National Aeronautics and Space Administration

From Concept to Reality

[ACCOMPLISHMENTS REPORT 2012]

Goddard Space Flight Center's Innovative Partnerships Program Office

From Concept to Reality

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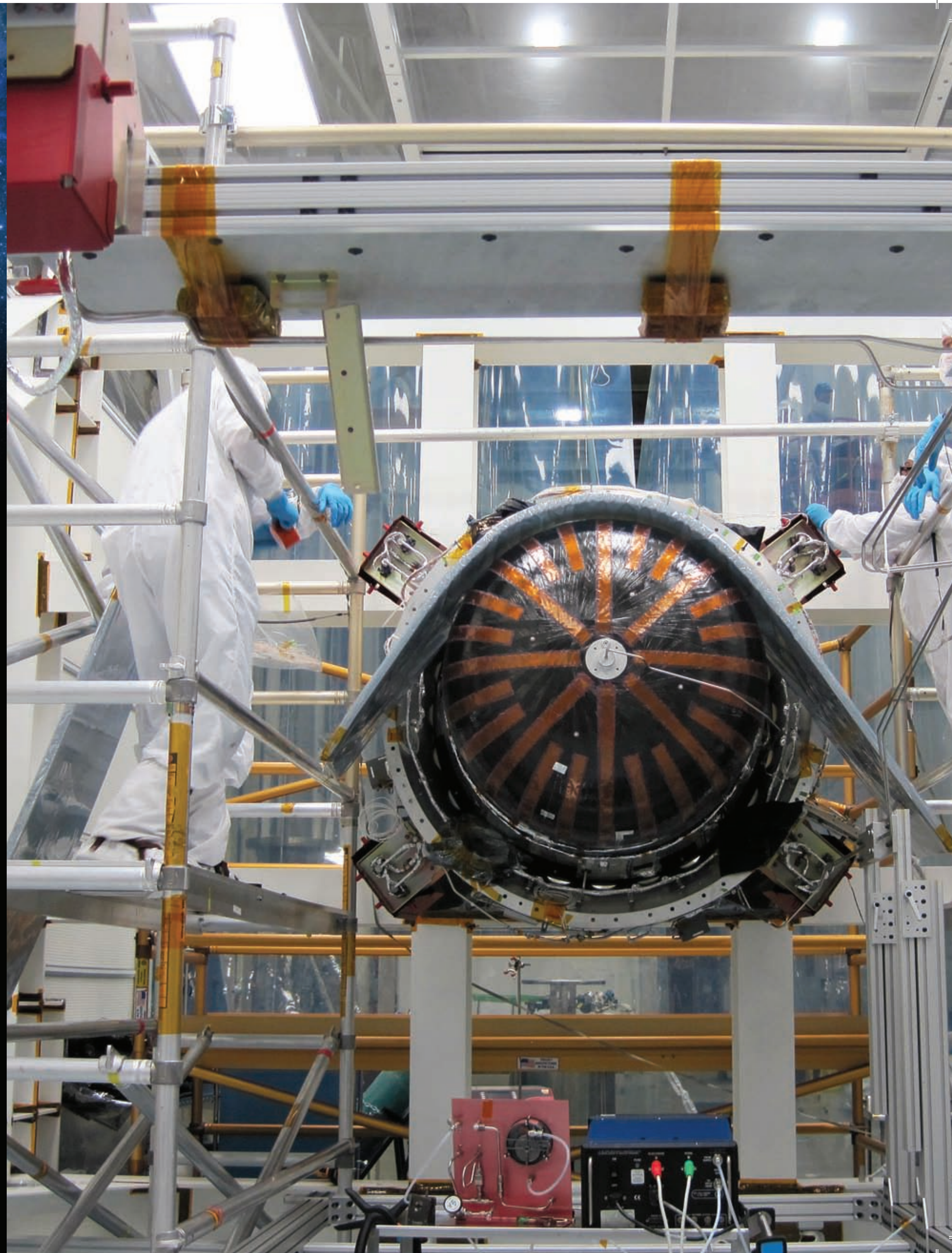
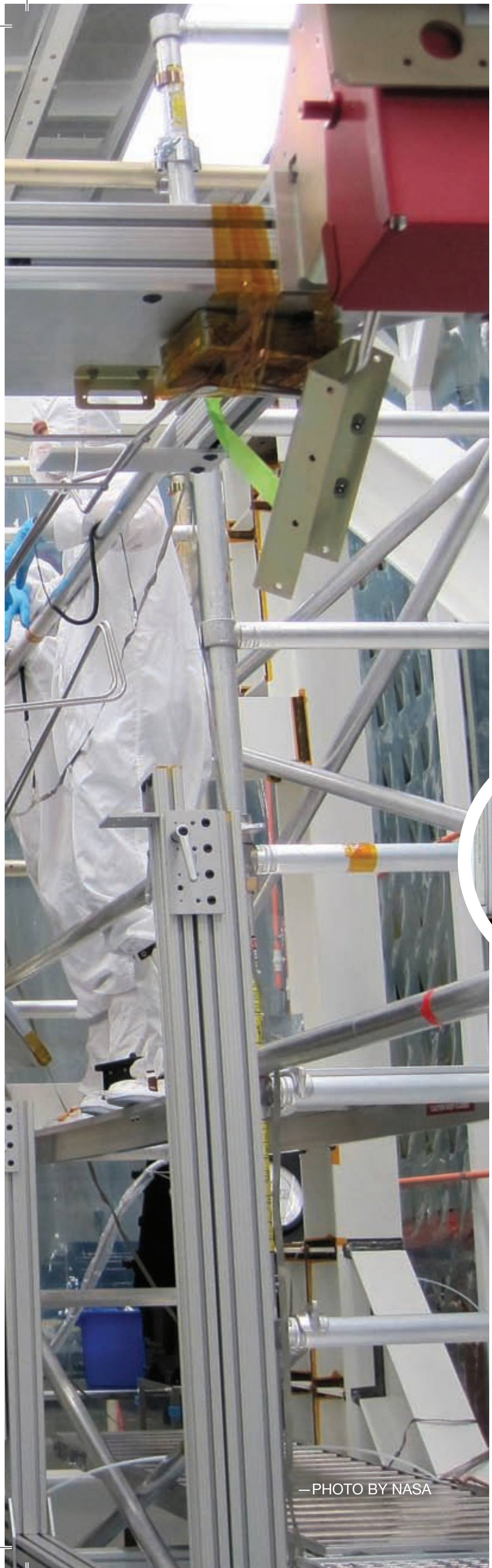




—PHOTO BY NASA

FROM THE CHIEF

Nona Minnifield Cheeks
CHIEF

Innovative Patnerships
Program Office
NASA Goddard Space
Flight Center

It's time once again to review the major accomplishments and milestones of the past year. And 2012 was an especially noteworthy one for both NASA Goddard and the Innovative Partnerships Program Office (IPPO).

Few missions in recent memory have fired the public's imagination as the Curiosity rover on Mars, which touched down on the Red Planet on August 6, 2012. A key component of the mission is the Sample Analysis at Mars (SAM) instrument package, developed at NASA Goddard. SAM has already made many scientific discoveries, and will continue to explore the Martian surface for years to come. At the same time, many technologies and innovations developed to support the SAM mission are now being made available to solve problems back here on Earth.

Another major news story in 2012 involved Hurricane Sandy. This highly unusual and destructive "superstorm" significantly increased awareness of global warming and how it will likely affect the world's weather. A critical resource for climatologists researching this issue is the vast store of Earth Science data collected by NASA missions during the past two decades. NASA Goddard continues to make this data readily accessible to scientists and commercial interests, who use it for applications in agriculture, forestry, fire detection, volcano monitoring, and many others. This data is also being presented to the general public through visualization technologies such as Hyperwall and Science on a Sphere.

The focus on the environment is also driving interest in "greener" technologies that are safer, more sustainable, and have less ecological impact. As part of this effort, NASA Goddard is developing propulsion systems based on propellant that is potentially far cheaper and less hazardous than traditional chemicals such as hydrazine. This work will likely be of high interest to the developing commercial space flight sector. It also offers significant value to other industries where environmental sensitivity is essential.

Throughout 2012 the IPPO led efforts to make these and all other NASA Goddard technologies available to other entities developing applications that can help solve many of society's most pressing needs. We also continue to explore collaborations and opportunities, bringing in technologies and capabilities of vital importance to future NASA Goddard missions and goals. In this 2012 Accomplishments Report, we briefly review some of the technology transfer highlights of the past 12 months. Along the way, we examine a few of the many examples in which public investment in space science continues to provide value in a broad spectrum of terrestrial applications and markets.

OVERVIEW 2012

In this *2012 Accomplishments Report* we review the major technology transfer related events and accomplishments of the past 12 months. We focus on four areas in which NASA Goddard has developed technologies that can be especially useful for terrestrial applications, including:

- **Sample Analysis at Mars (SAM)** is a suite of three instruments onboard the Curiosity rover on Mars. SAM is designed to chemically analyze Martian air and soil. SAM's components comprise a number of NASA Goddard technologies that potentially could be adapted to a wide variety of commercial applications.

- **Visualization** includes Hyperwall and Science on a Sphere, two systems that display Earth Science data in ways that are both easily understandable by the layperson and highly entertaining and compelling. In this section we also briefly review how NASA Goddard makes this Earth Science data available to outside entities including government, academic researchers, and commercial interests. This data is then used for a broad (and growing) spectrum of important applications.

- **Green propulsion** encompasses NASA Goddard initiatives to develop in-space propulsion technologies that do not rely on traditional highly hazardous propellants such as hydrazine. Related projects include a fuel tank designed to break up harmlessly upon re-entry, and a cleaning system that requires no chemical additives.

- **Integrated Design Center (IDC)** provides a collaborative environment and facility for study sessions designed to define the parameters of potential NASA Goddard missions. This process helps guide decisions concerning which NASA work is appropriate for NASA Goddard. It also has potential value for commercial interests.

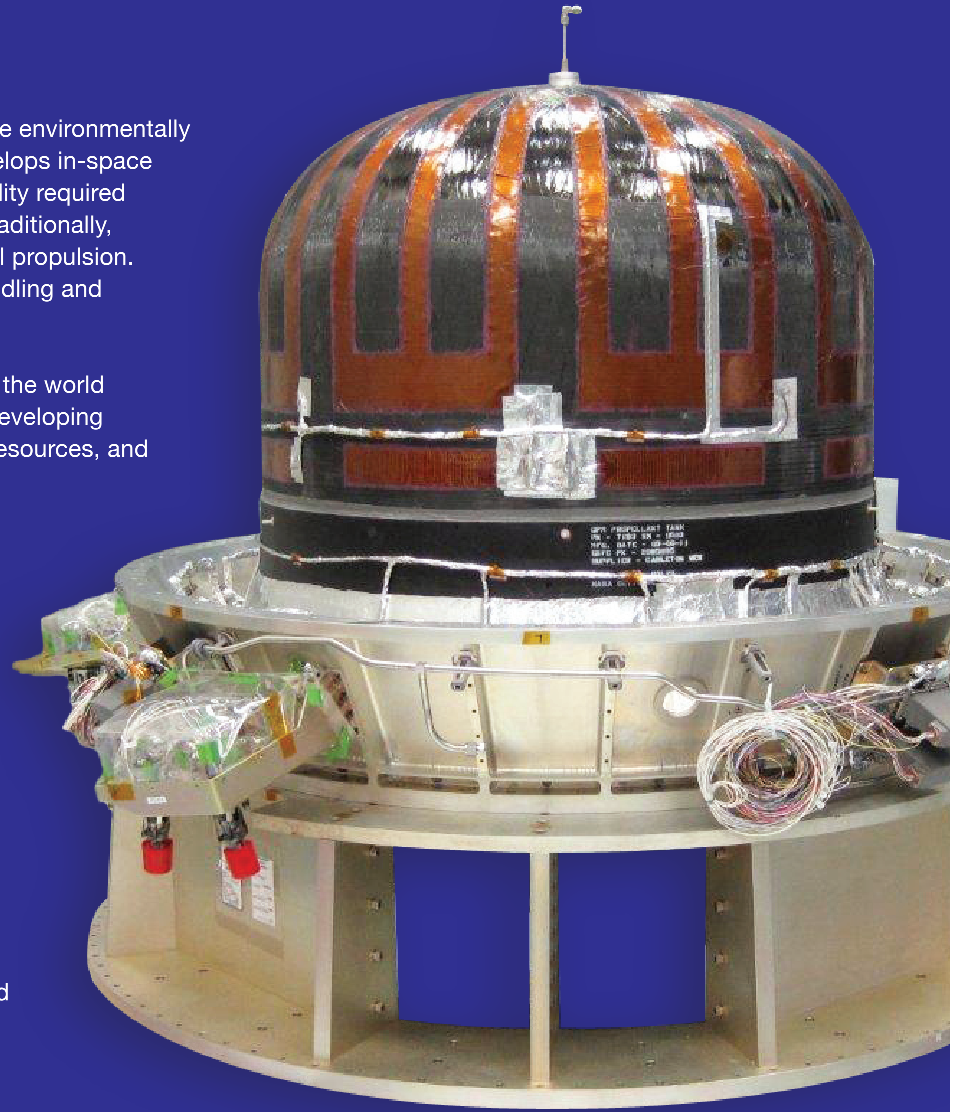
The *2012 Accomplishments Report* also reviews technology transfer events and initiatives attended by the Innovative Partnerships Program Office. We also list patenting and technology reporting associated with NASA Goddard scientists and innovators.

GREENER PROPULSION SYSTEMS

GPS

The year 2012 witnessed continued interest in the development of more environmentally sensitive propulsion systems. The NASA Goddard Propulsion Branch develops in-space systems that provide NASA missions with the high-precision maneuverability required for tasks such as positioning, alignment, and interplanetary navigation. Traditionally, hydrazine and hydrazine derivatives have been used for in-space chemical propulsion. These substances are highly toxic and dangerous, and require special handling and storage to ensure the safety of humans and the environment.

NASA Goddard is joining other NASA centers and space agencies around the world in seeking less hazardous alternatives to hydrazine. We are also actively developing propulsion systems based on technologies that are safer, use renewable resources, and have less overall impact on the environment.



These "greener" propulsion systems offer two very important benefits. First (and perhaps most obvious) there's the ecological advantages. But a critical additional factor is economic. Most experts agree that Earth's increasingly scarce natural resources, such as petroleum and natural gas, will grow more expensive in the future as their supplies dwindle. Renewable substitutes, on the other hand, should always remain available and abundant if properly and intelligently managed. And as hazardous materials are replaced with greener alternatives, there will be reduced downstream costs in terms of special handling, transportation, and disposal.

In this section, we present a general summary of the green propulsion efforts in which NASA Goddard has been involved in 2012. This includes participation in this year's Space Propulsion 2012 Conference held in Bordeaux, France. We also look at NASA Goddard technologies developed with greener propulsion systems in mind. A number of these technologies also offer potential value in several commercial applications.

NASA Goddard and Greener Propulsion Technologies

Throughout 2012, the NASA Goddard Propulsion Branch continued its aggressive development of new and greener alternatives to current in-space propulsion technologies and processes. This includes replacing hydrazine as a propellant, and developing a cleaning system that uses nitrogen bubbles created through gas agitation. In addition, NASA Goddard participated in the Space Propulsion 2012 Conference held in Bordeaux, France, to share information with sister space agencies around the globe.

2012 Space Propulsion Conference

The Space Propulsion 2012 Conference was held in Bordeaux, France on May 7 through 10. This event, organized by the Association Aéronautique et Astronautique de France in collaboration with ESA and CNES, is intended to "highlight programmatic and technical issues, to promote exchange of views and information in the two main areas of propulsion for spacecraft and for space transportation."

Representatives from NASA Goddard's Innovative Partnerships Program Office (IPPO) attended the Conference to participate in the NASA exhibit, engage interest in new NASA Goddard technologies related to advanced propulsion systems, and meet with members of the space propulsion industry.

The primary goals were to:

- Learn more about new propellants and propellant systems for space.
- Share ideas about applying current and new propellants to in-space propulsion for near and far term requirements.
- Encourage interest among other attendees to consider collaborating with NASA Goddard to advance the state-of-the-art of propulsion technologies.
- Promote the license of NASA Goddard component technologies that support space propulsion systems.

The Conference provided an excellent opportunity for attendees to learn first-hand about new trends in space technology requirements. Sessions focused on regulations and priorities for new propulsion materials and ancillary technologies; this promoted discussion about strategies for adapting a broader array of propellants to respective space programs. Key topics for these discussions included propellants for on-orbit missions and corresponding hardware systems, and structuring government and industry partnerships to validate new technologies.

There was widespread interest in NASA's position on and plans for alternative propulsion systems. Attendees frequently expressed the desire to meet with front line NASA technical personnel and decision makers about these technologies, strategies, and policies.

NASA Goddard's IPPO also promoted NASA Goddard intellectual property, such as the nitinol valve, for licensing and further development via partnering. This resulted in prospective licenses and possibly new agreements with several industry organizations.

Developing "Greener" Propulsion System Technologies

This past year saw the NASA Goddard Propulsion Branch focus on propulsion systems that have less detrimental impact on Earth's ecosystem. Three examples of related technologies include reducing NASA's reliance on hydrazine as a propellant, developing a fuel tank that breaks up in the Earth's atmosphere upon entry, and reducing the use of alcohol as a cleaning agent.

Replacing Hydrazine Propellant

The NASA Goddard Propulsion Branch continues to explore alternatives to hydrazine as a propellant. Although consistent and effective in terms of performance and reliability, hydrazine and its derivatives are highly toxic and require strict procedures for shipping, handling, and disposal. In addition to safety and environmental issues, the special preparations required for working with hydrazine can add significant time and difficulty to the development of a new propulsion system. These procedures can also be expensive.

A propellant that can replace hydrazine could also be of value in business markets such as the commercial satellite industry or aircraft escape systems. It may also have utility in non-propellant applications such as auxiliary power units.

"Demiseable" Fuel Tank GSC-16525-1

In an effort to reduce the amount of space debris that returns to Earth after a satellite has completed its mission, the NASA Goddard Propulsion Branch developed the so-called "demiseable" hydrazine fuel tank. Initially created for the Global Precipitation Measurement (GPM) mission, this system is the first fuel tank designed to break up harmlessly upon re-entry. This removes the hydrazine tank (which typically accounts for up to 20% of spacecraft debris) from the list of surviving items that must be accounted for when designing demiseable spacecraft.

In addition to its reduced environmental impact, a demiseable spacecraft can be lighter than traditional craft, which allows engineers to devote more mass to the payload. Such a spacecraft can also provide a mission with a longer lifetime, with more propellant dedicated to maneuvering.

Commercial spacecraft vendors producing low earth orbiting spacecraft will likely be interested in this demiseable tank technology, as will other government agencies and organizations that fly Earth observing and similar missions.

Green Precision Cleaning System GSC-16555-1

The effort to develop greener propulsion systems extends beyond finding alternatives to hydrazine. It also includes examining NASA Goddard Propulsion Branch processes, and looking for ways to do things in a more environmentally conscious way. For example, a comprehensive review of NASA Goddard Propulsion Branch methods revealed that the group routinely used high volumes of alcohol as a cleaning agent, including over 1000 gallons for one single mission. Not only did this present an environmental issue; it also resulted in considerable expense to NASA Goddard due to alcohol's cost to procure and its strict disposal requirements.

In response to these findings, the NASA Goddard Propulsion Branch decided to reduce their use of alcohol as a cleaning agent by developing a novel cleaning system based on cavitation bubbles, creating nitrogen bubbles within water through a process called gas agitation. By combining the use of both water and pressurized gas, the cleaning system creates a gas agitation effect in which the pulsing water and gas bubbles "scrub" the inside surfaces of equipment such as tubing more thoroughly than water alone.

