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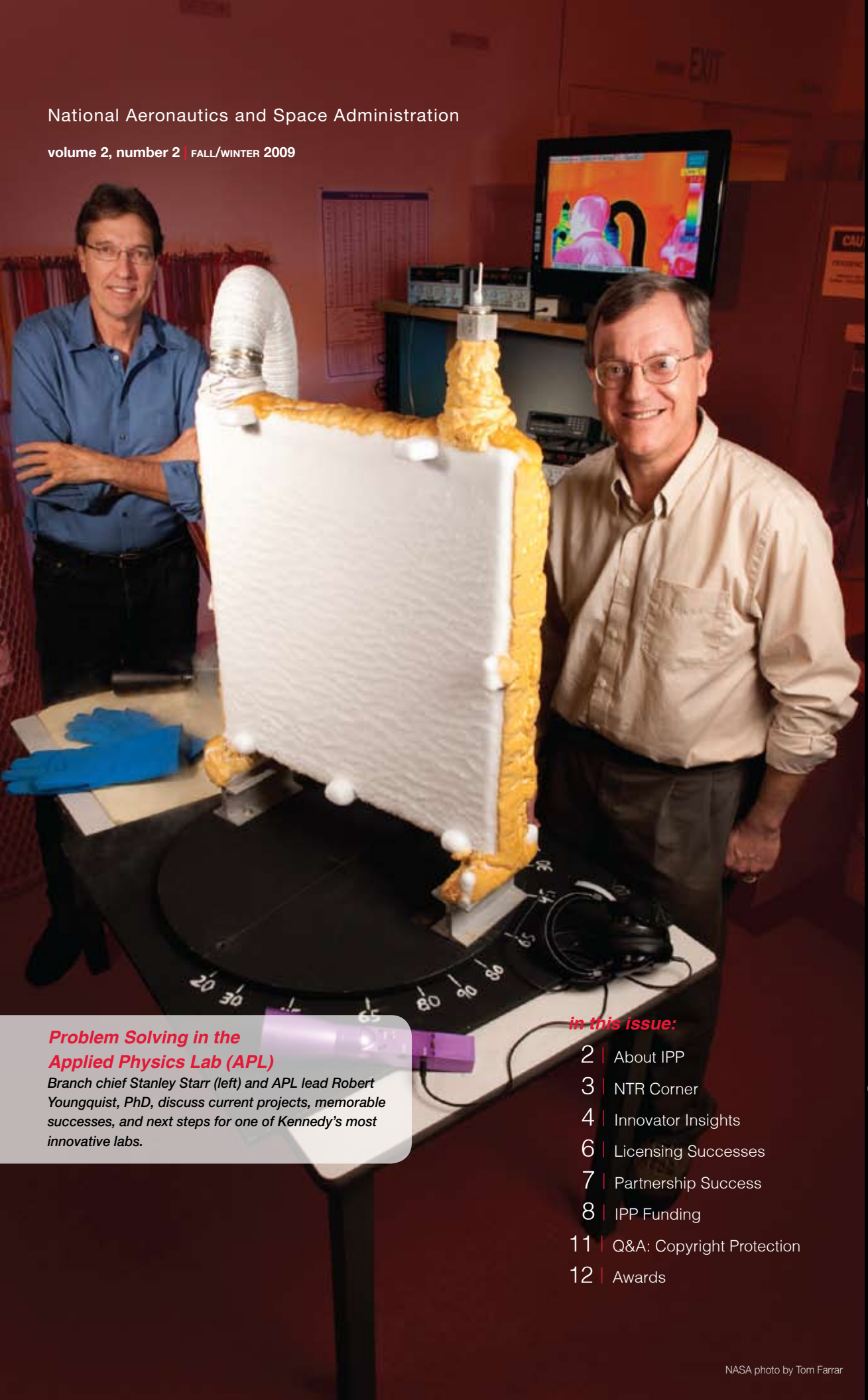


Problem Solving in the Applied Physics Lab (APL)

Branch chief Stanley Starr (left) and APL lead Robert Youngquist, PhD, discuss current projects, memorable successes, and next steps for one of Kennedy's most innovative labs.

in this issue:

NASA photo by Tom Farrar

Meet the Staff: **Alexis Hongamen, Technology Partnerships Manager**


NASA photo by Tom Farrar

Alexis Hongamen

As Technology Partnerships Manager at Kennedy Space Center, Alexis Hongamen plays a key role in strategically matching technology needs with potential solutions. "To be successful in this role, I need to be aware of all the technology needs at Kennedy as well as the relevant development going on here, at other NASA centers, and outside NASA," Hongamen says.

NASA's Innovative Partnerships Program (IPP) jumpstarts innovative technology development by forming partnerships between NASA and industry, academia, and other government labs to broaden the agency's technology portfolio. These partnerships and other efforts help fill specific technical gaps and accelerate development and maturation of technologies, all while saving money. The Kennedy infusion team has a carefully vetted priority list of technical needs, and as various funding sources become available, they review that list to match funds with proposed projects.

