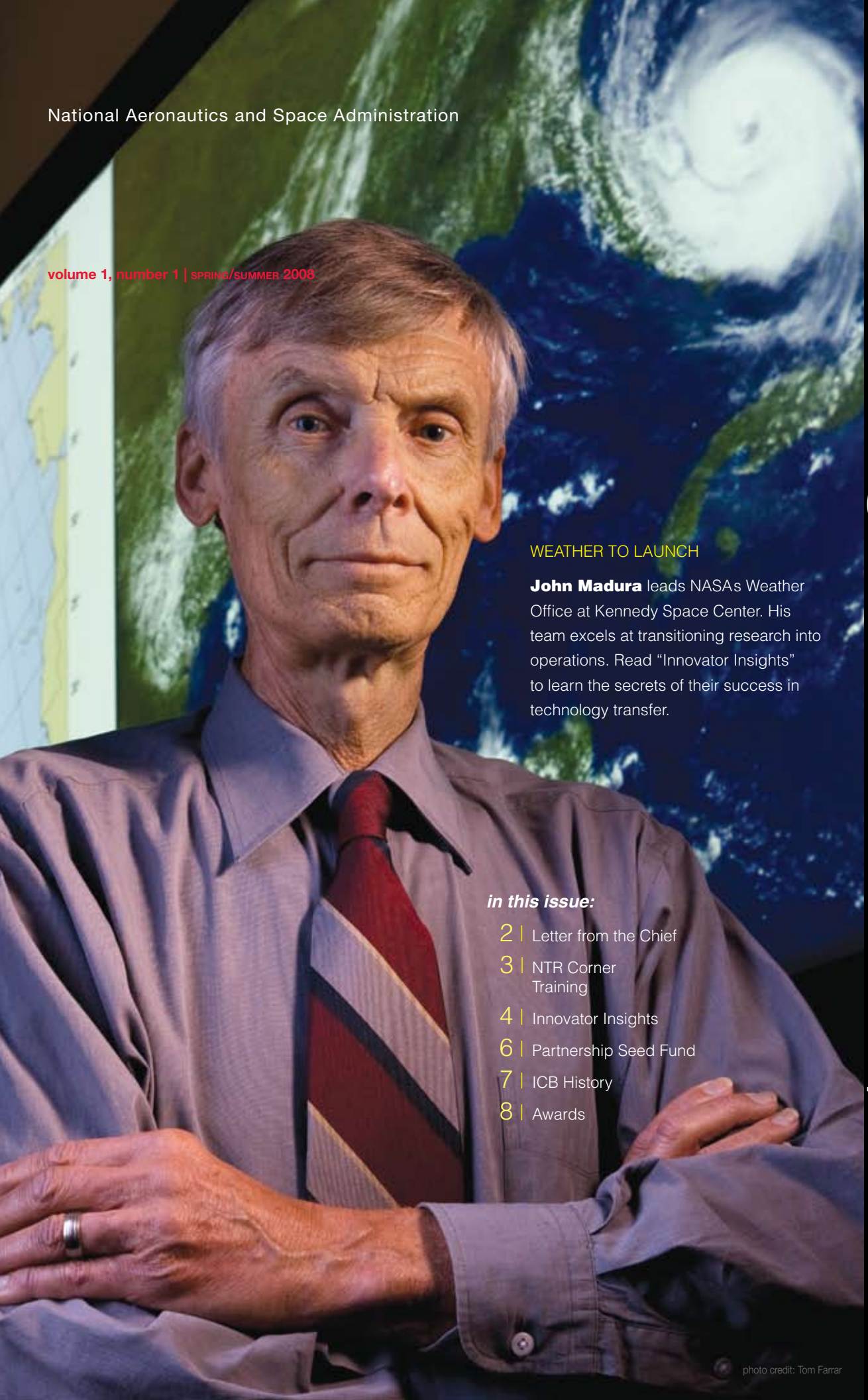
National Aeronautics and Space Administration



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tech transfer

KSC NEWS

WEATHER TO LAUNCH

John Madura leads NASAs Weather Office at Kennedy Space Center. His team excels at transitioning research into operations. Read “Innovator Insights” to learn the secrets of their success in technology transfer.

in this issue:

photo credit: Tom Farrar

Letter from the Chief

David Makufka

As NASA strives to achieve its space exploration, science, and other mission goals, developing and applying innovative technology will be essential to our success as an Agency. Through the formation of strategic technology partnerships, NASA can achieve its mission goals more effectively by combining NASA's resources with those of our partners. The Innovative Partnerships Program (IPP) fosters the development of these innovative technology partnerships among NASA, U.S. industry, academia, and other governmental organizations to benefit Agency programs and projects and to benefit the nation as a whole.