IPP OFFICE BIO

Romae Young

Technology Partnership Strategist

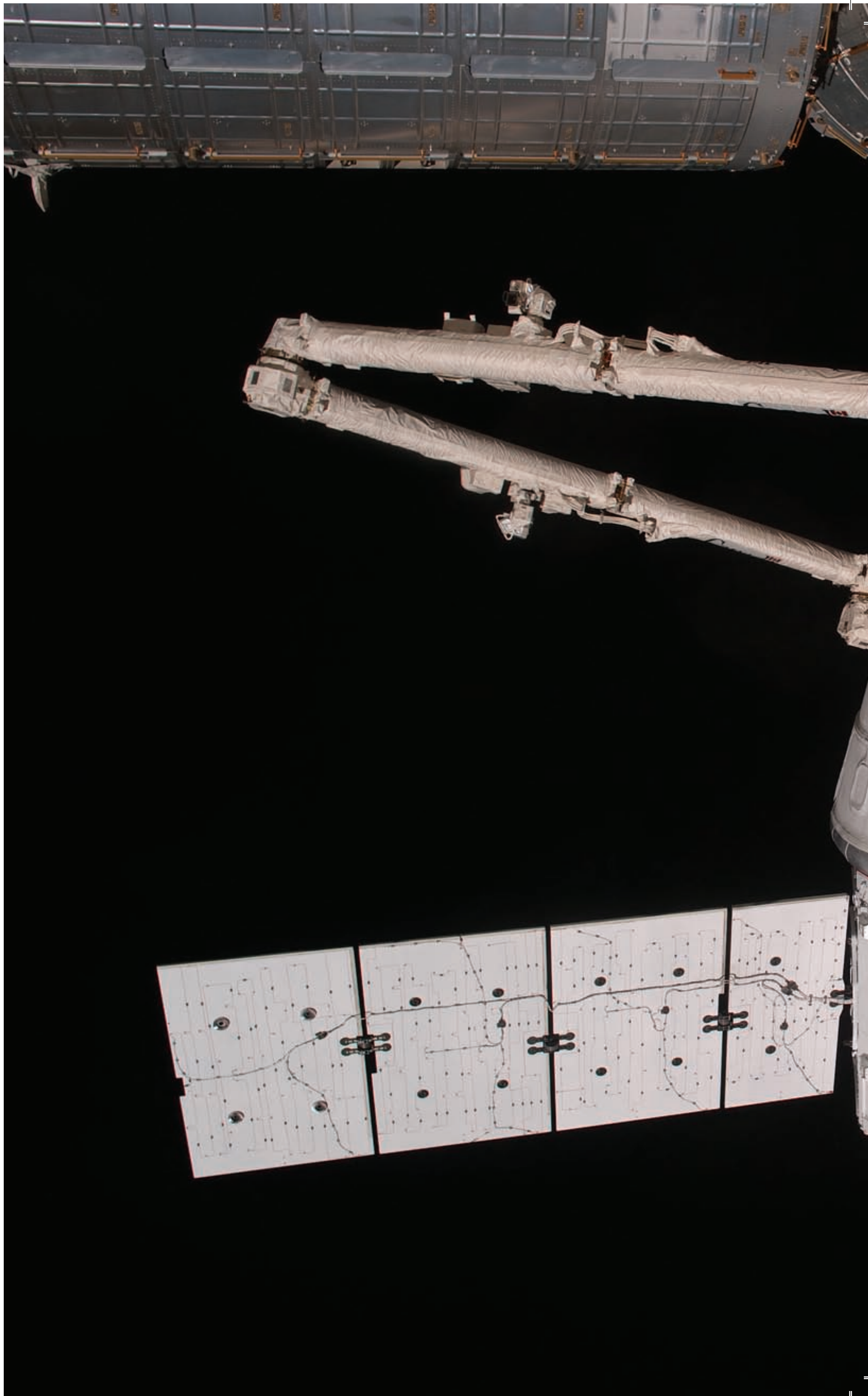
I have had the good fortune to have worked at both NASA and the Department of Defense. My interest is to explore partnership opportunities with other government agencies. The first step is to communicate with other government agencies the expansive development work being done at NASA Goddard in areas such as nanotechnology, materials, electronics, sensors, and cross-cutting technologies.

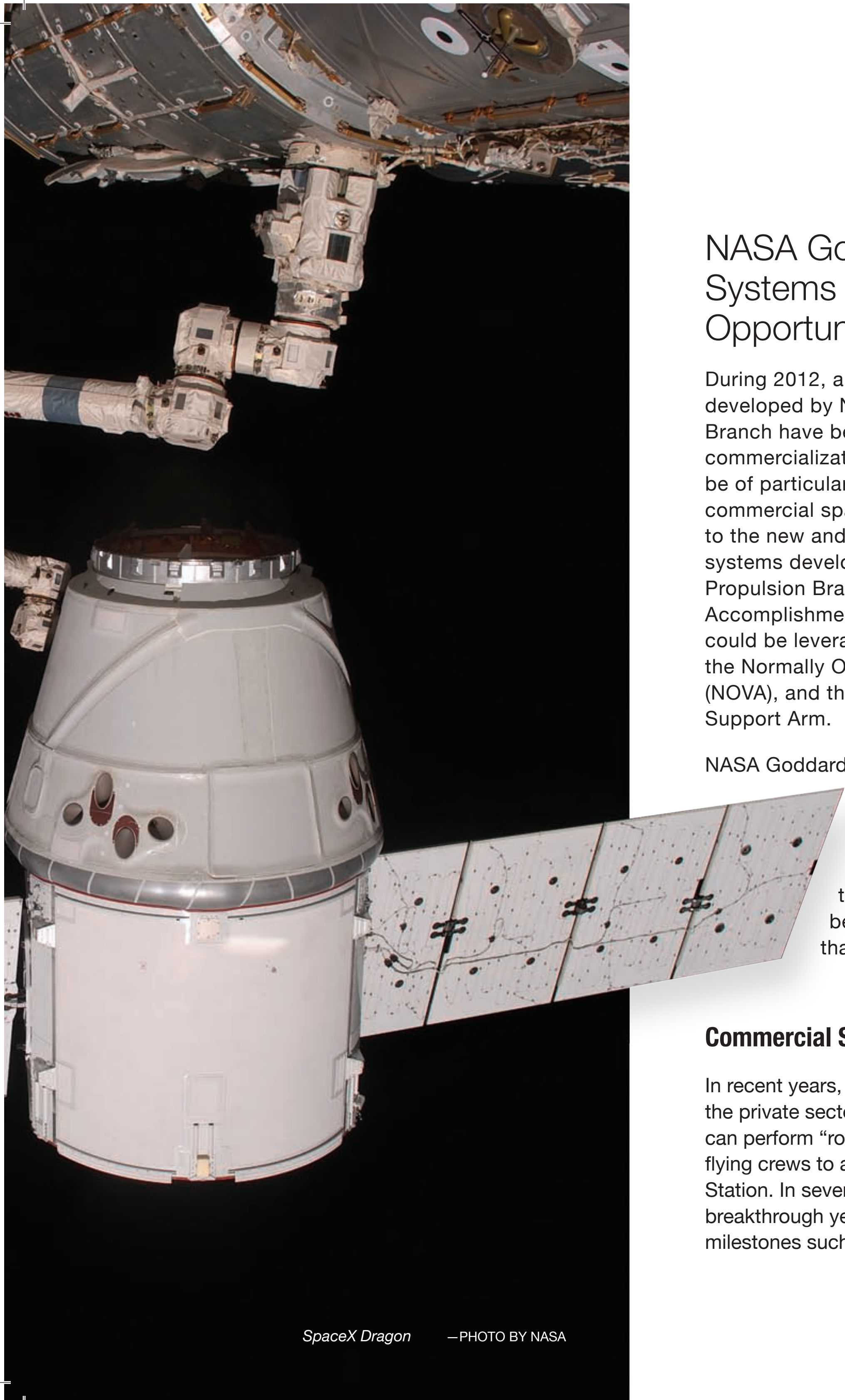
When officials from other NASA centers and government agencies visit NASA Goddard, they are amazed at our development work, much of which is being performed by civil servants. Partnering and leveraging technology nationally is not only the right thing to do to increase national capabilities in space and defense; it also helps to reduce cost. NASA Goddard has a lot to offer and is open to partnering.

Here, critical welds are X-rayed on the MMS fluid transfer system. —PHOTO BY NASA

NASA Goddard Propulsion Branch reports that this system has allowed the group to reduce its usage of alcohol cleaner down to 50 or 60 gallons per typical mission, a reduction of well over 90%. In addition, this system can be considered far “greener” and cheaper than alcohol cleaner, since it requires no additives, special shipping, handling, storage, or disposal.

This system could have very wide applicability far beyond NASA Goddard. For example, its potential value is apparent for any commercial site that requires a safe, environmentally friendly, and inexpensive cleaning system for their hardware and equipment.





SpaceX Dragon —PHOTO BY NASA

NASA Goddard Propulsion Systems Tech Transfer Opportunities

During 2012, a number of technologies developed by NASA Goddard Propulsion Branch have been made available for commercialization. These technologies may be of particular interest to the emerging commercial space flight industry. In addition to the new and greener in-space propulsion systems developed by NASA Goddard Propulsion Branch (described earlier in this Accomplishments Report), technologies that could be leveraged into this market include the Normally Open Permanent Isolation Valve (NOVA), and the Floating Orbital Weld Head Support Arm.

NASA Goddard also offers laboratory and test capabilities that could help smaller companies develop and qualify their space technologies. In addition, some of these technologies and capabilities could be adapted to applications other than space flight.

Commercial Space Flight and NASA

In recent years, NASA has increasingly looked to the private sector to help develop technologies that can perform “routine” space flight tasks, such as flying crews to and from the International Space Station. In several respects, 2012 represents a breakthrough year in this area, with high-profile milestones such as the success of SpaceX’s

IPP OFFICE BIO

Ted Mecum

Senior Technology Transfer Manager

As a Senior Technology Manager, I am responsible for the identification, review, planning, and evaluation of advanced aerospace technologies for potential patenting, software release, and/or licensing options. I am also involved in negotiating mutually beneficial partnerships between NASA and private industry, academia, and/or other government organizations. Each one of those responsibilities speaks directly to the theme of “from concept to reality.” For example, we frequently start with an idea of how a NASA Goddard technology might be valuable in non-space applications, and we help move it along the path towards real commercial products. Similarly, we often begin with the identification of a specific NASA Goddard need, and help develop a collaborative partnership that turns that need into a new capability to support our Space Science missions.

Dragon mission.

According to industry observers, one of the challenges facing the commercial spaceflight industry is propellant, where there has been no significant improvement in thrust-per-pound within the last 50 years. Solving such technical issues could open a large global market for commercial space flight, both within the U.S. and internationally.

NASA Goddard Propulsion Branch has developed a number of propulsion-related technologies that not only reduces the environmental impact of these systems; they also provide a number of other advantages, including cost, safety, and performance. For more information, see the article “NASA Goddard and Greener Propulsion Technologies” elsewhere in this Accomplishments Report.

Normally Open Permanent Isolation Valve (NOVA) GSC-16336-1

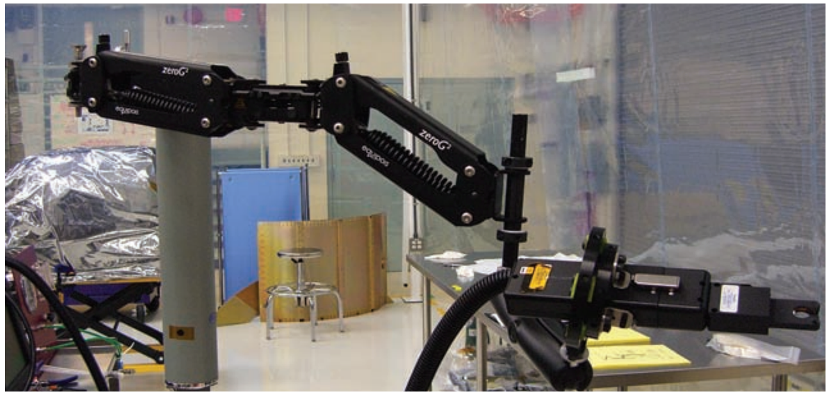
One technology that may be useful in commercial spaceflight and potentially many other applications is the “Nitinol-Actuated Normally Open Permanent Isolation Valve (NOVA),” a zero-leak permanent isolation valve designed for liquid propellant service on in-space propulsion systems. NOVA is a replacement to the currently used pyrovalve for all chemical propulsion systems.

Pyrovalves are widely used in spacecraft fluid systems. Unfortunately, they tend to experience unacceptably high failure rates in qualification testing. To address this problem, NOVA uses a so-called “shape memory” material called nitinol. This substance can be shaped and then compressed. When the material is subsequently heated, it resumes its original shape. In the NOVA, heat is applied when the valve needs to be closed. The nitinol then assumes its original shape, creating a leak-tight seal.

In addition to propulsion applications, NOVA could potentially be adapted to other purposes that require a safe heat-activated valve.

Floating Orbital Weld Head Support Arm GSC-16522-1

As we noted earlier, commercial spacecraft systems are becoming more prevalent. This market is likely to produce an accompanying need to develop and manufacture in-space propulsion systems more effectively. One likely future requirement is the ability to weld expensive, delicate equipment in a way that maintains high precision and ensures a low failure percentage due to misalignment or porosity.



First used to support cameras at sporting events, the support arm now aids in the development of mission critical propulsion components. —PHOTO BY NASA

The “Floating Orbital Weld Head Support Arm” technology developed by NASA Goddard Propulsion Branch may offer a number of benefits in this application. This technology, which is based on commercially available technology first used to support cameras at sporting events, aids in the critical alignment of the orbital weld head into the welding fixture. The system uses no extra “fixturing” to support heavy weld head cables. In addition, the arm acts as a zero gravity weld head support, making spacecraft propulsion manufacturing on the ground much easier and faster.

The support arm allows the operator to reach inside the spacecraft structure, which historically has been largely inaccessible and difficult to support. The arm is self-supporting, retractable, and safe to operate.

Development and Testing Facilities

NASA Goddard Propulsion Branch includes extensive laboratory facilities. These comprise a valuable resource that outside companies and other entities can use to develop their own technologies. Among the capabilities provided by the laboratories is flight qualification, an essential tool for technologies designed for use in space. Potential services include modeling, testing, and fabrication. These can be highly valuable to smaller companies who may not have the resources necessary to easily absorb the expense typically associated with these tools.

INTEGRATED DESIGN CENTER

IDC

At any given moment, NASA Goddard is awash in ideas. Some of these ideas may be newly formed, while others may be concepts that have been carefully considered and evolved over a period of time.

Of course, even the most brilliant idea is of little practical value unless it can be eventually developed to serve a useful mission or application. Is the science behind it sound? Can it be reproduced reliably, consistently, and cheaply? How will it fit into existing components and systems? Answering these and similar questions can require a long and complicated process. Failure to properly consider and understand every implication associated with an idea, whether within the government, academia, or private enterprise, can have major consequences. For example, development can be seriously delayed when unanticipated problems arise late in the process, issues that might have been avoided with more effective up-front evaluation. Conversely, failure to fully appreciate an idea's value and utility could prevent a promising technology from ever seeing the light of day.

NASA Goddard Space Flight Center has created the Integrated Design Center (IDC) to help better define the requirements of a proposed mission. The IDC brings together engineers from all discipline areas required for a mission, and provides a collaborative environment for a short (typically one week) and intense study session. Each study helps NASA Goddard define the parameters of an upcoming mission. This information can then be leveraged to help NASA Goddard build more complete and meaningful proposals — and also help identify which missions may or may not be worthwhile to pursue. This process also has obvious utility for private industry, for applications such as evaluating and analyzing the viability of a new concept or technology.

In this section, we describe IDC facilities and capabilities. We also briefly review the history of the IDC, and examine a typical one-week IDC session.

Integrated Design Center and Product Development

The NASA Goddard Integrated Design Center's (IDC) primary purpose is to support NASA space missions and related technology development. It can also provide significant value to non-NASA entities, including other government agencies, academia, and industry. For example, IDC studies can help companies prepare for proposals, vet technologies, and define technology roadmaps for long-term goals.

Since its inception, the IDC's client base has expanded to include non-NASA entities that have a need for the IDC's facilities, processes, tools, and expertise from a wide variety of technical disciplines. IDC engineers collaborate with clients to define and deliver products that can include basic design, functional diagrams, conclusions and recommendations, cost data, and other materials that can be leveraged to accelerate development and eventual success of the client's products and technologies.

Integrated Design Center in Action. —PHOTO BY NASA

IDC Facilities

The IDC currently conducts these studies in two lab facilities, the Mission Design Lab and the Instrument Design Lab. The IDC will in the future also include an additional facility currently in development, the Architecture Design Lab (ADL).

Mission Design Lab (MDL) provides conceptual end-to-end design and analysis for a wide variety of space mission concepts and architectures. This includes integration and test, launch and orbit establishment, operations (including ground), data collection and handling from the spacecraft to the scientist, and post-mission considerations including orbital debris requirements, controlled and uncontrolled re-entry or orbital storage, and even servicing options.

Instrument Design Lab (IDL) offers design and analysis services for space mission instruments. All instrument families can be developed, including telescopes, cameras, hyperspectral imagers, lidars and laser altimeters, spectrometers, coronographs, and others. These cover the full electromagnetic spectrum from microwave through gamma ray. Studies can develop initial end-to-end instrument concepts; or examine, evaluate, and/or improve existing instrument concepts or elements. Trade studies, risk analyses, independent assessments, and technology incorporation analyses can also be performed.

Architecture Design Lab (ADL), currently in conceptual development, will bring together highly experienced engineers with program managers and scientists who want to develop a basic approach or "architecture" for ideas with very little definition. Rather than provide a high level of actual engineering; these studies will instead focus more on engineering judgment and basic calculations. The goal is to consider the "what ifs" not usually performed during typical conceptual design studies. The ADL may also help define areas within the architecture where new technologies are needed or could be introduced.

How the IDC Works

Perhaps the most critical value the IDC offers to prospective clients is the ability to assemble the most applicable and relevant pool of engineering talent for a particular project, within a collaborative environment that allows these engineers to work closely with the client team. To do this, the IDC brings together all involved parties to the same location at the same time, and requires them to remain in place throughout the study. This ensures that the client is an active and engaged part of the IDC team.

As engineers contribute their input and views, the Lab Lead constantly evaluates the client's needs and the Systems Engineer evaluates the evolving design toward meeting the system requirements. And as the design develops and evolves, the client provides real-time feedback, which the engineers consider and incorporate into their work. This helps ensure that the finished product is both thorough and relevant to the client's needs.

The process begins several months before the IDC study is scheduled. This involves pre-planning work for the session, including one or more meetings or teleconferences with the client. These discussions are intended to help define the goals, objectives, and scope of the upcoming IDC study.

Arranging an IDC Study

To arrange an IDC study, contact Dr. Bruce Campbell, IDC Manager (301-286-9808, bruce.a.campbell@nasa.gov). Dr. Campbell and his staff will help you define the best IDC study to suit your needs.

The cost of an IDC session depends largely on factors such as the scope and complexity of the proposed study. Historically, the total cost for resources needed for a typical one-week study averages around $100,000. IDC sessions can be funded from non-NASA sources. However, funding from outside sources may require Space Act Agreements or other official vehicles which may impact the lead time for the study, and therefore should be discussed directly with IDC personnel when scheduling a proposed session.

IDC Services and Products

IDC services and products can benefit businesses in a variety of ways. The IDC can provide a company with engineering information about their project that helps define the scope and complexity of the work, what technologies are involved, how much it will likely cost, and many other aspects. This information can then form the basis for a realistic proposal that helps ensure timely and profitable project completion.

An IDC session can also vet a new technology. The session can explore whether or not a new technology will fit seamlessly into an existing system, and if so what advantages/disadvantages it may provide. The IDC can help with long-term planning, for instance by creating a technology roadmap to guide future

IPP OFFICE BIO

Cynthia Firman

SBIR/STTR Program Manager and Technology Infusion Manager

I have two primary responsibilities in the IPP Office: NASA Goddard SBIR/STTR Program Manager and NASA Goddard Technology Infusion Manager (TIM). The first role falls squarely into the "from concept to reality" theme. There are a lot of innovators out there who have an idea, but not the means to develop it. The SBIR/STTR program provides funding to help them turn the idea into something real. The second part of my work here, as the NASA Goddard TIM, involves the use and application of the development. In this capacity, I also help get the word out about what technology efforts are going on in the Small Business community. By the end of Phase II, the technology should be well along the development process, to be "infused" into NASA Goddard through Phase III contracts or via commercialization by the Small Business Concern and become part of our core technologies and capabilities.

development and commercialization of a new idea. In this way, an IDC session can examine theoretical concepts and components that are not yet technically possible but may become so in the future. Even if the technology is years away, an IDC session can review it and ideally develop a technology roadmap that may help the theoretical become a reality.

When the IDC session concludes, the client receives an interim presentation of the session's key conclusions. The interim presentation is reviewed and updated, to form the basis for the final presentation. The client also receives CAD drawings, spreadsheets, model outputs, and other related engineering materials.

Engineers Discussing a Proposed Mission Design. —PHOTO BY NASA

Conducting an Integrated Design Center Study

To address the increased competition for mission work between NASA Centers, NASA Goddard created the New Business Office (Code 100) in the 1990's to help decide which work to pursue, and to develop compelling proposals for that work. This in turn required the ability to perform conceptual engineering to test the feasibility of each proposal and provide credibility of the design.

To provide this capacity, in 1997 NASA Goddard created the Integrated Mission Design Center (IMDC), the forerunner to today's Integrated Design Center (IDC). In 1999 NASA Goddard created the Instrument Synthesis and Analysis Lab (ISAL), to provide commensurate capability to design NASA Goddard instruments. The IMDC and ISAL were soon combined under a single management structure, the Integrated Design Center (IDC), with the two main components renamed Mission Design Lab (MDL) and Instrument Design Lab (IDL). Since its formation, the IDC has conducted approximately 550 studies, roughly 34 per year.

Today the IDC conducts studies that are both highly intensive and very short; most are completed within a single week. Deliverables for each session include a presentation that defines the technical requirements, feasibility, dependencies, and other aspects of the client's concept. This presentation can then be leveraged by the client in multiple ways. The goal of a typical study is to begin the session on Monday with little more than a "blank sheet of paper," and by the end of Friday the client will receive a credible conceptual engineering design that, after a cost estimate is conducted, could form the foundation of a formal proposal.