> "I have found Kennedy researchers to be very open to whatever technology is out there.... My goal is to help them access it so they can accomplish their objectives."
>
> *— Alexis Hongamen, Kennedy's IPP Office*

Hongamen has nearly 20 years' experience at Kennedy, in capacities ranging from software development to shuttle launch payload processing. He has built a broad professional network of NASA stakeholders, which he leverages to achieve Kennedy's technology infusion goals. "I'm familiar with most of the players," says Hongamen, "and having built a rapport over time helps me connect projects and resources."

Most of Hongamen's IPP colleagues have been at Kennedy for more than 15 years and similarly possess a broad background of specialized knowledge about the center's technologies and current needs. "Although we're obviously more familiar with our homegrown technologies, we are very ready to step outside to match specific needs with what's out there," he notes.

An excellent example is an innovative camera that uses near-infrared wavelengths to detect ice on the shuttle's external tank. "This camera was developed by tapping into outside expertise that was matched up with a very specific need," explains Hongamen, adding that the device is slated to be used during the February 2010 shuttle launch. *(See page 9.)*

"We maintain an ongoing dialogue with our researchers to keep them informed about potential funding sources for the technologies they're working on," he says. Funding mechanisms include the IPP Partnership Seed Fund, the Kennedy IPP Office's Internally Funded Project Call, and the NASA Innovation Fund. *(For more information, see pages 8-10.)*

In addition, Hongamen also acts as a kind of technology intermediary, using his extensive network to apprise researchers of various expertise they may want to consider to advance their work. He makes use of the KSC Daily News e-mail alert and the KAITS action assignments, which go out to all directorates.

For Hongamen, communication is key, both with innovators who are working to further their research and with the IPP Office, which seeks to initiate cost-shared, joint-development partnerships. "I have found Kennedy researchers to be very open to whatever technology is out there that can enhance their efforts. My goal is to help them access it so they can accomplish their objectives." ▪

New Technology Report (NTR)

Technology title: **Monte Carlo Simulation to Estimate the Likelihood of Direct Lightning Strikes**

Inventors: **Carlos Mata, PhD, and Pedro Medelius, PhD**

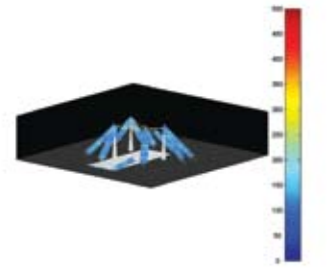
Case #: **KSC-12882-1**

What it is: This Monte Carlo simulation software program is used to analyze the likelihood of a lightning strike to any structure. Initially developed to analyze the lightning protection system for the area surrounding the LC-39 launch pads, the software tool has since been used to assess the lightning protection around guard shacks at Kennedy and NASA's Johnson Space Center, as well as the A-3 Test Stand for the Constellation Mission's J-2X engine, and also was used to design the new lightning protection system for the LC-39B launch pad.

What makes it better: The program's operation is based on the electrogeometrical model. The program uses random-number generators, statistical tools, internationally accepted lightning parameters, and the striking distance concept to calculate the incidence of lightning strikes to any object within the area of analysis. The software has been subject to peer review, within NASA and other government agencies, by about 35 experts in the field who endorsed the program's ability to provide reliable results, useful for valuable analysis. In addition, the software boasts high-speed operation and a user-friendly interface featuring multiple options for viewing data in both graphical and table formats, making analyses of data reports more helpful and timely.

How it might be used: Beyond use at NASA and by the U.S. Navy, the program can be applied to assessments of lightning strike vulnerability and lightning protection systems for nearly any type of structure. Particularly salient uses for the technology would be at sports stadiums and outdoor venues hosting large crowds. ■


NASA photo by Tom Farrar



Drs. Medelius (left) and Mata developed this innovative software program to help protect NASA spacecraft from lightning strikes while on the launch pad.

■ ■ ■

This innovation was Kennedy Space Center's nominee for the 2008 Software of the Year Award.

■ ■ ■


NASA photo

Applied Physics Lab

Stanley Starr, chief of the Applied Physics Branch at Kennedy Space Center, and Robert Youngquist, PhD, lead of the Applied Physics Lab, spoke with* Kennedy Tech Transfer News *about current projects, memorable successes, and next steps for one of Kennedy's most innovative labs.

What does the Applied Physics Lab do?

The APL is here to solve problems, helping make the processing of space vehicles and cargo safer, quicker, and more accurate. We often receive requests from spacecraft operations folks about immediate or long-term problems, and then we try to develop ways to solve them. Sometimes this involves inventing a new technology. Many NASA labs have specific expertise, but we're the lab of first choice for problems that don't fit elsewhere. We have a very broad and diverse portfolio of technology capabilities and have a reputation for coming up with inexpensive, simple solutions.

We also have staff longevity here at APL. A number of our folks have worked at Kennedy for over 20 years. So when problems come in the door, we try to address them ourselves or we might route them to other people who have that expertise. A lot of what we do is helping connect problems with solutions, and we often partner with other groups to get things done.

What kinds of projects do you take on?

We do all the oddball stuff. We're asked to help with everything from getting rid of vultures at the launch pad, to filling same-day requests for custom-made clamps, to building small optical sensors, to developing whole research programs. We show up at meetings and hear, "We're having a problem. Can you help us?" If we can't, we connect them to others who can.