Facilitating partnerships is just one aspect of technology transfer and one of the many responsibilities of the IPP Office at KSC. Therefore, we're launching *Kennedy Tech Transfer News* to help keep you informed of the new and innovative technologies being developed at the Kennedy Space Center and to highlight the successes that KSC has had in forming partnerships, transferring technology, and winning awards for technological innovations. *Kennedy Tech Transfer News* also provides information on programs, resources and opportunities that are available to assist you in forming technology partnerships, collaborating with external partners, and benefiting from your own innovations.

Our office brokers partnerships with companies and research institutions, and we help secure NASA's intellectual property. We manage the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs for Kennedy that stimulate technological innovation in the private sector, increase the commercial application of those research results, and encourage the participation of socially and economically disadvantaged businesses. We also manage the Space Act Awards program and are the conduit into *NASA Tech Briefs* and *Spinoff* magazines.

Technology transfer is a vital part of Kennedy Space Center's mission. Your innovations and expertise are national assets that can be used not only to achieve NASA's space program goals, but also to develop new products and processes that benefit industries around the world.

Our door is open and our staff is ready to help. Let's work together for even greater success. ■

David Makufka
Chief
Innovative Partnerships Program

Jim Nichols and Pasquale Ferrari (seated). Jeff Kohler, Janice Lomness, David Makufka, Joni Richards, Jennifer Van Pelt, Lewis Parrish, and Carol Dunn (standing).

NTR Corner: SMART Software

technology title:
System Maintenance Automated Repair Tasks

inventors: **Joseph Schuh, Nadean King, Elkin Norena, Brent Mitchell, Louis Locklear, Martin Belson, Mary Jo Al-Shihabi**, and **Derek Hardin**

case no.:
KSC-12909

From left to right: Louis Locklear, Nadean King, Elkin Norena, Brent Mitchell, Derek Hardin, Mary Jo Al-Shihabi, and Joseph Schuh. Not pictured: Martin Belson.

Photo credit: Regina Mitchell-Ryall

What it is: Originally developed specifically for spacecraft, this interactive decision analysis software system allows for uniform evaluation and repair of discrepancies. SMART captures the thought processes and tacit knowledge involved in decision analysis and provides the data and repair information in a user-friendly automated system.

What makes it better: SMART improves the technical accuracy, safety and timely delivery of repair procedures for a given discrepancy. Unlike existing manual systems, which are time-consuming, difficult to update, and subject to typos, transpositions, and personal preferences, and do not always render consistent outputs, SMART minimizes many types of errors and creates a knowledge base of uniform engineering repair processes.

How it might be used: Flexibly designed, SMART can be used by various engineering groups and work authorization and disposition platforms. The software can easily be tailored to the individual system's needs by the users. SMART has successfully captured the interconnecting hardware corporate knowledge of the Orbiter Electrical Engineering (OEL) group and is the first tool developed that links the hardware specification requirements with the actual "how to" repair methods, sequences, and equipment.

Tech transfer status: Nonprovisional patent application filed; license under negotiation. ■

training

Register now for the July 14th training session
Introduction to NASA Technology Transfer

Monday, July 14 • 9 a.m. to 11:30 a.m. or 1:30 p.m. to 4 p.m.

Technology transfer benefits you as well as NASA. This overview course teaches civil servants and contractors the ins and outs of technology transfer, including Kennedy-specific practices. You will learn how to work with Kennedy's Innovative Partnerships Program Office, understand the various mechanisms used to partner with organizations, and identify factors that accelerate the transfer of technology.