V&ESD

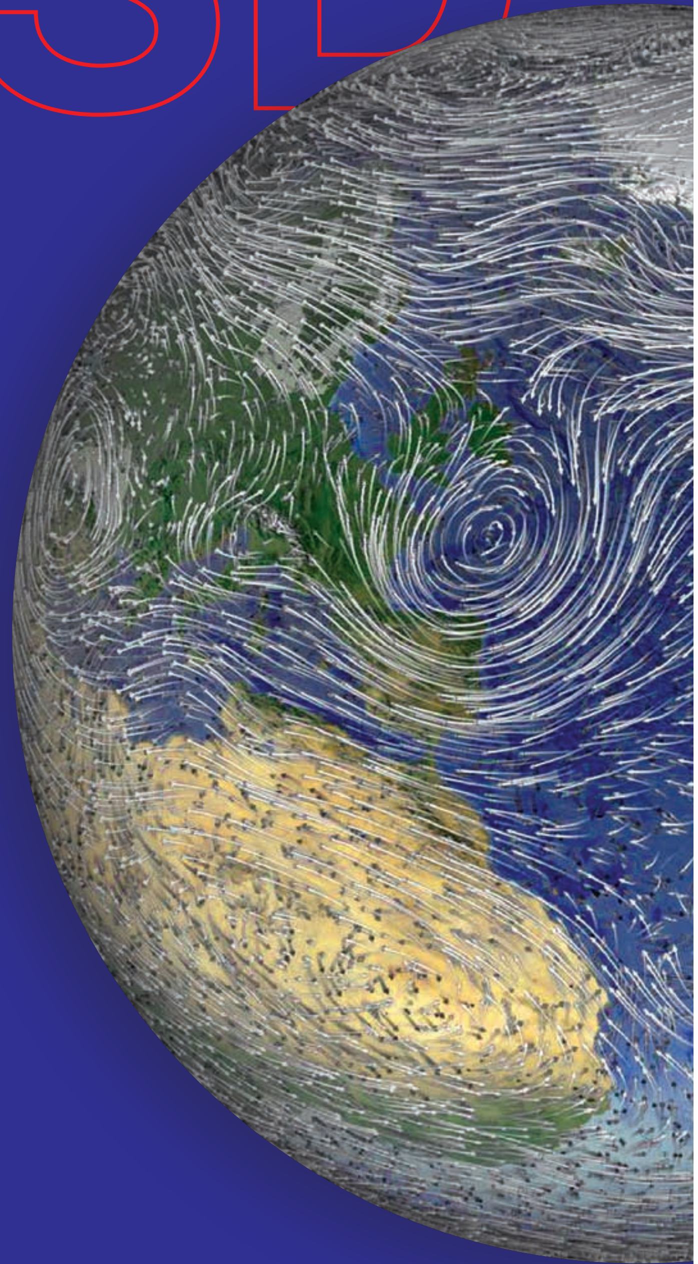
VISUALIZATION AND EARTH SCIENCE DATA

Over the years NASA Goddard has accumulated a vast amount of Earth Science data collected through numerous missions, for variables such as temperature, humidity, rainfall, ice cover, vegetation, and many others. NASA Goddard makes this data available for research and commercial applications. This data is also used for public outreach and informational purposes. This helps promote awareness and understanding of science concepts, presented in a way that is readily accessible and understandable to members of the general public, including younger students.

To do this, NASA Goddard creates visualizations that help illustrate important scientific themes that underlie Earth Science data. Many of these visualizations are available for viewing through the internet. Others require more sophisticated display technologies such as Hyperwall and Science On a Sphere. These are two important tools for presenting large datasets -- that in some forms might appear arcane or difficult for the layperson to easily digest -- in ways that people find highly understandable, compelling, and entertaining.

These visualizations, and the systems designed to display them to full advantage, perform a very important knowledge transfer function by presenting NASA's Earth Science data in a way the public can easily comprehend. The visualizations may also inspire the next generation of young scientists, engineers, and inventors to seek out careers in science.

In this section we present a general overview of NASA Goddard visualization technologies, specifically Hyperwall and Science on a Sphere. We also discuss several of the many ways NASA Earth Science data is being used for the benefit of communities around the globe. This includes both public safety and health (such as fire and flood risk monitoring), as well as commercial opportunities, that help demonstrate the enormous and continuous value returned on the public's investment in Space Science.



NASA Earth Science Visualizations

To help make Earth Science data more readily accessible and understandable to the public, NASA Goddard's Scientific Visualization Studio creates animations and images that graphically "visualize" the data. NASA Goddard has made thousands of these visualizations freely available by distributing them through the Scientific Visualization Studio web site (see http://svs.gsfc.nasa.gov/Gallery/index.html) and through other sites such as YouTube. One example is "Perpetual Ocean," which animates the Earth's ocean currents. This video has collected over a million views by the end of 2012. Other popular visualizations include the 2012 transit of Venus and the famous "Earthrise" photograph taken on Apollo 8.

Visualizations can be created from hard data, or from pure conceptualization. Although visualizations are not necessarily created for formal academic purposes, they could be assembled in ways that could form content for specific courses. In addition, visualizations can help prepare the public to make well-informed and effective decisions on important science and technology related issues, by presenting large sets of seemingly arcane data in ways that the average person can more easily understand.

Many visualizations can be easily viewed on an average computer screen. NASA Goddard is also involved in a pilot program for the NASA Visualization Explorer iPad app that allows schools to view science-related visualizations. More sophisticated visualizations may require advanced display technologies to be fully appreciated. NASA Goddard has helped develop two such display technologies, Hyperwall and Science On a Sphere.

Hyperwall

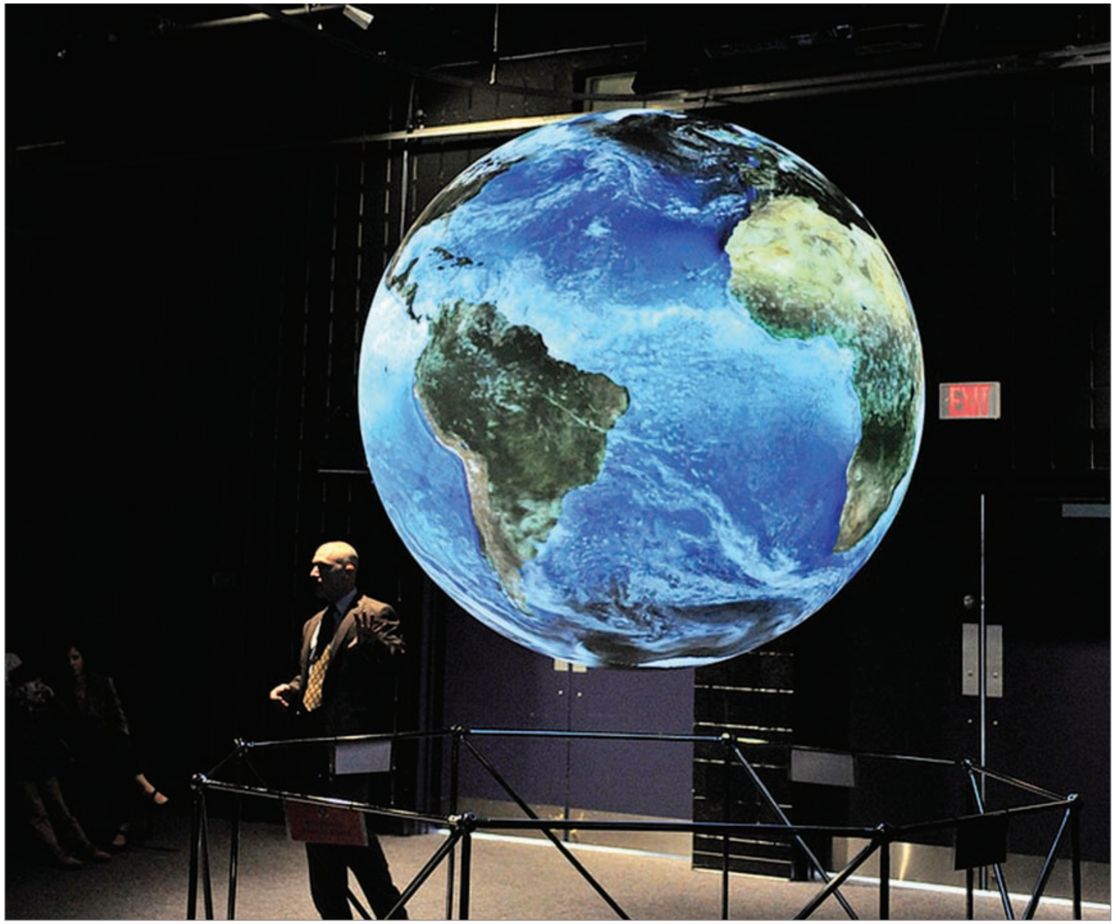
A Hyperwall is a display system developed by NASA Goddard in collaboration with NASA Ames. Hyperwall can run up to 9 or 15 separate visualizations simultaneously, providing a sophisticated, high resolution platform for viewing visualizations.

At present there are several Hyperwall installations, including a "travelling" version. Within NASA Goddard, the largest resides in the Computational and Information Sciences and Technology Office.

NASA Goddard continually develops new Hyperwall visualizations and makes these available for public outreach and to promote scientific literacy. The visualizations illustrate a broad spectrum of Earth Science topics by graphically presenting data collected from numerous NASA missions, several of which are currently active and continuously providing new data. Some illustrate change, such as climatological changes over the past several decades. Others show large-scale static images with associated text descriptions.

In the future a Hyperwall may serve as a supercomputer monitor, to run very high-level visualizations of phenomena such as global weather patterns. Other enhancements may include a higher level of interactivity, allowing scientists to change variables in real-time and immediately see the results on the screen. These and other enhancements could be developed for potential use in real time modeling and simulation, applications that may be of high value and interest to researchers within the government, education, and private industry.

Dr. Phil Webster demonstrates the NASA Goddard Hyperwall. —PHOTO BY NASA



Science on a Sphere. —PHOTO BY NASA

Science on a Sphere

Science On a Sphere is another advanced display technology for visualizing NASA Goddard Earth Science data. As the name suggests, Science On a Sphere uses computers and video projectors to display animated data onto the outside of a sphere. In a typical installation the sphere is suspended from above and surrounded at the corners of the room by four video projectors.

NASA Goddard is a major supplier of content for Science On a Sphere. The goal of each visualization is to present the "essence" of a NASA science mission, visualized in a way that makes it easily understood by children and other members of the public. For example, a series of Science on a Sphere visualizations have been created for climate change topics such as precipitation, ice mass, vegetation, and other factors, displayed as an organized presentation.

One of the first full-feature movies developed for Science On a Sphere is "Footprints," produced by NASA Goddard. This movie depicts satellite data and other visual effects, including visualizations about the biosphere, planetary views of city lights at night, and hurricane formation.

NASA Goddard Climate Data and Technologies

NASA Goddard has compiled a vast store of Earth observational data, on phenomena such as precipitation, temperature, vegetation, ice mass, and others. This data archive represents the collective results of a number of important NASA Earth Science missions. In addition, NASA scientists have developed climate models that are becoming increasingly important to an expanding array of new customers, including private sector partners using this data to generate commercial products.

Access to NASA Earth Science Data

NASA missions have accumulated – and continue to accumulate – a comprehensive database relating to the Earth's natural weather, climate, and geological systems. NASA Goddard makes this data available to non-NASA entities through three software architectures that programmers can incorporate into their code.

IPOPP (International Polar Orbiter Processing Package GSC-15570-1) enables Direct Readout programs to process, visualize, and evaluate Earth Science data. IPOPP provides fast access to products derived from this data. It has been used for a number of important applications and events, including the Deepwater Horizon oil spill incident.

IPOPP is currently used by the EOS and Soumi-NPP missions for real-time performance and state-of-health monitoring. It is also being used operationally by the NASA/MSFC Short-term

Prediction Research and Transition (SPoRT) Project; and by meteorological agencies around the globe, including the U.S. National Weather Service, U.S. Air Force Typhoon Warning Center, Australian Government Bureau of Meteorology, Météo-France, and the United Kingdom Met Office.

Sensor Web 2.0 (GSC-15535-1) gathers and assimilates data from a network of space-based, airborne, and ground-based sensors. This allows these disparate sensors to function as a single unit. This capability is of major potential value during natural disasters.

Sensor Web 2.0 technology is an open architecture and system that can be used without licensing or other restrictions. This has resulted in collaborative relationships between NASA and several research universities, private laboratories, and other government agencies. Applications that are in development and/or are being contemplated for Sensor Web include flood early warning systems; volcano monitoring; hurricane location, strength, and trajectory determination; tsunami detection and mitigation; oil spill detection and monitoring, space-weather event detection, and detection of other harmful weather and natural phenomena, among others.

NASA Goddard Hyperwall. —PHOTO BY NASA

Land Information System (LIS) 6.1 GSC-16290-1 allows programmers to integrate satellite-based and ground-based observational data products into modeling forecasts.

LIS allows programmers to reuse and share modeling tools, data resources, and assimilation algorithms. Applications include hydrologic research to enable accurate global water and energy cycle predictions, disaster management, water resources management, agricultural management, numerical weather prediction, air quality, and military mobility assessment.

Uses of NASA Earth Science Data

NASA Goddard's Earth Science data has been used for a broad spectrum of critical applications, including:

- Strategic fire mapping and resource planning. This includes fire monitoring for the Americas (Mexico), forest fire, hot spot and smoke plume detection in Thailand; and flashover fire detection in South Africa.
- Air quality monitoring and tracking, as first response detection for pollution tracking and source identification. This includes aerosol optical thickness measurement to monitor air quality following biomass burning in Indonesia.
- Weather forecasting for severe thunderstorm top detection and tracking.
- Daily and weekly tracking of sea ice for use in Russia and Japan.
- Oil spill monitoring.
- Water measurements to determine mosquito population in Thailand.
- Several flood early warning systems, developing in conjunction with the Namibia Department of Hydrology, Canadian Space Agency, Ukraine Space Research Institute, DRL (Germany), and 18 Caribbean countries.
- Flood potential mapping in Kenya and India.
- Typhoon prediction and monitoring in Taiwan.

On June 10, 2012, NASA's Aqua satellite passed over Colorado and New Mexico and captured smoke and heat from the High Park Fire in Colorado, and the Whitewater-Baldy Complex and Little Bear fires in New Mexico.
—PHOTO BY NASA

IPP OFFICE BIO

Enidia Santiago-Arce

Technology Transfer Manager

As Technology Transfer Manager, my role is to dream up all the ways NASA Goddard technologies can be used. Typically when an engineer or scientist creates an invention, it's for a very specific and narrow purpose, such as to improve an existing capability for a particular mission. My role is to understand the new technology and how it's used, and then use my imagination to explore how that technology can be adapted to other uses. This doesn't happen immediately, of course. It involves a lot of research on my part, and staying abreast with the latest publications in fields such as medicine, imaging, engineering, and others.

I also need to keep current with the latest business trends and developments. This is an important point: successful technology transfer requires me to be as up to date as possible with both technology and business, so I can make the connections that help turn "concept to reality" -- in other words, help turn my original idea about how a technology could be used into a viable potential product. This also involves finding the right partners and collaborators who can make this happen.

An example of how NASA Earth Science data can help protect lives involves a volcano monitoring system. This system imaged an eruption in the Republic of the Congo, and executed a lava temperature algorithm. In the process, the application determined that the direction of lava flow was confined to the west side of the volcano's slope. Authorities therefor cancelled evacuation for the other areas, saving livestock and crops that would otherwise have been abandoned.

Another application serves Namibia. Previously, residents in northern Namibia often failed to heed flood evacuation warnings from the country's Department of Hydrology and subsequently had to be rescued with boats and helicopters, resulting in major loss of farm animals. Authorities demonstrated a system developed from NASA Earth Science data by showing satellite imagery taken during peak flood conditions that revealed how extensive flooding could be. This helped convince residents to heed the next evacuation warnings, which saved lives, livestock, and government funds not spent on rescue efforts.

These are just a sampling of the many ways in which applications built on top of NASA Goddard technologies can utilize Earth Science data to address pressing societal needs around the world. By sharing this information, NASA Goddard can help inform developers and inspire them to build their own applications, thereby expanding the value and use of this data.

Earth Science Technologies

In 2012, NASA Goddard made available for technology transfer several technologies that provide easier management and manipulation of its Earth Science data. These technologies allow NASA and non-NASA users to maximize the value of NASA resources when developing applications and products based on NASA Goddard's climate data.

For example, the **Virtual Climate Data Server (vCDS) GSC-16444-1** is a cloud-oriented software appliance designed specifically for the data management needs of data-centric climate applications. A growing challenge for the Earth Science and climate modeling communities is how to manage expanding volumes of data, literally hundreds of terabytes and constantly growing. To address this, the vCDS provides policy-based control over collection-building, managing, querying, accessing, and preserving large scientific data sets. vCDS benefits NASA's aerospace and aeronautical mission by extending the effectiveness of NASA's remote sensing and climate modeling capabilities.

The vCDS includes several associated technologies that are also being made available to users outside NASA Goddard. These include Administrative Extensions, NetCDF Module, and Repetitive Provisioning.

Virtual Climate Data Server Administrative Extensions GSC-16446-1 provide the Open Archive Information System (OAIS) database extensions, OAIS metadata views, and collection action logging required to manage system-level object provenance, provide views and QA over OAIS metadata compliance, and support administrative monitoring and control over vCDS-managed collections of scientific data. When provisioned with Administrative Extensions, a vCDS can deliver policy-based control over collection-building, managing, querying, accessing, and preserving scientific data sets.

Administrative Extensions provide the core system capabilities for administrative control over vCDS managed collections. In addition, encapsulating system-level collections management operations as a module greatly simplifies the construction of tailored system administrator interfaces to the vCDS.

The **vCDS NetCDF Module GSC-16445-1** is an iRODS kit that encapsulates the microservice code, supporting utilities, rules, and configuration files required to implement the canonical create, read, update, and delete operations of an OAIS-compliant NetCDF collections-management kernel. When provisioned into vCDS, the resulting image becomes a software appliance tailored to the data management needs of a scientific collection of NetCDF data.

Repetitive Provisioning GSC-16447-1 provides an automated capability for building vCDS software stacks in various computing environments. vCDS itself is a software appliance that provides policy-based control over scientific data collections. Repetitive provisioning, along with the vCDS images produced by the provisioning process and the overall vCDS architecture, enable Virtualization-as-a-Service and various modes of deployment and distribution in cloud computing environments, including Platform-as-a-Service and Software-as-a-Service. Repetitive provisioning allows vCDS technology to be conveniently deployed into a tiered array of storage and compute resources, thereby providing operational flexibility to data centers that use vCDS technology.

SAMPLE ANALYSIS AT MARS

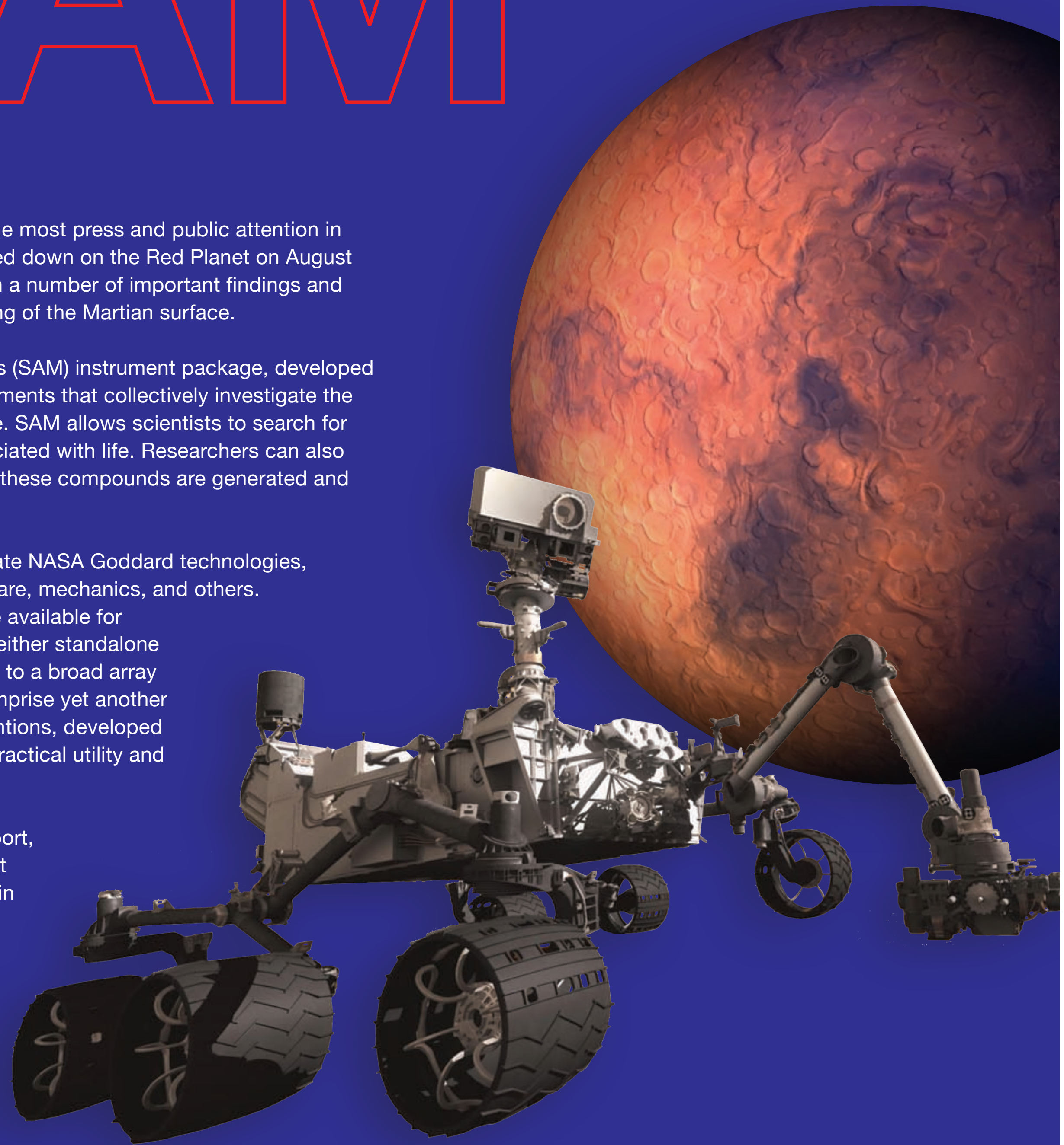
SAM

The NASA mission that probably attracted the most press and public attention in 2012 is the Curiosity Mars rover. Curiosity touched down on the Red Planet on August 6, 2012. Since then, it has reported back to Earth a number of important findings and discoveries that have advanced our understanding of the Martian surface.

