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Innovative Technology Partnerships Office

(Formerly the Innovative Partnerships Program Office - IPPO)

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ITPO

Nona Cheeks

[FROM THE *Chief*

From the Chief

As readers of the NASA Goddard *Tech Transfer News* are aware; each issue is dedicated to highlighting a particular group or technological capability within NASA Goddard, as the latest example of the many ways the Center is innovative in supporting space science missions while providing benefits to humanity. This issue is somewhat unusual in that the group being highlighted is our own, the Innovative Technology Partnerships Office (ITPO for short). Some of you may know us by our former name, the Innovative Partnerships Program Office (IPPO). And as this issue explains, much more than our name has changed over the past several years.

A member of the ITPO recently noted that since our team constantly promotes innovation throughout NASA Goddard; we should therefore lead by example and apply innovation at every opportunity to achieve our own goals. It goes without saying that NASA has faced numerous challenges in recent years; we are increasingly encouraged to find ways to do more with less, while ensuring that a new generation understands and appreciates the enormous societal value provided by investment in space science. To meet these challenges, the ITPO has constantly evolved to ensure we continue to provide innovative and creative tools to effectively facilitate technology transfer and public outreach for NASA Goddard.

This issue of the NASA Goddard *Tech Transfer News* serves as a "re-introduction" to the ITPO. Members of our team offer their views on the ITPO's goals, and the roles they play in helping us achieve these goals. We talk about how technology transfer has evolved over the years, and the ways the ITPO has responded to these changes to ensure we remain at the leading edge of the process. Two of our members are recent additions to the ITPO; they offer their perspectives on joining the team at this critical stage and applying their respective backgrounds to their new technology transfer objectives. We also discuss several recent examples of "outside the box" initiatives we have undertaken to facilitate technology transfer in new and unusual ways. And we provide a few examples of NASA Goddard technologies that are currently generating significant interest for potential terrestrial applications and commercial markets.

In addition, we interview two of our contractor partners, to demonstrate how the ITPO has extended its reach far beyond NASA Goddard to gain access to global contacts. This provides us with additional opportunities to promote awareness of NASA Goddard technologies into regions and markets that might otherwise be difficult to penetrate.

We hope you find this issue informative and interesting. If you have any questions about anything we discuss, please contact the ITPO and we will be happy to speak with you directly.

Nona Cheeks
Chief, Innovative Technology Partnerships Office (Code 504)
NASA Goddard

ITPO

OVERVIEW OF THE *Innovative Technology Partnerships Office*

Overview of the ITPO

The NASA Goddard Innovative Technology Partnerships Office (formerly the Innovative Partnership Programs Office) is responsible for the Center's technology transfer partnerships, and SBIR/STTR initiatives. In this article, we briefly review some of the ITPO's roles and responsibilities relative to Tech Transfer.

Taking stock

The first step is to ensure the full inventory of NASA Goddard inventions and innovations is fully documented. The ITPO proactively works with innovators to ensure that each invention is properly acknowledged and recorded, providing each technology the opportunity to be made available for use outside NASA Goddard. ITPO meets regularly with scientists and engineers, to stay current with their research and all ongoing developments within those areas. This involves a formal systematic procedure used at NASA Goddard known as the New Technology Assessment (NTA) process.

The NTA process allows the ITPO to maintain an up-to-date understanding of the technologies NASA Goddard innovators (both civil servants and contractors) are developing and considering.

Seeking multiple perspectives

In determining how these technologies can be adapted to other applications inside and outside NASA, the ITPO makes special effort to hear from all possible perspectives. NASA Goddard routinely collaborates with organizations and agencies to utilize NASA technologies for addressing technology needs and gaps, and advancing new products. Small businesses often make excellent commercialization targets for NASA Goddard technologies; particularly those ideally suited for niche markets and applications. To reach small companies, the ITPO works with organizations dedicated to the promotion and development of small technology businesses in a particular region.

The ITPO also partners with other entities. For example, NASA Goddard is collaborating with the University of Baltimore's Merrick School of Business to analyze and consider the commercial potential for a variety of NASA Goddard technologies. The goal is to equip the students with sufficient technical background about the invention and its capabilities to define potential new uses for it. In return, NASA Goddard will receive formal reports, assessments, and commercialization recommendations from the University.

Innovative Technology Partnerships Office staff member Eric McGill speaks with an attendee at the 2013 Goddard Industry Day meeting.

—PHOTO BY NASA

Promoting technologies through publication

To reach a broader audience both within and outside NASA, the ITPO publishes the journal you are now reading, the NASA Goddard *Tech Transfer News*. This is a quarterly periodical dedicated to promoting technology transfer and reporting related recent events. Each issue typically includes:

- Feature articles and interviews around the current issue's major theme. The theme usually highlights a particular NASA Goddard capability or area of expertise. In some cases, the theme may focus on a NASA Goddard mission.
- An interview with the Chief Patent Counsel for NASA Goddard's Office of Patent Counsel, as well as an outside patent attorney, each offering their different perspectives on various aspects of patenting law.
- A "Success Story" involving NASA Goddard's Small Business Innovation Research (SBIR) and/or Small Business Technology Transfer (STTR) programs.
- Latest NASA Goddard technology transfer news and events.
- Information about recently developed NASA Goddard innovations, including metrics, patents, awards and recognition, and so on.

This content is written with technology transfer clearly in mind. At the same time, the articles are intended to be readily accessible and of interest to a more general audience than some of the more technology-specific documents listed on the ITPO web site.

Thinking outside the box

In keeping with the theme of innovation, the ITPO has pursued many "non-traditional" avenues to promote the cause of technology transfer. For instance, in 2011 the ITPO announced a partnership with Tor-Forge Books, a well-known publisher of science fiction. This outreach project, called "Science Fiction meets Science Fact," pairs NASA Goddard scientists and engineers with Tor-Forge writers to help raise awareness of (and enhance public interest in) science, technology, engineering and mathematics (STEM). The end result will be the creation of a new science fiction work that will include NASA-inspired content.The first of these works will be published on February 11, 2014. *[See also "Interview with the Innovative Technology Partnerships Office" elsewhere in this issue.]*

▶ *Actor Peter Cullen, the voice behind Hasbro's Transformers leader OPTIMUS PRIME, speaks at the 2012 NASA OPTIMUS PRIME Spinoff Awards ceremony.*

—PHOTO BY NASA

As part of its public outreach campaign, the ITPO has hosted the NASA OPTIMUS PRIME Spinoff Awards contest and awards ceremony. This contest, which is open to all U.S. students grades 3 through 12, helps students recognize some of the many NASA space-related inventions that have found their way into everyday life and benefitted the public. Students create videos about NASA technologies that have been adapted to terrestrial applications and submit them for judging; winners receive their awards (including a cash prize to be used to further the awardee's education) at a formal ceremony.

Sponsors for this contest include Hasbro, the makers of the highly popular Transformers action figures. (The OPTIMUS PRIME character is the fictional leader of the Transformers.) The choice of OPTIMUS PRIME as a symbol of the contest is a deliberate one. One of the key attractions of the Transformers toys is their ability to be "transformed" from one object into another. The context helps students understand that NASA technologies can be similarly "transformed" from their originally designed purpose into another, often very different application.

Technology transfer success stories

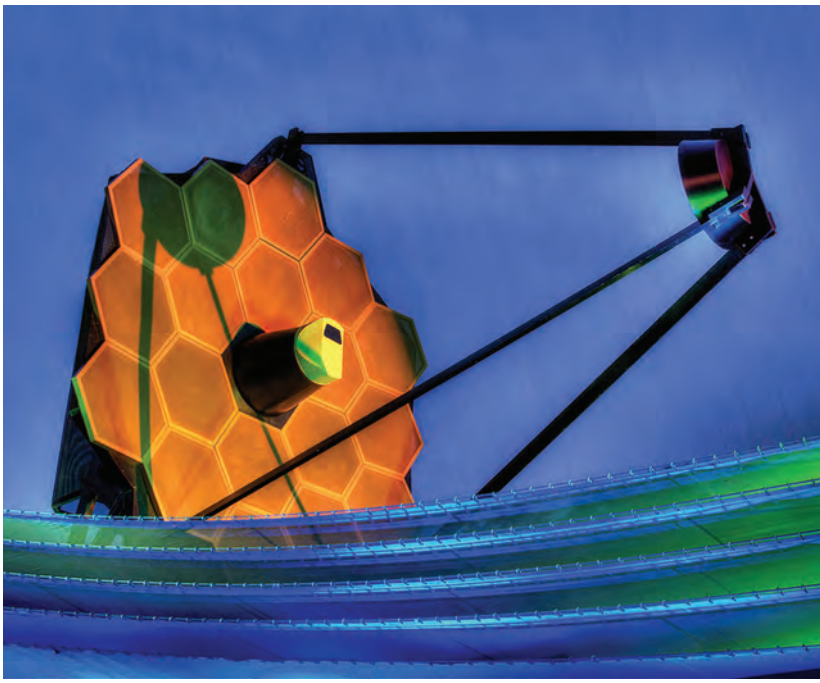
The ITPO's technology transfer efforts have produced numerous success stories in a wide variety of fields. A number of these have involved medical technologies. For example, to support the upcoming James Webb Space Telescope (JWST) NASA Goddard employs adaptive optics and wavefront sensing. These techniques can be adapted to any application that requires fast image correction; including lasik surgery, confocal microscopy, and medical imaging (MRI already uses active phase retrieval).

NASA Goddard technologies originally developed for the Hubble Space Telescope (HST) have also been adapted to health care. One example is technology designed to enhance HST's images, which has now evolved into a "micro-endoscope" that helps physicians perform micro-invasive arthroscopic surgery with more accurate diagnoses. This enables surgeons to view what is happening inside the body on a screen, eliminating the need for a more invasive diagnostic procedure that could add time, money, and discomfort to a patient's treatment.