Offered in the KLI Building. Choose morning or afternoon session. For details, please call Carol Dunn at (321) 867-6384. To register, visit https://satern.nasa.gov. Registration is on a first-come, first-served basis. ■

KSC Weather Office

The only forecasting the Weather Office does is to predict continued success in transitioning research into operations. John Madura, M.S.; Frank Merceret, Ph.D.; and Jennifer Ward, M.S., share the secrets of their success in technology transition.

From left to right: Joe Barrett, Frank Merceret (seated), Bill Bauman, Winnie Crawford, and Leela Watson.

What does the Weather Office do?

Let's start with what we don't do: We don't forecast weather; we don't make go/no-go calls at launch countdowns.

At the Weather Office, we help engineers and operators design requirements that make sense, and we make sure those requirements are correctly and effectively communicated to people responsible for meeting them. We have Agency-wide responsibility for operational weather support for launches and landings of NASA manned spacecraft and launches of NASA expendable launch vehicles. We ensure that all engineering studies, design proposals, anomaly analyses, and ground processing and launch commit criteria properly consider atmospheric impacts. We also coordinate all weather research and development funded through Kennedy Space Center, including on- and off-site contractors, universities, and private corporations.

The Weather Office was established in the late 1980s after studies showed that 50 percent of all launch scrubs were due to weather. Our office coordinates all of the weather research and puts it into operations. John Madura manages the office. He is a meteorologist, formerly the Commander of the Air Force's 45th Weather Squadron. Frank Merceret, an atmospheric physicist, came in to lead the Applied Meteorology Unit (AMU) when it was created in 1991. Jennifer Ward joined in 2001 and is becoming our lightning sensor expert. The three of us, along with our civilian contractors, form the Weather Office team.

Storm clouds blanket the sky over the Vehicle Assembly Building and Launch Control Center. Half of all launch scrubs are due to weather, and lightning is a big contributor.

What is the AMU and how does it work?

The AMU develops and evaluates weather technology and then transitions it into operations. The unit is operated by one of our contractors and managed by the KSC Weather Office. The AMU has a reputation for producing high-value products on time and on budget. Before the AMU was created, researchers would develop something and throw it over the fence to the operators, and it might take two Ph.D.s and an engineer to make it work. Because the operators didn't have the time or expertise to make the technology work, the innovations weren't being used. We needed a way to transition technology from the lab to the shop floor and get it working. That's what the AMU does.

How do you measure your success?

Our processes have been showcased in the Navy's database of Best Manufacturing Practices, and our work is frequently published in peer-reviewed journals. We have received awards from NASA and the National Weather Association for sustained excellence in transitioning technology to operations. Most important, what we have developed is being used on the operations floor.

From left to right: Jennifer Ward, John Madura, and Frank Merceret

You've been strikingly successful in transitioning innovations to operations. How do you do it?

We have a structure in place to give our customers what they want. NASA, the Air Force, and the National Weather Service (a key player in the Shuttle landing forecasts done by the Spaceflight Meteorology Group in Houston) negotiated a tri-Agency agreement, and all three are involved in managing the AMU. Technology transition is a cooperative effort of all the stakeholders.

The people who will use our products submit proposals on how they would like to employ our resources. Once a year, we meet face-to-face with them to prioritize the proposals and come up with the projects that will do the most people the most good.

What makes your approach work so well?

Two things. First, we are co-located with our customers. The Air Force provides space, utilities and equipment for the AMU next door to the Range Weather Operations forecasters. There can be a cultural gap between scientists and operational forecasters. Sometimes it's as if they speak different languages. Having daily face-to-face access to one another, knowing each other's abilities and limitations, breaks down communication barriers. We know each other personally and professionally. With daily contact, we can make small corrections along the way. Having that human basis to form our relationship is a better way to build our team.

Second, we continuously involve our customers in the planning and execution of our work. This includes quarterly detailed technical reports on the progress of each task, followed by a teleconference to discuss the reports with all the stakeholders.

How does the IPP Office help?

For divisions that don't have the close relationships with their customers that the Weather Office has, the IPP Office can be an intermediary between what the customer needs and what the researchers produce. Building those relationships is a process that can be taught, and the IPP Office is ideal for that.

