National Aeronautics and Space Administration

STRATEGIC PARTNERSHIPS OFFICE

RISE TO THE CHALLENGE

2020 ACCOMPLISHMENTS REPORT

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ABOUT THE COVER

It's easy to compare the year 2020 to climbing a mountain – slow, frustrating, and deeply challenging. Like so many other groups of people across the country, the Strategic Partnerships Office at NASA's Goddard Space Flight Center faced brand new challenges when the COVID-19 pandemic hit. Mountain-climbing has its rewards, though. It forces you to think differently and explore untested routes. It teaches patience and understanding. And it promises a beautiful view from the top of the world. When it comes to transferring NASA technologies, SPO will always rise to the challenge, no matter how steep the journey.

Photo illustration: NASA/ Danielle Battle

Photo credit: Unsplash/Nikola Duza

OFFICE OF THE CHIEF

In March 2020, everything was about to change, but we didn't quite know it yet. At the Strategic Partnerships Office (SPO), we were busy processing a flurry of New Technology Reports from Goddard's innovator community. The office planned to launch the first installment of a new speaker series in March, but as news of the COVID-19 pandemic turned increasingly concerning, it became clear to me that the year would take an unexpected turn.

Many of Goddard's civil servants and contractors transitioned to working from home, a new and challenging change of routine. Separated by distance but connected through technology, we had to adapt to these circumstances and figure out how to carry forward the center's many missions.

The ingenuity and compassion of Goddard's people struck me immediately. At Goddard and all across NASA, innovators applied their problem-solving skills to the biggest trials of the pandemic, seeking out space technologies that could be adapted for the cause. While still conquering huge milestones in space, Goddard's workforce sought solutions to Earth's problems, as well. I've been honored to help figure out ways to bring these ideas to the commercial realm and hope to share more news of these developments in the next accomplishments report.

In the meantime, I'm pleased to present all we accomplished in 2020. Goddard innovators reported hundreds of new technologies this year, and previous years' inventions garnered an assortment of awards. SPO pivoted to all-remote interactions, leveraging virtual presentation tools to launch a number of successful events about technology transfer and partnerships.

During this strange and unusual year, I'm proud of all that SPO has managed to do. Despite the pandemic forcing us apart, the drive to make a difference has forged us all together.

Darryl R. Mitchell, Chief

Strategic Partnerships Office
NASA's Goddard Space Flight Center

PHOTO: *NASA Goddard/Samantha Kilgore*

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JOE FAMIGLIETTI
Goddard SBIR/STTR Lead

QUENTON BONDS
Goddard SBIR/STTR Lead

PHOTOS: *NASA Goddard/Samantha Kilgore*

WE ARE YOUR PARTNER IN TECH

In a tumultuous year, it's more important than ever to remember the positive work that Goddard's Strategic Partnerships Office managed to accomplish despite many challenges. In all three program areas – technology transfer, partnerships, and the SBIR/STTR programs – SPO made strides and helped support NASA's mission.

The fiscal year started strong, with **a high volume of New Technology Reports** passing through SPO's hands. By the end of Fiscal Year 2020, SPO had logged 278 NTRs, the most in a single year since Fiscal Year 2014. Thanks to the hard work and dedication of our innovators, Goddard scored second place against all other NASA centers for most NTRs. To help facilitate this influx of NTRs, SPO reduced the time it takes to process NTRs by 35 percent, successfully eliminating backlog.

In February of 2020, SPO helped coordinate the second **NASA Commercialization Training Camp**, hosted at NASA's Johnson Space Center in Houston, Texas. The training camp brings together current and former professional athletes through Space Act Agreements with professional athletic organizations to familiarize players with NASA's Technology Transfer Program and commercialization opportunities for NASA technology.

Next, SPO hosted its 25th **Annual New Technology Reporting Program**, an event that honors Goddard's technology developers for excellence in innovation and helping to facilitate the process of tech transfer. For the 25th anniversary of the program, SPO invited special guest speaker Obafemi Ayanbadejo to address the audience about his NASA technology license and startup business. The event also included comments from the family of James Kerley, a late Goddard inventor whose passion for technology development and creativity inspires future generations of innovators.

Not long after wrapping up this event, most of Goddard was sent home to telework indefinitely due to the COVID-19 pandemic. As it became clear that this new way of life would continue for some time, SPO worked hard to find ways to stay in touch with Goddard's innovator community and continue pushing forward tech transfer, partnerships, and SBIR/STTR. SPO launched new virtual initiatives, such as **Virtual Roadshows**, **The Coffee Break** and **Goddard Reads**, to keep innovators engaged and communicating about activities relating to SPO.

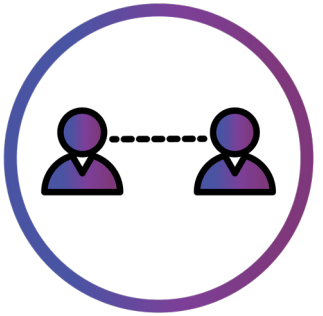
SPO welcomed **two new technology managers** to the office in 2020 – Viva Miller and Josh Levine. Miller worked at the U.S. Patent and Trademark Office as a primary patent examiner for almost 10 years, then took a detail position with SPO in 2018 and officially joined NASA in 2020 as a senior technology manager. She holds a bachelor's degree in applied mathematics from William and Mary, and master's degree in engineering management from Duke University, and a law degree from Rutgers University. Levine worked as a research engineer at the University of Washington, then spent 10 years at the U.S. Patent and Trademark Office until joining SPO as a contractor and then converting to a civil servant in 2020 as a technology manager. He holds a bachelor's degree in mechanical engineering with a minor in biomedical engineering from the Rose-Hulman Institute of Technology.