Another very versatile technology developed at NASA Goddard is the Hilbert-Huang Transform (HHT). This is highly efficient, adaptive, and user-friendly set of algorithms used to analyze, encode, or modulate signals or data sets for a multitude of applications. HHT was originally developed as part of NASA's ongoing research into ocean waves. The HHT has recently been licensed by DynaDx Corporation and added to DataDemon, their graphical signal analysis tool.

An advanced micro-pulse, multi-beam, multi-channel instrument that times the flight of single photons has been developed as a pathfinder for next-generation laser altimetry. While NASA will use this technology to map the Earth and planets, eventually doctors may use it to map the intricacies of human anatomy. This technology could probe tissue within the body, potentially discerning, for example, the difference between non-cancerous and malignant tumors based on the way they scatter and depolarize multi-wavelength laser pulses.

These are only a few examples that demonstrate how to optimize use of space research and technology for medical devices. Beyond medical devices, NASA Goddard applications can be applied to other fields such as: environmental monitoring, agriculture, food, weather and climate, transportation, energy, communications, computer science and software, manufacturing, sports and entertainment, health and safety, and many others.



James Webb Space Telescope

—PHOTO BY NASA

Conclusion

The Innovative Technology Partnerships Office, through its many technology transfer projects, SBIR/STTR and partnership initiatives, has played a pivotal role in finding mutual use of NASA capabilities and technologies. The ITPO continues to ensure that NASA GSFC investments made in cutting edge technologies are provided the widest opportunity possible to address problems and issues here on Earth, even as they serve their original purpose to advance our understanding of the Earth, Solar System, and Universe.

INNOVATIVE TECHNOLOGY *Partnerships Office Interview*

ITPO Interview

The Innovative Technology Partnerships Office (formerly the Innovative Partnerships Program Office, or IPPO) facilitates all aspects of technology transfer and infusion at NASA Goddard. In this interview, ITPO team members share their experiences in promoting technology transfer, how their roles have evolved over the years, and related topics.

Q. *How does the ITPO facilitate technology transfer at NASA Goddard?*

Nona Cheeks

Nona Cheeks (Chief): We have a great team in place, very talented, engaged, and well-connected. We have a diverse group of engineers and scientists who are very committed to looking at new ways for facilitating technology transfer, ways that help drive technology development forward while reducing costs. There's always something new to be learned.

To broaden our reach, we have also developed a network of key contacts, each with their own network. This brings us into contact with many new faces in industry, individuals within large and small companies, established and emerging industries – people with whom we may not have been able to readily access in the past.

We're constantly reviewing and managing our portfolio of technologies and capabilities. We then consider ways to leverage our resources for technology transfer, partnerships, and SBIR/STTR to either make our technologies available to outside entities, or bring new technologies into NASA Goddard to fill a need. We often capture new technologies through partnerships, or via the SBIR/STTR program.

We also reach out to business schools, who can help us assess technologies and identify potential commercial markets for them. And we meet with companies in university incubators.

Ted Mecum

Ted Mecum (Senior Technology Manager): We are here to help NASA Goddard protect its strategic assets. The first step in that is to identify those assets. In many cases, inventors may not even realize the potential impact their technology may have outside of the Center. One of our roles is to help our inventors understand just how useful and valuable their technologies may be.

We also help bring recognition to NASA Goddard innovators. In the past, this recognition often came from within NASA. Increasingly, we're also seeking recognition from outside the agency, nominating NASA Goddard innovations for awards such as the R&D 100, Space Foundation, Federal Labs Consortium, and others. Our goal is to help ensure that NASA Goddard is fully recognized for being a leader in innovation and technology.

Our industry outreach activities include calling companies directly and seeking investors interested in our technologies. To help prioritize our efforts, we work with Foresight Science and Technology.

For example, we provide Foresight with a number of technologies we believe may have commercial potential, and Foresight assesses the technology through a report we call a Jump Start. The purpose of this report is to research the potential commercial viability of the technology in a non-NASA application, and based on this research assign the technology a priority of Low, Medium, or High. If the technology receives a High priority rating, Foresight, along with our other strategic contractor support team Voxcella, works with us to find potential partners willing to speak with us about the technology to discuss possible licensing or other forms of partnership. *[For more information about how the ITPO collaborates with Voxcella and Foresight Science and Technology, see the article "ITPO Partners" elsewhere in this issue of the NASA Goddard Tech Transfer News.]*

James La (Technology Manager): I have been working at NASA Goddard for 27 years, and have worked on a variety of projects and missions, including design engineer for flight systems. I have done a lot of design work, flight systems integration and test (I&T), and spacecraft system engineering. My experience has provided me with a broad understanding of how a project develops, from Phase A (the beginning) through Phase E (mission operation). I have also been involved in mission end-of-life process that required satellites or man-made space objects to be reentered into the atmosphere without causing human injury or property damaged, which is a very interesting area. This experience allows me to bring a lot of technical expertise to my role with the ITPO.

I joined the ITPO three months ago. Although I am new to the group, my long experience with NASA Goddard provides me with a large network of contacts within the Center.

I have spoken with chief technologists about flight hardware, which some believe is an area where "it's all been done." But this isn't true at all; people are still coming up with new ideas and solving problems. The key is to listen when someone comes up with a new idea. Don't just show them the door; contact the ITPO because we may find uses for it others haven't considered before. Otherwise, you might be throwing away a potentially useful technology. A lot of great ideas can get lost this way.

Q. *Besides the new name, what else has changed within the ITPO over the past few years? Are you doing anything different now that you weren't doing when you started, and vice versa?*

Nona Cheeks: Over the years, the way we do things has definitely evolved. We now tend to be more proactive in strategizing how to target and prioritize the three main elements of our group's responsibility: technology transfer, partnerships, and SBIR/STTR.

For instance, we've developed a number of innovative approaches to technology transfer, finding new ways to move technologies developed at NASA Goddard into private industry. This includes IP auctions, publishing online catalogs of technologies, and hosting and sponsoring tech briefings to industry clusters in which we present specific segments of the NASA Goddard technology portfolio. In our SBIR/STTR program we encourage companies responding to the annual solicitation to consider a research license for building on NASA GSFC patents.

Ted Mecum: I have been with the group since 1997. Over the years, technology transfer has tilted in different directions from time to time -- the focus points one way for a while, and then another.

For example, years ago the emphasis was on NASA licensing the technology we developed to private industry, a process frequently referred to as "spinoff." Then there was a push for collaboration, bringing in technologies already developed outside NASA. This is often termed "technology infusion" and it sometimes takes precedent over spinoffs. There's also been a push to promote NASA as an organization that benefits mankind, by providing free access to our research and data for STEM education and other applications. At any given time, each of these areas is being actively promoted, with varying degrees of priority given each one at different times.

The bottom line is that we're always trying to meet NASA's goal for technology transfer and educational outreach.

Darryl Mitchell (Senior Technology Manager): In the past we often took a broad approach in our licensing strategy, such as attending industry trade shows and conferences with people staffing a booth in the hope that the right contact would eventually stop by. We now tend to be more focused

Darryl Mitchell

concerning to whom we target specific technologies. We have new tools at our disposal to do this.

And we also work groups and companies such as our commercialization partners Foresight Science and Technology and Voxcella, who have well-developed networks into industry that we can leverage to find the right people for our technologies.

Dennis Small

Dennis Small (Technology Manager): One development is the Technical Opportunity Sheet. The sheet gives overview detail, application and benefits of a featured technology. The sheet also gives information for a potential partner to contact the ITPO.

We also developed a NASA Goddard Space Flight Material Transfer Agreement. The agreement allows Goddard patented intellectual property (material) to given to an industry partner for a specific intended use. This is a legal document signed by our partner.

Nona Cheeks: A recent trend in the SBIR/STTR program is to make available NASA-developed technologies as part of the solicitation process. When a company responds to the solicitation, part of their plan includes explaining how they will build upon our available technology to address our need. This has allowed companies to apply NASA technologies to help us resolve technology challenges. Companies get a research license for the technology while they're working under the SBIR/STTR. If they subsequently build on the technology after the SBIR/STTR is completed, it's another way of getting NASA Goddard technology into public use.

Darryl Mitchell: The America Invents Act has significantly changed the playing field. In order to avoid disclosing the details of an invention before the IP protection is securely in place, we now tend to be more targeted in our approach to promoting technologies, focusing on a select group of potential partners rather than making the information generally available to everybody.

Q. *What are some of the more innovative or unusual ways the ITPO has undertaken to promote technology transfer?*

Enidia Santiago-Arce (Technology Manager): One of the cool things we've been involved in is our partnership with Tor-Forge Books, a major publisher of science fiction. The goal of this collaboration is to publish a series of science-based, commercial fiction books around concepts pertinent to the current and future work of NASA. Tor-Forge authors have teamed up with NASA Goddard inventors to discuss new technologies we've developed, and then write scientifically accurate and entertaining fiction based on these technologies.

The first novel to come out of this effort is Pillar to the Sky, written by best-selling author Dr. William Forstchen. Dr. Forstchen visited the Center twice, and talked to our scientists about topics such as climate change and nanotechnology. The book is based on "space elevator" technology. It will be out on February 11th 2014, and NASA Goddard plays a central role in the plot.

We believe that this book, as well as other popular works that we expect will come out of our collaboration with Tor-Forge, will help promote more public awareness of NASA Goddard and the many things we do.

Darryl Mitchell: One ongoing outreach program we've been involved with is the OPTIMUS PRIME Spinoff Contest. This is a program where students submit videos about NASA spinoff technologies, with the winners receiving prizes. This year first-place winners will come to NASA Goddard and work with our production team to produce a short promotional video. They'll also be given a VIP tour of the Center, and meet with actor Peter Cullen, the voice of OPTIMUS PRIME in the TRANSFORMERS movies.