Onboard Curiosity is the Sample Analysis at Mars (SAM) instrument package, developed by NASA Goddard. SAM is a suite of three instruments that collectively investigate the chemistry of the Martian surface and atmosphere. SAM allows scientists to search for compounds of the element carbon that are associated with life. Researchers can also use SAM's instruments to explore ways in which these compounds are generated and destroyed in the Martian ecosphere.

SAM's instruments consist of a number of separate NASA Goddard technologies, in areas such as chemical analysis, optics, software, mechanics, and others. A number of these technologies have been made available for commercialization outside NASA Goddard, and (either standalone or in various combinations) offer significant value to a broad array of potential applications. These technologies comprise yet another compelling example of how NASA Goddard inventions, developed originally with space science in mind, can offer practical utility and benefit here on Earth.

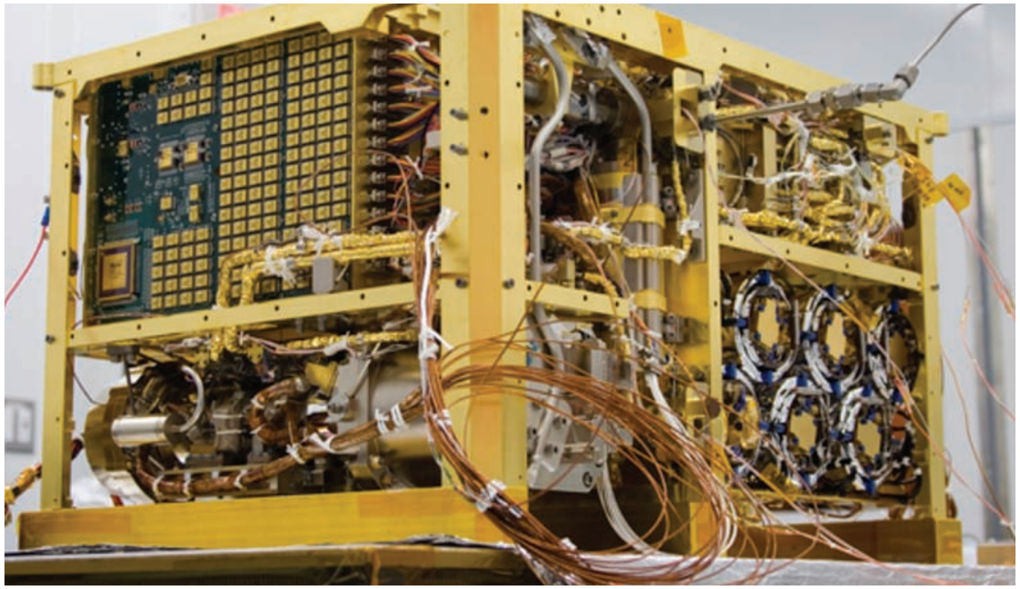
In this section of the 2012 Accomplishments Report, we present an overview of the Sample Analysis at Mars instrument suite and NASA Goddard's role in developing it. We also examine a sampling of the individual technologies developed by NASA Goddard to support SAM and similar space science missions in the future.



Curiosity and the Sample Analysis at Mars (SAM) Instrument Suite

For much of 2012 the science news was filled with articles about the Curiosity lander on Mars. This mission appears to be one of the more high-profile and avidly followed in recent years. Curiosity is the first Mars rover able to scoop soil into analytical instruments. Its highly-anticipated (and closely watched) landing occurred on August 6, 2012 in Mars' Gale Crater.

A critical component of Curiosity's onboard tool set is the Sample Analysis at Mars (SAM) package developed at NASA Goddard. SAM is a suite of instruments designed to allow scientists to examine the chemistry of the Martian surface and atmosphere. These measurements will help us better understand environmental conditions over time and potentially help determine whether or not Mars could support and preserve evidence of microbial life, either now or at some earlier point in its planetary history.



For example, in late 2012 SAM tentatively identified perchlorate, a compound of oxygen and chlorine, in a soil sample. This reactive chemical was previously found in arctic Martian soil by NASA's Phoenix Lander. Reactions with other chemicals heated in SAM have formed chlorinated methane compounds, one-carbon organics that were detected by the instrument. The chlorine is of Martian origin; but it may be possible that the carbon was carried from Earth by Curiosity and detected by SAM's high sensitivity. Future tests will hopefully shed more light on this subject.

SAM Components

SAM comprises over half of Curiosity's science payload, and consists of three primary instruments: a gas chromatograph, a quadrupole mass spectrometer, and a tunable laser spectrometer.

Gas chromatograph separates molecules of close molecular weight, measures and analyses the gases by mass, and routes gases to the mass spectrometer for further analysis. The gas chromatograph has its own detector; but also feeds the separated fractions to the quadrupole mass spectrometer and the tunable laser spectrometer for more detailed analysis.

Quadrupole mass spectrometer identifies gases by molecular weight and electrical charge of their ionized states. It performs this function by separating elements and compounds by mass for identification and measurement. A primary purpose of the mass spectrometer is to check for several elements associated with terrestrial life, such as carbon, nitrogen, sulfur, and oxygen.

Tunable laser spectrometer uses absorption of light at specific wavelengths to measure the abundance of various isotopes of carbon, hydrogen, and oxygen in atmospheric gases such as methane, water vapor, and carbon dioxide. The isotope ratios can provide clues about Mars history. These measurements are accurate to within 10 parts per thousand.

In addition to these three primary components, SAM also includes a number of subsystems and technologies critical to its success. These include

- Solid sample inlet tubes where Curiosity's robotic arm delivers powdered samples that the rover drills from rocks or scoops from soil.
- Sample manipulation system for moving the powdered samples to the next steps in analysis.
- Valves, pumps, carrier-gas reservoirs and regulators, pressure monitors, chemical scrubbers, and two ovens that can heat samples to about 1,000 degrees C.

Note that in addition to its science and analytical measurement capabilities, SAM also represents a significant technological accomplishment in terms of miniaturization. "Traditional" instruments that can provide SAM's functionality and capabilities would likely fill a laboratory here on Earth; for Curiosity these instruments have been miniaturized to the approximate size of a microwave oven. Therefore these technologies may also be highly useful in space or Earth-based chemical analysis applications where size and weight are important considerations.

Going Forward

Original plans called for Curiosity to remain active on the surface of Mars for two years. In December of 2012, Curiosity's mission was extended indefinitely.

Curiosity will also serve as a basic design for a future mission to Mars, tentatively scheduled for the 2020 timeframe. As explained in a December 2012 announcement issued by NASA, this future mission will utilize technologies developed for Curiosity wherever feasible. It may also incorporate new instruments and technologies to fulfill its unique and advanced science agenda. An example of a potential new technology that may be included in this future Mars mission (and possibly others related to Solar System exploration) is the "In Situ Wet Chemistry Laboratory," a lab-on-a-chip device designed for detecting and analyzing biological molecules in a sample.

In addition to future space missions, many SAM components individually or in combination could potentially be adapted to terrestrial applications. NASA Goddard's Innovative Partnerships Program Office has helped make a number of these technologies available for commercial development. For more information, see the article "Sample Analysis at Mars (SAM) and Related Technologies" elsewhere in this *2012 Accomplishments Report.*

IPP OFFICE BIO

Dennis Small

Technology Transfer Manager

As Technology Transfer Manager, my responsibilities include identifying, reviewing, and evaluating new and innovative technologies for potential patenting and/or licensing consideration. I also have the role of negotiating partnerships between NASA and private industry, academia, and/or other government organizations. I have an opportunity to help define and participate in industry outreach activities about technology transfer practices and outcomes. I meet business leaders and talk about the broad range of technologies available for licensing at NASA Goddard.

For me, the theme "from concept to reality" means being the conduit for NASA innovators and potential partners. NASA Goddard has a great deal of intellectual property. One of the greatest pleasures of my job is identifying intellectual property that leads to partnerships between the NASA and industry. I enjoy assisting teams to produce ideas (concepts) that lead to product fruition. These new products provide economic and societal benefits that fuel economic growth. Now that's reality!

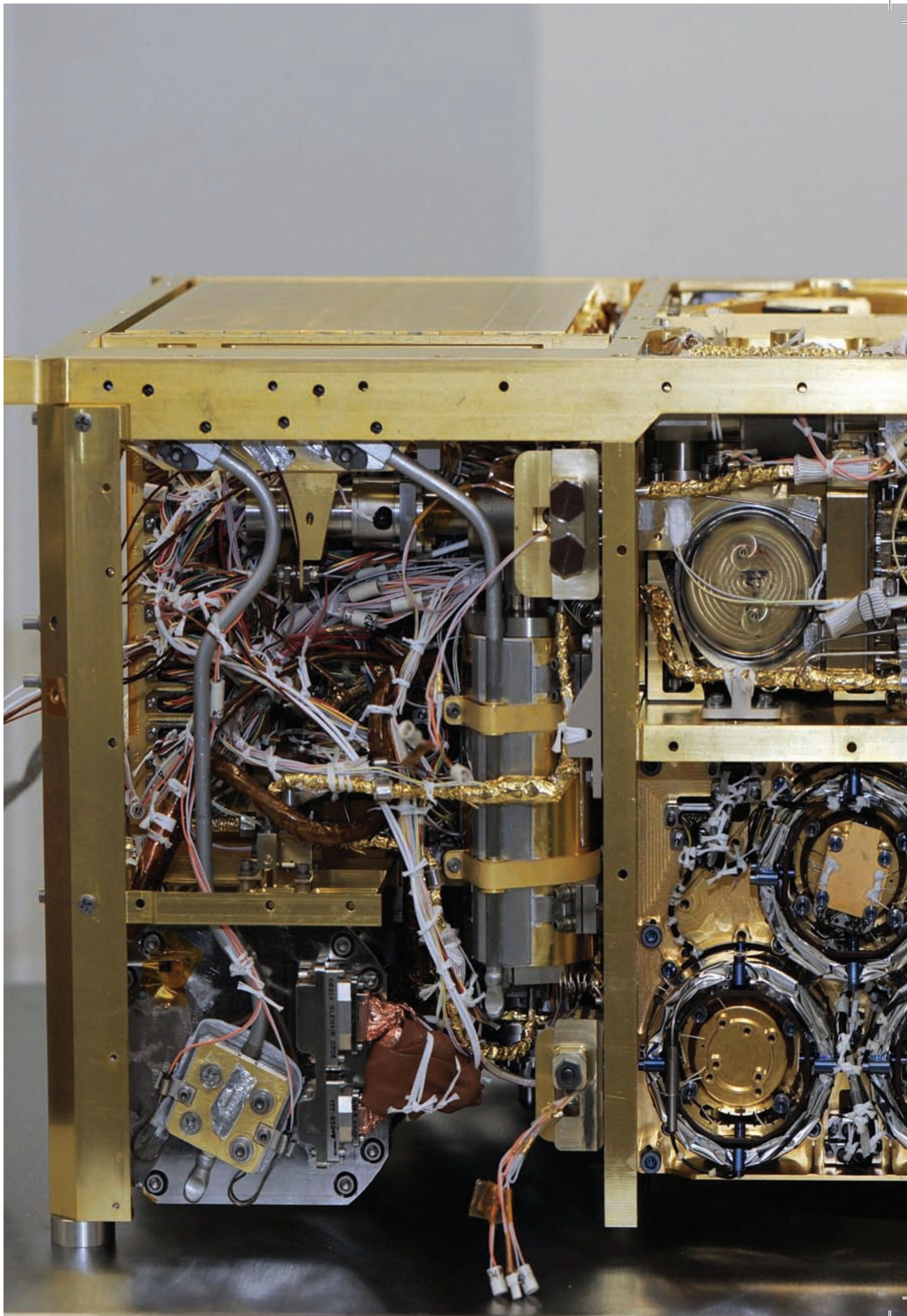
Sample Analysis at Mars (SAM) and Related Technologies

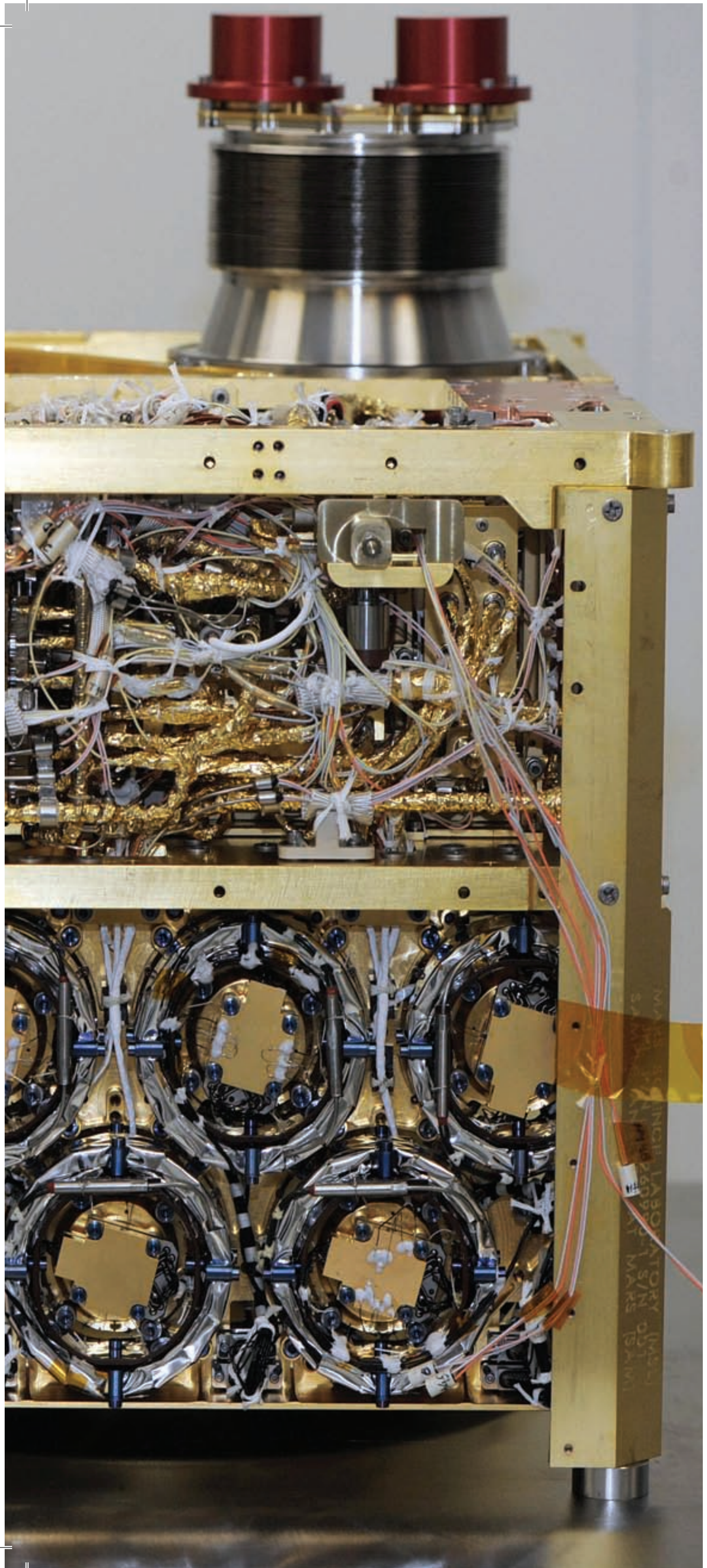
Curiosity's Sample Analysis at Mars (SAM) instrument package, developed by NASA Goddard, provides scientists the capability to search for organic molecules on the Martian surface. SAM instruments are more sensitive and versatile than any similar instrument previously sent to Mars. It also can provide information about other ingredients of life and clues to past environments.

As mentioned earlier, SAM consists of three primary instruments:

- Mass spectrometer separates elements and compounds by mass for identification and measurement.
- Gas chromatograph separates molecules of close molecular weight, measures and analyzes the gases by mass, and routes gases to the mass spectrometer for further analysis.
- Laser spectrometer measures the abundance of various isotopes of carbon, hydrogen, and oxygen in atmospheric gases such as methane, water vapor, and carbon dioxide. These measurements are accurate to within 10 parts per thousand.

These three instruments are supported by a sample manipulation system (SMS) and a Chemical Separation and Processing Laboratory (CSPL). The latter incorporates a number of separate technologies, including microvalves, gas manifolds, chemical and mechanical pumps, carrier gas reservoirs and regulators, and others. CSPL samples the atmosphere on Mars by introducing a small amount of gas through an inlet tube to the SAM instruments. SAM analyzes solid phase materials by transporting finely sieved materials to one of the SMS sample cups' the cup with the sample then enters a SAM pyrolysis oven to release volatiles.





Microvalve GSC-15906-1

NASA Goddard has submitted many NTRs related to SAM. One example is the Miniaturized Double-Latching Valve (a.k.a. microvalve) designed for gas sampling systems. The microvalve offers many advantages over other high-end high-performance valve technologies. For example, it has fewer parts than existing valves, and offers both reduced complexity and less stringent manufacturing tolerance requirements. Compared to other valves, the microvalve is more reliable, weighs less, and is easier and less expensive to fabricate.

Key innovations of the microvalve include:

- Floating pintletip that allows for relaxed manufacturing tolerances.
- Removable solenoid that can be easily replaced if there is a failure in any coil.
- Shimming capability that determines the amount of compression achieved in the Belleville washer stack and allows for looser tolerances for the individual parts.

Collectively, these features offer easier, cheaper, and quicker manufacturing and maintenance. The floating pintletip provides higher reliability while simplifying assembly. And the removable solenoid reduces the impact of electrical failures discovered during ground testing.

SAM instruments incorporate over 40 microvalves. In addition, many upcoming and proposed NASA

IPP OFFICE BIO

Darryl Mitchell

Senior Technology Transfer Manager

As a Tech Manager in the Innovative Partnerships Office, I have an opportunity to work on cases spanning the full spectrum from concept to reality. My job is to find new pathways and/or partners to get those cases that I can through the pipeline into the realm of reality. That's much easier said than done; and unfortunately, there are many that don't make it all the way. As a result, we are always looking for new ways to increase our effectiveness in transferring the brilliant ideas that cross our desks every day into practical applications. When it works, everybody wins!

missions could have a need for microvalve technology. For example, Southwest Research Institute (SwRI) is preparing proposals for two NASA Discovery Missions that would each employ up to 10 microvalves. The Europa Jupiter System Mission could require a similar number of microvalves. Kennedy Space Center's Regolith and Environment Science and Oxygen and Lunar Volatiles Extraction (RESOLVE) mission is another prime candidate for microvalves, this mission could require approximately 30 units.

In the commercial sector, the microvalve could be adapted for several applications and markets, such as gas regulation for the semiconductor industry, hand-held instruments for homeland security, and high temperature valves for use in the petroleum industry, among others.

Sample Analysis at Mars Instrument Simulator (SAMSIM) GSC-16566-1

Another SAM related invention is the Sample Analysis at Mars Instrument Simulator (SAMSIM). This is a high-fidelity numerical tool dedicated to plan-and-validate operations of the SAM instrument on the surface of Mars. The simulator provides mission planners with accurate predictions of the instrument electrical, thermal, and mechanical responses to scripted command loads.

The simulator concept and techniques can be used to model other systems for space or industrial applications. The simulator can be readily modified to model a commercial gas chromatograph mass spectrometer (GCMS). And the SAMSIM gas flow library is a standalone entity that can be utilized to build models for complex gas flow of vacuum systems.

HEXPANDO GSC-16109-1

It's important to bear in mind that NASA inventions aren't confined to high-tech applications; many have been adapted to everyday use. An example of this is HEXPANDO, originally developed for SAM. This is an expanding head hexagonal wrench designed to retain fasteners and keep them from being dislodged from the tool.

The tool is intended to be used to remove or install socket head cap screws in remote hard-to-reach locations or in circumstances when a dropped fastener could cause damage to delicate or sensitive hardware. This tool could be useful for any mechanical assembly operation where the risk of losing a socket head cap screw could cause problems or failures.

Lab-on-a-Chip GSC-15970-1

As noted previously, SAM can detect faint traces of organics and identify a wide variety of them. To build upon and improve this capability for future missions to Mars and other Solar System bodies, NASA Goddard is currently developing the In Situ Wet Chemistry Laboratory. This is a lab-on-a-chip device designed for detecting and analyzing biological molecules in a sample. This combines multiple NASA Goddard technologies into a compact, lightweight unit designed for exobiology analysis on Mars, Titan, Europa, or any New Frontiers or Discovery Program missions that focus on the search for biologically relevant organic materials. And by offering the promise of portable, quick identification of DNA, this technology may also be useful in important health applications, such as testing drinking water in the field.

The lab not only offers the potential of detecting whether or not a sample is biological; it could also be eventually developed to the point where it may actually be able to identify whether or not certain DNA is present. This immediately raises a broad spectrum of possible health and medical related applications. For example, this capability could theoretically be used to analyze a sample of drinking water, to detect a variety of dangerous microbes or pathogens. And the fact that this unit is potentially portable means it could be used in the field, for example in remote locations where consuming contaminated drinking water is often the most common means for contracting disease.