License agreements are technology transfer in action – they grant non-NASA entities permission to use and manufacture NASA technologies in the commercial sector. SPO **signed 13 license agreements** in Fiscal Year 2020 with companies from around the country. One notable example from 2020 involves a search and rescue receiver developed by NASA's Search and Rescue (SAR) Office, based at Goddard. NASA's SAR Office generates search and rescue technologies for the Cospas-Sarsat community, which uses satellites to provide location data to authorities searching for people who are lost or otherwise in need of rescue. The new receiver was licensed by Concentric Real Time LLC, based in Ellicott City, Maryland, and it improves on the previous generation of technologies, providing more accurate location data than older systems. Other licenses from the year include four licenses of the Aeropod, an aerial device that can attach to a kite and hold science instruments aloft as they collect data. These licenses encourage STEM engagement by making aerial data collection more accessible for students and citizen scientists.

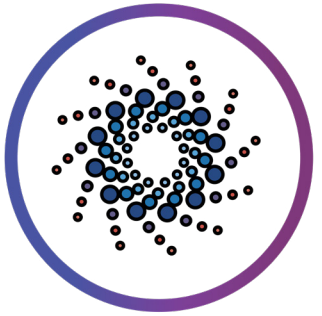
Please read on for more stories about SPO's unique year.

OUR THREE FUNCTIONS

TECH TRANSFER



PARTNERSHIPS



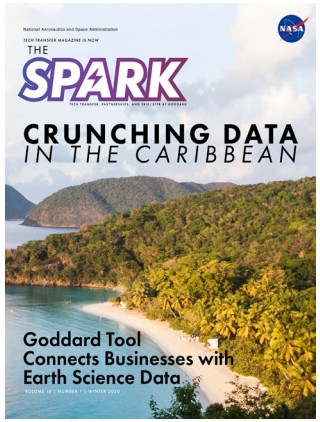
SBIR/STTR

STRATEGIC PARTNERSHIPS OFFICE

TECHNOLOGY TRANSFER

2020

ACCOMPLISHMENTS REPORT **2020**



THE SPARK MAGAZINE

It was a big year for SPO's flagship magazine – the publication received a redesign and a new name! The magazine once known as Tech Transfer magazine is now The Spark magazine, alluding to the spark of inspiration that drives Goddard's innovators to create, design, and build the technologies that power exploration and spinoff into commercial products. In each issue, SPO features technologies, innovators, and commercialization successes that tell the story of technology transfer at Goddard. Here's a snapshot of what The Spark magazine covered in 2020. To read full issues, please visit https://partnerships.gsfc.nasa.gov.

WINTER 2020

The Spark delved into the story of a fascinating Goddard technology with a long name – Modern-Era Retrospective Analysis for Research and Applications (MERRA) Analytical Services. This technology seeks to improve access and unleash treasure troves of Earth insights for scientists and CEOs alike. MERRA Analytical Services leverages one of NASA's Earth science datasets to answer climate questions quickly and efficiently.

Oliver Jones and M. von Nkosi licensed MERRA Analytical Services to study climate change in the Caribbean. Together, they formed the Institute for Local Innovations Global Delivery System, a team that will work with students to use data analysis and tackle climate issues impacting public health, disaster response, emergency services, and other areas. Jones, who is originally from the Caribbean, and Nkosi envision a collaborative effort connecting the worlds of science, technology, economics, and business in pursuit of Earth insights.

SPRING 2020

SPO took to the skies in Spring 2020 with innovators Geoff Bland and Ted Miles, inventors of the Aeropod. The invention is a lightweight, inexpensive structure that stabilizes science instruments when attached to a kite, making data collection low-cost and relatively simple to accomplish. Patented in 2012, Aeropods have been used in a number of scientific studies, with research topics spanning diverse fields such as volcanology and air pollution. On top of that, Aeropods are part of a robust education program that makes remote sensing and in-situ measurements accessible to students.

The Spark spoke to Bland about his experience developing education programs involving the Aeropod, and this year, Bland was recognized with an award from the Federal Labs Consortium Mid-Atlantic Region for his work. Please see the Awards section of this report for more.

SUMMER 2020

The Spark focused on small satellites or "SmallSats" for its summer issue to coincide with the annual Small Satellite Conference, which went all virtual for the first time ever in 2020. As more government agencies and companies adopt rideshare as a solution to carrying multiple payloads into space, the summer issue covered upcoming NASA missions that will use rideshare to save millions of mission dollars per year. SmallSats can be designed specifically to fit within ESPA rings, which attach to launch vehicles and feature slots where secondary payloads can stow securely until deployment in space.

The summer issue also highlighted five SmallSat missions currently underway at Goddard and provided a list of patented and patent-pending Goddard SmallSat technologies available for companies to license.

FALL 2020

The fall issue of The Spark magazine featured space technology for satellites – as the private space industry grows, Goddard's technology developments for science missions can be directly applied to spacecraft built and launched by companies. Among the technologies covered, SPO highlighted a receiver that brings GPS navigation to high-altitude missions, as well as a technology that reduces image blur in cameras and spectrometers aboard spacecraft.
In the same issue, The Spark included two new Goddard technology licenses that show promise in the fields of agriculture and search and rescue.

cFS SOFTWARE OF THE YEAR

SPO celebrates Goddard's amazing technologies year-round, but we're especially proud when they receive the recognition they deserve. This year was a prolific year for Goddard technology, with awards from NASA's Inventions and Contributions Board, the Federal Labs Consortium, and the Space Technology Hall of Fame. Here, SPO features some highlights from this year's collection of award-winning technologies.

