phase 3 contracts in the table below total nearly \$2.4 million.

### 2008 SBIR Phase 3 Contracts

Company	Phase 3 Amount	Technology
A&P Technology	\$515,000	Affordable composite fan containment case with integral toughening elements
Adherent Technologies	\$40,000	Surface modification of exfoliated graphite nanoreinforcements
Expert Microsystems, Inc.	\$99,225	Sensor data qualification for exploration systems task
Infinity Fuel Cells	\$500,000	Advanced product water management hydrogen oxygen polymer electrolyte membrane (PEM) fuel cell stack
Makel Engineering	\$105,032 up to \$339,550	"Lick and Stick" sensor system development
Physical Sciences	\$329,000	Fiber optic concentrated light transfer system development
Radiometrics	\$29,500	Advanced radiometer to detect aircraft icing from water in clouds
Sentient Corporation	\$50,000	Damage progression model for roller bearings in helicopter gearboxes
Sierra Lobo, Inc.	\$99,225	Reduced-gravity Cryo-Tracker® Mass Gauging System testing and analysis
Web Core	\$399,664	Aging and durability tests of advanced composite sandwich structure for jet engine fan case applications
Web Core	\$250,000	Sandwich structures for higher temperature supersonic jet engine fan "hard wall" containment cases

*Cryo-Tracker is a registered trademark of Sierra Lobo, Inc.*

## IPP Seed Fund Updates

The Partnership Seed Fund is an initiative out of the Innovative Partnerships Program (IPP) at NASA Headquarters to enhance NASA's ability to meet missions' technology goals by providing seed funding to address barriers and initiate cost-shared, joint-development partnerships. Seed funding in 2008 injected another \$375,000 from IPP, \$430,000 from project funding, and \$510,000 from private companies, to bring the total funding for Glenn-based projects since 2006 to \$12.6 million.

### 2006 Seed Fund Projects



#### **Alternative Fuels Given Green Light for Advanced Engines**

This collaboration between Glenn and Pratt & Whitney tested Fischer-Tropsch fuels and blends in ultrahigh-bypass and PW308 engines to provide a scientific basis for deciding what alternative fuels are applicable for aircraft use, given the many constraints for aircraft fuel. The

tests established that an equal blend of jet and Fischer-Tropsch fuels can run in advanced engines with no combustor or fuel compatibility issues. Glenn research findings, using a Hot Liquid Process Simulator, revealed improved thermal stability at low Jet-A-to-alternative fuel ratios, and documented gaseous and particulate matter emissions data. Additional collaborations between Air Force Research Laboratory (AFRL) and Boeing were identified before the project ended in 2008, including DC-8 ground tests scheduled for early 2009.



#### **Lithium-Ion Batteries Add Safety and Power to Missions**

NASA worked with A123 Technologies, ABSL Space Products, and Northrop Grumman Space Technology to

demonstrate the viability of the inherently safe A123 commercial lithium-ion (Li-ion) cells for human-rated aerospace applications. A collaboration that began with Glenn and the Jet Propulsion Laboratory in 2006 to reflect high-power battery mission hardware needs for future lunar mission scenarios was completed in 2008. The project documented A123's commercially available Li-ion cells and their applicability to the ABSL battery design approach, and successfully cultivated business relationships between the cell and space hardware manufacturers and aerospace users.

### 2007 Seed Fund Projects

#### **Generalizing Moon Tire Technology**

Physical testing is under way for the high-load Gen2 tires that have been fabricated as a result of collaborations with Goodyear and the Human Robotic Systems project out of NASA's



Exploration Systems Mission Directorate. This project was designed to serve the types of lunar and Earth vehicles that could use improved wire mesh, airless/rubberless tires based on those developed in the 1960s for the Apollo Lunar Roving Vehicle. The project is developing new tools to model, build, and test several prototypes to support exploration of the Moon, as well as Earth passenger vehicles.