2012 TECHNOLOGY DISCLOSURES

Disclosures

- REQUIREMENTS IN TIME AND FREQUENCY DOMAINS

  Eddie Akpan

- DIRECT OBSERVATION OF NANO-SCALE CONTACTING SURFACES

  Timothy Longson

- MUTI-BEAM OPEN-PATH FIBER-TO-FIBER COUPLER

  Emily Steel, Gordon Blalock, Kenneth Cory

- OPTIMIZED CARBON NANOTUBE GROWTH ON SELF-CATALYZING METAL FOILS FOR THERMAL INTERFACE APPLICATIONS

  Timothy Longson, James Maddocks, Ali Kashani

- A DATA FUSION APPROACH FOR GLOBAL ESTIMATION OF FOREST CHARACTERISTICS FROM SPARSE LIDAR DATA

  James Tilton, Bruce Cook, Paul Montesano

- A HIGH CROSS-POL ISOLATION MULTI-FREQUENCY ANTENNA FOR CLOUD AND PRECIPITATION RESEARCH

  James Carswell

- A HYBRID FIBER/SOLID-STATE REGENERATIVE AMPLIFIER WITH TUNABLE PULSE WIDTHS FOR SATELLITE LASER RANGING

  Demetrios Poulios, Donald Coyle

- A RETURN TO ZERO PSEUDO NOISE LIDAR MODULATION TECHNIQUE FOR MAKING RANGE RESOLVED ATMOSPHERIC MEASUREMENTS

  John Burris

- AUTOMATED EVALUATION SOFTWARE (AES) WEB APPLICATION

  April Hildebrand

- CRUQS A MINIATURE FINE SUN SENSOR FOR NANOSATELLITES

  Scott Heatwole, Carl Snow, Luis Santos

- FASR - FEEDBACK AUGMENTED SUB-RANGER

  Gerard Quilligan, Charles McClain

- GRAPHENE BASED IMPERMEABLE BARRIER LAYER FOR CRYOGENIC TANKS

  Mahmooda Sultana, Jeffrey Stewart, Stephen Scotti, Theodore Johnson, Emilie Siochi

- GREEN PRECISION CLEANING SYSTEM

  Michael Wilks

- HELIOS: EXTREME WEATHER VULNERABILITY WARNING SYSTEM

  Austin Stanforth, Vijay Lulla, Daniel Johnson

- HIGH SPEED VISIBLE AND NIR CAMERAS AND GPU BASED FAST WAVE-FRONT CONTROL ELECTRONICS FOR BALLOON BORNE AND GROUND BASED DIRECT EXO-PLANET IMAGING

  Richard Lyon, Peter Petrone, Udayan Mallik

- HIGH-POWER HIGH SPEED SLECTRO-OPTIC POCKELS CELL MODULATOR

  Phillip Battle, Justin Hawthorne

- INTEGRATED GENOMIC AND PROTEOMIC INFORMATION SECURITY PROTOCOL

  Harry Shaw, Brian Gosselin

- LARGE-AREA, UV-OPTIMIZED, BACK-ILLUMINATED SILICON PHOTOMULTIPLIER ARRAYS

  Vinit Dhulla

- LOW COST MLI THERMAL BLANKET FOR HIGH TEMPERATURE APPLICATIONS UP TO 1400AND#730;C

  Michael Choi

- LYMAN ALPHA DOPPLER IMAGING INTERFEROMETER (LADII)

  Phillip Chamberlin, Qian Gong

- ON-ORBIT MODULATION TRANSFER FUNCTION CHARACTERIZATION OF TERRA MODIS USING THE MOON

  Taeyoung Choi

- PHASE CHANGE MATERIAL FOR TEMPERATURE CONTROL OF IMAGER OR SOUNDER ON GOES TYPE SATELLITES IN GEO

  Michael Choi

- PRACTICAL UAV OPTICAL SENSOR BENCH WITH MINIMAL ADJUSTABILITY

  Paula Gonzales, Jeffrey Pilgrim

- RADIATION HARD BY DESIGN (RHBD) ELECTRONICS

  Gary Maki, Sterling Whitaker

2012 TECHNOLOGY DISCLOSURES

- SAM/MSL CONTAMINANTS SPECTRAL LIBRARY

  Prabhakar Misra, Raul Garcia-Sanchez, Paul Mahaffy, John Canham, Doris Jallice

- SCIENCE ANALOG BOARD

  Seshagiri Nadendla

- THE RECOVER BURNED AREA EMERGENCY RESPONSE DECISION SUPPORT SYSTEM CONCEPT, DESIGN, ARCHITECTURE, AND OPERATION

  John Schnase

- THREE CANTED RADIATOR PANELS TO PROVIDE ADEQUATE COOLING FOR INSTRUMENTS ON SLEWING SPACECRAFT IN LEO

  Michael Choi

- TRANSLATIONAL MODULATORS FOR LINEAR POLARIZATION TRANSFORMATION OPERATING VIA THE INTRODUCTION OF A VARIABLE PHASE DELAY BETWEEN RIGHT- AND LEFT-HANDED CIRCULAR POLARIZATION STATES

  David Chuss, Edward Wollack, Kongpop U-Yen, Giampaolo Pisano

- USING PRE-MELTED PHASE CHANGE MATERIAL TO KEEP PAYLOAD WARM WITHOUT POWER FOR HOURS IN SPACE

  Michael Choi

- WIDE BAND, DUAL POLARIZED ULTRA-LOW NOISE FOCAL PLANE ARRAY FEED FOR ACTIVE/PASSIVE MICROWAVE REMOTE SENSING

  Manohar Deshpande

- COMPARISON TOOL FOR JAVA ARCHIVE FILES AND JAVA CLASS FILES

  Andrew Spina

- A NOVEL LENSLET COUPLED PINHOLE MASK TO SUPPRESS STARLIGHT FOR HIGH CONTRAST IMAGING

  Qian Gong, Michael McElwain

- SOFTWARE FOR EXECUTING CCSDS 121B STANDARDS ON “LOSSLESS DATA COMPRESSION”

  Penshu Yeh

- AUTOMATED ENCLOSED GATE TRANSISTOR LAYOUT CELLS FOR RADIATION TOLERANT ASIC DESIGN

  Jeffrey DuMonthier

- NEW RHBO ELECTRONICS

  Gary Maki, Sterling Whitaker

- SOFTWARE FOR EXECUTING INTERNATIONAL STANDARD CCSDS 123B ON “LOSSLESS MULTISPECTRAL & HYPERSPECTRAL IMAGE COMPRESSION”

  Penshu Yeh

- MIRRORLET ARRAY FOR INTEGRAL FIELD SPECTROMETERS (IFS)

  Qian Gong, Phillip Chamberlin, David Content, Jeffrey Kruk

- HIGH PRECISION TECHNIQUE FOR STACKING FAR-INFRARED BANDPASS FILTERS

  Ari Brown, Willie Merrell

- PROCESS TO FORM DUPONT KAPTON HN POLYMIDE FILM INTO SPRINGS

  John Moery

- GENERAL MISSION ANALYSIS TOOL (GMAT) R2012A

  Steven Hughes, Linda Jun, Wendy Shoan, Tuan Nguyen, Thomas Grubb, Joel Parker, Harvey Walden, Vladimir Lumelskly, Darrel Conway, Shawn Hoffman, John Bez

- A NON-INTRUSIVE PRESSURE-LINE DRYER

  Qiang Ji

- NOVEL FAR ULTRAVIOLET PHOTODECTECTOR FOR OPEN SPACEAPPLICATIONS

  Paul Shnitser, Victor Grubsky, Keith Shoemaker, Roman Ostroumov

- SAMPLE ANALYSIS AT MARS INSTRUMENT SIMULATOR

  Mehdi Benna, Tom Nolan

- OPENLIS

  Christa Peters-Lidard, Sujay Kumar, Yudong Tan, David Mocko, James Geiger, Luther Lighty, Randal Koster, Rolf Reichle, Susan Olden, Ben Zaitchik

- MINIATURE TIME-OF-FLIGHT MASS SPECTROMETER (TOF-MS) WITH A WIRE RING REFLECTRON AND COMBINED DETECTOR BODY / ION GATE

  Timothy Cornish, Scott Ecelberger

- GMSEC API GENERIC JMS MIDDLEWARE WRAPPER

  Robert Wiegand, Matthew Handy

- BIAMOLED (BIOMETRIC INTEGRATED ACTIVE-MATRIX ORGANIC LIGHT-EMITTING DIODE) DISPLAY

  Eleanya Onuma

- SELF FOCUSED OPTICAL VORTEX FOR USE AS A TRACTOR BEAM

  Demetrios Poulios, Paul Stysley, Richard Kay, Donald Coyle, Gregory Clarke

- SCOTCH-TAPE MIRROR FOR HARD X-RAYS

  Maxim Markevitch

- CICERO CONFIGURATION MANAGEMENT SYSTEM - A GENERIC, CUSTOMIZABLE, WEB-BASED DATABASE APPLICATIONTO FACILITATE DOCUMENTATION CHANGE

  David Robshaw, Martyn Noss

- GREAT (GODDARD MISSION SERVICES EVOLUTION CENTER (GMSEC) REUSABLE EVENTS ANALYSIS TOOLKIT)

  Matthew Handy, Robert Wiegand

- GIOVANNI TABLET APP SUITE

  Christopher Lynnes, Hannah Kerner

- THUNDER WHEEL

  Eleanya Onuma

- PACKET TO ELECTRICAL GROUND SUPPORT EQUIPMENT (EGSE) INTERFACE CONVERTER, VERSION 4.0.

  Thomas Pfarr

- PARTIALLY TRANSPARENT PETALED MASK/OCCULTER FOR VISIBLE RANGE SPECTRUM

  Shahram Shiri, Wasyl Wasylkiwskyj

- PHOTONIC WAVEGUIDE CHOKE JOINT WITH ABSORPTIVE LOADING

  Edward Wollack, David Chuss, Kongpop U-Yen

- DEVELOPMENT OF A 1,920 X 2,048 (2K X 2K) GAAS QWIP ARRAY

  Murzban Jhabvala, Christine Jhabvala, Kwong Kit Choi

- PHASE II FOR FIBER COUPLED PULSE SHAPER FOR SUB-NANOSECOND PULSE LIDAR

  Tony Roberts, Gregg Switzer, Philip Battle

- DRIVER COMMUNICATION DISRUPTOR

  Eleanya Onuma

- MERRA ANALYTIC SERVICES (MERRA/AS) CONCEPT, DESIGN, ARCHITECTURE, AND OPERATION

  John Schnase, Daniel Duffy

- PHASE II FOR DOMAIN ENGINEERED MAGNESIUM OXIDE DOPED LITHIUM NIOBATE FOR LIDAR-BASED REMOTE SENSING

  Philip Battle, Martin Fejer, Carsten Lang

- FLEXIBLE MULTILAYER OXYGEN AND WATER BARRIER FILM FOR FOOD PACKAGING AND RELATED APPLICATIONS

  Stuart Cogan, Michael Gilbert

- UV-TO-SWIR PHOTODIODE

  Abhay Joshi, Shubhashish Datta

- FLASHPOSE: RANGE AND INTENSITY IMAGE-BASED TERRAIN AND VEHICLE RELATIVE POSE ESTIMATION ALGORITHM

  Nathaniel Gill, John Van Eepoel, Joseph Galante

- SYNTHETIC IMAGING MANEUVER OPTIMIZATION (SIMO) SBIR PHASE 2

  Alvar Saenz-Otero, John Merk

- DUPLICATE OF MODIFIED COLLINS CRYOCOOLER FOR CRYO-PROPELLANT THERMAL MANAGEMENT

  Chuck Hannon, Jake Hogan, Martin Segado, John Brisson

- COMPOSITE ROLLED MAGNETOMETER BOOM, CROMAG BOOM

  Robert Taylor, Dana Turse, Mark Reavis

- BROADBAND PHOTON-COUNTING MICROWAVE KINETIC INDUCTANCE DETECTOR

  Samual Moseley, Kongpop U-yen, Ari Brown, Thomas Stevenson, Wen-Ting Hsieh, Edward Wollack, Negar Ehsan

- GEO SERVICING SATELLITE MISSION ARCITECTURE

  Bo Naasz, Benjamin Reed, Joseph Pellegrino

- WAVELENGTH DRIFT CORRECTOR FOR WIND LIDAR RECEIVERS (T4.01-9860)

  J. Sirota

2012 TECHNOLOGY DISCLOSURES

- RIDGE WAVEGUIDE STRUCTURES IN MAGNESIUM-DOPED LITHIUM NIOBATE

  Justin Hawthorne, Gregg Switzer, Philip Battle, Phil Himmer

- AN OMNIDIRECTIONAL, CIRCULARLY POLARIZED, BROADBAND, S-BAND ANTENNA FOR SPACECRAFT COMMUNICATIONS

  Ali Mahnad, Devid Green

- FORTRAN TESTING AND REFACTORING INFRASTRUCTURE

  David Alexander

- PARTICLE FILTER SIMULATION AND ANALYSIS ENABLING NON-TRADITIONAL NAVIGATION

  John Gaebler, Alinda Mashiku, Russell Carpenter

- CARBON FOAM WICK STRUCTURES FOR LOOP HEAT PIPE AND HEAT PIPE APPLICATIONS

  Eric Silk, David Myre, Brandon Stanley, Matthew Stanley

- OPTICAL DEVICE FOR CONVERTING A LASER BEAM INTO TWO COALIGNED BUT OPPOSITELY DIRECTED BEAMS

  Donald Jennings

- A SIMPLE ESD TEST APPARATUS FOR SOLDERING IRONS

  Jose Sancho, Robert Esser

- SPACE OPERATIONS LEARNING CENTER (SOLC) IPHONE/IPAD APPLICATION

  Scott Hull, Daniel Binebrink, Heng Kuok

- ALGORITHM SUPPORT FUNCTIONS (ASF) VIIRS DAY/NIGHT BAND (DNB) LOOK UP TABLES (LUT) (GVVSSE & GVVSLE) GENERATION (VIIRS 001)

  Calvin Liang

- ALGORITHM SUPPORT FUNCTIONS (ASF) GEOLOCATION LOOK-UP TABLE (LUT) TOOL

  Lushalan Liao

- ALGORITHM SUPPORT FUNCTIONS (ASF) VIIRS DNB ZERO OFFSET VS. RESPONSE LOOK-UP TABLES (LUT) (VIIRS 047)

  Stephanie Weiss

- ALGORITHM SUPPORT FUNCTIONS (ASF) VIIRS DUAL GAIN ANOMALY TRACKING

  Shu-Hsiang Lou

- ALGORITHM SUPPORT FUNCTIONS (ASF) VIIRS H-SCALE FACTOR LOOK-UP TABLE (LUT) (VIIRS 100)

  Tohru Ohnuki

- ALGORITHM SUPPORT FUNCTIONS (ASF) VIIRS ICE SURFACE TEMPERATURE (IST) REGRESSION COEFFICIENT GENERATION TOOL (VIIRS 016)

  Robert Mahoney

- ALGORITHM SUPPORT FUNCTIONS (ASF) VIIRS LAND SURFACE TEMPERATURE (LST) REGRESSION COEFFICIENT GENERATION TOOL (VIIRS 014)

  Robert Mahoney

- ALGORITHM SUPPORT FUNCTIONS (ASF) VIIRS QUARTERLY SURFACE TYPE (QST) LAND WATER MASK (LWM) OVERLAY TOOL (VIIRS 200)

  Robert Mahoney, Don Searcy

- ALGORITHM SUPPORT FUNCTIONS (ASF) VIIRS SEA SURFACE TEMPERATURE (SST) REGRESSION COEFFICIENT GENERATION TOOL (VIIRS 004)

  Robert Mahoney

- ALGORITHM SUPPORT FUNCTIONS (ASF) VIIRS SEA SURFACE TEMPERATURE (SST) MATCHUP GENERATION TOOL (VIIRS 004A)

  Albert Danial

- ALGORITHM SUPPORT FUNCTIONS (ASF) VIIRS SURFACE TEMPERATURE (ST) IP REGRESSION COEFFICIENT GENERATION TOOL (VIIRS 028)

  Robert Mahoney

- ATMS RDR EXTRACTOR CALIBRATION/VALIDATION TOOL

  Alex Foo

- CRIS NONLINEARITY CORRECTION COEFFICIENTS ANALYSIS CALIBRATION/VALIDATION TOOL

  Chunming Wang

- CRIS ON-ORBIT SPECTRAL CALIBRATION/VALIDATION TOOL

  Denise Hagan

- CRLS RADIOSONDE OBSERVATION (RAOB) MATCHUP CALIBRATION/VALIDATION TOOL

  Alex Foo

- CRLS RDR DATA READER CALIBRATION/VALIDATION

  Chunming Wang

- CRLS SDR QUALITY FLAG (QF) TRENDING PGE CALIBRATION/ VALIDATION TOOL

  Denise Hagan

- OMPS CALIBRATION SDR CHECK AND OMPS STATISTICS EARTH SDR CALIBRATION/ VALIDATION TOOL [OMPS SDR GLOBAL DISPLAY TOOL]

  Wen-Hao Li, Bhaswar Sen

- OMPS READER FOR OPERATIONAL BINARY TABLES CALIBRATION/VALIDATION TOOL

  Bhaswar Sen

- OMPS TOTAL COLUMN AND NADIR PROFILE READER, MAPPER AND ANALYSIS CALIBRATION/VALIDATION TOOLS

  Megan Novicki, Wen-Hao Li

- VALIDATING CRLS GEOLOCATION SDR USING VIIRS CALIBRATION/ VALIDATION TOOL

  Denise Hagan

- VIIRS AEROSOL OPTICAL THICKNESS (AOT)/ AEROSOL PARTICLE SIZE PARAMETER (APSP) CALIBRATION/ VALIDATION TOOL

  Sid Jackson

- VIIRS BAND-TO-BAND REGISTRATION, MTF, HSR AND LSF CALIBRATION/VALIDATION TOOL

  Lushalan Liao

- VIIRS CALIBRATOR VIEW VISUALIZATION AND ANALYSIS CALIBRATION/VALIDATION TOOL

  Frank Sun

- VIIRS CLOUD MASK (VCM) TOOL AND COEFFICIENT GENERATION DOCUMENT CALIBRATION/ VALIDATION

  Barbara Lisager, Keith Hutchinson

- VIIRS CLOUDS {CLOUD OPTICAL THICKNESS (COT), CLOUD TOP PARAMETERS (CTP) & CLOUD BASE HEIGHT (CBH)} CALIBRATION/VALIDATION TOOL

  Eric Wong, Li Wen-Hao

- VIIRS COMMON MATCHUP CUTOUT CALIBRATION/ VALIDATION TOOL, V2.9

  Albert Danial

- VIIRS CO-REGISTERED IMAGE VISUALIZATION CALIBRATION/ VALIDATION TOOL

  Lushalan Liao

- VIIRS EARTH RDR VISUALIZATION & ANALYSIS CALIBRATION/ VALIDATION TOOL

  Steven Mills, Frank Sun

- VIIRS ENCODER ANALYSIS CALIBRATION/VALIDATION TOOL

  John Shepanski

- VIIRS GAIN MAP GENERATION CALIBRATION/VALIDATION TOOL

  Shu-Hsiang Lou

- VIIRS ICE SURFACE TEMPERATURE (IST) CALIBRATION/VALIDATION TOOL

  Justin Ip

- VIIRS LAND SURFACE TEMPERATURE (LST) CALIBRATION/VALIDATION TOOL

  Justin Ip

- VIIRS OCEAN COLOR PHASE I CALIBRATION/VALIDATION [OVERLAP MATCHUP (OMT) CAL/ VAL TOOL]

  Patty Pratt

- VIIRS OCEAN COLOR (OC) POLARIZATION VERIFICATION TOOL (PVT) PHASE II CALIBRATION/VALIDATION TOOL

  Patty Pratt

- VIIRS OVERPASS RADIOMETRIC COMPARISON CALIBRATION/ VALIDATION TOOL

  Ziping Sun

- VIIRS QUARTERLY SURFACE TYPE (QST) LOGIC TREE UPDATES ALGORITHM SUPPORT FUNCTIONS (ASF) TOOL

  Alain Sei

- VIIRS QUARTERLY SURFACE TYPE (QST) UPDATES ALGORITHM SUPPORT FUNCTION (ASF) TOOL

  Alain Sei

- VIIRS RDR EXTRACTOR CALIBRATION/VALIDATION TOOL

  Michael Plonski

- VIIRS SEA SURFACE TEMPERATURE (SST) CALIBRATION/ VALIDATION TOOL

  Sid Jackson

- VIIRS SURFACE REFLECTANCE AND VEGETATION INDEX CALIBRATION & VALIDATION TOOL

  Alain Sei

2012 TECHNOLOGY DISCLOSURES

- VIIRS SUSPENDED MATTER CALIBRATION/VALIDATION TOOL

  Sid Jackson

- VIIRS TELEMETRY PROBES - ON DEMAND CALIBRATION/ VALIDATION TOOL

  Michael Plonski

- DEVELOPMENT OF TRANSITION-EDGE HOT-ELECTRON MICROBOLOMETERS (THM) FOR MILLIMETER AND SUBMILLIMETER ASTROPHYSICS

  Wen-Ting Hsieh, Emily Barrentine, Thomas Stevenson, Kongpop U-yen, Edward Wollack

- MEASURING FOREST CANOPY HEIGHT USING ICESAT-2 SIMULATED DATA

  Ross Nelson, Ricardo Topham

- ACCELEROMETER FOR SPACE APPLICATIONS BASED ON LIGHT-PULSE ATOM INTERFEROMETRY

  Adam Black, Frank Roller, Thang Tran

- ADVANCED EXOPLANET STAR TRACKER FOR ORBIT SELF DETERMINATION

  George Hindman

- DUAL-LASER OPTICAL MODULE INTEGRATED WITH MICROCHIP CAPILLARY ELECTROPHORESIS AND AUTOMATED ON-CHIP IMMUNOASSAY

  Hong Jiao

- ELECTRONICALLY-TUNED HARMONIC MATCHING NETWORKS FOR HIGH EFFICIENCY RF POWER AMPLIFIER

  Salvador Mendez, Timothy Wurth, Jeffrey Wells

- HIGH PRESSURE "PUMP-ON-A-CHIP" TECHNOLOGY

  Hong Jiao

- CARBON NANOTUBE-BASED SUPERCAPACITOR

  Jun Ai, Fedor Dimov

- HIGH PRECISION METAL THIN FILM LIFTOFF TECHNIQUE

  Ari Brown, Amil Patel

- TOOL FOR AUTOMATED RETRIEVAL OF GENERIC EVENT TRACKS (TARGET)

  Shawn Freeman, Kwo-Sen Kuo, Thomas Clune, Carlos Cruz, Jules Kouatchou, Robert Burns

- LASER BASED, TEMPERATURE INSENSITIVE, CARBON DIOXIDE ISOTOPE RATIO MEASUREMENTS

  Steven Massick, Kristen Peterson, Anthony Gomez

- LASER BASED, TEMPERATURE INSENSITIVE, CARBON DIOXIDE ISOTOPE RATIO MEASUREMENTS

  Steven Massick, Kristen Peterson, Anthony Gomez

- HIGH TEMPERATURE AND HIGH QE BROADBAND LONGWAVE INFRARED SLS FPA FOR LANDSAT

  Mani Sundaram

- THE NASA VIZ APPLICATION AIMS TO DEVELOP AN INTUITIVE AND HIGHLY INTERACTIVE APPLICATION FOR THE IPHONE TO SHOWCASE THE BEST MULTIMEDIA CONTENTPRODUCED BY THE NASA GSFC STORYTELLING TEAM. THIS APPLICATION IS AN EXTENSION OF THE NASAVIZ IPAD PROJECT, WHICH WAS RELEASED ON JULY 26, 2011.