A few years ago, the shuttle program asked us to help them with "wet tile" problems. During re-entry, the waterproofing in the orbiter tiles burns out, and if the orbiter is exposed to rain before it gets back to the Orbiter Processing Facility (OPF), the tiles can soak up a large amount of water. This typically isn't a problem with a Kennedy landing, but sometimes after landing out west, the orbiter is subjected to heavy downpours. Trying to determine which tiles are wet and removing the water in them once caused a launch delay, so we were asked to help.

We developed a novel water removal system known as a water extraction tool, or WET, and two new water detection aids. One water detector pulls an air sample out of a tile and measures the humidity to determine if water is present, and the other measures the capacitance of the tile to indicate the presence of water. These tools are currently being used by the shuttle program.

All NASA photos by Tom Farrar

(APL)

In the lab right now, our engineers are working on electroactive polymers for advanced valve design, water diffusion through carbon composites in support of the Launch Services Program and the Ares system, leak-detecting patches that will change color when exposed to hypergols, an imaging camera that helps detect ice on the shuttle's external tank, and optical systems to help locate and quantify defects in orbiter windows. These are just a few of our ongoing projects.

With so much innovation coming out of your lab, your team must have a lot of experience filing New Technology Reports (NTRs). Why is that important?

Many researchers may not be aware of it, but you can become eligible for awards by filing an NTR. If the technology is written up in *NASA Tech Briefs*, if its software is approved for release, or if a patent application is filed, the inventors receive a monetary award. Dr. Youngquist serves on the Inventions and Contributions Board (ICB), which meets quarterly to review and assess the value of technologies generated under NASA funding for their eligibility to receive Space Act Awards. (*See page 12 of this issue and the Fall/Winter 2008 edition of* Kennedy Tech Transfer News.)

While it's certainly nice to receive a check in the mail for your efforts, one of the reasons NASA exists is to serve as a technology engine for the country, and that means producing technologies that result in business—people producing things, solving problems, and making the country better. Many individual stories demonstrate how NASA brings value to society, and without NTRs, that just can't happen.

What are some of your most memorable success stories?

We do a lot of work in leak detection, dating back to 1989, when the entire shuttle fleet was grounded because of hydrogen leaks. Our lab built a better leak detector than what was available on the market. We still use it today to find and fix hazardous fluid leaks in shuttle launch and ground support equipment. UE Systems, Inc. licensed the technology and now manufactures and sells the device to a variety of industries for leak detection in pressure and vacuum systems.

Another invention that stands out is a laser scaling device now being sold by BAE Systems. We built the device to measure the extent of damage done to the shuttle's external tank by hail and woodpeckers. It uses laser beam spots projected on a remote surface and photographed to provide scaling information. BAE Systems licensed the technology, and this tool now provides crime scene investigators with the ability to shoot photographs at scale without having to physically enter a scene.

It is amazing to think that a technology we originally built to help us evaluate the extent of bird damage on the external tank now is being used to help solve crimes. You never know where things are going to end up. Technology spinoffs are one of the reasons NASA should be supported. *(For more information about both of these successes, see page 6.)*

What's next for the lab?

We're excited about a new, small, very inexpensive inductive position sensor that can measure position to a few nanometers of resolution, with full range of a few thousandths of an inch. It's a custom device for the specific application of measuring defects in orbiter windows. Enough interest came back from a commercialization study that a provisional patent application may be filed.

Another innovation that has come back with positive comments following a market assessment provides highly accurate calibration of the wavelength assignment for spectrometers. Compared with currently available techniques, accurate to 1 nanometer, this new method is accurate to approximately 0.01 nanometers.

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Virtual Ruler Provides Scale for Many Applications

NASA invention sizes up situations, from the launch pad to crime scenes

A device developed by Kennedy Space Center engineers for use on the space shuttle launch pad is now helping solve crimes here and abroad.

Robert Youngquist, PhD, and a team of NASA engineers in Kennedy's Applied Physics Lab designed a device to measure the extent of damage to the shuttle's external tank, caused by hail and mischievous birds. Dr. Youngquist remembers engineers out on the launch pad, taking pictures with zooming camera lenses.

"Pictures clearly showed damage to the tank, but there was no scale," Youngquist recalls. "They had no idea how big the dings and defects were."

NASA photo by Tom Farrar

Starting with an idea from two shuttle engineers, Youngquist built a prototype device using laser beams to provide scaling information. He then worked with others to develop software that computed the distance scale.

Marketed today as part of the Forensics Source™ product line sold by BAE Systems's Safariland™ line of business, the patented laser scaling device is used by investigators at crime scenes to shoot photographs that can be accurately portrayed in a two-dimensional medium. The Federal Bureau of Investigation has purchased some units, and the U.S. Department of Defense uses the tool in military crime scene investigations overseas. Industrial photographers use it to shoot scaled photos of large items that are not easily accessible, even with ladders or lifts.