NASA SOFTWARE OF THE YEAR 2020

Flight software is the specialized code that runs onboard a spacecraft. With core Flight System (**cFS**), software developers at Goddard created a software package that included the core pieces of code that every mission needs, as well as the artifacts that accompanied it, featuring a "layered" approach that would allow for the addition of mission-specific code built on top of validated and existing code. For its incredible impact at Goddard, across NASA, and beyond, cFS won NASA's Software of the Year 2020 award.

The cFS structure includes an operating system abstraction layer that enables cFS to port from operating system to operating system with practically no modifications, a platform abstraction layer that makes it easy to port cFS to new flight computers, and the core Flight Executive layer that includes all the common services NASA missions need to succeed.

This layered flight software framework also includes individualized mission applications, much like apps on a smart phone. cFS became fully open source in 2015, and many NASA missions have used cFS, including the CubeSat Dellingr and the larger Global Precipitation Measurement (GPM) mission.

cFS has a number of advantages that make it a great fit for small satellite missions, as well as larger endeavors such as the Artemis program. Currently, Goddard is working with NASA's Johnson Space Center in Houston, Texas to certify cFS for the Lunar Gateway, a key piece of the Artemis program that will serve as an outpost and support system with NASA returns to the Moon.

SPACE TECHNOLOGY HALL OF FAME 2020

Now more than ever, we rely on technology to keep us connected when we can't see each other in person. With today's video conferencing systems, members of the NASA community can communicate with each other in a matter of seconds, no matter how many miles of distance separate them. These advances wouldn't be possible without earlier innovations that pave the way, such as the Audio Conference Bridge Technology, invented through a contract at Goddard. This pivotal communication system joined the Space Technology Hall of Fame in 2020.

In the 1950s, NASA used a complex system with dozen of technicians working around the clock, manually plugging and

AWARD WINNING TECH

unplugging cables to enable groups on the ground to connect with each other and astronauts in space. The agency envisioned a simpler, more efficient system, and in the 1980s, NASA hired a company to make instant and automatic voice connections possible. After contracting with Goddard to build out the system and develop the conference bridge, the company took the concept and commercialized it.

Today, the Compunetix conference bridge can be found behind the scenes enabling numerous call-in meeting lines, and even some web-based video conference calls rely on a Compunetix switch to connect audio. The technology improved NASA's communications while helping teams all across the world work more effectively together, regardless of location.

NASA COMMERCIAL INVENTION OF THE YEAR 2020 RUNNER UP

Thermal Management Technologies (TMT), a company based in North Logan, Utah, licensed the Diminutive Assembly for Nanosatellite deploYables (**DANY**) in 2018, and in 2019, TMT completed its first sale. This year, DANY won the recognition of runner-up in NASA's Commercial Invention of the Year award selections.

DANY – created by Goddard inventors Luis Santos, Scott Hesh, and John Hudeck – provides a reliable mechanism to secure deployable elements of a small satellite, safely stowing them until receiving a signal to burn through a plastic restraining link and release them for use in space. Deployable elements on a small satellite can include solar arrays, sun shades, radiators, or antennas. The entire assembly is about the size of a credit card, making it ideal for small satellites that have significant space constraints.

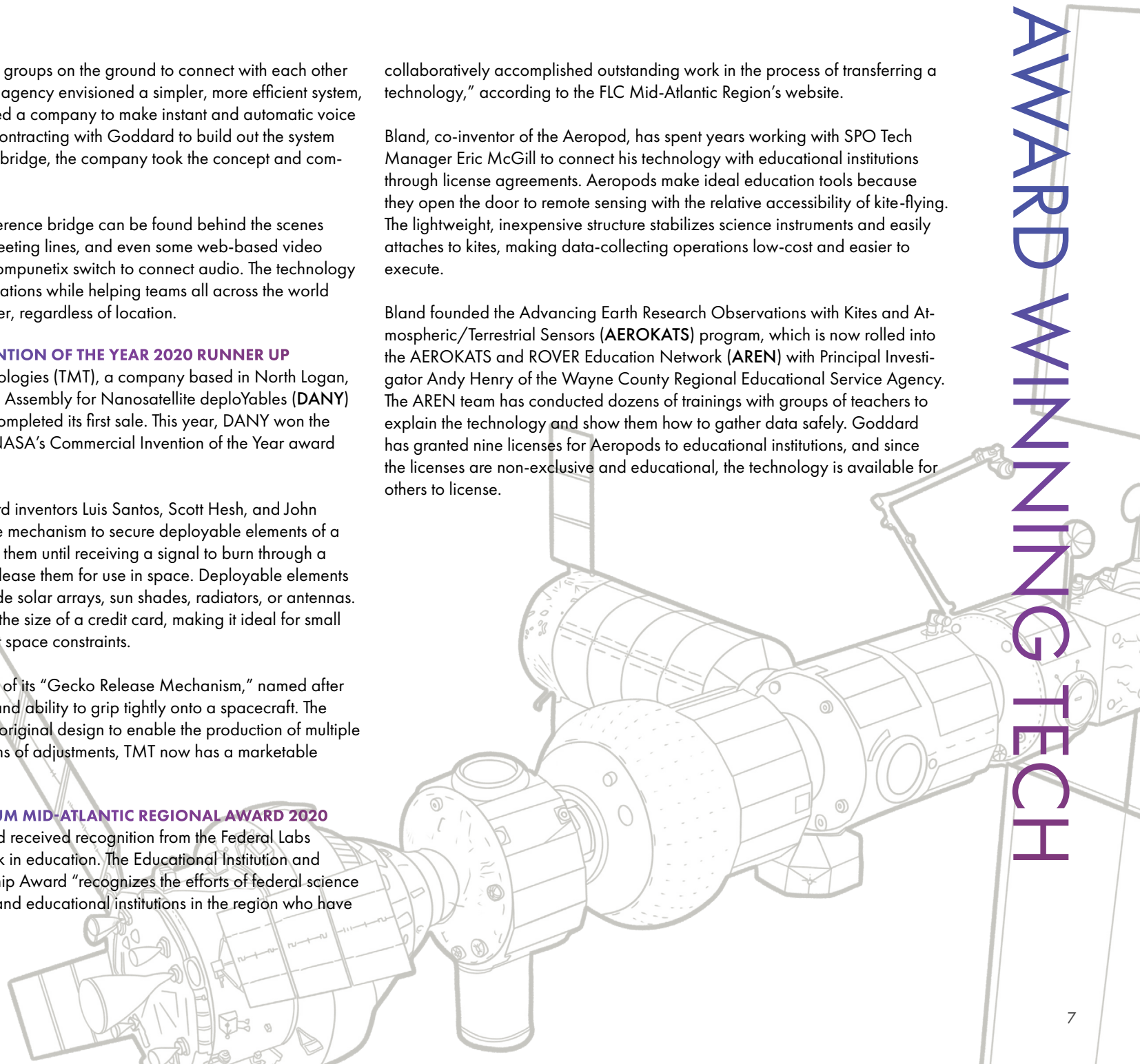
TMT used DANY as the core of its "Gecko Release Mechanism," named after the device's gecko-like size and ability to grip tightly onto a spacecraft. The TMT team modified NASA's original design to enable the production of multiple units, and after several months of adjustments, TMT now has a marketable product for sale.