  Troy Ames, Carl Hostetter, Horace Mitchell, Joycelyn Jones, Wade Sisler, Katherine Lewis, Helen-Nicole Kostis, Kayvon Sharghi

- GLOBAL PRECIPITATION MEASUREMENT (GPM) SPACECRAFT FLIGHT SOFTWARE (FSW) VERSION 4.2.3

  David McComas, Maureen Armbruster, Maureen Bartholomew, David Hardison, Susanne Strege, Nicholas Yanchik, Ji-Wei Wu, Michael Lambertson, David Kobe, Stephen Judy, Robert McGraw, Scott Applebee, Anren Hu, William Keksz, Bruce Trout, James Dailey, Chien-Cheng Fu

- SINGLE PHOTON COUNTING NANOWIRE SPECTROSCOPIC DETECTOR

  John Hagopian

- SLIM FOR AGILE MISSION LIFECYCLE MANAGEMENT

  Manas Bajaj, Andrew Scott, Anh Phung

- SPACECUBE V2.0 PROCESSOR CARD, ENGINEERING MODEL

  David Petrick, Dennis Albaijes

- INTERNATIONAL SPACE STATION (ISS) EXPERIMENT CONTROL CENTER

  Jeffrey Hosler, Daniel Espinosa, David Petrick

- ATMS SDR READER CALIBRATION/VALIDATION TOOL

  Alex Foo

- GODDARD MISSION SERVICES EVOLUTION CENTER (GMSEC) WEB SERVICE 1.1

  Vuong Ly, Robert Wiegand, LaMont Ruley

- GEMS 1.2

  Timothy Esposito, Danford Smith

- CUBESAT POWER SYSTEM WITH AUTOMATIC HIGH-POWERED PAYLOAD CYCLING

  Thomas Flatley

- JWST/ISIM IC&DH INSTRUMENT FLIGHT SOFTWARE (IC12.5)

  Bruce Savadkin, Gary Smith, Brett Mathews, Charles Rogers, Christos Xenophontos, Edgar Greville

- ADVANCED SPACECRAFT INTEGRATION & SYSTEM TEST SOFTWARE (ASIST) VERSION 9.7.N

  Ryan Detter, Edwin Fung, James Dowling, Larry Alexander, Jeffrey Condron, Daniel Grogan, Thomas Green, Peter Gorog, George Wofford

- AN IPHONE/IPAD MOBILE APPLICATION FOR THE WALLOPS RESEARCH RANGE: WHATS UP AT WALLOPS

  Pamela Pittman, Nathan Riolo

- AN ANDROID MOBILE APPLICATION FOR THE WALLOPS RESEARCH RANGE: WHATS UP AT WALLOPS

  Pamela Pittman, Nathan Riolo

- SWITCHABLE VOLTAGE REGULATOR CIRCUIT WITH OVER CURRENT DETECTION

  David Petrick

- ADVANCED MISSION GRAPHICS HEALTH AND STATUS MONITOR

  Sandra Kleckner, Sarah Daugherty, Earl Taylor, Benjamin Cervantes, Nathan Riolo, Jeffrey Dorman, Deborah Stanley, Michael Matthews, Debra Parks

- AMMONIA LEAK DETECTION THROUGH X-RAY FLUORESCENCE

  Jordan Camp, Scott Barthelmy, Gerry Skinner

- LIGHTWEIGHT LIQUID HELIUM DEWAR FOR HIGH-ALTITUDE BALLOON PAYLOADS

  Alan Kogut, Bryan James, Dale Fixsen

- COMMON SENSE CLIMATE INDEX

  James Hansen

- ASSERT-BASED UNIT TEST TOOLS

  David McComas, Steven Slegel

- ADVANCED MISSION GRAPHICS (AMG) DISPLAY BUILDER

  Debra Parks, Sandra Kleckner, Sarah Daugherty, Earl Taylor, Benjamin Cervantes, Nathan Riolo, Jeffrey Dorman, Deborah Stanley, Michael Matthews

- ADVANCED MISSION GRAPHICS (AMG) MISSION CONFIGURATION SERVER

  Debra Parks, Sandra Kleckner, Sarah Daugherty, Earl Taylor, Benjamin Cervantes, Nathan Riolo, Jeffrey Dorman, Deborah Stanley, Michael Matthews

- RANGE SAFETY FLIGHT ELEVATION LIMIT CALCULATION SOFTWARE

  Raymond Lanzi

- DUPLICATE OF MULTIPASS SPECTROSCOPY CELL WITH INTEGRATED INPUT OUTPUT FIBER DELIVERY

  Philippe Bado, Tom Haddock

- OPEN SOURCE PLATFORM-NEUTRAL BLAS LIBRARY

  Kyle Spagnoli

- VERY LOW-COST, RUGGED, VACUUM SYSTEM PHASE II

  Paul Sorensen, Christian Passow, Steve Bilski, Robert Kline-Schoder

- EXPLORATION PORTABLE ELECTROSTATIC DETECTOR

  Telana Jackson, William Farrell

- SPHERICAL EMPIRICAL MODE DECOMPOSITION

  Nicolas Gagarin

- JAMES WEBB SPACE TELESCOPE INTEGRATED SCIENCE INSTRUMENT MODULE (ISIM) ALIGNMENT OPTIMIZATION TOOL

  Brent Bos

- ORBIT DETERMINATION TOOLBOX 2012A (V5.0)

  Kenneth Getzandanner, Russell Carpenter, Kevin Berry, John Gaebler

- SPACECUBE V2.0 FLIGHT PROCESSOR CARD

  David Petrick, Thomas Flatley, Alessandro Geist

2012 TECHNOLOGY DISCLOSURES

- DATA ENCODING AND PARALLELIZATION PORTING TECHNIQUES TO TRANSFORM DATA-INTENSIVE APPLICATIONS PROCESSING BINARY DATA FORMATS TO HADOOP/MAPREDUCE

  Qiming He

- VIRTUAL TELESCOPE DEMONSTRATION MISSION

  Neerav Shah

- NEAR-EARTH ASTEROID HYPER-RESOLUTION IMAGER (NEAHRI) DEVELOPMENT

  Brent Bos, Patrick Thompson, James Rice

- COMPACT FOCAL PLANE ASSEMBLY FOR PLANETARY SCIENCE

  Ari Brown, Shahid Aslam, Wei-chung Huang, Rosalind Steptoe-Jackson

- PROPELLANT LOADING VISUALIZATION SOFTWARE

  Bryan Friia, Graham Webster

- DEVELOPMENT OF TECHNOLOGY FOR A COMET SAMPLE RETURN MISSION

  Joseph Nuth, Donald Wegel, Lloyd Purves, Edward Amatucci

- METER CLASS SINGLE CRYSTAL SILICON (SCSI) MIRROR FABRICATION

  Peter Hill, Vincent Bly

- CONFORMAL CARBON NANOTUBES FOR STRAY LIGHT SUPPRESSION, NEAR-IDEAL CALIBRATORS, DETECTORS AND OTHER APPLICATIONS

  John Hagopian, Vivek Dwivedi

- NANO-ANTENNA DESIGN FOR ENERGY HARVESTING AND LIGHT DETECTION

  John Hagopian, Edward Wollack, Shahram Shiri, Patrick Roman

- NANO-ANTENNA DESIGN FOR EXTENDING THE BAND GAP OF SILICON DETECTORS

  John Hagopian, Patrick Roman, Shahram Shiri

- (HYPER)GAUSSIAN LIQUID CRYSTAL IRIS FOR DIFFRACTION SUPPRESSION IN OPTICAL SYSTEMS

  John Hagopian, Shahram Shiri

- HYDROLYSIS USING NANOSCALE ANTENNAS

  John Hagopian, Shahram Shiri

- HYDROLYSIS USING PLATINUM OR OTHER METALLIC NANO-PARTICLES

  John Hagopian

- IN SITU AIRBORNE FORMALDEHYDE INSTRUMENT

  Andrew Swanson, Thomas Hanisco, Steven Bailey

- PHOTONICS WAVEGUIDE CIRCUIT BASED FOURIER TRANSFORM SPECTROMETER ON A CHIP FOR INFRARED REMOTE SENSING APPLICATIONS REQUIRING LOW-MASS, LOW-POWER SYSTEMS

  Shahid Aslam, Tilak Hewagama, Patrick Roman, George Shaw, John Annen, Hollis Jones, John Allen, Theodor Kostiuk, Donald Jennings

- THE GLOBAL MICROSCOPE: INTEGRATING NASA DATA INTO LEARNING AND TEACHING

  Sarah Baker

- FABRICATION METHOD FOR LOBSTER-EYE OPTICS IN <110> SILICON

  James Chervenak, Michael Collier, Jennette Mateo

- FLEXIBLE MICROSTRIP CIRCUITS FOR SUPERCONDUCTING ELECTRONICS

  James Chervenak, Jennette Mateo

- LASER-BASED TRACTOR BEAMS FOR REMOTE SENSING AND SAMPLE COLLECTION APPLICATIONS

  Paul Stysley, Demetrios Poulios, Richard Kay, Donald Coyle

- 42: A COMPREHENSIVE GENERAL-PURPOSE SIMULATION OF ATTITUDE AND TRAJECTORY DYNAMICS AND CONTROL OF MULTIPLE SPACECRAFT COMPOSED OF MULTIPLE RIGID OR FLEXIBLE BODIES

  Eric Stoneking, Brayden Holus

- EXPENDABLE COMPOSITE CANARIES FOR RADOME HEALTH MANAGEMENT

  John Evans

- TASS-ENHANCED NEAR EARTH NAVIGATION EXPERIMENT

  Kenn Gold, Michael Mathews, Peter MacDoran, Michael Davies, Monther Hasouneh

- A NOVEL HYBRID COLOR MAPPING APPROACH TO GENERATING HIGH RESOLUTION HYPERSPECTRAL IMAGES

  Chiman Kwan, Jin Zhou

- PRECISION MINIATURE ATTITUDE DETERMINATION AND CONTROL SYSTEM

  Steve Fujikawa

- ADVANCED CMOS RADIATION HARDENED MICRO PROCESSOR BASED STRUCTURED ASIC AND DESIGN FLOW

  Kelly DeGregorio, Dale Wilson, Douglas Hackler, Scott Dahl

- COVARIANCE ANALYSIS OF ASTROMETRIC ALIGNMENT ESTIMATION ARCHITECTURES FOR PRECISION DUAL SPACECRAFT FORMATION FLYING

  Neerav Shah, Philip Calhoun

- ELECTROMAGNETIC SCATTERING AND ABSORPTION PROPERTIES OF MULTIPLE SPHERE CLUSTERS VIA PARALLELIZED T-MATRIX FORTRAN CODE

  Michael Mishchenko, Daniel Mackowski

- SINGLE-FREQUENCY NARROW LINEWIDTH 1.5UM SEMICONDUCTOR LASER SUITABLE FOR SPACEFLIGHT OPERATION

  Lew Stolpner, Georgious Margaritas

- LOW-POWER RADIATION-HARDENED DELAY-INSENSITIVE ASYNCHRONOUS MICROCONTROLLER TECHNOLOGY CAPABLE OF OPERATING IN EXTREME TEMPERATURE ENVIRONMENTS

  Marcelo Sschupbach

- INDEPENDENT TEST CAPABILITY (ITC) SYNCHRONOUS BUS (ITCSB)

  Steven Saeger, Daniel Nawrocki, Scott Zemerick, Justin McCarty, Jeffrey Joltes, Brandon Bailey, Gary Carvell, Mark Pitts, Justin Morris

- CRYOGENIC AND VACUUM COMPATIBLE METROLOGY SYSTEMS

  Gregory Scharfstein

- PASSIVATION OF FLEXIBLE YBCO SUPERCONDUCTING CURRENT LEAD WITH AMORPHOUS SILICON DIOXIDE LAYER

  Daniel Yohannes, Robert Webber

- METHOD FOR THE SYNTHESIS OF BULK AMORPHOUS FERROMAGNETIC MATERIALS

  David Gray, Alex Aning

- THE FIRST MONOLITHIC SILICON CARBIDE ACTIVE PIXEL SENSOR ARRAY FOR SOLAR BLIND UV DETECTION

  Leonid Fursin

- LOW ER-DOPED YTTRIUM GALLIUM GARNET (YGG) AS ACTIVE MEDIA FOR SOLID STATE LASERS (SSLS) AT 1651 NM

  Igor Kudryashov

- LOW-NOISE ANALOG APDS WITH IMPACT IONIZATION ENGINEERING AND NEGATIVE FEEDBACK

  Xudong Jiang, Mark Itzler

- ADVANCED SPACECRAFT NAVIGATION AND TIMING USING CELESTIAL GAMMA-RAY SOURCES (GLINT)

  Suneel Sheikh, Chuck Hisamoto, Zaven Arzoumanian

- POROUS SILICON ON SILICON-ON-INSULATOR SUBSTRATES

  Amil Patel

- JWST IV&V SIMULATION AND TEST (JIST) CORE

  Justin Morris, Daniel Nawrocki, Scott Zemerick, Steven Seeger, Justin McCarty, Jeffrey Joltes, Brandon Bailey, Mark Pitts

- JWST IV&V SIMULATION AND TEST (JIST) RT LOGIC T501 EMULATOR

  Daniel Nawrocki

- JWST IV&V SIMULATION AND TEST (JIST) SOLID STATE RECORDER (SSR) SIMULATOR

  Scott Zemerick

- SOFTWARE FOR PLANNING AND IMPLEMENTING OPTICAL TESTING

  Scott Antonille, Randal Telfer, Cherie Miskey, Don Lindler, Eliot Malumuth, Derek Sabatke, Wayne Landsman

- DIGITALLY STEERED ANTENNA ARRAY FOR NAVIGATOR GPS RECEIVER

  Monther Hasouneh, Heitor Pinto, Luke Winternitz, Jennifer Valdez

- HADS ANALYSIS SOFTWARE FOR ASSEMBLY AND ALIGNMENT OF X-RAY MIRRORS

  Timo Saha, Scott Rohrbach, William Zhang

2012 TECHNOLOGY DISCLOSURES

- CART - CHALLENGE ACTION RESULT TRACKING TOOL

  Wesley Powell, Kenneth Li, Sharon Cooper, Lixa Rodriguez-Ramon, Malinda Thomas, Robert Lebair, Arletta Love

- SOLAR DYNAMICS OBSERVATORY COMMAND AND DATA HANDLING ELECTRONICS

  Kenneth Li, Harry Culver, Ronald Barasch, Kevin Ballou, Kevin Hawkins, Lars Hovmand, Michael Osman, John Pope, John Folk, Wesley Powell

- GENTRE, VERSION 2

  Brent Newhall, Luther Lighty

- CONTROLLED THERMAL EXPANSION ALLOYS

  Timothy Stephenson

- TRMM PRECIPITATION CALCULATOR WITH DATE AND SHAPEFILE INPUTS

  Gerasimos Michalitsianos

- SELF-CALIBRATING VECTOR HELIUM MAGNETOMETER (SVHM)

  Robert Slocum, Andy Brown

- COOLSPICE: SPICE SIMULATOR FOR CRYOGENIC ELECTRONICS

  Akin Akturk, Neil Goldsman, Siddharth Pothare

- LASER FEMTOTESLA MAGNETIC GRADIOMETER

  Robert Slocum

- TOXOGRAPHY: MAPPING AND FORECASTING TOXINS AND ALLERGENS AS THEY MOVE ABOUT THE ENVIRONMENT

  James Perry

- WIDEBAND, DUAL POLARIZED L-BAND ANTENNA ELEMENT FOR MICROWAVE REMOTE SENSING

  Manohar Deshpande

- WFF LDE WEB DATABASE

  Prasad Hanagud, Angela Walker, Brandon Wright, Michelle Leimbach, Julie Hurst, Cheryl Maguire

- THERMALLY AND SPECTRALLY CONTROLLED NIST-TRACEABLE AMBIENT RADIOMETRIC CALIBRATIONS IN THE REFLECTED SOLAR WAVELENGTH REGION

  James Butler, Si-Chee Tsay, Leibo Ding, Qjang Ji

- NONLINEAR ADAPTIVE FILTER FOR MEMS GYRO THERMAL BIAS CANCELLATION

  Joseph Galante

- COMPACT KA BAND ANTENNA FEED WITH DOUBLE CIRCULARLY POLARIZED CAPABILITY FOR NASA'S KA BAND COMMUNICATION APPLICATIONS

  Cornells Du Toit, Kenneth Hersey

- HIGH COEFFICIENT OF PERFORMANCE HGCDTE AND METALLIC SUPERLATTICE-BASED THERMOELECTRIC COOLERS

  Silviu Velicu, Cynthia Deters

- MULTI FREQUENCY RADIO SIGNAL GENERATOR (MRSIG)

  Kenn Gold, Michael Davies

- NEW ACTION ITEMS SYSTEM

  Christopher Martino, David Kuok

- WEEKLY TOOL

  Christopher Martino, David Kuok

- APPARATUS FOR HIGH RESOLUTION MEASUREMENTS OF TOTAL HEMISPHERIC EMISSIVITY AT CRYOGENIC TEMPERATURES

  James Tuttle, Edgar Canavan, Michael DiPirro

- SATURN AND URANUS PROBE APPROACHES

  Amato Michael

- CONCEPT STUDY OF SPACE BORN MM-WAVE RADAR FOR SPACE AWARENESS

  Manohar Deshpande, John Gaebler

- DUAL POLARIZED WIDEBAND P-BAND ANTENNA FOR NASA GSFCS ECOSAR CAMPAIGN

  Manohar Deshpande, Quenton Bonds, Rafael Rincon

- ULTRA WIDE BAND DUAL POLARIZED BEAM STEERING P-BAND ARRAY ANTENNA

  Cornelis Du Toit

Patents Issued

- BLOCKING CONTACTS FOR N-TYPE CADMIUM ZINC CADMIUM ZINC TELLURIDE (CDZNTE)

  Bradford Parker, Feng Yan, Sachidananda Babu, Carl Stahle

- OTOACOUSTIC PROTECTION IN BIOLOGICALLY-INSPIRED SYSTEMS

  Michael Hinchey, Roy Sterritt

- SPACEFLIGHT KA-BAND HIGH RATE RAD HARD MODULATOR

  Jeffrey Jaso

- SPACE LINK EXTENSION RETURN CHANNEL FRAMES (SLE-RCF) SERVICE (USER SIDE) SOFTWARE LIBRARY

  Vuong Ly, Timothy Ray

- FORMULATION FOR EMOTION EMBEDDING IN LOGIC SYSTEMS
  Steven Curtis

- HILBERT-TRANSFORM-BASED PHASE REFERENCING ALGORITHM FOR WIDE-FIELD IMAGING INTERFEROMETRY

  Stephen Rinehart, Nargess Memarsadeghi, Richard Lyon, David Leisawitz

- LOW FREQUENCY WIDEBAND STEP FREQUENCY INVERSE SYNTHETIC APERTURE RADAR FOR 3-D IMAGING OF INTERIOR OF NEAR EARTH OBJECTS/ PLANETARY BODIES

  Manohar Deshpande

- FLIGHT MIRROR MOUNT AND FLIGHT MOUNTING PROCEDURE FOR AN ULTRA-LIGHTWEIGHT HIGH-PRECISION GLASS MIRROR

  Thomas Wallace, Shane Wake, Scott Antonille, David Content

- CROSSED SMALL DEFLECTION ANALYZER (SDEA) FOR WIND/ TEMPERATURE SPECTROMETER (WTS)