"The laser scaling device developed by NASA works great with nearly any camera and provides crime scene photographers with exceptional scaling and measuring capabilities, indispensible when documenting crime scenes," says Safariland spokesman Eric Schellhorn. "Our customers use it extensively in blood spatter, shoe, and track photography and in other situations where a conventional scale would not be appropriate. The partnership has been instrumental in making this space-age technology available to assist forensic technicians in solving crimes."

The Forensics Source tool weighs about half a pound and is powered with a replaceable nickel-cadmium battery. The laser beams are accurate to approximately 200 feet and provide more than 0.0625-inch accuracy. The Windows®-based software included in the package allows a user to import a photograph, benchmark two laser dots, and add a scale to the photo.

"It is a great feeling to see your technology have so many positive impacts," says Youngquist. ■

Forensics Source and Safariland are trademarks of Safariland, LLC; Windows is a registered trademark of Microsoft Corporation.

Portable Device Finds Low-Level Leaks

Long-range leak finder commercialized for use in pressure and vacuum systems

Photo courtesy of UE Systems, Inc.

Twenty years ago, the entire space shuttle fleet was grounded because of hydrogen leaks in the shuttle's main engine compartments. To solve the problem, scientists at Kennedy Space Center modified a parabolic reflector to work with a portable detector to locate hard-to-find, hazardous fluid leaks in launch and ground support equipment.

> "Our Long Range Module has helped companies around the world reduce energy waste by locating compressed air leaks at a distance."
>
> *— Alan Bandes, UE Systems*

Modified for commercial use and now licensed by UE Systems, Inc., the device works like an ultrasonic telescope, magnifying the sound caused by leaks and electric arcing. The innovation incorporates advanced circuitry, transducers, and a unique parabolic collecting horn that delivers a high degree of reliability, sensitivity, and versatility while screening out background noise.

(continued on page 10)

IPP Partnership Seed Fund Enables Development of Needed Exploration Technology

Sun-Shield Supports In-Space Cryogenic Propellant Storage

Infusion support from NASA's Innovative Partnerships Program (IPP) has enabled early-stage development of a deployable sun-shielding device to support long-duration in-space propellant storage. A 2007 IPP Partnership Seed Fund award allowed Kennedy Space Center to partner with United Launch Alliance (ULA) and ILC Dover Corporation as well as NASA's Glenn Research Center to begin work on the project. Although actual flight is still a few years away, it is anticipated that a test article will be ready for a full-scale flight test as early as 2011.

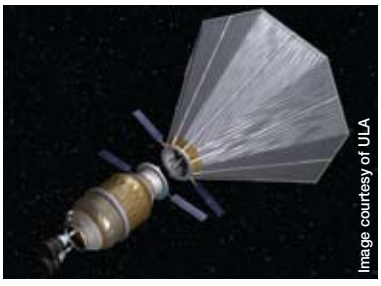
The Seed Fund assists with funding and oversight development by partnering with industry to take a concept from the demonstration model to a full-scale test article. *(See related article, pages 8-10.)* In this case, funding helped with design, development, and testing as well as risk analysis of the shield, materials, components, and assembly.

According to Gary O'Neil of the Launch Services Program at Kennedy, who served as co-principal investigator (PI), the collaborative effort was critical to efficient maturation of the deployable sun-shield. "Each organization brought valuable expertise and experience that allowed a lot of developmental ground to be covered quickly and at low cost," says O'Neil.

This prototype of the fully deployed sun-shield was developed by researchers from Kennedy, Glenn, United Launch Alliance, and ILC Dover Corp., whose partnership was supported by the IPP Partnership Seed Fund.

Propellant Depots Needed to Accommodate Extended Missions

One of the problems to be overcome for extended space missions is the need for long-term storage of high-performance propellants at cryogenic temperatures. Heating from the sun in space can cause propellant loss through boil-off of cryogenic liquids, even if they are in space for just a few hours. Human missions using cryogenic propellants will require longer duration storage, particularly for concepts such as propellant depots, which would function as on-orbit gas stations that could be supplied by commercial or international launches.



A device that shields the depot from the sun's radiation would maintain cryogenics at a constant temperature and support extended storage without boil-off. Long-term propellant storage could enhance and add flexibility to exploration missions and destinations, including near-Earth objects, Mars, and beyond. Not only would long-term propellant storage extend cryogen-based exploration, but it also would aid in the development of other space-related inflatable structures, such as human shelters, antennas, solar arrays, and re-entry shields. In addition, such an innovation would advance technologies needed for efficient and innovative lightweight space structure designs.

IPP helped fund the development of just such an innovation. The partners defined system requirements, determined materials and fabrication techniques, and tested components in a vacuum chamber at cold temperatures.

Design Provides Reliability and Redundancy

The deployable sun-shield's overall system design is a lightweight, segmented thermal radiation shield that is stowed during launch, then deployed after the fairing is jettisoned. The design includes a three-layer shade with a roller assembly, vertical boom, columnator, and sleeve. The shield is composed of six petals that deploy independently to provide reliability and redundancy. A boom located at the center of each of the six petals inflates independently of the other five. If a single petal fails to deploy, the remaining petals will not be affected.

Extensive research was conducted to select the appropriate materials for the shield, and testing was performed in extremely cold temperatures in various loading conditions and configurations. The partners met all technical goals and objectives. Among the many achievements were raising the technology readiness level (TRL) from 4 to 5 for thermal vacuum deployment and successfully deploying components in a vacuum at calculated lowest boom temperatures (-140°F).