#### **Lunar Regolith Excavation**

Machinery used for mining critical consumables such as water and oxygen from the Moon has demonstrated its ability to extract and crush soil samples for processing. The collaboration with the Northern Centre for Advanced Technology, Inc. (NORCAT) aims to focus on modeling lunar mining operations to improve power and mass estimates and on developing lunar mining technologies, such as regolith excavation and handling concepts, and performance measurements linked to the harsh lunar environment.





### **Low-Density Turbine Blade Superalloys**

Hot corrosion testing showed favorable results in Glenn's collaboration with Honeywell to scale-up low-density alloys. The alloy compositions have been selected, and casting vendors are preparing cost quotations. The project aims to produce low-density, strong turbine blades that show improved performance and reduced fuel burn and emissions in subsonic aircraft. The work may accelerate the development of a new hybrid turbine disk critical to an Air Force long-range strike fighter.

### **Aerogel Thermal Insulation**



The collaboration with Aspen Aerogels and Parker Hannifin demonstrated the ability to mass-produce a polymer crosslinked aerogel and to apply an aerogel as thermal insulation. Aspen Aerogels designed an affordable and environmentally safe production process that will advance the technology's readiness for space.

Parker Hannifin demonstrated the polymer cross-linked aerogel's thermal insulation capability in its refrigeration products and transfer lines.

### **Advanced Space Power Systems Pallet**



Advanced power systems are critical for future space missions. A systems requirements document for a Space Power Pallet that consists of a fuel cell stack, an electrolysis stack, and a lithium-ion (Li-ion) battery was developed via a partnership between NASA,

The Boeing Company, and Teledyne Energy Systems. NASA provided Li-ion battery performance data and human-rated safety guidelines that were incorporated into the overall preliminary system design Boeing developed. Results from this project will provide definition for overall design and interface requirements for integrating these technologies into a system that can be evaluated in a space environment. Flying such a demonstration will provide valuable experience in system integration, thermal control, and water management for human-rated, fuel cell-based power/energy storage systems.

### **Metallic Foam Acoustic Liners**

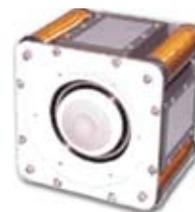


Tests of samples of metallic foam acoustic liners for turbofans showed a 4 dB reduction in turbofan noise with no significant performance penalties. The liners, tested on an Federal Aviation Administration-certified (FAA-certified) Williams International FJ44-class engine, may be able to double as fan rub-strip and containment components, reducing engine weight.

## **2008 Supplemental Projects**

### **High-Endurance Hall Thruster**

NASA is taking steps to incorporate an innovative life-extending technology into Busek's 600 W Hall thruster (BHT-600) while maintaining and improving the thruster's performance. The collaboration between Glenn and the Busek Company has established a new magnetic circuit design for the BHT-600 that will accommodate the incorporation of the life-extending discharge channel replacement mechanism. Performance and erosion evaluation of the the long-life BHT-600 thruster will be performed in summer 2009 at Glenn. The high-endurance 600 W Hall thruster will be part of an electric propulsion system that will enable science missions to explore the outer reaches of the solar system.



### **Cryogenic Propellant Boil-Off Reduction System**

Current cryogenic fluid storage systems have a maximum storage life of 9 hours. This collaborative project with Ball Aerospace aims to demonstrate an efficient cryogenic thermal control system that could enable longer-term cryogenic fluids storage by eliminating boil-off. The system would intercept heat before it enters the cryogenic storage tank. A prototype shield has been delivered to Ball Aerospace, and preparations are under way to install it for the demonstration test in late spring 2009.



## Spinoffs

*Spinoff 2008* highlights recent significant research and development activities across NASA and the successful transfer of space program technology to the marketplace. Below are those activities that originated at Glenn.



### ***Polyimide Boosts High-Temperature Performance***

Maverick Corporation of Blue Ash, Ohio, licensed DMBZ-15 polyimide technology from Glenn. This ultrahigh-temperature material provides substantial weight savings and reduced machining costs compared to the same component made with more traditional metallic materials. DMBZ-15 has a wide range of applications, from aerospace (aircraft engine and airframe components, space transportation systems, and missiles) to nonaerospace (oil drilling and rolling mill), and is particularly well-suited to use as face sheets with honeycombs or thermal protection systems for reusable launch vehicles, which encounter elevated temperatures during launch and reentry.