We use the IPP office to submit information for the Space Act Awards. We want to recognize the people who do good work. IPP also makes sure that information about our products is sent along to *NASA Tech Briefs*.

The IPP Office has been very helpful in setting up research partnerships. Although most of our technology transition is handled through the AMU, the KSC Weather Office supports a significant amount of research through other organizations, such as universities, other government agencies and the private sector. We see the IPP Office as a facilitator to put us in contact with resources. For instance, IPP connected us to a doctoral student at Florida State University researching lightning cessation. At our Center, people are outside hauling toxins and explosives, moving expensive hardware, operating cranes, lifting payloads, and maintaining facilities. We can't expose that operation to lightning. One of our biggest problems is determining when to shut down operations if lightning is expected and when it is safe to resume work. If we issue false alarms or keep the warnings out too long, it can cost millions of dollars in idled manpower.

Any advice for your colleagues?

Communicate with your customer. Maximize your resources through partnerships. Make use of the IPP Office's help. ■

KENNEDY SPACE CENTER, FLA., August 30, 1983—A powerful electrical storm created an eerie tapestry of light near Space Shuttle Launch Complex 39-A in the hours preceding the launch of STS-8 at 2:32 a.m. that day. The driving rains and dazzling lightning display ceased after this photo graph was taken by Sam Walton of United Press International, and the launch proceeded.

IPP Partnership Seed Fund

For the past two years, the IPP at NASA Headquarters has used the Partnership Seed Fund to address barriers and initiate cost-shared, joint-development partnerships. These partnerships are designed to increase the range of technology solutions available to NASA, broaden NASA's technology portfolio, improve cost avoidance, accelerate development and maturation of technologies, and create a larger pool of qualified commercial providers.

IPP's Seed Fund provides "bridge funding" that enables larger partnership and development efforts. It also encourages the leveraging of funding, resources, and expertise from the non-NASA partners as well as NASA programs, projects, and Centers. For example, the 2007 Seed Fund projects based at KSC (see table below) are pooling together $6.2 million in funding. More than 20%—$1.4 million—was provided by IPP's Seed Fund, while the non-NASA partners chipped in $1.7 million. The other half ($3.1 million) came from NASA programs.

KSC's IPP Office coordinates and advises the proposal efforts for Seed Fund projects, and partners can include government agencies, small and large businesses, universities, and other NASA Centers. More information about the next Partnership Seed Fund is scheduled to appear in the Fall/Winter issue of *Kennedy Tech Transfer News*. Or contact Janice Lomness, Innovative Partnerships Manager (867-1539; Janice.K.Lomness@nasa.gov). ■

Partner	Technology/Focus	Project Goals/Benefits
DEM Solutions	Electrodynamic and mechanical forces to DEM software	Simulate granular materials, from dust to gravel, to reduce field testing.
Hawaii Office of Aerospace Development and University of Hawaii	Lunar analog field demonstration of exploration technologies	Field test ETDP, ISRU and HRS technologies at a realistic lunar-analog site to reduce mission risk, cost and time.
PPG Industries and University of Texas Health Science Center	Rapid assessment of a smart, environmentally friendly coating	Select and develop materials that release corrosion-inhibitors on demand to prevent corrosion at launch pads.
Sierra Lobo Inc.	Liquid to gaseous helium pump skid	Develop and test a high-pressure liquid helium pump to replace aging helium tube bank trailers.
United Launch Alliance	Deployable sun shield	Create a device to support extended cryogenic storage, saving time and money, as well as to accelerate development of space-based deployable structures.

2006 Seed Fund Success

Although IPP's Partnership Seed Fund program is a relatively new initiative, it is already demonstrating its value to NASA. For example, a 2006 project involving KSC and Sierra Lobo is contributing to the Lunar Lander and Earth Departure Stage vehicles and may be used by the Ares I program.

NASA contractor Sierra Lobo had invented Cryo-Tracker® as a high-tech "gas gauge" for cryogenic fluids. Its mass gauging system (MGS) accurately measures cryogenic liquid mass and temperature in tanks that are more than 60 feet tall. However, to be applied to NASA programs, this technology required testing for flight readiness.