Looking Ahead

The next steps for this technology include fabricating a full-scale shield and performing flight design validation testing.

"Through the IPP collaboration, we've been able to prove out and refine design parameters associated with reliable deployment and material behavior in the space environment," says co-PI Laurie Walls, also of the Launch Services Program at Kennedy. "With that accomplished, we can focus on thermal optimization to address gaps in the shields and incorporating other cooling augmentations to approach the goal of zero boil-off of our cryogenic propellants." ■

IPP Funds Innovative R&D

NASA's Innovative Partnerships Program (IPP) fosters collaboration between NASA and small and large businesses, universities, and other government agencies in order to fill specific technical gaps and accelerate development of various technologies. These collaborations, along with other efforts, provide a means to acquire, mature, and infuse technology and capabilities for agency programs. IPP also provides funding, such as the Partnership Seed Fund and the Innovation Fund, that creates a path to actual field use for innovations that might otherwise languish in a laboratory.

IPP supports all mission directorates and has program offices at each of the NASA centers. At Kennedy Space Center, the IPP Office assists researchers in applying for Seed Fund and Innovation Fund awards. The office also has IPP resources to invest (at its discretion) in center-based research and development (R&D) projects.

Seed Fund Bridges Technical Gaps

IPP's Seed Fund provides "bridge funding" that enables larger partnership and development efforts. The program requires matching funds from a developer or partner and support from one or more existing NASA programs or projects. Kennedy's IPP Office coordinates and advises the center's proposal efforts for Seed Fund projects. "This is funding that helps get a technology off the ground," explains Alexis Hongamen, Kennedy's Technology Partnerships Manager. "The ultimate goal is to identify the merits of a technology and whether it can at some point warrant a traditional funding source," he adds. Notable Seed Fund projects at Kennedy include the following. *(The Seed Fund also aided the development of a sun-shield to support long-duration in-space propellant storage; see page 7.)*

> "The ultimate goal [of the Seed Fund] is to identify the merits of a technology and whether it can at some point warrant a traditional funding source."
>
> *— Alexis Hongamen, Kennedy's IPP Office*

Lunar Dust Modeling Software

Michael D. Hogue, PhD, and Carlos I. Calle, PhD

Partner: *DEM Solutions, Inc.*


NASA photo

This software program enhances an existing discrete element modeling (DEM) tool to provide more accurate modeling of lunar dust and regolith. The advancement reduces the need for extensive field testing required for regolith excavation, processing, and dust mitigation technologies. The project was recently completed, and the DEM software is now available for use with the In-Situ Resource Utilization Project. In addition, the capabilities offered by this technology are benefiting several U.S. companies, including John Deere, Pfizer Inc., and Procter & Gamble.

> "We are delighted to be continuing our collaboration with NASA and contributing to development of technologies in support of their lunar program. This project will... provide more accurate models of particle electrostatics and interactions with electric and magnetic fields, which are critical to effective simulation of handling and processing of highly charged lunar dust and regolith."
>
> *— John Favier, PhD, chief executive officer, DEM Solutions*

Space-Based Monitoring of Radiation Damage to DNA

Howard G. Levine, PhD

Partners: *NASA's Ames Research Center and Louisiana Tech University*

Objectives of this newly funded project are to develop a miniaturized device that can monitor damage to DNA in real time, advancing our understanding of the effects of radiation exposure in space. A microfluidic system will allow for rapid and continuous genetic DNA sample analysis in a small package that can be flown on a nanosatellite. The project primarily supports the Exploration Systems Mission Directorate's In-Situ Bioanalytical Technologies area of focus, and it also has implications for the Space Operations and the Science Mission Directorates.

Vegetable Production System

Raymond M. Wheeler

Partner: *Orbital Technologies Corporation*

New light-emitting diode (LED) arrays for collapsible plant growth chambers are the focus of the latest research effort to provide a low-resource system to produce fresh vegetables for crews on long-duration missions. The new LED technology is expected to reduce overall volume and mass while doubling light output. The project also calls for testing of capillary rooting mat concepts and vibration and acoustic hardware tests. Also planned are tests with lettuce and radish plants to assess chamber performance and compare yields to baseline data gathered from related tests.


NASA photo

Innovation Fund Supports Early Stage Novel Research

The NASA Innovation Fund is a new funding structure that is designed to support NASA innovators in the early stages of formulating concepts for novel technologies and new processes that have the potential to revolutionize the way the agency performs its missions.

New technologies or processes that have the potential to also address other national and global challenges are of particular interest for this program. Projects generally are those that are too early in their development to compete for support from other NASA funding sources.

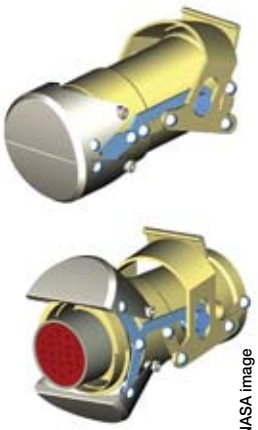
"This funding allows NASA researchers to work outside the box and focus on projects they usually don't have time for," says Hongamen. "It strictly pays for NASA labor over a short period of time." As initial reviews of the program have been positive, he says Kennedy's IPP Office expects to see a new round of funding in 2010.