Ted Mecum: NASA is unique among government agencies in that under the authority of the Space Act Agreement of 1958, we are allowed to receive money from other entities in compensation for performance of services. This allows us to market our unique expertise, capabilities, and facilities for commercial applications, as long as we do not compete with private industry or

make a profit from the services. The money we receive is for reimbursement for our employees' time and expense, and helps contribute to our infrastructure costs.

The ITPO can promote NASA Goddard capabilities. We compile a list of our capabilities, and then engage in outreach and marketing programs that canvass organizations who might have a need for these capabilities.

Outreach can consist of trade shows and publications. We help negotiate partnerships and legally binding agreements. Many people I talk to at conferences and agency trade shows don't know that NASA can accept money. This is apparently not widely known. We are typically involved in many legal and formal agreements per year. Of these, a percentage is reimbursable.

For example, we have many capabilities devoted to optics. If we have capabilities that are not available to the regional market, such as cryogenics, we will make these services available. But other services, such as calibration, may already be offered by private companies. In such cases, we don't offer our services because we don't want to compete with these companies, although in some cases we may contract out our facilities to these companies. It's important to note, however, that in any such arrangements we stipulate up front that we cannot be subject to any strict deadlines, because our NASA work will always take priority.

And as Nona mentions, we have also participated in IP auctions, where the public can bid on NASA technologies. The highest bidder who meets the minimum bid can then negotiate with NASA Goddard to license the technology.

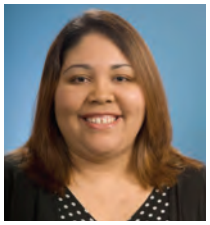
Q. *What are some of the technologies you have been working with recently?*

Darryl Mitchell: A NASA Goddard technology that is generating a great deal of interest from multiple companies is the modulated X-ray source. This is a compact device that can produce x-rays in a novel way. Traditional devices produced X-rays by heating a tungsten filament. Since this process is thermally driven, it can't really be turned on and off quickly. The NASA Goddard invention is based on the photoelectric effect. As a result, it can be turned on and off much faster. There are multiple potential applications for this.

For example, since the X-rays can be delivered in very precise pulses, this device can be used in the medical field to closely control the amount of X-ray exposure patients receive. Other applications include space communications and material analysis.

Nona Cheeks: One broad area of related technologies involves medical devices. A recent example involved a mirror polishing technique developed for the James Webb Space Telescope. This technology is now being looked at to help calibrate equipment used in Lasik eye surgery.

Ted Mecum: NASA Goddard has developed a wide variety of software over the years, and we've been very active in making it available to the public in many different forms. In some cases, we release the software for free; while in others we look for ways the software can be leveraged into business applications. For example, an Arizona company called Broadreach Engineering licensed GPS software and patents developed by NASA Goddard. Broadreach is incorporating these technologies and functionality into products they have developed for satellite on-orbit positioning. The Goddard technologies provide some important advantages in this application, including resistance to space radiation and superior signal strength and acquisition speed. We've also licensed software to Design America Inc., a company in College Park, Maryland, for their Advanced System for Integration and Spacecraft Test (ASIST) satellite ground control system.



Enidia Santiago-Arce

Enidia Santiago-Arce: We have received a lot of interest in GMSEC. This is a software platform that greatly simplifies and accelerates the development of satellite ground systems. It also provides software developers an easier entry point into NASA Goddard and potentially other government agencies such as the Air Force. Any developer interested in selling code to us can make it GMSEC compliant.

There's also been huge interest recently in CubeSat related technologies, such as SpaceCube. These technologies are being developed to be small,

rugged, high-performing, and energy-efficient – characteristics that have many potential terrestrial applications.

Dennis Small: I have been spending a great deal of my time on the Lotus Dust Mitigation Coating and Molecular Adsorber Coating. The Lotus Dust Mitigation Coating is modeled after the self-cleaning, water-repellant lotus leaf, and designed to keep NASA assets clean in the dusty Lunar and Martian environments. This coating disallows buildup of dust, dirt, water, and more on surfaces. This coating, which has been successfully tested on painted, aluminum, glass, silica, and some composite surfaces, could aid in keeping medical assets clean. The coating is a few months away from becoming sprayable.

The Molecular Adsorber Coating is zeolite-based, sprayable molecular adsorber coating designed to prevent outgassing in materials in vacuums. The coating has helped maintain on-orbit flight instrument performance in contamination sensitive instrument systems. The application of the Molecular Adsorption Coating can improve the containment of volatiles and contaminates in pharmaceutical production, chemical, and manufacturing processing.

Q. *What are some of the major takeaways you would like people to understand about the ITPO?*

Nona Cheeks: It's important to understand that technology transfer is a two-way street. Not only does it involve applying a NASA-developed technology to an industry need; it also entails filling a NASA need by forming relationships with outside entities. For example, we can use the SBIR program to pay a company to help build a new capability for NASA.

Enidia Santiago-Arce: I would like people to understand that the ITPO is here to help. We don't just go around collecting NTRs; our ultimate goal is to empower the use of NASA Goddard technology beyond the original space applications for which it was developed. We want people to be knocking on our door and asking "how can I make this happen?"

Jim La

Jim La: One thing I always emphasize when speaking to an inventor is that no idea is a crazy idea. Not willing to move forward with an idea because you think your idea has no value is the worst thing an innovator can do. There is always some application, someone out there who has a problem this invention might solve. We have the connections to help find that person.

One mistake innovators often make is to believe their technology has only one unique purpose, and may not be suitable for anything other than the space application for which it was originally developed. The ITPO philosophy is just the opposite: the possibilities are endless. Our role is to help define those possibilities. To do this requires creativity and networking. It also requires educating people as to just how precious their inventions are.

People also tend to be too humble, and sometimes think their work is routine and there's nothing of interest to report. My advice to them is to speak to us anyway; we can work with you to assess an idea and develop it further – and ultimately find uses for it. From my perspective, the worst-case scenario is when someone does something good, and never tells anyone about it.

Dennis Small: ITPO responsibilities are more than collecting the Disclosure of Invention and New Technology Forms and managing the Center's intellectual property. We use NASA Goddard technology to build partnerships with industry, government agencies, and universities. Our office works to license NASA Goddard developed technologies that have commercial application that leads to stimulating not only Maryland's economy, but the economy world-wide. Help us to help you! WE ARE ITPO!

STRATEGIC CONTACTOR *Support Team Interview*

Support Team Interview

To expand the reach and depth of its commercialization efforts, the NASA Goddard Innovative Technology Partnerships Office partners with strategic contractor support teams. These teams help provide the ITPO with industry experience that helps facilitate technology transfer. They also provide access to a global network of commercialization contacts.

We recently spoke with two key members of the ITPO's strategic contractor support staff, Dr. Joey Holmes of Acuity Edge (working with NASA Goddard under a contract with Voxcella) and Dr. Phyl Speser of Foresight Science and Technology.

Q. *Can you tell us a little about your respective companies?*

Dr. Joey Holmes: We founded Acuity Edge in 2000 to deliver business insight and technology transfer services. In the past, we generally provided off-site services, following a model similar to Foresight Science and Technology's.

Earlier, I was part of a company that did some work with NASA Goddard. During that time I met Nona Cheeks, and we stayed in contact over the years. Four years ago I was approached to manage the ITPO's on-site contractors. I accepted, and now work with the ITPO under a contract with Voxcella.

Dr. Phyl Speser: Foresight is one of the oldest companies operating in the technology transfer field. We've been doing this a long time, 36 years and counting. In the process we have developed a global presence. We have worked with thousands of customers over the years.

Q. *What services do you provide to the ITPO?*

Dr. Phyl Speser

Phyl Speser: Our primary responsibilities include putting together leads for the group. We also play a role in assessing technologies, doing publications, such as this one, and helping with deal-making. We also provide the "utility infielder" – pitching in when and where needed. As part of that we do a lot of exploratory work to see what other kinds of domestic and international partnering is feasible.

For instance, NASA Goddard is very well known in areas such as providing global climate data. What may not be as widely known are all the different markets this data potentially impacts. Climate data, for example, is of interest to power utility companies, since it affects loading. On one side is generation. We can help address questions such as how much power solar cells or will turbines will generate. On the other side is use. People drive will more often in areas where precipitation will rise. Global warming may lead to higher air conditioning demand. The point is there's many different ways NASA Goddard's earth observation data can be valuable, if it can be delivered to the right people in the right way. Our role is to help facilitate this process, to ensure that as many people as possible know about the value of NASA Goddard technology and how to access it easily.

Joey Holmes: My team provides a number of key services. This includes screening technologies, to help decide whether or not they are viable commercialization candidates.

If the answer is yes, we'll start direct marketing the technology. For example, if we have a software technology that might be of interest to say IBM, we'll call them directly to initiate a discussion.

Our team provides the "feet on the ground" within the Center to help with commercialization efforts. To make this happen, we provide on-site contractors with technology transfer experience, people who know and understand what technology transfer is all about.

Q. *What are some of the unique skills your team brings to the ITPO?*

Dr. Joseph Holmes

Joey Holmes: The ITPO is very strong in indirect marketing, but hasn't always been as active in direct marketing. To address this, my team built a direct marketing department. It is proving effective to get people interested. The key is to contact people whom we feel might have a use for a particular technology. We teach out staff to maintain a "Rolodex" of contacts. The goal isn't necessarily to call the perfect person in the company every time; but to at least find someone who can direct us to that ideal person.

Phyl Speser: Foresight is a full-service commercialization company with contacts and offices around the world. In the course of our business, we are constantly running into opportunities for NASA Goddard. We will encounter someone with a particular business problem, and through our familiarity with the ITPO we can inform that person about how NASA Goddard technology may be able to help solve their problem. For instance, we recently became aware of a company that was looking for a way to detect leaks in underground pipelines. We realized that NASA Goddard's IR imaging technology could do this, so we brought it to their attention – early stage discussions are now underway.