IPP's Seed Fund provided the opportunity to develop Flight System Verification Plans for each of the major units of the Cryo-Tracker MGS. In addition, the partnership enabled thermal modeling for the sensing element as well as progress in converting the electronics to flight avionics.

Watch future issues of *Kennedy Tech Transfer News* for more about how IPP partnerships add value to NASA. ■

ICB History

NASA's Inventions and Contributions Board (ICB) and Space Act Awards Program are practically unknown outside of NASA's scientific community. Yet their history is a microcosm of NASA's own history and extensive technological achievement. The ICB reviews waivers of title to inventions by NASA contractors and gives monetary awards. Created by the Space Act of 1958, the ICB is an innovative and historical concept that has chronicled NASA's challenges and innovation.

As a senator, former President Johnson drafted the National Aeronautical Space Act of 1958 establishing NASA. As vice president, he chaired the National Aeronautics and Space Council. As president, he renamed LOC and Station No. 1 of the Atlantic Missile Range the John F. Kennedy Space Center.

A visionary Congress recognized that if NASA was to achieve it chartered purpose, "the preservation of the role of the United States as a leader in aeronautical and space science and technology," then incentives must be given to the agency's scientists, engineers, and technologists to create technologies needed by the fledgling space program. Today, these contributors are honored with awards for (1) innovations reported in *NASA Tech Briefs* ($350 per author), (2) software approved for release ($1,000 for a sole author, $500 each for multiple authors), or (3) inventions that have been approved for patent applications ($1,000 for a sole inventor, $500 each for multiple inventors). In addition to these more "automatic" awards, the ICB recognizes significant scientific and technical contributions with Space Act Awards. These "Board Action" awards can range up to $100,000. (For more on ICB awards, see page 8.)

The latest ICB annual report highlights the Robot Cable-Compliant Device that Enduro has developed into a walker called the Secure Ambulation Module used to help injured soldiers at the Walter Reed Medical Center. That same device was used in space in NASA Space Technology 5 Mission, which measures the magnetosphere and demonstrates miniaturized technology for future nano-satellitwe constellation missions.

Each of NASA's 10 centers has become a part of the history documenting the technological achievements of NASA's past and paving the way for the future. The ICB acts as a repository of NASA's valuable technologies, which continue to have a tremendous impact on the U.S. economy. The 2003 ICB annual report estimated that the extraordinary impact of just a few of these cases on the U.S. economy and world commerce was documented at over $200 billion, and the aggregate of all 98,000 awards granted in the board's 50-year existence is conservatively estimated to have contributed over half a trillion dollars in wealth to the economy with technology that will change how we work and live.

At a recent Space Act Awards Luncheon honoring inventors at the Kennedy Space Center, ICB director Tony Maturo reiterated the importance of the inventors: "You are really the fiber that makes NASA what it is today and what it will be tomorrow." ■

Q&A

Q: Eureka! I've invented something. Now what do I do?

A: File a New Technology Report (NTR) using the online eNTRe system (http://entre.nasa.gov).

- Reporting new technologies is ***required*** of NASA civil servants under NASA Policy Directive 2091.A and by contractors through their contractual agreements.
- It is important that you file the required NTR forms before publishing or presenting your results publicly. Premature public disclosure can compromise NASA's position in terms of patenting your invention.
- An NTR is required to make your technology eligible for awards.
- If you need assistance in completing the NTR, contact Kennedy's Innovative Partnerships Program Office (Technology.Transfer@ksc.nasa.gov).

awards

Tech Transfer Awards

October 1, 2007, to March 31, 2008

†Contractor

Board Action: 7

Clamshell Sleeving Cutter by James Hart†

Smart Sensor Architecture in Support of Intelligent System Health Management by Carlos Mata†, Angel Lucena, Rebecca Oostdyk†, Jose Perotti

Self-Validating Thermocouple by Carlos Mata†, Peter Vokrot†, Jose Perotti, Carlos Zavala†, Bradley Burns†, and Josephine Santiago

Monte Carlo Simulation to Estimate the Likelihood of Direct Lightning Strikes by Carlos Mata† and Pedro Medelius†

Electrostatic Precipitator that Operates in Pure GN2 Environments by Charles Buhler†, Carlos Calle, Mindy Ritz†, Robert Cox†, and Sid Clements†