  Theodore Finne, Federico Herrero

- THE CORNER CATHODE: MAKING COLLIMATED ELECTRON BEAMS WITH A SMALL NUMBER OF ELECTRODES

  Federico Herrero, Patrick Roman

- SENSOR COMPLETE REQUIREMENTS ALGORITHM FOR AUTONOMOUS MOBILITY

  Steven Curtis

- OTOACOUSTIC PROTECTION IN BIOLOGICALLY-INSPIRED SYSTEMS

  Michael Hinchey, Roy Sterritt

- COMPACT PLANAR MICROWAVE BLOCKING FILTER

  Edward Wollack, Kongpop U-yen

- AERODYNAMICALLY STABILIZED INSTRUMENT PLATFORM FOR KITES AND TETHERED BLIMPS (“AEROPOD”)

  Ted Miles, Geoffrey Bland

- HUGHES PARTICLE – SURFACE INTERACTION MODEL

  David Hughes

- OTOACOUSTIC PROTECTION IN BIOLOGICALLY-INSPIRED SYSTEMS

  Michael Hinchey, Roy Sterritt

- PASSIVELY Q-SWITCHED SIDE PUMPED MONOLITHIC RING LASER

  Steven Li

- SOFTWARE PACKAGE VERSION 1.3 FOR THE CAMERAS FOR ALL-SKY METEOR SURVEILLANCE (CAMS)

  Peter Gural, Petrus Jenniskens

- ADVANCED SPACECRAFT INTEGRATION & SYSTEM TEST SOFTWARE (ASIST) VERSION 20.0

  Ryan Detter, Edwin Fung, James Dowling, Jeffrey Condron, Thomas Green, George Wofford, Charles Englehart, Larry Alexander, Peter Gorog, Daniel Grogan

- SPACECRAFT PARAMETER DATABASE TOOL

  Lawrence Alexander

- IMPROVED SYMBOL TIMING ESTIMATION DESIGN FOR A DISTORTED POISSON COMMUNICATIONS CHANNEL

  Wai Fong, Wing-Tsz Lee

2012 PATENTS

- ARC:A LOW COST AND SCALEABLE ARCHIVE STORAGE MANAGEMENT SYSTEM

  Robert Mason

- ATMS ANTENNA BEAM ANALYSIS SOFTWARE

  Kenneth Hersey

- FITNESS (FREQUENCY INITIATED TECHNIQUE FOR A NOVEL EXERCISE STABILITY SYSTEM)

  Steven Curtis

- SYMMETRIC ABSORBER-COUPLED MICROWAVE KINETIC INDUCTANCE DETECTOR DESIGN - 12 IRAD

  Kongpop U-yen, Edward Wollack, Ari Brown, Thomas Stevenson, Amil Patel

- RIDGE WAVEGUIDE STRUCTURES IN MAGNESIUM-DOPED LITHIUM NIOBATE - STTR PHASE II

  Justin Hawthorne, Gregg Switzer, Philip Battle, Phil Himmer

- STACKED CAPACITOR SPECIAL LEAD ADAPTER

  Stuart Kai

- METHOD OF CONTROLLING A LARGE NUMBER OF THERMOELECTRIC COOLERS THAT MINIMIZE HEAT REJECTION SYSTEM SIZE FOR COOLING DETECTORS

  Michael Choi

- RAPID OPTICAL CHARACTERIZATION SUITE FOR IN SITU TARGET ANALYSIS OF ROCK SURFACES (ROCSTAR)

  Pamela Conrad, Barbara Zukowski, Peter Morey

- MISSION OPERATIONS CENTER - PRECIPITATION PROCESSING SYSTEM (MOC-PPS) INTERFACE SOFTWARE SYSTEM (MPISS) VERSION 3

  Jeffrey Ferrara, William Calk, Tina Tsui

- SSSHIFT - SYNTHETIC SKELETAL-MUSCULAR SYSTEM HIERARCHICALLY IMPLEMENTED FLEXIBLE TOPOLOGY

  Steven Curtis

- WALLOPS FLIGHT FACILITY 6U ADVANCED CUBESAT EJECTOR (ACE)

  Luis Santos, John Hudeck

- LEARNS (LOGIC EXPANSION FOR AUTONOMOUSLY RECONFIGURABLE NEURAL SYSTEMS)

  Steven Curtis

- SINAPSE (STRUCTURE OF INTERFACE FOR NEURAL ARCHITECTURES PSYCHOLOGICALLY STABLE EVOLUTION)

  Steven Curtis

- THE REMOVAL OF MID-SPATIAL FREQUENCY (MSF) ERRORS USING STRESS-POLISHING

  Peter Hill

- GEO-CORRECTION FOR AIRBORNE PLATFORMS (GCAP) 1.0

  Vuong Ly, Timothy Creech, Joshua Bronston

- AN INNOVATIVE DESIGN TO MINIMIZE SIZE OF HEAT REJECTION SYSTEMS THAT USE THERMOELECTRIC COOLERS TO COOL DETECTORS IN SPACE

  Michael Choi

- MIRRORLET ARRAY FOR INTEGRAL FIELD SPECTROMETERS (IFS)

  Qian Gong, Philip Chamberlin, David Content, Jeffrey Kruk

- A NON-INTRUSIVE METHOD OF RESOLVE THE THERMAL-DOME-EFFECT OF PYRANOMETERS

  Si-Chee Tsay, Qiang Ji

Provisional Patents Filed

- MINIATURIZED HIGH SPEED MODULATED X-RAY SOURCE

  Keith Gendreau, Zaven Arzoumanian, Steve Kenyon, Nick Spartana

- ADVANCED PLANETARY ATMOSPHERE-MAGNETOSPHERE MASS SPECTROMETER (APAMMS): ASTID FUNDED FOR EUROPA

  Edward Sittler

- APPARATUSES AND METHODS TO ENABLE SUB-MHZ PRECISION IN FAST LASER FREQUENCY TUNING

  Jeffrey Chen, Kenji Numanta, Stewart Wu, Guangning Yang

- INTEGRATED GENOMIC AND PROTEOMIC INFORMATION SECURITY PROTOCOL

  Harry Shaw, Brian Gosselin

- IMPLEMENTATION PLATFORM FOR NEW METHODOLOGY OF REDUCING SENSOR AND READOUT ELECTRONICS CIRCUITRY NOISE IN DIGITAL DOMAIN USING REFERENCE SPACE PIXELS

  Semion Kizhner, Max Pinchinat, Thomas Flatley, Dominic Benford

- DEVELOPMENT OF THE HILBERT-HUANG TRANSFORM REAL-TIME DATA PROCESSING SYSTEM WITH 2-D CAPABILITIES

  Semion Kizhner

- A CRYPTOGRAPHIC APPROACH TO MICRORNA TARGET BINDING ANALYSIS

  Harry Shaw

- A HIGH EVENT RATE, ZERO DEAD TIME, MULTI-STOP TIME-TO-DIGITAL CONVERTER APPLICATION SPECIFIC INTEGRATED CIRCUIT

  George Suarez, Jeffrey DuMonthier

- A HIGH EVENT RATE, ZERO DEAD TIME, MULTI-STOP TIME-TO-DIGITAL CONVERTER APPLICATION SPECIFIC INTEGRATED CIRCUIT

  Roy Sterritt, Michael Hinchey

- AUTONOMIC AUTOPOIESIS

  Roy Sterritt, Michael Hinchey

- ENHANCED ADHESION MULTIWALLED CARBON NANOTUBES ON TITANIUM SUBSTRATES FOR STRAY LIGHT CONTROL

  John Hagopian, Stephanie Getty, Manuel Quijada

- MINIATURIZED HIGH SPEED MODULATED X-RAY SOURCE

  Keith Gendreau, Zaven Arzoumanian, Steve Kenyon, Nick Spartana

- SAMPLING THEOREM IN TERMS OF THE BANDWIDTH AND SAMPLING INTERVAL

  Bruce Dean

- MINIATURIZED LASER HETERODYNE RADIOMETER FOR CARBON DIOXIDE (CO2), METHANE (CH4), AND CARBON MONOXIDE (CO) MEASUREMENTS IN THE ATMOSPHERIC COLUMN

  Emily Steel, Matthew McLinden

- WAFER LEVEL MICROCHANNEL FABRICATION PROCESS FOR LAP-ON-A-CHIP DEVICES

  Yun Zheng, Edward Wassell, Manuel Balvin, Stephanie Getty

- PHASE CONTROLLED MAGNETIC MIRROR FOR WAVEFRONT CORRECTION

  John Hagopian, Edward Wollack

- POWER PROVISION BASED ON SELF-SACRIFICING SPACECRAFT

  Michael Hinchey, Emil Vassev

- RESOLUTION ENHANCED PSEUDO RANDOM CODE TECHNIQUE

  Steven Li

- SPACECUBE MINI

  Michael Lin, David Petrick, Alessandro Geist, Thomas Flatley

- TIRS SINGLE CRYSTAL SILICONSCENE SELECT MIRROR ENVIRONMENTAL QUALIFICATION REPORT

  John Hagopian, Scott Rohrbach, Vince Bly, Armando Morell, Jason Budinoff

- V-ASSEMBLY DUAL HEAD EFFICIENCY RESONATOR (VADER) LASER TRANSMITTER

  Barry Coyle, Paul Stysley, Demetrios Poulios

- VECTORIZED REBINNING ALGORITHM FOR FAST DATA DOWN-SAMPLING

  Jeffrey Smith, David Aronstein, Bruce Dean

- EXPANDABLE RECONFIGURABLE INSTRUMENT NODE - WEB SENSOR STRAND DEMONSTRATION

  Lawrence Hilliard, Manohar Deshpande

SBIR/STTR ACTIVITIES

2011 SBIR Phase I

2011 STTR Phase I

2010 SBIR Phase II

2011 SBIR Phase I

Keystone Aerospace
Hot Springs, AR
Advanced Exoplanet Star Tracker for Orbit Self Determination

ASTER Labs, Inc.
Saint Paul, MN
Advanced Spacecraft Navigation and Timing Using Celestial Gamma-Ray Sources

Predictive Science Incorporated
San Diego, CA
Anticipating the Geoeffectiveness of Coronal Mass Ejections

Biospherical Instruments, Inc.
San Diego, CA
HybridSpectral Radiometer Systems to Support Ocean Color Cal/Val

Southwest Sciences, Inc.
Santa Fe, NM
Robust optical carbon dioxide isotope analyzer

Translume, Inc.
Ann Arbor, MI
Quantitative Nutrient Analyzer for Autonomous Ocean Deployment

HJ Science & Technology, Inc.
Santa Clara, CA
Novel High Pressure Pump-on-a-Chip Technology

AOSense, Inc.
Sunnyvale, CA
Accelerometer for Space Applications Based on Light-Pulse Atom Interferometry

Dallas Optical Systems, Inc.
Rockwall, TX
Diamond Turned Super Alloy Mandrel for Slump Forming X-Ray Observatory (IXO) Mirrors

American Semiconductor, Inc.
Boise, ID
A 45 nm Low Cost, Radiation Hardened, Platform Based Structured ASIC

Luminit, LLC
Torrance, CA
Carbon Nanotube-based Supercapacitor

CrossTrac Engineering, inc.
Sunnyvale, CA
Millisecond X-ray Star Tracker

2011 STTR Phase I

Intelligent Fiber Optic Systems Corporation
Santa Clara, CA
Miniaurizable, High Performance, Fiber-Optic Gyroscopes for Small Satellites

Arkyd Astronautics, Inc.
Bellevue, WA
Multi-functional Optical Subsystem Enabling Laser Communication on Small Satellites

2010 SBIR Phase II

Redfern Integrated Optics, Inc.
Santa Clara, CA
Development of a Single-Frequency Narrow Linewidth 1.5mm Semiconductor Laser Suitable for Spaceflight Operation

Tahoe RF Semiconductor Inc.
Auburn, CA
Miniaturized Radiation Hardened Beam-Steerable GPS Receiver Front End

Voxtel, Inc.
Beaverton, OR
Large-Area, UV-Optimized, Back-Illuminated Silicon Photomultiplier Arrays

Iris AO, Inc.
Berkeley, CA
Picometer-Resolution MEMS Segmented DM

Applied Material Systems Engineering, Inc. (AMSENG)
Schaumburg, IL
The Conductive Thermal Control Material Systems for Space Applications

2011 SBIR Phase I

Emergent Space Technologies, Inc.
Greenbelt, MD
TASS-Enhanced Near Earth Navigation System

ASTER Labs, Inc.
Saint Paul, MN
Advanced Spacecraft Navigation and Timing Using Celestial Gamma-Ray Sources

Decisive Analytics Corporation
Huntsville, AL
Enhanced Path Planning, Guidance, and Estimation Algorithms for NASA's GMAT

Princeton Lightwave, Inc.
Cranbury Township, NJ
Low-Noise Analog APDs with Impact Ionization Engineering and Negative Feedback

Princeton Lightwave, Inc.
Cranbury Township, NJ
Efficient in-band diode-pumped Q-switched solid state laser for methane detection

QmagiQ
Nashua, NH
High Temperature and High QE Broadband Longwave Infrared SLS FPA for LANDSAT

AGILTRON Corporation
Woburn, MA
High Performance Spatial Filter Array Based on Signal Mode Fiber Bundle

Radiation Monitoring Devices, Inc.
Watertown, MA
Modified High Gain APDs for Multi-beam Ladar Instrumentation

UNITED SILICON CARBIDE, INC.
Monmouth Junction, NJ
The First Monolithic Silicon Carbide Active Pixel Sensor Array for Solar Blind UV Detection

Nu Waves Ltd.
Middletown, OH
High Efficiency Switching Power amplifier for Earth Radar Observation System (HESPEROS)

Prime Photonics, LC
Blacksburg, VA
Bulk metallic glass for low noise fluxgate

HYPRES, Inc.
Elmsford, NY
Low Heat-Leak YBCO Leads for Satellite-Borne ADR Magnets

Translume, Inc.
Ann Arbor, MI
Quantitative Nutrient Analyzer for Autonomous Ocean Deployment

Flexure Engineering
Greenbelt MD
Cryogenic and Vacuum Compatible Metrology Systems

Maryland Aerospace, Inc
Crofton, MD
Integrated CubeSat ADACS with Reaction Wheels and Star Tracker

InterCAX, LLC
Atlanta, GA
SLIM for Agile Mission Lifecycle Managemen

EM Photonics
Newark, DE
OpenCL-Based Linear Algebra Libraries for High-Performance Computing

Open Research, Inc.
Gaithersburg, MD
Towards Rapid Application Provisioning in the Cloud

Signal Processing, Inc.
Rockville, MD
High Performance and Accurate Change Detection System for HyspIRI Missions

2011 STTR Phase I

Applied NanoFemto Technologies, LLC
Lowell, MA
Photonic antenna coupled middle-wave infrared photodetector and focal plane array with low noise and high quantum efficiency

EPIR Technologies, Inc.
Bolingbrook, IL
Infrared Microspectrometer based on MEOMS Lamellar Grating Interferometer

2010 SBIR Phase II

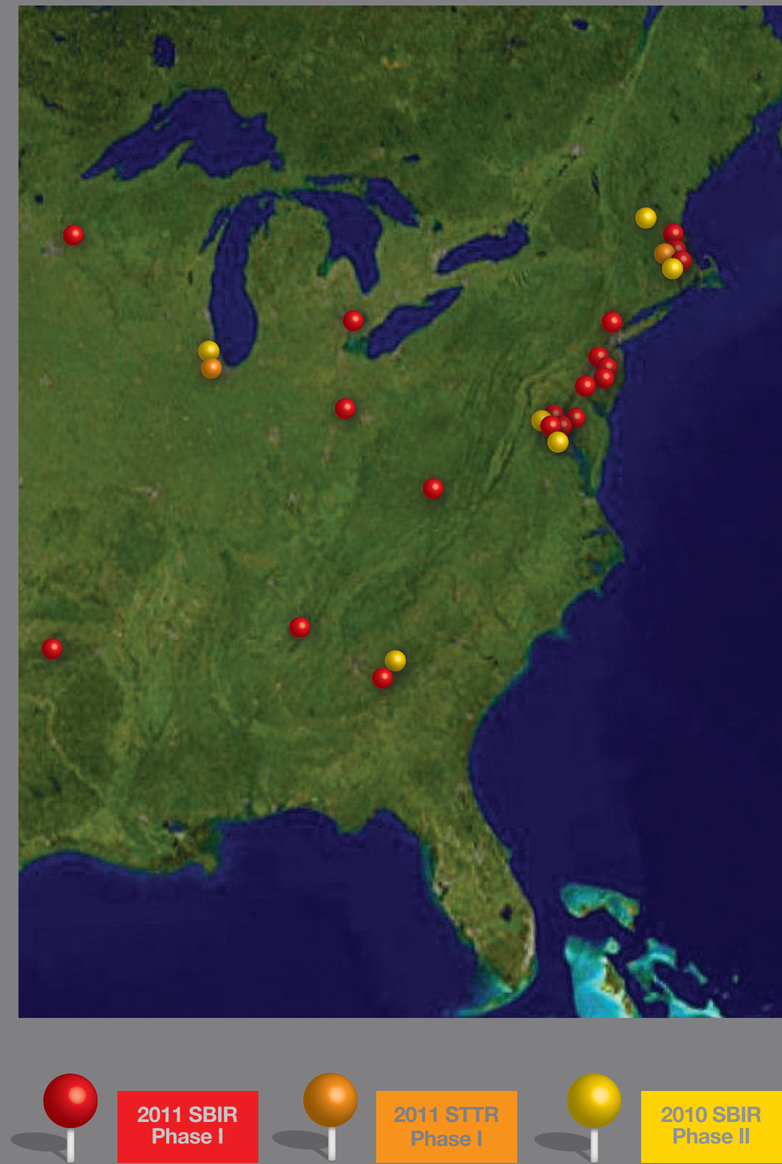
CoolCAD Electronics
College Park, MD
Novel Silicon Carbide Deep Ultraviolet Detectors: Device Modeling, Characterization, Design and Prototyping

Creare, Inc.
Hanover, NH
An Ultra Low Power Cryo-Refrigerator for Space

Q-Peak, Inc.
Bedford, MA
A LIBS/Raman System for Planetary Surface Measurement

Masstech, Inc.
Columbia, MD
Formaldehyde Profiler Using Laser Induced Fluorescence Technique

Applied Material Systems Engineering, Inc.(AMSENG)
Schaumburg, IL
The Conductive Thermal Control Material Systems for Space Applications



Spirit of Innovation Awards Conrad Foundation

(March 29-31, 2012, Moffett Field, CA)

The Conrad Foundation is based on the rich legacy of the late Apollo 12 astronaut and entrepreneur, Charles “Pete” Conrad. His wife, education activist Nancy Conrad, founded the organization in 2008. The Conrad Foundation is dedicated to fundamentally shifting how science, technology, engineering and math (STEM) are taught in K-12 schools and across socioeconomic levels. It is the only not-for-profit, 501(c)(3) organization of its kind to combine education, innovation and entrepreneurship to spark student interest in STEM careers and sustain a knowledge-based economy. Representatives from the NASA Goddard IPPO attended the Conrad Foundation’s 2012 Spirit of Innovation Summit on March 29th - March 31st at Ames Research Center to explore opportunities for collaboration involving the potential infusion of Goddard developed technologies into future student projects. For more information about the Conrad Foundation, go to http://www.conradawards.org/.

Satellite 2012 Conference & Exhibition

(March 12-15, 2012, Washington, DC)

The Satellite 2012 Conference is an annual commercial telecommunications conference that focuses on the latest trends in the commercial spacecraft industry. Conference topics range from satellite subsystem technologies to existing and future market trends, hosted payload opportunities and government/commercial partnerships. Representatives from NASA Goddard’s IPPO attended the Satellite 2012 conference on March 12th - March 15th to investigate potential partnership opportunities in the areas of communication, guidance navigation and control as well as propulsion technologies.

NASA Optimus Prime Spinoff Awards

(April 12, 2012, Cape Canaveral, FL)

The NASA Optimus Prime Spinoff Awards ceremony was held April 12 at NASA Kennedy Space Center. The contest is run by NASA Goddard’s Innovative Partnerships Program Office (IPPO) with the goal to raise student awareness of how NASA technologies provide benefits to the public. A second goal is to show the similarities with the popular Optimus Prime character from Hasbro’s Transformers. Students nationwide in grades 3 through 12 participated in this year’s contest.

The ceremony included managers from NASA and Hasbro, the winning students, and associated NASA innovators and their commercial partners. A special guest was actor Peter Cullen, the voice of Optimus Prime in the highly successful Transformers movies. The NASA Optimus Prime Award is intended to help students recognize some of the many NASA space-related inventions that have found their way into everyday life and benefitted the public. Partners for this event included Hasbro, Rocket 21, ASME, the U.S. Patent Office, and Solar Protective Fabric.

Goddard’s Innovative Partnerships Program Office (IPPO) Senior Technology Manager Darryl Mitchell addresses parents, students, and teachers in the Rocket Garden of the Kennedy Space Center Visitors Complex. – PHOTO BY NASA

Peter Cullen, the voice behind Hasbro's popular Transformers character OPTIMUS PRIME, speaks to guests during the 2012 OPTIMUS PRIME Spinoff Award Ceremony held at the Kennedy Space Center Visitors Complex. —PHOTO BY NASA

Participants in the NASA Optimus Prime program create videos highlighting how a particular NASA invention has been "spun off" as a product that can now be used by the public. This continues a long tradition of NASA inventions and research, originally intended for space missions, being made into products for everyday life. These include important breakthroughs in computers, medical science, communications, photography, and advanced materials.