Foresight employs people with a great deal of industry experience from many different perspectives. When we see a technology, we're not just thinking about how it could be used in space; we are also looking for other applications. One of the things we bring to NASA Goddard is the ability to see things from an industrial perspective, because we have senior people who ran R&D or business development for various companies across a spectrum of industries.

Joey Holmes: One thing we've come to understand is that no one knows everybody. No one person can rely solely on their own personal network of contacts; at times we have to have the ability and courage to cold call when necessary. In such cases, it's especially important to have a compelling technology message prepared. If we can't present the technology in a way that provides clear benefits to the person at the other end of the line, we're not going to get the traction we need to take the discussion beyond that initial phone call. To do this, we need to be as clear and simple as possible, describing the technology via a quick "elevator pitch." This is somewhat contrary to how some technologists think, since they may tend to focus on the details of the technology rather than placing themselves into the shoes of the customer.

What we learn in these discussions can also help NASA Goddard inventors. Potential customers often tell us what they need in terms of technology. We can pass along this feedback to NASA Goddard. Even if there's no interest in a particular technology, the feedback we receive from our discussions can provide great insights to NASA Goddard. If the business person isn't interested in the technology, we'll ask them for a wish list of things they need. We'll also ask them what would impress them in terms of technology. Our goal is to engage in a dialog in which potential customers tell us what they need, and we try to match those needs with the appropriate NASA Goddard technologies. We're always talking to industry, listening to the voice of the customer. What we try to avoid is the approach of "here's the technology, take it or leave it."

Phyl Speser: The people in the ITPO tend to be technical people who have transferred into a business function. Foresight tends to approach the situation from the other way around: we do have experience managing technology, but from more of a business focus. This creates an interesting synergy, with our two groups coming together from different angles.

Q. *What are some of the interesting NASA Goddard technologies your team has been working with?*

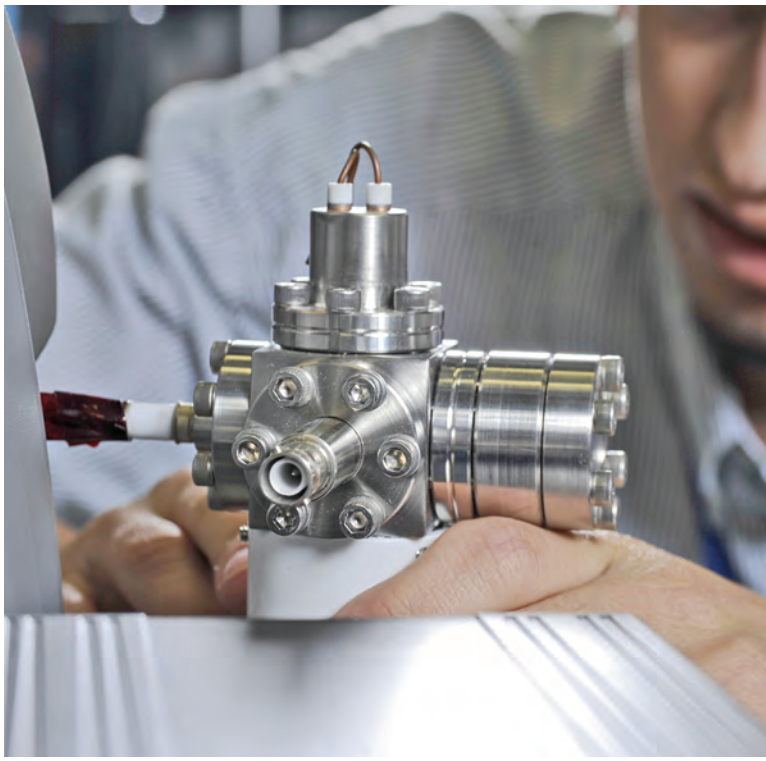
Phyl Speser: In addition to the climate data and IR technologies I mentioned earlier, another interesting technology is SARSAT. We're working with the ITPO to gather industry input to help design the next generation of antennas.

For example, we've spoken with aircraft companies such as Boeing, Airbus, Bombardier, and others through an informal advisory group, to help develop a SARSAT antenna that can be placed on a plane. Airplanes are very complicated systems. By checking with industry in advance we can avoid downstream problems when it comes time to integrate a new antenna into and onto the platform.

But some of the most exciting stuff we are working on is the wavefront portfolio. Between earth observation and astrophysics, NASA Goddard has some impressive capabilities when it comes to capturing and using light to see things. What is particularly exciting is we are doing much more than licensing a set of technology. We are working to build longer-term partnerships between users of light-wave technology in various industries and the technical team at NASA Goddard.

▶ *Sarsat*

—PHOTO BY NASA



▶ *Modulated X-ray source*

—PHOTO BY NASA

Joey Holmes: Within the past year we've looked at a number of interesting technologies. One that stands out in particular is the modulated X-ray source, which we believe is a real technology transfer winner since it can be used in multiple applications, including medical, communications, material science, and others.

For example, we're in discussions with Phillips about a potential agreement. The modulated x-ray source could serves as a platform technology for multiple purposes.

Q. *How do your two teams interact with each other?*

Joey Holmes: I liken our interaction with Foresight as two hands coming together. My group often performs an initial screening of technologies to determine whether or not they have obvious commercial potential. If the technology looks viable, we will recommend to the ITPO that Foresight write a JumpStart report for it. This report will help gauge potential interest in the technology.

If a technology is deemed to have commercial potential – either through the original triage my team performs, or through a Foresight JumpStart – we will initiate direct marketing efforts on its behalf. We also advise the ITPO Technology Managers. Foresight also provides guidance to the Technology Managers for some technology areas.

Phyl Speser: Joey has wonderful people working for him right there on site at NASA Goddard. His group basically handles a lot of the work internal to NASA Goddard, while Foresight is more oriented to doing the legwork outside the Center. We also provide guidance for technologies that fall into the "we have no idea" category as far as commercialization is concerned. If a technology is a clear yes or no and the technology managers know exactly how to get it out to industry, there's really no reason for Foresight to be involved. We come into play for technologies that folks can use some help with. Some of the more exploratory stuff we do pioneers new approaches that the internal folks can use.

Q. ***What are some of the takeaways you would like readers to understand about your group?***

Phyl Speser: I would like people throughout NASA Goddard to understand that Foresight is available to speak to anyone about anything you think we can help with, or where you just want a sounding board. Of course, we are part of the ITPO so we will coordinate with ITPO management to ensure you get all the help you need and that we can provide within the scope of our code's mission. We're always happy to have a quick "off-the-clock" conversation with people to help provide advice and guidance concerning technology commercialization. A big part of Foresight's mission to help find more revenue streams for NASA Goddard to support the Center's science goals.

Joey Holmes: A year from now, we'd like to be able to say the following:

- Direct marketing is a core piece of service designed to drive licensing deals.
- We have an efficient and effective technology screening process in place to harvest our portfolio and provide faster response and processing of technologies.
- We provide strategic guidance to ITPO Technology Managers, offering creative experience and service as a sounding board for the ITPO.

Our ultimate goal is to utilize innovation as an asset. NASA Goddard is highly innovative in developing new technologies. We want to be equally innovative in commercializing those technologies. To do this we will strive to be increasingly business-friendly, adopting processes that move at the speed of business.

Phyl Speser: I'd also like to add that NASA Goddard is one of our favorite clients! Goddard is doing so many cool things, and we're very proud to play our role in the process.

In the course of doing business Foresight attends many professional conferences and meetings, such as SPIE. Invariably, we find that NASA Goddard is known and highly respected by attendees. What isn't as well-known is that NASA Goddard can often provide technologies that can help people's businesses. This is a message that we'd like to get out there: each scientist and engineer is an "ambassador" for NASA Goddard. When you give a paper or do a poster session, include a slide at the end or a box in you poster encouraging people to share their technical needs and ask you about how they can work together with NASA Goddard to solve their technical and business challenges.

"How can we help?" is Foresight's business ethos; and it's one we'd also like to encourage every scientist and engineer to include whenever they talk to people off base. Just pass the leads to us at ITPO. ITPO is there to handle the business arrangements so you can focus on the science, engineering, and technology. That simple message will create opportunities for us to leverage our existing work, bring exciting new sponsored research or collaborative projects in, and expand our relevance to NASA and the American people.

[INTERVIEW WITH *Steven Naus, SBIR/STTR Program Manager*

Interview

One of the ITPO's critical responsibilities is to manage NASA Goddard's participation in NASA's Small Business Innovation Research (SBIR) program. NASA maintains an active SBIR/STTR program that operates across NASA Centers. For more information about NASA's SBIR/STTR program, including how to submit a proposal in response to a solicitation, see http://sbir.gsfc.nasa.gov/SBIR/SBIR.html.

Steve Naus recently joined the ITPO to manage NASA Goddard's role in NASA's SBIR/STTR program. We recently spoke to Steve about his new role and responsibilities

Steve Naus

Q. Tell us a little about your background.

I have been with NASA Goddard for 23 years, primarily as a physicist. I started in parts engineering and also worked in parts manufacturing. I eventually moved into IT, which at the time was somewhat lacking in providing services.

After working for several years in IT, I was ready for a change; so I accepted a position in the ITPO group. Over the years, I've done a lot of managing. I wanted to get back into the lower TRL levels of technology. Currently, I typically work with TRL levels 3 through 5.

Q. What do you see as the primary goal of the SBIR/STTR program?

For SBIRs, we take what the technical side comes up with and get it into the hands of SBIR applicants. The goal is to help improve the science for missions.

Q. What are the basic phases of the SBIR/STTR program?

There are several levels of SBIR. There's Phase I and Phase II. There's also a category called phase IIe, or Phase II Extended. In this phase, NASA Goddard will match funding up to a certain level. The final phase is Phase III, which relies solely on outside funding.

Q. How has the SBIR/STTR program at NASA Goddard evolved? Does the program do anything differently now compared to in the past?