Twenty projects were selected out of more than 230 proposals for the inaugural Innovation Fund. Two Kennedy projects received funding in July 2009 and have already completed their work.

Dust Tolerant Intelligent Electrical Connection Systems

Mark E. Lewis

This project investigated techniques to mitigate lunar dust intrusion and accumulation on reusable electrical connectors. Researchers also explored non-intrusive methods to detect circuit faults and automatically route signals through alternate recovery paths while a vehicle or lunar surface system equipment is in operation. Such a system would have obvious benefits for NASA lunar and Mars missions, but it also would assist the military as well as mining and oil and gas exploration operations, which are often conducted in uncontrolled environments.



NASA image

Repair Techniques for Composite Structures

LaNetra C. Tate, PhD

NASA photo

This project provided a path forward for developing operational requirements and needs for an on-site repair plan for composite parts in airframes. Use of composites in airframes is in demand, but because such a wide variety of airframe structures exists, technicians are hampered in their inspection tool calibration efforts to accurately diagnose damage. In preparation for delivery of Ares V at Kennedy, the center partnered with NASA's Marshall Space Flight Center to evaluate current repair technologies; evaluate current repair requirements; develop and define damage limits for a composite structure; and fabricate, damage, inspect, and repair a composite part.

Internally Funded Projects Address High-Priority Needs

Kennedy's IPP Office funds technologies that address center needs as documented on the center's high-priority needs list. "We receive funding from IPP at headquarters, and we are allowed to use it to address Kennedy's needs," explains Hongamen. As with the Seed Fund, projects require an outside partner, but the funding level is generally two or three orders of magnitude lower than Seed Fund levels.

Ice Detection Camera System Upgrade

Charles Stevenson

Partner: *MDA Corporation*

NASA photo

This upgrade to a prototype system uses near-infrared wavelengths to detect ice on the shuttle's external tank. The new system is lighter and smaller as well as more reliable and user friendly. A joint effort between Kennedy, the U.S. Army Tank Automotive Research, Development, and Engineering Center, and MDA Corporation, the camera system is slated to be used during the February 2010 shuttle launch.

Cryogenic Orbital Testbed

Laurie Walls and Wesley Johnson

Partners: *United Launch Alliance (ULA), Sierra Lobo Inc., Innovative Engineering Design, and Yetispace Inc.*

Image courtesy of ULA

Kennedy researchers are partnering with industry to develop a Cryogenic Orbital Testbed (CRYOTE) to demonstrate critical cryogenic fluid management technologies on a relevant scale in the actual space and ground environment. Results from CRYOTE experiments will aid in the development of high-efficiency ground operations, lunar surface systems, enhanced upper stages, propellant depots, solar thermal and nuclear thermal propulsions, and cryogenic science applications.

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Innovator Insights

(continued from page 5)

The technology applies primarily to miniature charge-coupled device (CCD) spectrometers but also may be useful for larger spectrometers. These types of spectrometers are used in many types of systems, ranging from analytical chemistry to fiber optic communications.

Like many of our innovations, the calibration tool came about because our researchers needed a more accurate tool than what was available on the market, so we developed it ourselves. That's what makes us different from other Kennedy labs. We have a broad focus, and we're ready to find solutions for problems as they come in the door. ■

Portable Device Finds Low-Level Leaks

(continued from page 6)

The most common applications are to detect leaks in pressure and vacuum systems, such as pipelines, air-conditioning systems, power transmission lines, and pressurized overhead telephone cables.

"Our Long Range Module has helped companies around the world reduce energy waste by locating compressed air leaks at a distance," says Alan Bandes, vice president of marketing at UE Systems. "It has also saved many facilities from costly outages by identifying hazardous electrical emissions before they reached flashover conditions. It is not a stretch to say that this device has saved millions of dollars worldwide."

NASA still uses the device to find leaks on flight hardware and in fuel tank tests, as well as for shuttle missions. "Who knows how much money has been saved by avoided leaks, losses, and electrical problems?" speculates Robert Youngquist, PhD, lead Kennedy inventor for the project. "In addition, the country gets an economic boost from the jobs created to make and sell the device." ■

NASA photo by Tom Farrar

Youngquist Named Engineer/Scientist of the Year

Kennedy's IPP Office offers its sincere congratulations to Robert Youngquist, PhD, who received the inaugural Engineer/Scientist of the Year Award from Kennedy Space Center. Announced on December 8, 2009, this award recognized Dr. Youngquist for his innovations, his leadership of the Applied Physics Lab *(see pages 4-5)*, and his mentoring of students and colleagues pursuing higher degrees. ■

IPP Funds Innovative R&D

(continued from page 9)

Combining Funds to Accomplish Goals

At times, Kennedy's IPP Office is creative about assembling technology funding packages, leveraging different funding sources in order to accomplish goals.