Space Propulsion 2012 Conference

(May 7 – 12, 2012, Bordeaux, France)

The Space Propulsion 2012 Conference was held May 7 through 12 in Bordeaux, France. In attendance were NASA Goddard representatives who led and participated in panel discussions, gave presentations, and oversaw the NASA exhibit. NASA Goddard personnel also took part in meetings with current and potential partners within NASA and industry.

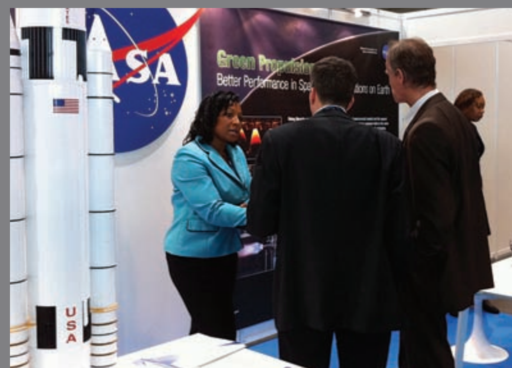
NASA Goddard's primary goals in attending were to learn more about new propellants and propellant systems for space, share ideas about applying current and new propellants to in-space propulsion for near and far term requirements, and encourage interest in collaborating with NASA Goddard to advance the state-of-the-art of propulsion technologies. An additional goal was to further promote the licensing of NASA Goddard component technologies that support space propulsion systems.

The Conference's plenary and breakout sessions were focused on understanding regulations and priorities pertaining to various new propulsion materials and subsequent technologies. As a result, discussions during and following the sessions focused on the best strategies going forward for adapting a broader array of propellants in respective space programs.

Key areas of specific interest to NASA Goddard included:

- Propellants for on-orbit missions.
- Utilization of corresponding hardware systems.
- Structuring government and industry partnerships for technology demonstration to validate new materials.
- Other mechanisms to determine performance requirements for new propulsion materials.

During the conference, the Innovative Partnerships Program Office (IPPO) marketed NASA Goddard intellectual property for component technologies (such as a nitinol valve, GSC-16336-1) for licensing and further development via partnering. This resulted in prospective licenses and possibly new agreements with several industry organizations that are currently being managed by NASA IPPO.



Deputy Center Director for Science & Technology Christyl Johnson speaks with attendees at the NASA booth. —PHOTO BY NASA

Conference on Lasers and Electro-Optics (CLEO)

(May 9 – 11, 2012, San Jose, CA)

Innovative Partnerships Program Office (IPPO) Technology Manager, Enidia Santiago-Arce, presented at CLEO 2012's Tutorial: Technology Transfer 101: Technology Licensing and Tech Startups session. During this presentation Ms. Santiago-Arce described partnering and licensing processes and mechanisms, and shared some of NASA's successful partnering stories.

2012 Nebula Awards Weekend

(May 17 – 20, 2012, Arlington, VA)

The 47th annual Nebula Awards Weekend was held Thursday, May 17 through Sunday, May 20, 2012 at the Hyatt Regency Crystal City in Arlington, VA. These awards, presented by the Science Fiction and Fantasy Writers of America (SFWA), recognize the year's best novel, novella, novelette, short story, and script in the science fiction and fantasy genres. The event was attended by many writers and editors, and included meetings and panel discussions, followed by a banquet on the evening of May 19. The SFWA, founded in 1965, currently has over 1,500 members representing many of the leading writers of science fiction and fantasy.

The 2012 Nebula Awards Weekend included an exhibit presented by the NASA Goddard. The exhibit offered attendees the opportunity to meet NASA personnel, and also provided souvenir space photographs for visitors. In addition, NASA Goddard hosted two panel sessions. The first was "The Potential for Life Beyond Earth: Exoplanets and Astrobiology." In this panel, NASA scientists who study exoplanets, life in extreme conditions, and complex molecules in the solar system discussed the current state of research and what discoveries might be coming in the near future. The second panel was "Exploring the Earth — From Above." This featured a discussion of NASA's latest scientific developments in areas such as climate change and space weather.

Associate Lab Chief of Goddard's Observational Cosmology Lab, Dr. Stephen Rinehart, speaks at a panel discussion on the potential for life beyond Earth at the 47th Annual Nebula Awards Weekend on May 17, 2012, at the Hyatt Regency Crystal City in Arlington, Virginia. —PHOTO BY NASA

NASA's presence at the Nebula Awards event was part of the Agency's ongoing campaign to emphasize the historically strong affinity and synergy between the science research and science fiction communities. Many people currently involved in science and technology credit science fiction as a significant early inspiration for their career choices. In this way, the continued high popularity of science fiction literature, films, and games can serve as an important gateway to the general public.

Science Jamboree

(June 5, 2012, Greenbelt, MD)

The NASA Goddard Innovative Partnerships Program Office (IPPO) hosted a table during this year's annual Science Jamboree taking

IPPO Technology Manager Enidia Santiago-Arce hosts the IPPO booth and speaks with attendees during the 2012 Goddard Science Jamboree. —PHOTO BY NASA place on June 5, in the building 28 atrium. The IPPO distributed information on partnering with NASA as well as literature on NASA's SBIR/STTR program. The Science Jamboree gives Goddard's top scientists and engineers the opportunity to showcase their work to the thousands of people who work at Goddard. This year's jamboree emphasized Earth Science, Heliophysics, and space weather and occurred in conjunction with "Sun-Earth Day" which was held to celebrate the transit of Venus.

2012 Celebrate Goddard Day

(June 28, 2012, Greenbelt, MD)

The IPPO participated in Celebrate Goddard Day on June 28, 2012. Celebrate Goddard

IPPO staff member Adil Anis hosts the IPPO prize wheel during the 2012 Celebrate Goddard Day event on the Goddard Mall. Guests could spin the wheel for a chance to have their photo taken or win various other prizes. —PHOTO BY NASA

Day allows Goddard personnel and interns the opportunity to get acquainted with many of the different aspects of Goddard while touring the center and taking part in various activities and games. The IPPO display explained how to become involved in new technology reporting, and also provided information about the NASA Goddard SBIR/STTR program and the benefits it provides. The booth also hosted a prize wheel giving visitors a chance to have their photo taken as a memento.

Federal Lab Consortium (FLC) Mid-Atlantic and Northeast Regional Meeting

(August 28-30, 2012, Cambridge, Maryland)

Innovative Partnerships Program (IPP) Office Senior Technology Manager, Enidia Santiago-Arce, presented at the FLC Regional meeting held in Cambridge, Maryland on August 28 - 30, 2012. Ms. Santiago-Arce's presentation showcased specific examples of how technology development and technology transfer have made a positive impact on people's lives. Collaborative efforts between federal agencies and outside parties that have resulted in tangible benefits to the public were presented to highlight the ultimate goal of NASA GSFC's technology transfer activities.

Juxtopia® Urban Innovation and Cooperative Entrepreneurship (JUICE) Conference

(September 19, 2012, Baltimore, MD)

Innovative Partnerships Program (IPP) Office Senior Technology Manager, Enidia Santiago-Arce, presented to a group of microenterprises (MEs), small businesses, inventors, students and high tech investors at the Juxtopia(r) Urban Innovation and Cooperative Entrepreneurship (JUICE) Conference taking place on September 19, 2012 in Baltimore, Maryland. Ms. Santiago-Arce's presentation dealt with partnering and collaborating with NASA by taking advantage of NASA Goddard's reach portfolio of technologies that are available for licensing.

63rd International Astronautical Congress

(October 1 through 5, Naples, Italy)

Representatives from several NASA Centers attended the 63rd annual meeting of the International Astronautical Congress (IAC), held in October in Naples, Italy. The IAC is organizes by the International Astronautical Federation, the world's leading space advocacy body with more than 200 members on six continents.

Among the session at this year's conference was "Moon, Mars and Beyond: Analogues, Habitation and Spin-Offs," co-chaired by Nona Cheeks, Chief for NASA Goddard's Innovative Partnerships Program Office. The purpose of this session was to explore the design of habitats and habitable structures for analogue environments and extra-terrestrial planetary surfaces, including spin-offs for terrestrial applications. The session included two presentations delivered by the IPP:

- "Optimize Use of Space Research and Technology for Medical Devices" (IAC-12,E5,2,8,x16096) presented by Ms. Cheeks reviewed the many ways the IPP Office facilitates technology transfer at NASA Goddard. It then presented numerous examples of how NASA Goddard innovations have been adapted for use within the medical community.

- "Using Real Options to See the Effect on Social Needs of Space Visualization Tools" (IAC-12,E5,2,9,x15843) presented by Dr. Phyl Speser of IPP's commercialization partner Foresight Science & Technology. According to Dr. Speser, the contribution of space technology to the economy is seriously underestimated because we only look at one dimension of a technology's value: its ability to generate revenues. In the commercial sector, patents and other IP is more than just a right to make a specific technology. As an asset, it has other uses – both as an enabler of future products and as a trading chip to protect potentially totally unrelated products. These uses affect the future value of the company, which is captured in its stock price. Just as real options help us better estimate the net discounted value of the revenues, stock options let us calculate contribution to the on-going concern value of the company. This value is, of course, less liquid because you have to sell stock or stock options to obtain it, but it is something you can take to the bank. By targeting potential licensees whose stock value is likely to be greater if they obtain the technology, we increase the likelihood of licensing.

Ms. Cheeks also co-chaired the session "Space Technologies - Earth Applications." This session presented examples of technologies developed to support space programs that have (or offer the potential to) transform and shape future society. This session also featured presentations from Ms. Cheeks and Dr. Speser:

- "Vetting Space Based Technology Societal Impacts" (IAC-12, E5,1,12,x15639) presented by Ms. Cheeks reviewed the technology transfer process implemented at NASA Goddard. This includes identifying the new innovation, evaluating possible applications for it, and promoting awareness of it throughout industry and the public. the presentation also highlighted the many ways in which NASA technologies can provide important benefits to society.

- "Lessons from the Technology Transfer in the Academic Sector" (IAC-12,E5,1,1,x15641) presented by Dr. Speser. This presentation explained how technology transfer is like "the nucleus in the atom of commercialization in the molecule of knowledge dissemination." Therefore doing technology transfer is much more than merely licensing, an awareness NASA Goddard has been acting on for years. Dr. Speser explored how offices like the IPP can be more entrepreneurial. An example is NASA Goddard's role in catalyzing a multinational space agency initiative in space technology applied to telemedicine.

4th Annual Donna Edwards College and Career Fair

(October 13, 2013, Landover, MD)

Innovative Partnerships Program (IPP) Office staff members hosted a display at the 4th Annual Donna Edwards College and Career Fair at the Prince George's Sports Complex in Landover, Maryland. The career fair was held for middle and high school students to plan and gather information for their educational and professional future. Representatives from colleges, universities, training centers and various government agencies were on hand offering resources in financial aid and education opportunities. The IPP demonstrated NASA'S Home and City website informing the public of technologies that were originally developed by NASA, and are now being used in homes and businesses for other purposes. The IPP also spoke with attendees about Spinoff technologies, the NASA OPTIMUS PRIME Spinoff Video Contest, and distributed Spinoff Brochures, NASA Home and City Cards, NASA Home and City Posters and the IPP *2011 Accomplishments Report*.

Innovative Partnerships Program Office Senior Technology Manager, Ted Mecum, talks with a visitor about NASA technologies that are used in our everyday lives. —PHOTO BY NASA

Innovation 2 Commercialization: Making Tech Transfer Count

(November 2, 2012, Rockville, MD)

The Innovative Partnerships Program (IPP) Office participated in the Innovation 2 Commercialization: Making Tech Transfer Count conference held at the Universities at Shady Grove, and hosted by the Montgomery County Department of Economic Development. The conference featured exhibits from federal, academic tech transfer offices, business resources, educational programs and funding resources, and offered panels on Innovation, Commercialization and Financing. The IPP Office was on hand to talk with attendees about partnerships, licensing opportunities and technology transfer.

20th Annual New Technology Reporting Program

(November 8, 2012, National Agricultural Library, Beltsville, Md.)

The Innovative Partnerships Program (IPP) Office held its 20th Annual New Technology Reporting Program on November 8, 2012 at the National Agricultural Library, located in Beltsville, Md. This annual program is held to recognize leadership in technology development and outreach support, and to recognize successful innovation and technology transfer. This year's program featured guest speaker Lorry Lokey, founder of the press release company Business Wire. Mr. Lokey spoke on innovation and best business practices for managing science and technology.

Phil Auerswald interviews Lorry Lokey at the 20th Annual New Technology Reporting Program at the National Agricultural Library in Beltsville, MD. —PHOTO BY NASA

NASA Goddard Center Management was also on hand to present patent awards to innovators as well as the 2012 James Kerley Award to Dr. Bruce Dean, Dr. Matthew Bolcar, Dr. Ron Shiri, Dr. Timo Saha, J. Scott Smith, Dr. David Aronstein and Rick Lyon for their work in Wavefront Sensing. The Kerley Award is presented to the individual or individuals who best exemplify leadership in technology transfer activities over the past year.

NASA Technology Days Showcase

(November 28-30, 2012, Cleveland, OH)

Innovative Partnerships Program (IPP) Office staff members Darryl Mitchell, Enidia Santiago-Arce, and Brady Spenrath attended the 2012 NASA Technology Days Showcase held in

Bert Pasquale talks with an attendee at the 2012 NASA Technology Days Showcase held November 28th – 30th in Cleveland, Ohio. —PHOTO BY NASA

Cleveland, Ohio. This three-day event was held to connect industry representatives from the Aerospace, Automotive, Innovative Manufacturing, Advanced Energy, and Human Health fields, with NASA centers from across the country and provide information on technology transfer, licensing and partnership opportunities.

Noche de Ciencias at USPTO

(December 13, 2012, USPTO, Alexandria, VA)

On December 13th, the Society of Hispanic Professional Engineers (SHPE) hosted Noche de Ciencias (Science Night) at the US Patent and Trademark Office in Alexandria, Virginia. The event was targeted towards all local students interested in college studies or a career in science, engineering, or technology. Several engineering firms, local universities, the Department of Energy, and Goddard's Innovative Partnerships Program (IPP) Office hosted booths at the event. Students could talk about college experiences and gather information on obtaining careers in science or technology fields. IPP Technology Manager Enidia Santiago-Arce, sat down with several students for in-depth discussions, as additional staff members promoted the NASA OPTIMUS PRIME Spinoff Contest for students. The video contest is open to students in grades 3 – 12, and winners receive a scholarship donated from the American Society of Mechanical Engineers, as well as the opportunity to meet NASA astronauts and Peter Cullen, the voice of OPTIMUS PRIME.

Innovative Partnerships Program Office staff member Trina Cox, talks with attendees at the 2012 USPTO National Trademark Expo. —PHOTO BY NASA

2012 USPTO National Trademark Expo

(October 19-20, 2012, USPTO, Alexandria, VA)

The Innovative Partnerships Program (IPP) Office participated in 2012 United States Patent and Trademark Organization (USPTO) National Trademark Expo in Alexandria, VA. This two day event is held to help educate the public about trademarks and their importance in the global marketplace by showcasing federally registered trademarks through educational exhibits and themed displays. IPP staff members were on hand to talk with attendees and promote the NASA OPTIMUS PRIME Spinoff Contest for students.

NASA Goddard IPP Office and Information Technology and Communications Directorate receive InformationWeek Technology Award

NASA Goddard's IPP Office and the Information Technology and Communications Directorate were collectively named "Best Innovative Government Agency" by InformationWeek Magazine. This award was presented during the InformationWeek 500 conference, which took place on September 9 through 11, 2012, in Dana Point, CA.

IPP Office Senior Technology Manager Ted Mecum (left), and Information Technology and Communications Directorate Director and Chief CIO Adrian Gardner, accept the award for Best Innovative Government Agency during the InformationWeek 500 Conference. —PHOTO BY NASA

InformationWeek is a major provider of news and information for IT professionals. Its goal is to deliver mission-critical business and technology content though its web sites, applications, magazines, and events. The InformationWeek 500 Conference is held annually to honor the most innovative U.S.-based users of business technology. This year's conference featured talks and presentations from many of today's leading technology visionaries and hosted over 275 of the nation's top business technology executives.

Dr. James Tilton wins American Astronautical Society's 2012 Lloyd V. Berkner Award

The American Astronautical Society has named James Tilton the recipient of their 2012 Lloyd V. Berkner Award. This annual award recognizes significant contributions to the commercial utilization of space technology. Dr. Tilton was honored for his efforts in commercializing his Recursive Hierarchical Segmentation (RHSEG) software.

Dr. James Tilton. —PHOTO BY NASA

RHSEG was originally developed at NASA Goddard to enhance and analyze images such as those taken of Earth from space by NASA's Landsat and Terra missions. Applications include topographical analysis such as ice and snow mapping. Another application is "space archeology," where satellite images are examined for subtle signs of previous human activity.

RHSEG was subsequently nonexclusively licensed to Bartron Medical Imaging, LLC, for application in the healthcare industry. Barton's MED-SEG product utilizes RHSEG capabilities to enhance the clinician's diagnostic power to analyze and interpret a wide range of medical images. This system is especially suited to enhance the diagnosis and management of diseases that are imaged using digital X-rays, soft-tissue imaging, mammograms, ultrasounds, MRI, CT, and PET scans.

Dr. Tilton will be presented his award at the upcoming Awards Luncheon to be held in March 2013, in conjunction with the 51st Robert H. Goddard Memorial Symposium.

Wavefront Sensing team receives the 2012 James Kerley Award. Left to right: Bill Oegerle, Christyl Johnson, David Aronstein, Matt Bolcar, Ron Shiri, Rick Lyon, and Juan Roman. —PHOTO BY NASA

IPP Office presents James Kerley Award at 20th Annual New Technology Reporting Program

The IPP Office held its 20th Annual New Technology Reporting Program on November 8, 2012 at the National Agricultural Library, located in Beltsville, MD. This annual program recognizes leadership in technology development and the support of outreach to industry for commercial applications of NASA Goddard technology.

This year's program featured guest speaker Lorry Lokey, founder of the global press release company Business Wire. Mr. Lokey spoke on innovation and best business practices for managing science and technology.

NASA Goddard management was on hand to present patent awards to innovators. The 2012 James Kerley Award was presented to Dr. Bruce Dean, Dr. Matthew Bolcar, Dr. Ron Shiri, Dr. Timo Saha, J. Scott Smith, Dr. David Aronstein, and Rick Lyon for their work in Wavefront Sensing. The James Kerley Award recognizes the individual(s) who best exemplify leadership in technology transfer activities over the past year.

ICB AWARDS

Software Awards: 7

- GLOBAL PRECIPITATION MEASUREMENT (GPM) OPERATIONAL SIMULATOR (GO-SIM) INSTRUMENT SIMULATIONS

  Dan Nawrocki, Jeffery Joltes, Justin Morris, Steven Seeger

- ITC SYNCHRONOUS COMMUNICATIONS BUS - 1553 (ITCSB_1553) / GPM OPERATIONAL SIMULATOR (GO-SIM) 1553 API

  Jeffery Joltes, Justin McCarty, Justin Morris, Steven Seeger

- GLOBAL PRECIPITATION MEASUREMENT (GPM) OPERATIONAL SIMULATOR (GO-SIM) CORE

  Arturo Ferrer, Brandon Bailey, Charles Rogers, Dan Nawrocki, Jeffery Joltes, Justin Morris, Steven Seeger

- LUNAR RECONNAISANCE ORBITER (LRO) SPACECRAFT FLIGHT SOFTWARE

  Michael Blau, Lonnie Walling, Bruce Trout, Thomas Clement, Michael Yang, Glenn Cammarata, Larry Shackelford, Joel Chiralo, Ji-Wei Wu, Susanne Strege

- INTEGRATED SPACE WEATHER ANALYSIS SYSTEM (ISWA)

  David Berrios, Lutrz Rastaetter, Marlo Maddox, Michael Hesse, Peyush Jain, Richard Mullinix

- GODDARD SATELLITE DATA SIMULATION UNIT

  Toshihisa Matsui

- SPACE WEATHER ANDROID APP; A STANDALONE ANDROID APPLICATION WHICH DISPLAYS SPACE WEATHER INFORMATION TO USERS

  David Berrios, Michael Hesse, Richard Mullinix, Marlo Maddox

Board Action Award (SAA): 1

- FURTHER REFINEMENT OF THE COMPUTATIONALLY EFFICIENT HSEG ALGORITHM

  James Tilton

Board Award (SAA) - Invention of the Year Nomination: 2

- PIVOT 2.0: RADIATION HARDENED, FAST ACQUISITION/WEAK SIGNAL TRACKING GPS RECEIVER

  Gregory Boegner, Luke Winternitz, Steve Sirotzky

- MULTIMODAL PRESSURE FLOW ALGORITHM

  Norden Huang, William Gloersen, Liming Salvino

Board Award (SAA) - Software of the Year Nomination: 3

- GO-SIM SUITE

  Steven Seeger, Arturo Ferrer, Justin McCarty, Justin Morris, Charles Rogers, Dan Nawrocki, Brandon Bailey, Jeffery Joltes

- INTEGRATED SPACE WEATHER ANALYSIS SYSTEM (ISWA)

  David Berrios, Lutrz Rastaetter, Marlo Maddox, Michael Hesse, Peyush Jain, Richard Mullinix

- AUTOMATIC EXTRACTION OF PLANETARY IMAGE FEATURES

  Jon Benediktsson, Sebastiano Serpico

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and Space Administration
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