The SBIR program has changed over the years. At first, we'd look at single patents. This year, we basically look at the whole technology portfolio and make it available for consideration. If a company has interest in any technology, they can propose a project that uses it.

In the past, the SBIR program was limited to certain patents, which may have limited the solicitations – there were potential uses for our technology we may not have considered.

We now target the SBIR to a topic, as long as it maps to a certain need of NASA Goddard.

Q. What technology areas look interesting in terms of generating SBIR/STTR work?

As a physicist, a lot of the technology I see looks very interesting to me. One area that really seems to be crystalizing is CubeStat. There are many uses for technologies designed to perform within strict limitations of size and weight. Miniaturization can help technologies perform better and faster. Tom Flatley was recently named Technologist of the Year based on his CubeStat related work. There are lots of applications where reduced power is a benefit.

Innovative Technology Partnerships Office (ITPO) Senior Technology Manager Ted Mecum, talks with an attendee at 2013 Goddard Industry Day.

—PHOTO BY NASA

2013 Goddard Industry Day

(AUGUST 13, 2013, GREENBELT, MD)

The Innovative Technology Partnerships Office participated in NASA Goddard's 2013 Industry Day, at NASA Goddard Space Flight Center on August 13, 2013. This year's conference was designed to support Service-Disabled Veteran-Owned Small Businesses, with a series of networking and matchmaking opportunities to help increase the knowledge base of how to successfully do business with NASA. The conference included a half day of speakers, networking, and matchmaking sessions, with approximately 400 attendees from small businesses, federal organizations, and prime contractors.

In the News

The following is a brief review of a few recent news stories prominently featuring NASA Goddard.

MAVEN launch

On November 18, 2013, the Mars Atmosphere and Volatile EvolutioN (MAVEN) spacecraft was successfully launched from the Cape Canaveral Air Force Station Space Launch Complex 41. MAVEN's mission is to explore the upper atmosphere of Mars. MAVEN's instrument package includes the Neutral Gas and Ion Mass Spectrometer (NGIMS), developed at NASA Goddard. The purpose of NGIMS is to measure the composition and isotopes of neutral ions in the Martian atmosphere.

MAVEN is expected to go into orbit around the Red Planet in September 2014. For more information about the MAVEN mission, see http://www.nasa.gov/mission_pages/maven/main/.

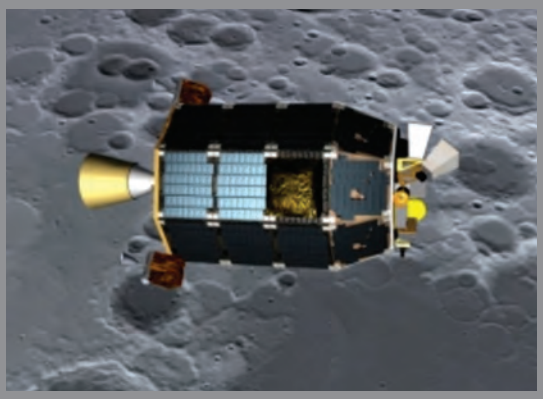
Artist's rendition of the MAVEN spacecraft approaching Mars

—PHOTO BY NASA

Busy season for NASA Goddard space instruments

The NASA Goddard Space Flight Center achieved a rare distinction of having three planetary instruments in operation simultaneously, each in a different location in space:

- Lunar Atmosphere and Dust Environment Explorer (LADEE) entered lunar orbit on November 20 and began science operations the following day. In early December, LADEE's Neutral Mass Spectrometer examined the tenuous lunar atmosphere, collecting samples over multiple orbits.



LADEE in orbit around moon

—PHOTO BY NASA

- MAVEN (see above) in December was in early "cruise phase." The mission's NGIMS instrument was placed in operation for the first time on December 4, to measure calibration gases in the instrument.
- Curiosity's Sample Analysis at Mars (SAM) instrument continues to analyze multiple

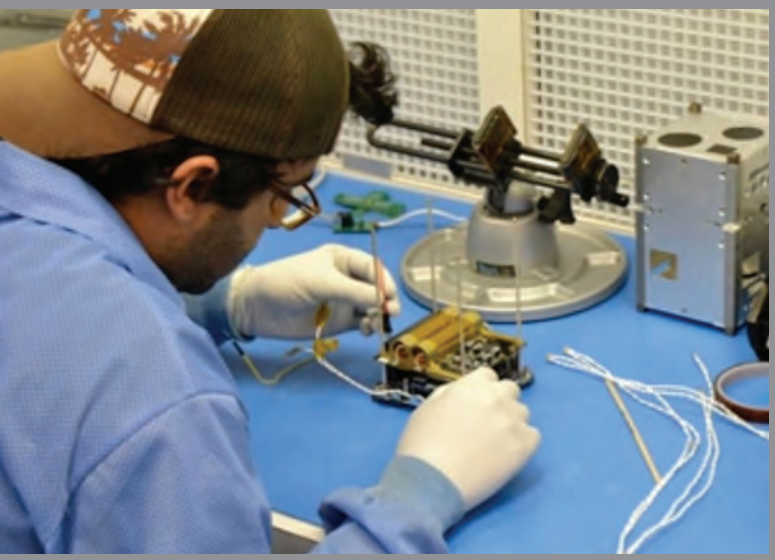
samples of the Martian atmosphere and soils and rocks. This research will help determine whether or not Mars may have been habitable in the past. *[See also the Fall 2012/Winter 2013 issue of the NASA Goddard Tech Transfer News.]*

Read more at: http://phys.org/news/2013-12-nasa-goddard-planetary-instruments-score.html

CubeSat Launch Initiative

On November 19, 11 CubeSat satellites were launched into space from NASA Goddard's Wallops Flight Facility. This launch was part of the ongoing CubeSat Launch Initiative program. These CubeSat satellites were carried as auxiliary payloads aboard a U.S. Air Force Minotaur 1 rocket. The miniature satellites, which included the first developed by high school students, all appear to have commenced successful operation after deployment.

The CubeSat platform represents a class of miniature research instruments that are often referred to as nanosatellites. *[See also the Spring 2013 issue of the NASA Goddard Tech Transfer News.]* For more information, see http://www.nasa.gov/press/2013/november/nasa-helps-launch-student-built-satellites-as-part-of-cubesat-launch-initiative/.



Student working on a CubeSat satellite.

—PHOTO BY NASA

NASA Goddard receives final James Webb Space Telescope primary mirror segments

In December, the final 3 of 18 primary mirrors for the James Webb Space Telescope (JWST) arrived at NASA Goddard from Ball Aerospace and Technologies Corporation of Boulder, CO. When fully integrated and launched in 2018, the hexagonal mirror segments will work together as a single primary mirror of 6.5-meter diameter, representing the largest mirror segments ever flown in space (and the first to deploy in space).

A primary mirror segment and the secondary mirror arrives at NASA Goddard in November.

—PHOTO BY NASA

Placed in orbit a million miles above Earth, JWST will be the most powerful space telescope ever built. Its purpose will be to explore every phase of our universe's evolution. JWST is a joint project of NASA, the European Space Agency, and the Canadian Space Agency.

To learn more, see http://www.redorbit.com/news/space/1113030975/last-three-mirrors-james-webb-space-telescope-arrive-at-nasa-121813/#ZZJgg6dWzuAJCBzv.99.

Technology Disclosures

Disclosures

- **PHASE OCCULTED VISIBLE NULLING CORONAGRAPH**

  Richard Lyon, Mark Clampin, Peter Petrone

- **HIGH-ENERGY INSTRUMENTATION FOR SMALL SATELLITE PLATFORMS**

  Georgia De Nolfo

- **COMPACT LIGHT TRAP VENT**

  Francisco San Sebastian

- **COMPOSITE CAPACITIVE TACTILE/FORCE SENSOR ARRAYS FOR ROBOTIC SPACE APPLICATIONS**

  Edward Sabolsky, Timothy Weadon, Thomas Evans

- **FLIGHT HARDWARE VIRTUALIZATION FOR SCIENCE DATA PROCESSING (FY12 IRAD)**

  Alan Cudmore, Justin Rice

- **A MICRO CYLINDRICAL ION TRAP (U-CIT) MICRO MASS SPECTROMETER INSTRUMENT SYSTEM (UMSIS) FOR NASA PLANETARY EXPLORATION**

  Patrick Roman, William Brinckerhoff, George Manos, Kyle Gregory

- **RELEASE OF A STUCK SOLAR ARRAY OR ANTENNA - ADDITIONAL CONCEPTS**

  Alejandro Rivera, Paul Nikulia, Michael Liszka, Thomas McBirney, Mark Behnke

- **ADVANCED MISSION DESIGN AND NAVIGATION ANALYSIS**

  Gregory Marr

- **A RADIATION HARDENED QUAD 12-BIT DIGITAL-TO-ANALOG CONVERTER APPLICATION SPECIFIC INTEGRATED CIRCUIT**

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- **POSE ALGORITHM FOR RANGE IMAGES**

  Matthew Strube, Nathaniel Gill, Joseph Galante, John Van Eepoel

- **LOW POWER THERMONIC EMISSION ELECTRON GUN OPERATING AT 1 ATMOSPHERE**

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- **HIGH REFLECTANCE SILICON DIELECTRIC MIRRORS FOR INFRARED ASTRONOMY**

  Kevin Denis, Edward Wollack, Samuel Moseley, Manuel Quijada

- **GIGABIT PER SECOND DATA PROCESSING**

  Teresa Sheets, Stanley Hunter

- **FABRICATION OF AN INTEGRATED PHOTONIC WAVEGUIDE JOINT IN MICROMACHINED SILICON**

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- **FAILURE ANALYSIS OF DIELECTRIC BREAKDOWNS IN BASE-METAL ELECTRODE MULTILAYER CERAMIC CAPACITORS**