One example is the Cryo-Tracker® mass gauging system. Designed as a high-tech "gas gauge" for cryogenic fluids, it received funding in 2006 from the Small Business Innovation Research (SBIR) program and the IPP Seed Fund as well as from the Launch Services Program at Kennedy. The innovation also received support through IPP's Facilitated Access to Space Technology (FAST) program, which enabled testing in microgravity in 2008 and 2009.

Another innovation that has benefited from multiple funding sources is a self-healing wire insulation. This ongoing project is developing a system to allow a polymer film, such as those used in electrical wire insulation, to repair itself in the event of a minor damage event, such as a crack or cut. Because of its relevance to the Exploration Technology Development Program, the project received a Seed Fund award in 2006. In addition, it also received discretionary funds from Kennedy's IPP Office.

A Catalyst for Innovation

The most successful NASA-industry partnerships occur when both parties contribute resources and have a vested interest in the outcomes. The funding provided by IPP facilitates such partnerships and other R&D efforts, playing a key role in advancing critical technologies for NASA and the commercial marketplace. For more information about these funding mechanisms, please contact Alexis Hongamen in Kennedy's IPP Office (867-3107 or Alexis.Hongamen-1@nasa.gov). ■

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

The Ins and Outs of Copyright Protection

In a continuing series of articles on intellectual property issues,* Kennedy Tech Transfer News *asked the center's patent counsel Randy Heald to give a brief overview of copyright protection.


NASA photo by Tom Farrar

Could you start by explaining what a copyright is?

A copyright is a form of intellectual property that gives the author of an original work certain exclusive rights to the work. These include the exclusive right to make copies, the exclusive right of publication, distribution, and adaptation (i.e., derivative works) for a limited period of time. Examples of copyright subject matter include papers, books, songs, and computer software.

How does a copyright differ from a patent?

Patents are granted by the U.S. Patent and Trademark Office to protect new and useful processes, machines, methods of manufacture, composition of matter, and other patentable inventions. The patent protects the inventive concept. In comparison, copyright applies to original, creative works and only protects the expression of the work (i.e., the specific words, shapes, and colors that go into the expression). The copyright, which is issued by the Library of Congress, protects the expression of an idea, whereas a patent protects the factual information conveyed by the idea.

Is the work of civil servants and government contractors copyrighted?

The rules are different for civil servants and contractors. Original works by employees of the federal government in performance of their official duties cannot receive U.S. copyright protection. However, original works created by a NASA contractor are copyrightable and owned by the contractor. NASA may allow the contractor/copyright owner to retain and assert copyright, or the agency may require assignment of copyright to NASA. But even if NASA does not require copyright assignment, contracts always are written so that NASA obtains (at a minimum) a royalty-free license to make copies of, publish, and distribute for government purposes any work created by the contractor.

How does a copyright work in the case of software?

Acquiring a copyright for contractor-developed software is essential when NASA seeks to control the commercialization and/or distribution of the software. Therefore, procurement contracts involving software development normally include a clause requiring that a copyright to software created by a contractor be assigned to NASA on request.

Why is it important for NASA to have the copyright on contractor-developed software?

Owning the copyright greatly simplifies software distribution. An outside contractor's software might need to be used by in-house contractors, which is not in and of itself a problem. But in the likely event that the software is improved on and evolves into a "derivative work," then things can get messy if NASA does not hold the copyright. That's why the clause is normally included in software-related procurement contracts—it keeps everything clean.

What about open source software?

Open source is a topic for another day. NASA is in the process of developing a policy on open source. But I will say that if you are thinking about signing an open source license for software to use as part of your NASA work, you should first contact patent counsel. Some open source license agreement terms can be problematic, so let us review it so we can avoid problems later.

What is the most important aspect of copyright for Kennedy personnel to understand?

Just because you work for the government does not mean that you have carte blanche to use other people's copyrighted material. Without permission, you cannot pull photos, songs, or software from Web sites and use them for NASA efforts or documents. The government can be required to pay damages for the unauthorized use of copyrighted works. Remember that a copyright notice need not appear on a work that is protected by copyright. If you do not know that the work is in the public domain, you should always assume that it is copyrighted. Patent counsel is available to provide guidance for any official activities of Kennedy employees. ■

For more information, contact Randy Heald (867-7214, Randall.M.Heald@nasa.gov).

Inventions and Contributions Board Awards

April 1 to September 30, 2009

To be eligible for any of these awards, innovations must have a New Technology Report (NTR) on file. For the Board Award, NASA Form 1329 also must be completed. Kennedy's IPP Office can help with the award application process. For more information, contact Kennedy's Awards Liaison Officer: Carol Dunn (867-6381; Carol.A.Dunn@nasa.gov).