FEDERAL LABS CONSORTIUM MID-ATLANTIC REGIONAL AWARD 2020

NASA innovator Geoff Bland received recognition from the Federal Labs Consortium (FLC) for his work in education. The Educational Institution and Federal Laboratory Partnership Award "recognizes the efforts of federal science and technology employees and educational institutions in the region who have collaboratively accomplished outstanding work in the process of transferring a technology," according to the FLC Mid-Atlantic Region's website.

Bland, co-inventor of the Aeropod, has spent years working with SPO Tech Manager Eric McGill to connect his technology with educational institutions through license agreements. Aeropods make ideal education tools because they open the door to remote sensing with the relative accessibility of kite-flying. The lightweight, inexpensive structure stabilizes science instruments and easily attaches to kites, making data-collecting operations low-cost and easier to execute.

Bland founded the Advancing Earth Research Observations with Kites and Atmospheric/Terrestrial Sensors (**AEROKATS**) program, which is now rolled into the AEROKATS and ROVER Education Network (**AREN**) with Principal Investigator Andy Henry of the Wayne County Regional Educational Service Agency. The AREN team has conducted dozens of trainings with groups of teachers to explain the technology and show them how to gather data safely. Goddard has granted nine licenses for Aeropods to educational institutions, and since the licenses are non-exclusive and educational, the technology is available for others to license.



SUPPORTING OUR

THE INNOVATION CATALYST

During a year with extremely high numbers of New Technology Reports, the Strategic Partnerships Office launched a handful of new approaches to connect with Goddard innovators and keep them informed about technology transfer activities. In October 2019, SPO debuted the first issue of The Innovation Catalyst, a digital newsletter with content designed specifically for inventors at Goddard. Later, when the COVID-19 pandemic removed the possibility of in-person events and trainings, SPO launched The Coffee Break, a virtual event series that highlighted various aspects of SPO's three program areas: tech transfer, partnerships, and SBIR/STTR. Here's an overview of SPO's new internal communications initiatives.

THE INNOVATION CATALYST

SPO Chief Darryl Mitchell envisioned a monthly publication that would inspire and "catalyze" inventors at Goddard, and with that, The Innovation Catalyst was born. Each issue features informative articles, links to resources, event recaps, advertisements for upcoming events, and Q&As with SPO staff members. Topics covered in the past year include license agreements, software release, NASA's SBIR/STTR programs, patents, and much more. The newsletter is distributed on SPO's website and also through an email list.


National Aeronautics and Space Administration

THE INNOVATION CATALYST

NOVEMBER 2020

VETERAN SPOTLIGHT — JOE FAMIGLIETTI

SPO is celebrating Veterans Day in the month of November to honor service members past and present for their hard work and dedication. We didn't have to look too far to find a veteran to celebrate – SPO's very own Joe Famiglietti served in the Navy in the 1980s as an electronics technician and reactor operator aboard the USS Honolulu, a Los Angeles class submarine.

As SBIR/STTR co-lead for NASA's Goddard Space Flight Center, Joe Famiglietti coordinates Goddard's participation in the agency's SBIR and STTR programs. Though Famiglietti's professional path led to NASA, his career began when he joined the military as a junior in high school. He excelled in math and science, and after speaking to a recruiter about the opportunities available through serving, Famiglietti enrolled in the Navy's nuclear program.

Once he completed his training, Famiglietti joined the crew of the USS Honolulu, spending months at a time underwater aboard the submarine. Though submarines have a reputation for being cramped, Famiglietti says he isn't claustrophobic and navigated the vessel's low ceilings and small bunks just fine. Famiglietti was stationed in Hawaii and traveled to Japan, Guam, the Philippines, and Micronesia during his tour.