### ***Sensors Increase Productivity in Harsh Environments***

California's San Juan Capistrano-based Endevco Corporation licensed three patents for high-temperature, harsh-environment silicon carbide (Si-C) pressure sensors from Glenn. Endevco began testing a sample batch of sensors and is preparing for initial marketing trials. The company is exploring the sensors' use in government markets, as well as in commercial markets, including commercial jet testing, deep well-drilling applications where pressure and temperature increase with depth, and in automobile combustion chambers.



### ***Novel Process Revolutionizes Welding Industry***

Glenn, Delphi Corporation of Troy, Michigan, and the Michigan Research Institute entered into a project to study the use of Deformation Resistance Welding (DRW) in the construction and repair of stationary structures with multiple geometries and dissimilar materials, such as those NASA might use on the Moon or Mars. Traditional welding technologies are burdened by significant business and engineering challenges, including high costs of equipment and labor, heat-affected zones, limited automation, and inconsistent quality. DRW addresses each of those issues, while drastically reducing welding, manufacturing, and maintenance costs.

### ***Water-Based Coating Simplifies Circuit Board Manufacturing***

Advanced Coatings International of Akron, Ohio, prototyped the platform chemistry for a polyimide-based, waterborne, liquid photoimagable coating ideal for the manufacture of printed circuit boards. The Polymers Branch at Glenn contributed extensive knowledge of polyimide chemistry and expertise in the synthesis of ultraviolet light-curable polyimides that were critical components in this technology.



### ***Battery Technology Stores Clean Energy***

Headquartered in Fremont, California, Deeya Energy, Inc., is now bringing its flow batteries to commercial customers around the world after working with former Glenn scientist Lawrence Thaller. Deeya's liquid-cell batteries (l-cells) have higher power capability than Thaller's original design, are less expensive than lead-acid batteries, are a clean energy alternative, and are 10 to 20 times less expensive than nickel-metal hydride batteries, lithium-ion batteries, and fuel cell options. The l-cells back up Deeya's newly developed flow batteries, the smallest in the industry, used for cell towers in rural areas. The l-cells also can be used as an energy supply backup for cash machines and traffic lights.



### ***Magnetic Separator Enhances Medical Treatment Possibilities***

Since 1988, NASA has issued over 25 SBIR contracts with four NASA centers to the company now known as Techshot, Inc., of Greenville, Indiana. Currently, Techshot and a spinoff company, IKOTech, are marketing the Magsort, a quadruple magnetic sorter that collects specific biological cells from a liquid suspension by running it through a magnet assembly. Its applications include the detection of rare cancer cells in circulating blood and the removal of undesired cells from bone marrow transplants.



For more information on NASA spinoffs, visit <http://www.sti.nasa.gov/tto/>

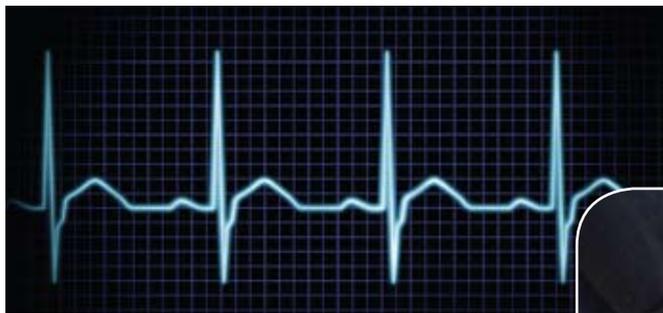
## Licenses



From left: Dr. Harry D. Rowland (Endotronix), Dr. Felix A. Miranda (Glenn), and Dr. Rainee N. Simons (Glenn)