Volume-Averaged Height Integrated Radar Reflectivity by Monte Bateman†, James Dye†, E. Krider†, Sharon Lewis†, Douglas Mach†, John Madura, Michael McAleenan†, Todd McNamara†, Frank Merceret, Johnny Weems†, John Willett†, Ann Koons†, Dennis Boccippio, and Hugh Christian

Automated Metrology Processes by Jeffrey Cheatham†

Patent Application: 3

Communicating System with Adaptive Noise Suppression by David Kozel†, Richard Birr†, and James Devault

Corrosion Prevention of Cold Rolled Steel Using Water Dispersible Lignosulfonic Acid Doped Polyaniline by Tito Viswanathan†

Improved Thermal Reactivity of Hydrogen Sensing Pigments in Manufactured Polymer Composites by Luke Roberson, Trent Smith, Martha Williams, LaNetra Tate, and Janine Captain

Software Release: 7

Change Management Express by George Berry†, Joanne Breen†, Gail Fischer†, Charles Harnden†, Patricia Karpinski†, and Claudia Mears†

Action Management Express by George Berry†, Charles Harnden†, Patricia Karpinski†, and Claudia Mears†

LabVIEW Vision Development Module Region of Interest Selection Tool by Christopher Immer†

Microwave Scanning Beam Landing System Near Field Signal Processor by Stephen Simmons† and Marshall Scott Jr.†

Personal Computer Ground Operations Aerospace Language 2 by Brian Bateman†, Jason Kapusta†, Melvin Ayala†, Dana Sorensen†, Michael Popovich†, and James Mikell†

CaTS—A Carrier Tracking System by David Ben-Arieh† and Kyle Grabill†

Web-based Change Request Management by John O'Brien†

Tech Brief: 6

Hydrogen Peroxide Concentrator by Clyde Parrish

Time Domain Reflectometry Using a Time-Varying Pulse Width by Angel Lucena, Pedro Medelius†, Pamela Mullinex, Carlos Mata†, PoTien Huang, Carlos Zavala†, Josephine Santiago, and John Lane†

Core Technical Capability Laboratory Management System by Linda Shaykhian, Curtis Dugger, and Laurie Griffin

Auto-Generated Semantic Processing Services by Rodney Davis† and Greg Hupf†

Exploration Systems Mission Directorate Distributed Observer Network by Michael Conroy, Rebecca Mazzone, William Little, David Mann†, Priscilla Elfrey, Kevin Mabiev†, Thomas Cuddy†, Mario Loundermon†, Stephen Spiker†, Don Whiteside†, Frank McArthur†, Tate Srey†, and Dennis Bonilla†

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

Kennedy Tech Transfer News

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Kennedy Tech Transfer News is the semiannual magazine of the Innovative Partnerships Program Office at NASA 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 goals:

- Filing required New Technology Reports on eNTRe (http://entre.nasa.gov)
- Pursuing partnerships to accelerate R&D
- Finding new applications for space-program technology
- Identifying innovative funding sources
- Communicating partnership opportunities via conferences, workshops, papers, presentations, and other outreach efforts
- Seeking recognition by applying for technology-related awards

Please send suggestions or feedback about Kennedy Tech Transfer News to the editor.

ICB Awards

Many awards are available to NASA researchers, as managed by the Inventions and Contributions Board (ICB):

- Space Act Board Awards are bestowed for technologies with significant scientific and technical contributions. ***Value:*** Up to $100,000
- Patent Application Awards recognize the filing of a full (i.e., nonprovisional) patent application. ***Value:*** $500 (more than one inventor) or $1,000 (sole inventor)
- Software Release Awards are given when a software program has been approved for some form of public release. ***Value:*** $500 (more than one inventor) or $1,000 (sole inventor)
- Tech Brief Awards are given for technologies approved for publication in *NASA Tech Briefs*. ***Value:*** $350

To be eligible for any of these awards, innovations must have a New Technology Report on file. For the Space Act Board Award, NASA Form 1329 also must be completed.

IPPO can help with the award application process. For more information, contact the Award Liaison Officer: Carol Dunn (867-6381; carol.a.dunn@nasa.gov).