He decided to leave the military when he returned from his tour so he could spend more time with his family. He earned a bachelor's degree in physics from George Mason University and joined a co-op program that allowed him to work at Goddard while earning his degree. Since then, Famiglietti has worked as an instrument developer, payload manager, and technology manager before transitioning to the SBIR/STTR realm.

Famiglietti says the discipline he learned in the military came in handy when he went to college.

"The focus mentality I gained from the military enabled me to do very well in college, which in turn showed that I had the competence and aptitude for work at Goddard," he adds.

Famiglietti has both a daughter and son-in-law currently serving in the military. Famiglietti says he's very proud of them, and though the phrase "thank you for your service" has become something of a cliché, he says, he thinks it's a nice way to show appreciation when it's said with sincerity.

SPO wishes all veterans a happy November – thank you for serving our country!

www.nasa.gov
NP-2020-12-624-GSFC

STRATEGIC PARTNERSHIPS OFFICE

National Aeronautics and Space Administration

THE INNOVATION CATALYST

DECEMBER 2020

INNOVATING THROUGH THE PANDEMIC: MAKE SPACE FOR YOUR MENTAL HEALTH

The COVID-19 pandemic has upended life in the United States, bringing with it added stress and worry. According to survey data from the Centers for Disease Control and Prevention (CDC), "symptoms of anxiety disorder and depressive disorder increased considerably in the United States during April–June of 2020, compared with the same period in 2019." In fact, CDC survey data shows that 40 percent of U.S. adults indicated struggles with mental health or substance abuse, and 25 percent of adults ages 18–24 had seriously considered suicide in the past month.

"Everyone has a different experience of it, and it's important to remember that there are so many layers to people's lives," says Ashley Pruett, a psychologist at NASA's Armstrong Flight Research Center. "Even though we're all going through the same thing as a country, it's different for each family."

As the pandemic lumbers on and the country shoulders the burden of continued political upheaval and racial injustice, the Strategic Partnerships Office (SPO) asked Pruett for her advice on coping with feelings of sadness, loneliness, stress, and other challenges. SPO is known for encouraging Goddard innovators to report their new technologies, but we also want to encourage you to take care of your wellbeing. Whatever you're going through, you're not alone, and we'll share some additional resources at the end of the article.

DEALING WITH STRESS

Whether you're working fulltime from home or going on center, it's likely that your normal routine has experienced a jarring shift. Each scenario creates its own unique stressors – for people who live alone, the constant isolation can bring feelings of loneliness. Parents with kids at home are shouldering their work responsibilities on top of caring for their children and helping them with remote learning. Work and family responsibilities merge in overwhelming ways.

For those going on center, safety protocols and new admission requirements are constant reminders of the pandemic. Your usual seasonal allergies have suddenly become a foreboding omen. The stress can feel unescapable.

"Some people feel like they're constantly 'on' and can't ever disconnect from work because they're working and living in the same space," Pruett says. "We don't work 100 percent of the time when we're going into a workplace, but there's this feeling of obligation with working from home, and it's creating mental drain."

No matter what your specific situation looks like, this year has produced challenges that didn't exist last year or has exacerbated pre-existing issues. The slow crawl of the pandemic can make it difficult to even recognize that you aren't OK.