### **Radio Frequency Telemetry System for Bio-MEMS Sensor Licensed for Use in Blood Pressure Monitor**

Endotronix, Inc. of Peoria, Illinois, licensed Glenn-developed telemetry and wireless powering systems for ultraminiature Bio-MEMS (microelectromechanical systems) sensors. The company is working with researchers at Glenn to advance demonstration of Bio-MEMS pressure sensors that will be used in the company's wireless, implantable sensors for cardiovascular applications. Endotronix plans to study the sensors in animals in 2009 and begin clinical testing in humans in 2010. The monitoring system is initially targeted toward doctors treating patients with high blood pressure and underlying cardiovascular disease. Endotronix plans to market the monitoring system to healthcare institutions treating patients with hypertension, aortic aneurysms, and congestive heart failure.



# Fueling Ohio's Economy

Innovations borne of the programs managed by Glenn's Technology Transfer and Partnership Office (TTPO) not only advance NASA missions but also contribute to the economy of our home state of Ohio. Through Small Business Innovation Research contracts, Seed Fund partnerships, and spinoffs, Glenn's TTPO plays a significant and active role in the state's economy.

## SBIR/STTR

Since 2003, Glenn has awarded \$11.6 million in Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) contracts to Ohio small businesses. When combined with other centers' awards to Ohio companies, NASA's SBIR/STTR impact in Ohio has been \$20.9 million over the past 6 years.

Glenn also continues to lead NASA centers in SBIR Phase 3 Awards. Glenn had 11 active Phase 3 awards in 2008, totaling nearly \$2.4 million. Ohio companies received nearly \$1.4 million of that, divided among **A&P Technology** of Cincinnati; **WebCore Technologies, Inc.**, of Miamisburg; **Expert Micro Systems, Inc.**, of Reynoldsburg; and **Sierra Lobo, Inc.**, of Fremont and Milan.

## Seed Fund Partnerships

**Goodyear Tire and Rubber Company**, headquartered in Akron, collaborated with Earth Science Mission Directorate's Human Robotic Systems in a Seed Fund partnership at Glenn to find new uses for Goodyear's wire mesh, airless/rubberless tires developed in the 1960s for Apollo Lunar Roving Vehicles.

Cleveland-based **Parker Hannifin Corporation** collaborated with Aspen Aerogels and Glenn in a Seed Fund partnership to demonstrate the thermal insulation capability of aerogels in refrigeration products and transfer lines.

## Spinoffs

Blue Ash-based **Maverick Corporation** is applying a polyimide technology from Glenn to a wide range of uses, both in aerospace, for aircraft engines, missiles, and space transportation systems, and for nonaerospace functions in oil drilling and rolling mills.

**Advanced Coatings International**, headquartered in Akron, prototyped the platform chemistry for a polyimide-based, waterborne, liquid photoimable coating for printed circuit boards. The environmentally friendly coating protects electronics manufacturing workers from outgassing of harmful volatile organic compounds (VOCs) and has the potential to reduce manufacturing and operating costs.

## Ohio Companies Involved in Glenn-Based SBIR/STTR Projects

The following Ohio companies participated in the SBIR/STTR program out of Glenn between 2003 and 2008.

Company	Ohio Location
Alphaport, Inc.	Cleveland
Cleveland Clinic	Cleveland
Cornerstone Research Group, Inc.	Dayton
Essential Research, Inc.	Cleveland
Hyper Tech Research, Inc.	Columbus
Innovative Scientific Solutions, Inc.	Dayton
KJB Consultants	Strongsville
Lake Shore Cryotronics, Inc.	Westerville
N&R Engineering	Parma Heights
Nastec, Inc.	Brook Park
NexTech Materials, Ltd.	Lewis Center
Pentalim Corporation	Findlay
Powdermet, Inc.	Euclid
Sest, Inc.	Middleburg Heights
Sierra Lobo, Inc.	Fremont
Spectral Energies, LLC	Dayton
Sunpower, Inc.	Athens
SynGenics Corporation	Delaware
TechLand Research, Inc.	North Olmsted
UES, Inc.	Dayton
ZIN Technologies, Inc.	Middleburg Heights

Our inventors are honored for their achievements.