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- **CUBESAT FORM FACTOR THERMAL CONTROL LOUVERS**

  Allison Willingham

- **MM-WAVE RADIOMETER FRONT-END DEVELOPMENT**

  Negar Ehsan, Matthew McLinden, Jared Lucey

- **METHOD AND DEVICE FOR EXTRACTING LIQUIDS FROM A SOLID PARTICLE MATERIAL**

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- **FABRICATION OF SI LEG-ISOLATED BI-CR THERMOPILES**

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- **TECHNIQUES FOR ON-ORBIT CRYOGENIC SERVICING**

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- **1 MICRON (1064 NM) PLANAR EXTERNAL CAVITY LASER - PLANEX**

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- **NASA SOIL MOISTURE ACTIVE PASSIVE MISSION (SMAP) RADIOMETER INSTRUMENT LEVEL 1-B (L1B) SCIENCE SIGNAL AND DATA PROCESSING SOFTWARE (SPS) FOR RADIO FREQUENCY INTERFERENCE (RFI) DETECTION AND MITIGATION (L1B SPS RFI)**

  Semion Kizhner, Matthew Brandt, Jeffrey Piepmeier

- **HELIO RADIO CUBESAT LUNAR EJECTION SYSTEM (HERCULES)**

  Elizabeth Daly, Elizabeth Blaiszik, Robert MacDowall, Fred Minetto

- **GRAVITE UPLOAD TOOL**

  Peyush Jain, Richard Ullman, Wayne McCullough, David Trang, Chintu Mistry, Ryan Gerard, Shyam Vyas, Michael Iwunze, Angelo Bertolli

- **NEUTRON SPECTROMETER FOR INNER RADIATION BELT STUDIES (IRAD FY14)**

  Georgia De Nolfo, David Sohi

- **SPF: A SOFTWARE FRAMEWORK FOR PSEUDOSPECTRAL NUMERICAL SIMULATION AT EXTREME SCALES**

  Thomas Clune

- **A RADIATION HARDENED QUAD 10-BIT DIGITAL-TO-ANALOG CONVERTER APPLICATION SPECIFIC INTEGRATED CIRCUIT**

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- **HOSE FOR IN-SPACE PROPELLANT TRANSFER BETWEEN TWO SATELLITES**

  Syrus Jeanes, Erik Tormoen, Antonio Pego, Cara Evers, Tom Ebert, Craig Fortier, Michael Stirling, Philip Kalmanson

- **WALD SEQUENTIAL PROBABILITY RATIO TEST FOR SPACE OBJECT CONJUNCTION ASSESSMENT**

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- **MAREA ZERO - A HIGH PERFORMANCE MIDDLEWARE LAYER FOR GMSEC BASED ON ZEROMQ**

  Juan Lopez Rubio

- **ELASTIC DEPLOYABLE COMPOSITE TUBULAR ROLL-OUT BOOM**

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- **METHOD AND LABORATORY SETUP FOR IMAGING TAPE LIFTS BY AUTOMATED MICROSCOPY**

  Alfred Wong, Taylor Fetrow, Nancy Carosso, Mark Hasegawa

- **GRAVITE PULL SERVER**

  Peyush Jain, Richard Ullman, Wayne McCullough, David Trang, Chintu Mistry, Ryan Gerard, Shyam Vyas, Michael Iwunze, Angelo Bertolli

- **NASA SOIL MOISTURE ACTIVE PASSIVE MISSION (SMAP) RADIOMETER INSTRUMENT LEVEL 0-B (L0B) SCIENCE SIGNAL AND DATA PROCESSING SOFTWARE (SPS) FOR PROCESSING OF SMAP SPACECRAFT RADIOMETER TELEMETRY FRAME (TF) FILES (L0B SPS) AND GENERATING A HALF-ORBIT FILE THE UNIT OF DATA INPUT TO THE SMAP SCIENCE DATA PROCESSING GROUND SYSTEM**

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  Kelvin Garcia, Michael Garrah, William Squicchiarini

- **COST AND RISK ANALYSIS OF SMALL SATELLITE CONSTELLATIONS FOR EARTH OBSERVATION**

  Sreeja Nag, Jacqueline LeMoigne-Stewart, Olivier de Weck, Charles Gatebe

- **MICROMACHINED INTEGRATED PACKAGE WITH HIGH THROUGHPUT AND WIDE-REJECT-BAND FOR BOLOMETRIC SENSORS**

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  Rafael Rincon, Kenneth (Jon) Ranson, Temilola Fatoyinbo, Lynn Carter

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- **FEMTO-SATELLITE SENSOR NODES FOR DISTRIBUTED SPACE MISSIONS**

  Kyle Gregory, Luke Winternitz, Rafael Garcia, Jennifer Valdez, Steven Kenyon, Juan Rodriguez-Ruiz, Nikolaos Paschalidis, Shannon Rodriguez, Penina Axelrad

- **SCIENTIFIC BALLOONS AS SOLAR SAILS**

  David Batchelor

- **PHOTONIC WAVEGUIDE CHOKE JOINT WITH IMPROVED STOP-BANDWIDTH**

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- **AIRBORNE FLIGHT-ABLE PRECISION AND FAST TUNABLE SEED-LASER SYSTEM**

  Jeffrey Chen, Stewart Wu

- **GUIDANCE AND TARGETING FLIGHT SOFTWARE**

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- **3D PLUS PROGRAMMABLE READ ONLY MEMORY (PROM) EMULATOR BOARD**

  Alessandro Geist, David Petrick

- **GODDARD MISSION SERVICES EVOLUTION CENTER (GMSEC) SECURE APPLICATION PROGRAMMING INTERFACE (API) MODULE VERSION 2.0**

  Robert Wiegand, Vuong Ly, Matthew Handy

- **ANALYSIS TOOL FOR HARTMANN MEASUREMENT DATA OF COMPONENTS OF X-RAY TELESCOPES**

  Timo Saha, Michael Biskach, William Zhang

- **A NOVEL MICROFABRICATION PROCESS FOR BUILDING THIN, LARGE AREA, SUSPENDED X-RAY ABSORBERS FOR LOW ENERGY X-RAY SPECTROSCOPY**

  Thomas Stevenson, Manuel Balvin, Kevin Denis, John Hagopian

- **CONFORMAL NANOTUBE BAFFLE FOR A COMPACT CORONAGRAPH (IRAD) STEP-2 PROPOSAL FY14 IRAD**

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  Matthew Schwaller, Colin Southwell, Louise Emmerson

- **FLIGHT PROVING A HELIOPHYSICS SOFT X-RAY IMAGER**

  David Sibeck, Michael Collier, Frederick Porter

- **HIGHLY ADAPTIVE PRIMARY MIRROR HAVING EMBEDDED ACTUATORS, SENSORS AND NEURAL NET CONTROL**

  David Pearson

- **"GODDARD TUNNEL" AKA GTUN**

  Mark Sinkiat, Gregory Menke

- **INHIBIT UNIT (IU) FOR PROPULSION & DEPLOYMENT ELECTRONICS (PDE) SYSTEM FOR THE LUNAR RECONNAISSANCE ORBITER (LRO) MISSION**

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- **OPTICAL ALIGNMENT OF THE GLOBAL PRECIPITATION MEASUREMENT (GPM)**

  Samuel Hetherington, Dean Osgood, Joseph McMann, Vicki Roberts, James Gill, Kyle McLean

- **ATOMIC INTERFEROMETER GRAVITY GRADIOMETER (AIGG) FY13 IRAD**

  Scott Luthcke

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

  Martin Fejer, Philip Battle, Carsten Lengrock

- **SATELLITE SITUATION UPDATE (SSUP)**

  Eric Stoneking

- **MODULAR PROPULSION & DEPLOYMENT ELECTRONICS (PDE) SYSTEM FOR THE LUNAR RECONNAISSANCE ORBITER (LRO) MISSION**

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- **GEOCAPE AIRBORNE SIMULATOR (GCAS)**

  Scott Janz, John Riley

- **RADIO FREQUENCY INTERFERENCE (RFI) MITIGATION FOR THE SOIL MOISTURE ACTIVE PASSIVE (SMAP) MICROWAVE RADIOMETER**

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- **IMPROVEMENT TO THERMONIC EMISSION 1 ATMOSPHERE ELECTRON GUN**

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- **MULTIPLEXED SUPERCONDUCTING NANOWIRE DETECTOR ARRAY (IRAD) STEP-2 PROPOSAL**

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- **GRAVITE DATABASE**

  Peyush Jain, Richard Ullman, Wayne McCullough, David Trang, Chintu Mistry, Ryan Gerard, Shyam Vyas, Michael Iwunze, Angelo Bertolli

- **NORMALLY-CLOSED ZERO-LEAK VALVE WITH MAGNETOSTRICTIVE ACTUATOR**

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  Gabor Tamasy, Erik Tormoen

- **NEXT GENERATION HIGH DATA RATE KA-BAND MODULATOR AND TRANSMITTER**

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- **KA-BAND GATEWAY (KAG)**

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- **FREQUENCY DIVERSITY TECHNIQUE FOR SPACE-BORNE RADAR DOPPLER MEASUREMENTS**

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- **INTEGRATED COMMAND-TELEMETRY COLLABORATION ENVIRONMENT (ICCE)**

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- **DISTRIBUTED BRAGG REFLECTION SOLID STATE LASER IN PHOTO-THERMO-REFRACTIVE GLASS**

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- **HSEGLEARN - A TOOL FOR LEARNING THE OPTIMAL HIERARCHICAL SEGMENTATION LEVELS FOR REPRESENTING A SELECTED GROUND COVER TYPE**

  James Tilton, Eric Brown De Colstoun, Robert Wolfe, Chengquan Huang, Sarah Smith, Jacqueline Philips, Bin Tan, Panshi Wang, Pui-Yu Ling

- **GATED CHOPPER INTEGRATOR (GCI)**

  Gerard Quilligan, Shahid Aslam

- **EARTH UPDATE**

  Colin Law, Patricia Reiff

- **LOTUS WET CHEMISTRY NANO-TEXTURED DUST MITIGATION COATING WITH HYDROPHOBIC PROPERTIES, SECOND GENERATION (LOTUS WC2 COATING)**