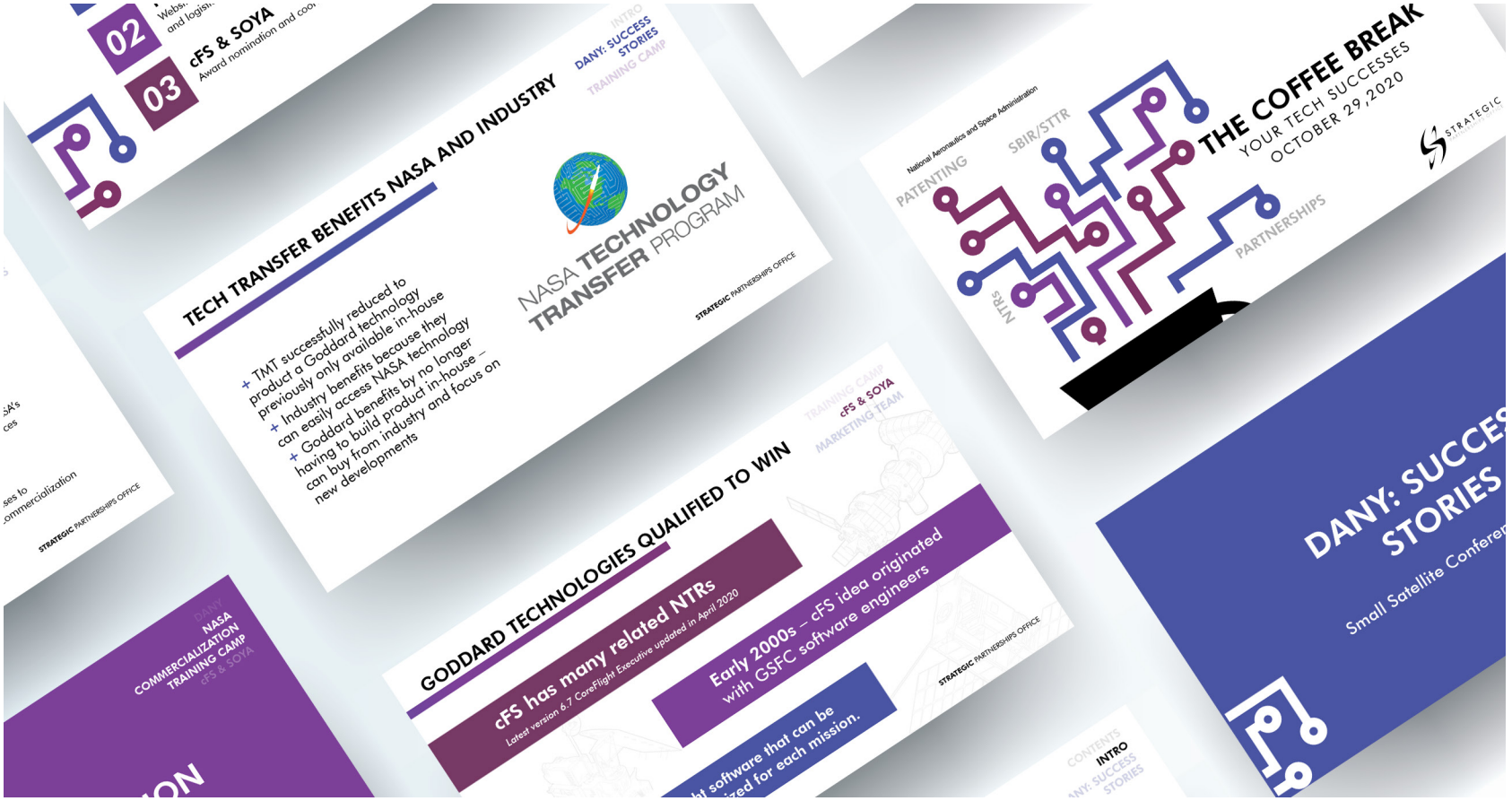
mm: mental mission

Mental Mission is a new SPO initiative that encourages innovators to prioritize their mental health during these challenging times.

www.nasa.gov
NP-2020-12-625-GSFC

STRATEGIC PARTNERSHIPS OFFICE

PHOTO CAPTION: *Each issue of SPO's newsletter, The Innovation Catalyst, contains new and useful information for Goddard's innovators.*



THE COFFEE BREAK

For years, SPO has held trainings and in-person meetups to foster discussion between inventors and technology transfer professionals at Goddard. The COVID-19 pandemic complicated SPO's efforts – how could the office still reach out to the innovator community while everyone was working from home? Out of these discussions, SPO's marketing team came up with The Coffee Break, a series of informal conversations held through an online platform that allowed everyone to participate. The sessions began with a short presentation on a tech transfer related topic, and then audience members could follow-up with questions to be answered in real time. Hundreds of members of the Goddard community attended The Coffee Break sessions, and SPO looks forward to launching the second iteration of the series.

PATENTS FOR 2020

METHOD OF MANUFACTURING LARGE AREA GRAPHENE AND GRAPHENE-BASED PHOTONICS DEVICES
Mahmooda Sultana, Mary J. Li, Anthony W. Yu
Patent Number: 10,450,650

NIOBIUM TITANIUM NITRIDE THIN FILM COATINGS FOR FAR-INFRARED ABSORPTION AND FILTERING
Ari D. Brown, Edward J. Wollack, Kevin H. Miller
Patent Number: 10,458,853

MICRO SCALE ELECTRO HYDRODYNAMIC (EHD) MODULAR CARTRIDGE PUMP
Matthew T. Showalter, Jeffrey R. Didion, Mario S. Martins, Franklin L. Robinson
Patent Number: 10,461,621

HIGH RESOLUTION ADDITIVE MANUFACTURING METHOD WITH REAL MATERIALS
Vincent T. Bly
Patent Number: 10,465,281

MOLYBDENUM NITRIDE ABSORBER COATING FOR A DETECTOR
Ari D. Brown, Kevin H. Miller, Edward J. Wollack
Patent Number: 10,466,108

KA-BAND HIGH-GAIN EARTH COVER ANTENNA
Victor J. Marrero-Fontanez, Cornelis F. DuToit
Patent Number: 10,476,141

WAVEGUIDE MOUNT FOR MICROSTRIP CIRCUIT AND MATERIAL CHARACTERIZATION
Kongpop U-Yen, Edward J. Wollack, Ari D. Brown
Patent Number: 10,483,610

DETECTOR CONTROL AND DATA ACQUISITION WITH CUSTOM APPLICATION SPECIFIC INTEGRATED CIRCUIT (ASIC)
Brian S. Smith, Markus Loose, Atul Joshi, Greg T. Alkire, Daniel P. Kelly, Edward S. Cheng
Patent Number: 10,502,622

SPATIALLY DISTRIBUTED GAIN ELEMENT SELF-PHASE-LOCKED, LASER APPARATUS AND METHOD
Mark A. Stephen
Patent Number: 10,516,246

POLARIZATION MAINTAINING, LARGE MODE AREA (PMVLMA) ERBIUM-DOPED OPTICAL FIBER AND AMPLIFIER
Mark A. Stephen, Anthony W. Yu, Jeffrey W. Nicholson
Patent Number: 10,530,114

HIGH EFFICIENCY S-BAND AMPLIFIER
Steven N. Bundick, Wei-Chung Huang
Patent Number: 10,560,063

SLOT SYNTHESIS FOR HIGH CARDINALITY PULSE POSITION MODULATION
Scott A. Merritt
Patent Number: 10,573,344

DISTRIBUTED HASH OBJECT ARCHIVE SYSTEM
Navid Golpayegani, Curt A. Tilmes, Damon N. Earp, Jihad S. Ashkar
Patent Number: 10,579,586