## Awards



Laurie J. Stauber

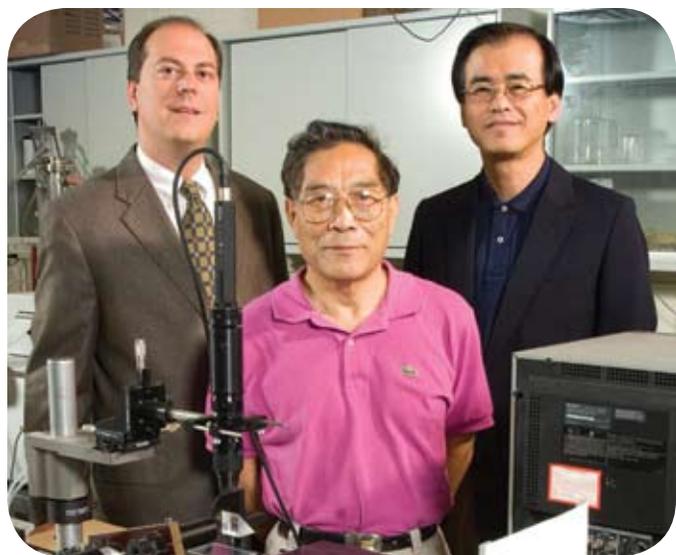
Our success in gaining recognition for Glenn's innovators reflects the significance of their technological advancements. For example, the R&D 100 Awards acknowledge the world-class status of Glenn's accomplishments through recognition at an annual event at Chicago's Navy Pier. In addition, NASA's Inventions and Contributions Board (ICB) allows these contributions to be recognized with cash awards and maximizes the value of Glenn technology by giving rewards and incentives to our inventors through the Space Act Awards program. I would like to thank all of our innovators for their creativity and dedication.

—Laurie J. Stauber, Award Liaison Officer

### R&D 100 Awards

#### *Multidimensional Contact Angle Measurement Device (MCAMD)*

**Dr. David F. Chao** and **Dr. John M. Sankovic** of Glenn, and **Dr. Nengli Zhang** of Ohio Aerospace Institute were honored for inventing the MCAMD, a breakthrough in measurement technology that enables a vast number of industries to measure transparent liquid drops on a solid surface. By collecting a host of crucial information simultaneously in a 360-degree view, MCAMD allows scientists to see how those droplets interact with different surfaces. MCAMD is superior to any other commercially available contact angle meters, which measure a contact angle only from a single side view. Although MCAMD's direct application involves NASA space missions, it can be used in industrial applications of paints and coatings, lubricants, glue, film cooling, biological cell adhesion, and boiling heat transfer.



From left: Dr. John M. Sankovic (Glenn), Dr. Nengli Zhang (Ohio Aerospace Institute), and Dr. David F. Chao (Glenn)



Photo courtesy of Picometrix®, LLC (an Advanced Photonix company)

#### *Terahertz Density-Thickness Imager*

**Dr. Donald J. Roth** of Glenn, **Dr. William P. Winfree** of NASA's Langley Research Center, and **Jeffrey P. Seebo** of Lockheed Martin received the award for their design and development of the Terahertz Density-Thickness Imager, which permits scientists and engineers to analyze the quality, compactness, and dimensions of nonconducting materials, such as foams, over a large, continuous region. In space travel, foams play a major role as thermal protections systems. With the new technology, NASA uses revolutionary methods and software to perform process and quality control of foams and other thermal protection system materials without destructively cutting and using laborious conventional quality-control methods. NASA scientists and engineers can measure foam spray quality, thickness, and density variations over a large area to detect hail damage, improper processing, or worker handling. The density-thickness imager technology now used exclusively by NASA may have applications for plastics, wood, paper, ceramics, and pharmaceutical materials.