Board Action Awards

Ames Angle Transfer Tool
by Kimberly Warren and Kevin Carlton

Analog Input Data Acquisition Software
by Ellen Arens†

Development of Specification Reference and Use Database to Facilitate Internal Monitoring and Assessment of Obsolete Specifications and Specification Revisions
by Lee Zook, Christopher Ray, William Yates, Charles Bennett, and Christopher Brooks (deceased)

Drive the Mars Rovers
by Donald DiMarzio

Ethernet Packet Dissector for EXPRESS Racks
by Matthew Parris†

Gaussian and Lognormal Models of Hurricane Gust Factors
by Frank Merceret†

Improved Thermal Reactivity of Hydrogen Sensing Pigments in Manufactured Polymer Composites
by Mary Whitten, Luke Roberson†, Trent Smith†, Martha Williams†, LaNetra Tate†, Janine Captain†, Cristina Berger, and Barbara Peterson

Incremental/Spiral Development Life Cycle Simulation Model for Software Development Projects
by Umanath Nayak, Carolyn Mizell†, and Charles Curley

Inline Electrical Connector Mate/Demate Pliers
by Brian Yutko†, Michael Dininny†, Gerard Moscoso†, and Adam Dokos†

ITT Cannon Connector Blade Lock R&R
by Connie MacAdam and William Kuzma

LabVIEW Driver for FLIR Photon Ethernet Module Interface
by Christopher Immer

Model and Graphic Information Converter (MAGIC)
by Wyck Hebert†

Novel Method for Measuring Air Leaks into the Vacuum Space of Large Liquid Hydrogen Tanks
by Robert Youngquist†, Stanley Starr†, and Mark Nurge†

Thermal Insulation Test Apparatus for Flat Specimens
by James Fesmire† and Stanislaw Augustynowicz

Two Stage Dilution/ Extraction Gas Sample System
by C. Arkin and Barry Meneghelli

Utilization of Desorption Electrospray Ionization (DESI) for the Selective In-Situ Detection of Hydrazine Derivatives
by Timothy Griffin† and Cristina Berger

Patent Application Awards

Development of Self-Sealing Tube Fittings for Cryogenic Applications
by Davood Moslemian, Wen Lung Chow, Lin Xiang Jia, Gregory Melton†, and Feng-Nan Lin†

Software Release Awards

Design Tool for Thermal Insulation Systems
by Jonathan Demko and James Fesmire†

Development of a Unique Software Architecture to Support the Evolution of the In Situ Resource Utilization (ISRU) Regolith and Environmental Science and Oxygen and Lunar Volatiles Extraction (RESOLVE) Engineering Breadboard Unit 2 (EBU2) Project
by Thomas Moss†, Mark Nurge†, and Stephen Perusich

GOSARS: Ground Operations Shop Aid Record System
by Michael Harris, Caryl McEndree, Antonio Rodriguez, and Michael Stackpole

Integrated Problem Reporting and Corrective Action System (iPRACA), ver. 2.00.0 release
by Mary Jo Al-Shihabi, Johathan Hart, Thuan Le, David Merchberger, Daniel Mondshein, Melody Flemming, Mark Brown, Jeffrey Noble, Shawn Pifer, and Marianne Rigolini

Kaizen Newspaper
by Scott Shearer, Mitchell Baker, Kenneth Reilly, Vijai Tiwari, and John Proferes

Lockout Tagout Tracking Utility
by Henry Wasmer

Toolkit for Enabling Adaptive Modeling and Simulation (TEAMS)
by Perakath Benjamin, Michael Graul, and Madhav Erraguntla

Tech Briefs Awards

Analog Input Data Acquisition Software
by Ellen Arens†

Group Capability Model
by Michael Olejarski, Amy Appleton, and Stephen Deltorchio

Hail Monitor Sensor Design for Shuttle Launch Safety
by Robert Youngquist†, Christopher Immer, Robert Cox, John Lane, and William Haskell

Inert Welding/Brazing Gas Filters and Dryers
by Jerry Goudy

Inline Electrical Connector Mate/Demate Pliers
by Brian Yutko†, Michael Dininny, Gerard Moscoso†, and Adam Dokos†

Insulation Test Cryostat with Lift Mechanism
by Adam Dokos†, Zoltan Nagy, James Fesmire†, Stanislaw Augustynowicz, and Brekke Coffman†

Method for Detecting Perlite Compaction in Large Cryogenic Tanks
by Robert Youngquist†

Moisture Uptake Test Apparatus and Method for Materials under Cryogenic Conditions
by Robert Breakfield†, Trent Smith†, Barry Meneghelli, James Fesmire†, Kevin Boughner†, and Kenneth Heckle

†*Civil servant*

NASA's ICB Awards

Board Action Award: An award, up to $100,000, based on such factors as the invention's significance; its stage of development; its actual use by NASA, the government, or industry; its potential for such use; and the level of creativity involved in making it

Patent Application Award: Awarded on receipt of a patent application serial number; $1,000 for a sole inventor or $500 each for multiple inventors

Software Release Award: Awarded when software is initially released by the center's Software Release Program to a qualified user for internal or external projects; $1,000 for a sole inventor or $500 each for multiple inventors

Tech Briefs Award: Awarded when an article is approved for publication in the *NASA Tech Briefs* magazine; $350 per inventor

Kennedy Tech Transfer News

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Kennedy Tech Transfer News is the semiannual magazine of the Innovative Partnerships Program Office at NASA's Kennedy Space Center in Cape Canaveral, Florida. This magazine seeks to inform and educate civil servant and contractor personnel at Kennedy about actively participating in achieving NASA's technology transfer and partnership goals. Please send suggestions or feedback to the editor.