MAGNETIC SHAPE MEMORY ALLOY ACTUATOR
Umeshkumar D. Patel
Patent Number: 10,581,345

CAPSULATION SATELLITE SYSTEM
Irving Joseph Burt
Patent Number: 10,604,280

COOPERATIVE SERVICE VALVE FOR SATELLITE MEDIA TRANSFER
Hans Raven, Matthew Ashmore, Erich Schulze
Patent Number: 10,604,281

MICROCONTROLLER CONTROLLED ALTIMETER
Scott V. Hesh, Taylor A. Green, Joshua T. Yacobucci
Patent Number: 10,648,806

SOLID STATE ANALOG ALTIMETER SWITCH
Scott V. Hesh
Patent Number: 10,648,807

SPACEBORNE SYNTHETIC APERTURE RADAR SYSTEM AND METHOD
Rafael F. Rincon, Kenneth J. Ranson, Temilola E. Fatoyinbo Agueh, Lynn M. Carter
Patent Number: 10,649,081

RADIATION HARDENED INPUT/OUTPUT EXPANDER WITH I2C AND SPI SERIAL INTERFACES
George Suarez, Jeffrey J. Dumonthier
Patent Number: 10,649,949

COMPACT WIDE BANDWIDTH PASSIVE PHASE SHIFTER FOR RADIO FREQUENCY AND MICROWAVE APPLICATIONS
Wei-Chung Huang
Patent Number: 10,651,815

CAVITY ENHANCED ABSORPTION SPECTROSCOPY (CEAS) FOR OZONE DETECTION
Steven A. Bailey, Thomas Hanisco
Patent Number: 10,656,131

MINIATURIZED ASTROMETRIC ALIGNMENT SENSOR FOR DISTRIBUTED AND NON-DISTRIBUTED GUIDANCE, NAVIGATION, AND CONTROL SYSTEMS
Sabrina N. Thompson, Sean R. Semper, Philip C. Calhoun, Neerav Shah
Patent Number: 10,657,371

EARTH COVERAGE ANTENNA SYSTEM FOR KA-BAND COMMUNICATION
Victor J. Marrero-Fontanez, Cornelis F. Du Toit
Patent Number: 10,658,756

ULTRA-BROADBAND MICROWAVE RADIOMETER OPTIMIZED FOR MICROSATELLITE APPLICATIONS
Joseph Knuble, Jeffrey Piepmeier, Kevin Horgan, Jared Lucey
Patent Number: 10,659,094

TWO-DIMENSIONAL PHONONIC METAMATERIAL FILTER STRUCTURE FOR ULTRA-LOW-BACKGROUND DETECTORS
Edward J. Wollack, David T. Chuss, Kevin L. Denis, Samuel H. Moseley, Karwan Rostem
Patent Number: 10,663,350

DUAL DYNAMIC RANDOM (DDR) ACCESS MEMORY INTERFACE DESIGN FOR AEROSPACE PRINTED CIRCUIT BOARDS
David J. Petrick, Alessandro D. Geist, Thomas P. Flatley
Patent Number: 10,667,398

SPACECUBE V2.0 FLIGHT CARD MECHANICAL SYSTEM
Milton C. Davis, David J. Petrick
Patent Number: 10,681,837

APPARATUS AND METHOD OF HYDROXYL DETECTION
Steven A. Bailey, Thomas F. Hanisco
Patent Number: 10,697,890

ROBOT ELECTRONICS UNIT (REU) MOTOR CONTROL BOARD (MCB)
Ireneusz Orlowski, Pietro A. Sparacino, Seshagiri Nadendla, Roger M. Chiei, David J. Petrick
Patent Number: 10,715,073

DEPLOYABLE MULTI-SECTION BOOM
Luis H. Santos Soto
Patent Number: 10,717,548

OXIDIZER NOZZLE TOOL AND QUICK DISCONNECT SYSTEM FOR FUELING
Hans R. Raven, Matthew W. Sammons, Patrick O'Neill
Patent Number: 10,730,646

SELF-REGULATING CURRENT CIRCUIT APPARATUS AND METHOD
Scott V. Hesh, Michael J. Mahon
Patent Number: 10,742,115

THERMOPILE BIAS METHOD FOR LOW VOLTAGE INFRARED READOUT INTEGRATED CIRCUITS
Gerard Quilligan, Shahid Aslam, Nicolas Gorius, Daniel Glavin, John Kolasinski, Dat Tran
Patent Number: 10,746,594

SOFTWARE-DEFINED RADIOMETER
Lynn R. Miles, Damon C. Bradley, Englin Wong, Alicia T. Joseph
Patent Number: 10,768,213