From left: Waldy K. Sjauw (Glenn), Robert D. Falck (Glenn), John P. Riehl (Glenn), and Stephen W. Paris (The Boeing Company)

## NASA Software of the Year Award

### *Optimal Trajectories by Implicit Simulation, Version 4 (OTIS 4)*

**John P. Riehl, Robert D. Falck, and Waldy K. Sjauw** of Glenn and **Stephen W. Paris** of The Boeing Company developed the OTIS 4 software program for use in trajectory performance studies. OTIS 4 uses trajectory simulation and optimization to predict how a vehicle will perform and to determine how best to fly a given vehicle. The user inputs the vehicle models; flight paths can be generated with respect to any of the major bodies in the solar system. OTIS 4, which can run on any computer that has a Fortran 95 compiler, may be used for nonaerospace applications.

## NASA ICB Awards

Through the Space Act Award process, NASA's Inventions and Contributions Board (ICB) recognized 178 Glenn inventors with awards totaling \$200,000 for significant contributions in science and technology to aeronautics and space activities.

- 3 Exceptional Space Act Awards (see right)
- 8 additional Space Act Awards
- 14 patent application awards, involving 32 inventors
- 36 inventors received Software Release Awards
- 33 *NASA Tech Briefs* articles published, rewarding 121 inventors

### Shadowgraphic Method to Measure Contact Angles With Flow Visualization in a Sessile Drop on a Nontransparent Substrate



—Dr. David F. Chao and Dr. Nengli Zhang

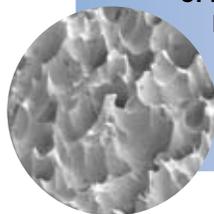


### MEMS (microelectromechanical systems) Packaging Technique and Chip Fabrication for High-Temp, Harsh-Environment Silicon Carbide Pressure Sensors

—Dr. Robert S. Okojie

### Hyperthermal Atomic Oxygen Texturing of Polymethylmethacrylate Optical Fibers for Blood Glucose Monitoring

—Bruce Banks



Sharing our work expands its impact.

# Events

Glenn is committed to sharing our knowledge and creative resources with the community. By hosting seminars and presentations, and disseminating information at public events, Glenn reaches out to local businesses and citizens. The Technology Transfer and Partnership Office (TTPO) demonstrates Glenn's commitment to making positive contributions to the public and becoming an integral part of the scientific and business communities.



## Celebrating NASA's 50th Anniversary



NASA officials joined political, business, technology, and academic leaders on February 21, 2008, to discuss the benefits of space exploration to Ohio's economy, now and in the future. Glenn Director Dr. Woodrow Whitlow, Jr., Ohio Governor Ted Strickland, and astronaut Piers Sellers were among those who participated in panel discussions, answering such questions as, "What is NASA's most important discovery so far?"

The event, held at the Center for Science and Industry in

Columbus, included a large display of space exploration and science exhibits. The Future Forum was part of a yearlong series celebrating NASA's 50th Anniversary.

## Smithsonian Folklife Festival

The TTPO staffed the Innovative Partnerships Program exhibit at the annual 2-week festival held on the National Mall in Washington, DC, every summer. The NASA program at the festival included Glenn experts moderating a panel presentation; hands-on educational activities; demonstrations of skills, knowledge, and oral history; and exhibits that explored the spirit of innovation, discovery, and service embodied by NASA.



Speakers and interactive displays drew crowds to Future Forum in Columbus, Ohio, part of a yearlong celebration of NASA's 50th Anniversary.

## Business Opportunity Forum

Over 125 companies attended this information-packed event at Glenn Research Center on May 16, 2008. The TTPO collaborated with the center's Procurement Division to present a day of workshops aimed at outlining upcoming procurement opportunities with NASA. Audiences at the standing-room-only event heard Kathleen Needham, Glenn's TTPO Chief, and Gynelle Steele, Glenn's SBIR/STTR Program Manager, give presentations about partnering with Glenn for collaborative R&D and NASA's program for small businesses. Laurie Stauber, Glenn's Commercialization Lead and Award Liaison Officer, was the lead organizer for the conference.