  Sharon Straka, Mark Hasegawa, Kenneth O'Connor, Victoria Pederzani Stotzer, Wanda Peters, Danielle Margiotta, Kritin McKittrick

- **SPACECRAFT BERTHING MONITORING SYSTEM FOR AUTONOMOUS RENDEZVOUS AND DOCKING OPERATIONS**

  Powsiri Klinkachorn, Jason Battin

- **A DUAL I2C AND SPI SLAVE CORE FOR FPGA AND ASIC IMPLEMENTATIONS**

  George Suarez, Jeffrey DuMonthier, George Winkert

- **DATA ACCESS TOOLKIT (DAT) BUILD 1**

  Chiu Wiegand, Brian Feldman, Karen Keadle-Calvert

- **SPACECRAFT DESIGN AND LAUNCH DISPENSER FOR DUAL SATELLITE LAUNCH**

  Carey Lively, Eric Thorstenson

- **ROBOT FOR THE CONTROLLED DEPOSITION OF MULTILAYER THIN FILM STRUCTURES**

  Scott Rommel, Scott Davis, Seth Johnson, Michael Anderson

- **LINUX KERNEL DRIVER AND SOFTWARE LIBRARY FOR SPACEWIRE PCI CARD**

  Thomas Johnson

- **GRAVITE MONITOR**

  Peyush Jain, Richard Ullman, Wayne McCullough, David Trang, Chintu Mistry, Ryan Gerard, Shyam Vyas, Michael Iwunze, Angelo Bertolli

- **MULTI-BAND HYDROLOGICAL RADAR**

  Paul Racette, Lihua Li, Gerald Heymsfield, Thomas Hand, Michael Cooley, Richard Park

- **CORE FLIGHT SYSTEM (CFS) SOFTWARE BUS NETWORK APPLICATION VERSION 1.0**

  Jonathan Wilmot, Robert McGraw

- **AUTONOMIC ANALYTICS**

  Roy Sterritt, Michael Hinchey

- **NEW FOCAL PLANE ASSEMBLY (FPA) FOR NEXT GENERATION PLANETARY THERMAL IMAGING (TIM) INSTRUMENTS**

  Gerard Quilligan, Ari Brown, Emily Barrentine, Brook Lakew, Shahid Aslam

- **PHOTOLITHOGRAPHIC MATCHED MICROWAVE BLOCKING FILTER**

  Kongpop U-yen, Edward Wollack

- **DEVELOPMENT OF HIGH CONTRAST LENSLETS FOR INTEGRAL FIELD SPECTROSCOPY**

  Michael McElwain, Qian Gong, Sara Heap, Karl Stapelfeidt, Bruce Woodgate

- **PRECISION THERMAL DETECTOR CONDUCTANCE DEFINITION WITH BALLISTIC THERMAL TRANSPORT**

  David Chuss, Edward Wollack, Kevin Denis, Samuel Moseley, Karwan Rostem

- **GODDARD MISSION SERVICES EVOLUTION CENTER (GMSEC) SECURE APPLICATION PROGRAMMING INTERFACE (API) RELEASE 3.5**

  Robert Wiegand, Vuong Ly, Matthew Handy, Joseph Gurganus, David Whitney, Daniel Hunke

- **INVESTIGATION OF A GENERIC MULTI-CHANNEL CHARGE SENSITIVE AMPLIFIER FOR GSFC SOLID STATE DETECTOR INSTRUMENTS**

  Udayan Mallik, Stanley Hunter, Lavida Cooper

- **RESTORE RPO SENSOR COMPLEMENT**

  Matthew Strube, Michael Moreau, Bo Naasz

- **COMPACT WIDE BANDWIDTH PASSIVE PHASE SHIFTER FOR RADIO FREQUENCY (RF) AND MICROWAVE APPLICATIONS**

  Wei-chung Huang

- **GNSS EPHEMERIS WITH GRACEFUL DEGRADATION AND MEASUREMENT FUSION**

  James Garrison, Michael Walker

- **MICRO FLIGHT EXECUTIVE (UFE) SMALL INSTRUMENT PROCESSING FRAMEWORK**

  Dwain Molock

- **RADIATION HARDENED BY DESIGN MULTI-PATH VARIABLE GAIN DIGITIZER WITH SELECTABLE AUTO-ZERO / CHOPPER STABILIZATION**

  Gerard Quilligan, Shahid Aslam

- **ADVANCED NUMERICAL INTEGRATION TECHNIQUES FOR HIGH-FIDELITY SDE SPACECRAFT SIMULATION**

  Joseph Galante

- **SECOND GENERATION SEARCH AND RESCUE SOFTWARE DEFINED RECEIVER**

  Reese Bovard

- **GRAVITE INCINERATOR**

  Peyush Jain, Richard Ullman, Wayne McCullough, David Trang, Chintu Mistry, Ryan Gerard, Shyam Vyas, Michael Iwunze, Angelo Bertolli

- **IMPROVED OPTICAL PLANAR WAVEGUIDE STRUCTURES FOR HIGH-PERFORMANCE LASER TRANSMITTERS**

  Mark Stephen, Anthony Yu

- **KA BAND EARTH COVERAGE ANTENNA FOR NASAS KA-BAND COMMUNICATION APPLICATIONS**

  Cornelis Du Toit, Victor Marrero-Fontanez

- **NASA SOIL MOISTURE ACTIVE PASSIVE MISSION (SMAP) RADIOMETER INSTRUMENT LEVEL 0-A (L0A) SCIENCE SIGNAL AND DATA PROCESSING SOFTWARE (SPS) FOR INITIAL PRE-PROCESSING OF SMAP SPACECRAFT RADIOMETER TELEMETRY FRAME (TF) FILES (L0A SPS) AND GENERATING FILES FIRST SCAN AND LAST SCAN TIMES IN DIFFERENT TIME FORMATS.**

  Semion Kizhner, Matthew Brandt

- **SATCAM: REAL-TIME VISUALIZATION OF OPERATIONAL SPACECRAFT BASED ON REAL-TIME TELEMETRY**

  Eric Stoneking, Dean Chai, Neerav Shah, Blair Carter

- **GAME AND REPOSITORY FOR APERTURE SOLUTIONS AND PATTERNS (GRASP)**

  Nargess Memarsadeghi, Richard Lyon, Jeffrey Hosler

- **CLIENT BERTHING SYSTEM / MECHANISM**

  Kelvin Garcia, Thomas Hanyok, Matthew Ashmore

- **JAMES WEBB SPACE TELESCOPE (JWST) SYSTEM FOR IMAGE DIGITIZATION, ENHANCEMENT, CONTROL AND RETRIEVAL (SIDECAR) APPLICATION SPECIFIC INTEGRATED CIRCUIT (ASIC) FLIGHT ASSEMBLY CODE (FAC) BUILD 7.0**

  Donna Wilson, Markus Loose, Matthew Lander

- **TEMPERATURE COMPENSATING PMT HOUSING**

  Francisco San Sebastian

- **VECTOR NETWORK ANALYZER CALIBRATION FOR QUASI-OPTICAL DUAL-PORTS**

  David Chuss, Edward Woliack

- **FIELDNOTES: A MOBILE APP FOR COLLABORATIVE EXPLORATION**

  Carl Hostetter, Troy Ames

- **CONSOLIDATED LEARNING ASSESSMENT INTERVIEWER FOR RECOMMENDED EXPERIENCES (CLAIRE)**

  Robert Menrad, Sophia Marnell

- **HYPERSPECTRAL IMAGE PROJECTOR WITH POLARIZATION CAPABILITY**

  Teresa Ewing, Steve Serati

- **THERMAL MICRO-EXTRACTION LABORATORY FOR EXTRACTION OF ORGANIC AND INORGANIC COMPOUNDS FROM MISSIONS TO PLANETS, SATELLITES, AND PRIMITIVE BODIES**

  Manuel Balvin, Michael Callahan, Yun Zheng, Ramsey Smith

- **SPACECRAFT AND SPACE SYSTEM FUEL-LEAK DETECTION SENSORS**

  Edward Sabolsky, Thomas Evans, Jonathon Taub

- **A HYBRID LOOP ELEMENT DESIGN FOR ENHANCED HIGH FREQUENCY REFLECTOR/REFLECTARRAY PERFORMANCE**

  Thomas Hand, Michael Cooley, David Sall, Gary Kempic

- **INTEGRATED SCIENCE INSTRUMENT MODULE (ISIM) HARDWARE MODELS**

  Dustin Geletko, Jeffrey Joltes, Steven Seeger, Justin Morris, Scott Zemerick

- **MULTIPLE FREQUENCY BAND SOFTWARE-DEFINED RADIOMETER**

  Lynn Miles, Damon Bradley, Englin Wong, Edward Kim, Jeffrey Piepmeier, Peter Young

- **REMOTELY OPERATED SENSOR PLATFORM FOR SHALLOW WATERS**

  Geoffrey Bland, Ted Miles

- **METHOD AND APPARATUS FOR MEASUREMENT OF ATMOSPHERIC CARBON MONOXIDE AND METHANE**

  Mark Paige, Anthony Gomez, Alan Stanton

- **MODULES FOR PROPULSION & DEPLOYMENT ELECTRONICS (PDE) SYSTEM FOR THE LUNAR RECONNAISSANCE ORBITER (LRO) MISSION**

  Jason Badgley

- **HERMETIC PHOTO TUBE HOUSING**

  Francisco San Sebastian

- **BI-STATIC ACTIVE MICROWAVE REMOTE SENSING OF REFLECTED SIGNALS-OF-OPPORTUNITY**

  Jeffrey Piepmeier, Carey Johnson, Manohar Deshpande

- **A PARTICLE-FOCUSING INLET TOWARD DEVELOPMENT OF AN IN SITU AEROSOL MASS SPECTROMETER**

  Melissa Trainer, Stephanie Getty, Eric Cardiff, Carrie Anderson, William Brinckerhoff