## Cleveland Engineering Society

Glenn's TTPO provided speakers for events hosted by the Cleveland Engineering Society, including presenting key technologies at the society's Sustainability Conference.

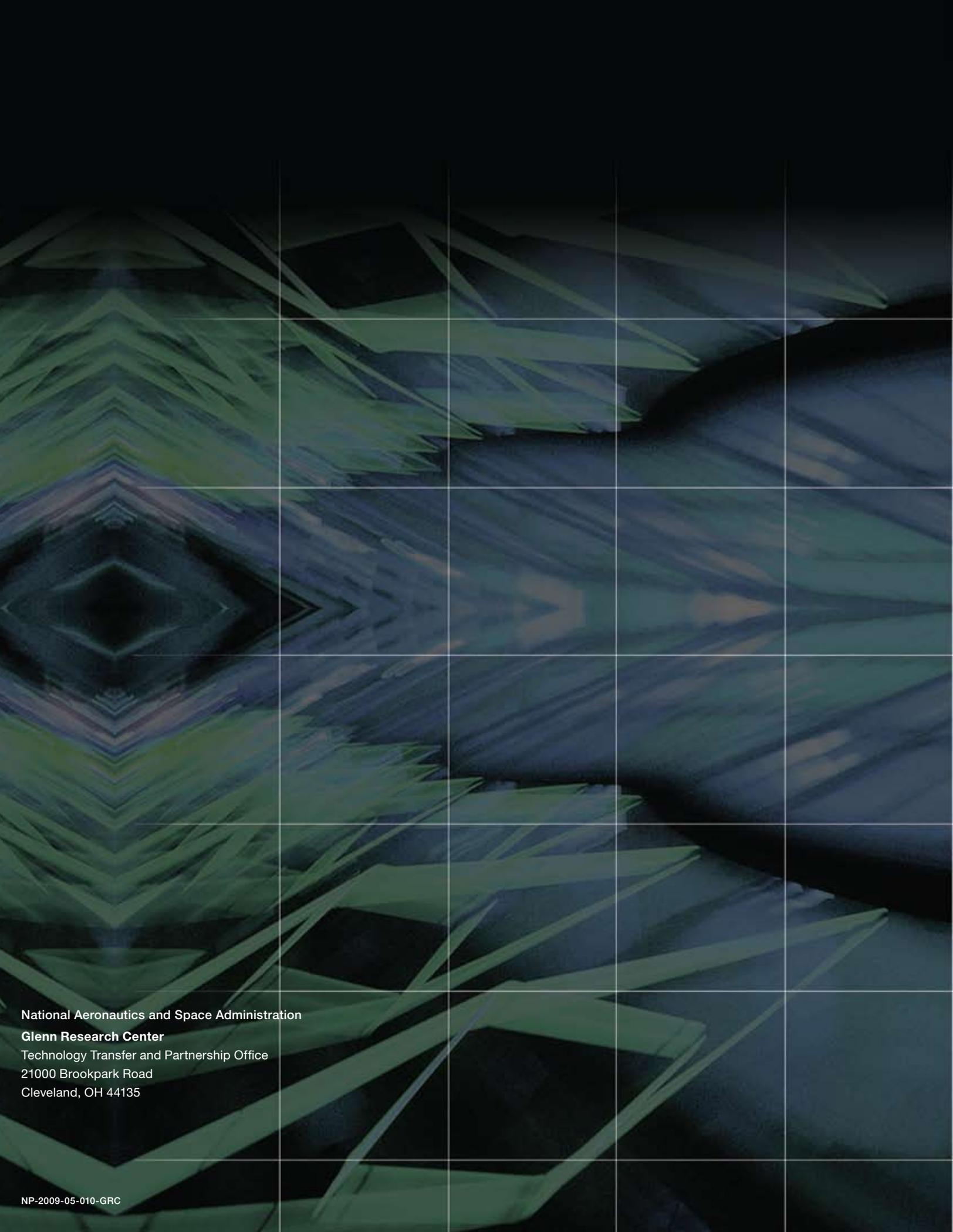
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