- **A 16-BEAM NON-SCANNING SWATH MAPPING LASER ALTIMETER INSTRUMENT**

  Anthony Yu, Michael Krainak, David Harding, James Abshire, Xiaoli Sun, Luis Ramos-Izquierdo, John Cavanaugh, Susan Valett, Thomas Winkert, Michael Plants, Cynthia Kirchner, Peter Dogoda, Brian Kamamia, R. Faulkner, Aleander Betin

- **LHR-CUBE: A LIMB-VIEWING CUBESAT INSTRUMENT FOR ATMOSPHERIC MEASUREMENTS OF METHANE AND CARBON DIOXIDE - FY13 IRAD**

  Emily Wilson, Scott Schaire

- **DESIGN AND FABRICATION OF NANOWIRE DETECTOR PIXELS WITH WAVELENGTH AND POLARIZATION DIVERSITY**

  John Hagopian, Thomas Stevenson, Shahram Shiri

- **GODDARD MISSION SERVICES EVOLUTION CENTER (GMSEC) SECURE APPLICATION PROGRAMMING INTERFACE (API) MODULE VERSION 1.0**

  Robert Wiegand, Vuong Ly, Matthew Handy, Thomas Sullivan

- **EFFICIENT RADIATION SHIELDING THROUGH DIRECT METAL LASER SINTERING**

  Jean-Marie Lauenstein, Steven Kenyon, Raymond Ladbury, Michael Xapsos, Jonathan Pellish, Donald Hawkins

- **GROUND ARCHITECTURE OPTIMIZATION USING AN ITERATIVE HILL CLIMBING ALGORITHM TO MINIMIZE LATENCY**

  George Bussey

- **MICRO-SCALE TESTING OF NON-WOVEN CARBON NANOTUBE SHEETS AND YARNS**

  Justin Jones, James Magargee, Fabrice Morestin, J. Cao

- **A SIMPLE IMPEDANCE MATCHED PLANAR MICROWAVE BLOCKING FILTER**

  Edward Wolack, Kongpop U-yen, David Chuss

- **MACHINE VISION BASED POSE ESTIMATION SYSTEM USING ELLIPSE DETECTION FOR SPACECRAFT AR&D**

  Marcello Napolitano, Andres Velasquez Escandon

- **MINIATURE, RUGGEDIZED OPTICAL ZOOM LENS**

  Ross Henry, Jonathan Kraeuter, James Biesinger, Jelila Mohammed

- **SIMPLER FRAMEWORK SOFTWARE LIBRARY VERSION 1.0**

  Timothy Ray

- **INSTRUMENT FOR MEASURING HG AND H2S CONCENTRATIONS IN NATURAL GAS LINES**

  Emily Wilson, Richard Kay, Demetrios Poulios

- **ROBOTIC GRIPPER FOR AUTONOMOUS RENDEZVOUS AND CAPTURE OF SATELLITES**

  Matthew Ashmore

Patent Applications Filed

- **CHEMICAL SENSORS BASED ON 2-DIMENSIONAL MATERIALS**

  Mahmooda Sultana

- **MIRRORLET ARRAY FOR INTEGRAL FIELD SPECTROMETERS (IFS)**

  Qian Gong, Philip Chamberlin, David Content, Jeffrey Kruk

- **SOFTWARE SUITE FOR MODELING AND SIMULATION OF SHAPED EXTERNAL OCCULTERS**

  Richard Lyon

- **SPACECUBE V2.0 PROCESSOR CARD, ENGINEERING MODEL**

  David Petrick, Dennis Albaijes

- **SPACECUBE V2.0 FLIGHT PROCESSOR CARD**

  David Petrick, Thomas Flatley, Alessandro Geist

- **SPACECUBE V. 2.0 FLIGHT POWER CARD**

  David Petrick, Pietro Sparacino, Milton Davis

- **PROPELLANT TRANSFER ASSEMBLY DESIGN AND DEVELOPMENT**

  Brian Nufer, Stephen Anthony, Craig Fortier, Philip Kalmanson

- **SPACECUBE V2.0 MICRO**

  David Petrick, Alessandro Geist, Michael Lin, Gary Crum

- **MUTI-FUNCTION MICROPOSTERS INSIDE OF MICROFLUIDIC CHANNEL FOR LAB-ON-A-CHIP DEVICE**

  Yun Zheng

- **MISSE-7 CONTROL CENTER**

  Jeffrey Hosler, Daniel Espinosa, David Petrick

- **GREEN PRECISION CLEANING SYSTEM**

  Michael Wilks

- **BROADBAND PLANAR IMPEDANCE TRANSFORMER**

  Negar Ehsan

Patents Issued

- **SPACECUBE DEMONSTRATION PLATFORM**

  David Petrick, Alessandro Geist, Gary Crum, Manuel Buenfil, Jeffrey Hosler, Tom Flatley, Daniel Espinosa

- **A LOW COST, LOW TEMPERATURE RADIOMETER FOR THERMAL MEASUREMENTS**

  James Tuttle, Thomas Halt, Michael DiPirro

- **REFINEMENT OF THE HSEG ALGORITHM FOR IMPROVED COMPUTATIONAL PROCESSING EFFICIENCY**

  James Tilton

- **AN INSTRUMENT SUITE FOR THE VERTICAL CHARACTERIZATION OF THE IONOSPHERE-THERMOSPHERE SYSTEM FROM 100KM TO 700KM ALTITUDE**

  Federico Herrero, Hollis Jones, Theodore Finne, Andrew Nicholas

- **SPECULAR COATINGS FOR COMPOSITE STRUCTURES**

  Russell Rowles, Robert Kiwak, James Lohr, Kenneth Segal, Wanda Peters

- **OPTIMAL PADDING FOR THE TWO-DIMENSIONAL FAST FOURIER TRANSFORM**

  Jeffrey Smith, David Aronstein, Bruce Dean

- **NON-PYROTECHNIC ZERO-LEAK NORMALLY-CLOSED VALVE**

  Rebecca Gillespie

Provisional Patents

- **RADIATION HARDENED 10BASE-T ETHERNET PHY**

  Michael Lin, Kevin Ballou, Daniel Espinosa, Edward James, Matthew Kliesner, David Petrick

- **SOFTWARE SUITE FOR MODELING AND SIMULATION OF SHAPED EXTERNAL OCCULTERS**

  Richard Lyon

- **OPTICAL NULL LENS VERIFICATION USING IMAGE-BASED WAVEFRONT SENSING**

  Peter Hill, Patrick Thompson, David Aronstein, Matthew Bolcar, Jeffrey Smith

Space Act Agreements

COMPANY	AGREEMENT TYPE	PARTNERSHIP ABSTRACT
Syneren Technologies Corporation	*Space Act Agreement*	*Syneren is interested in further testing and developing some of NASA GSFC effective noise reduction and data processingtechnologies.*
Johns Hopkins University	*Space Act Agreement*	*GSFC and JHU would benefit from the establishment of a formal relationship to educate Program participants about government Technology Transfer practices and resources as well as Goddard's innovative business practices.*
Johns Hopkins University	*Space Act Agreement Amendment*	*NASA GSFC and Johns Hopkins wish to produce and test detectors for the Cosmology Large Angular Scale Surveyor (CLASS) instrument.*
Department of Defense - SpaceTest Program	*Interagency Amendment*	*Memorandum of Agreement (MOA) delineates the roles and responsibilities among DoD STP and NASA GSFC on the terms, conditions, and funding for collaboration on the Space Test Program - Houston 4 (STP-H4) payload, in which DoD STP will provide integration and flight of the GSFC International Space Station SpaceCube Experiment 2.0 (ISE 2.0) on STP-H4, and GSFC will provide two (2) flight-qualified units of the SpaceCube Communication Interface Box (SpaceCube CIB) for STP-H4.*

COMPANY	AGREEMENT TYPE	PARTNERSHIP ABSTRACT
Emergent Space Technologies, Inc.	*Space Act Agreement Amendment*	*Emergent and NASA GSFC wish to enter into a fully reimbursable agreement to allow Emergent access and use of the GSFC Formation Flying Test Bed (FFTB) GPS test and simulation equipment and facilities, on a non-competitive and after-hours basis. Emergent currently staffs, maintains and operates the Facility on NASA GSFC's behalf for NASA's space mission support under contract to NASA GSFC. NASA GSFC benefits by maintaining test readiness and operational expertise including personnel, and recovery of facility maintenance costs.*
Sigmadyne, Inc.	*Space Act Agreement*	*The goal of this effort is to develop a manufacturing process for post-polishing an optical surface after figuring the optical surface with a sub-aperture fabrication tool, such as a diamond turning machine.*
Northrop Grumman Technical Services, Inc.	*Non-Reimbursable SAA*	*The purpose of this Agreement is to establish the extent of knowledge sharing between NASA Goddard and NGC in developing reaction sphere technology. NGC has successfully demonstrated a reaction sphere prototype and control algorithm with magnetic actuation and has filed for a US Patent for the spherical motor control methodology.*
Maryland Department of Business and Economic Development	*Space Act Agreement*	*NASA's Goddard Space Flight Center (GSFC) has need of specialized skills and technologies in order to support its numerous mission applications. GSFC is also committed to promoting the economic welfare of the surrounding Mid-Atlantic Region. As a result, GSFC desires to engage in technical exchanges with local technology organizations regarding new trends, theories, techniques, and problems in aerospace technology that may be applicable to GSFC's mission. In addition, the development of local educational and labor resources specific to GSFC's needs would provide GSFC with a powerful strategic advantage.*

invent. explore. connect.

▶ — PHOTOS BY GODDARD INNOVATIVE TECHNOLOGY PARTNERSHIPS OFFICE

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