SPACE WEATHER DATABASE
Chiu P. Wiegand
Patent Number: 10,769,224

COHERENT OPTICAL TRANSISTOR
Michael A. Krainak
Patent Number: 10,775,679

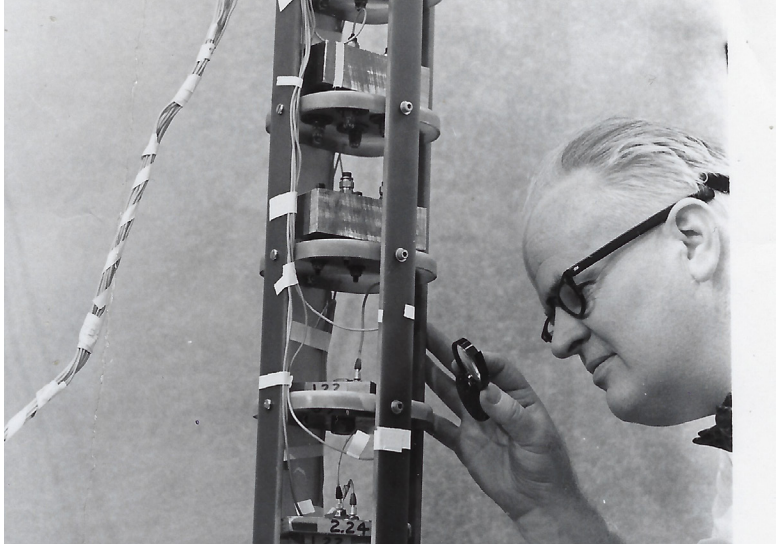
FREQUENCY DIVISION MULTIPLEXING SCHEME FOR PHASING SYNTHETIC APERTURE RADARS AND RECEIVERS
Rafael Rincon, Dee-Pong Daniel Lu
Patent Number: 10,778,355

MODIFICATION OF RADIATOR PIGMENTS USING ATOMIC LAYER DEPOSITION (ALD) OF THERMAL PROTECTIVE FILM MATERIAL
Vivek H. Dwivedi
Patent Number: 10,781,517

SUPERHYDROPHOBIC AND DUST MITIGATING COATINGS
Sharon A. Straka, Mark M. Hasegawa, Kenneth M. O'Connor, Victoria J. Stotzer
Patent Number: 10,786,830

BLACK MOLECULAR ADSORBER COATING SYSTEM
Nithin S. Abraham, Mark M. Hasegawa, Sharon A. Straka, John C. Petro
Patent Number: 10,787,575

NTR PROGRAM



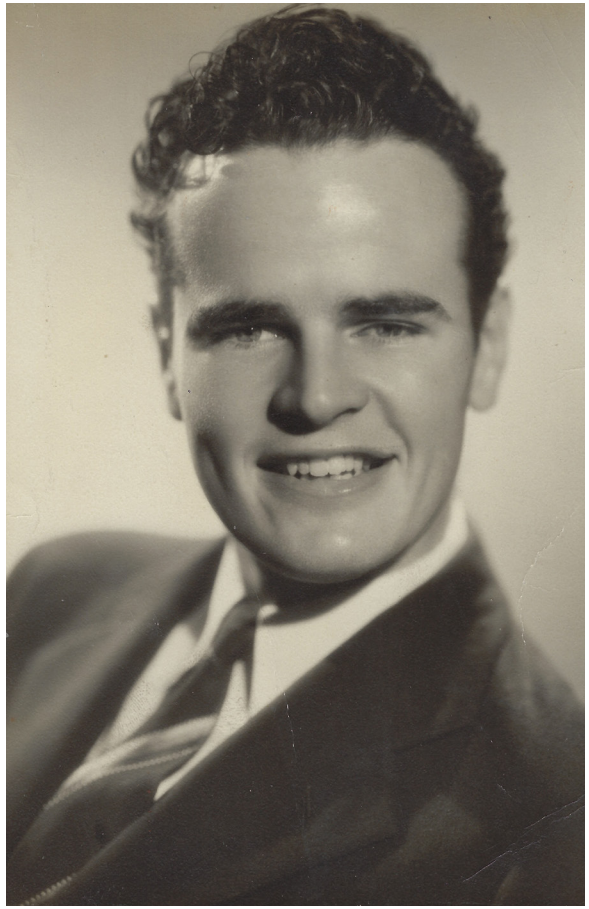
"The inventor never quits." This quote was included in a pamphlet from the memorial service of prolific Goddard inventor Jim Kerley, who passed away in 1994. The Strategic Partnerships Office commemorated his impact and legacy at the 25th Annual New Technology Reporting Program, a celebration of Goddard innovators and their yearly accomplishments. The James J. Kerley Award, named after Kerley, is presented each year as part of the ceremony.

At the 2020 program, SPO presented the Instrument Systems and Technology Division with a traveling trophy for the most New Technology Reports (NTRs) submitted in the past fiscal year. For the first time, SPO presented a science division with the same honor – in 2020, the Earth Sciences Division received the new traveling trophy.

SPO presented the James J. Kerley Award to Wanda Peters, Sharon Straka, Mark Hasegawa, and Kenneth O'Connor, the team responsible for inventing a Goddard technology called Lotus Coating. The Kerley Award recognizes innovators who demonstrate extraordinary commitment to technology development and commercialization.

To further honor Kerley's memory, members of the Kerley family spoke to the audience and shared stories about him. A display of Kerley's inventions and publications provided further insight into his esteemed career.

The 2020 program also included remarks from special guest speaker Obafemi Ayanbadejo, a NASA technology licensee and founder of HealthReel, Inc. At the end of the program, Goddard's Office of General Counsel presented patent plaques to Goddard innovators who received patents for their technologies within the past fiscal year.



PHOTOS: *Courtesy of Kerley Family*

A LIFETIME OF INNOVATION: JAMES KERLEY DEDICATED HIMSELF TO THE ART OF INVENTION

Growing up in Cheverly, Maryland, with a NASA inventor for a father, the five Kerley kids learned to expect the unexpected. A normal activity like fixing a broken car could turn into an engineering experiment when it involved James J. Kerley Jr., an engineer at Goddard for nearly 30 years.

His son, Joe Kerley, recalls asking his dad for help with his 1964 Plymouth Barracuda, which was experiencing a strange vibration issue. Jim Kerley specialized in minimizing vibration throughout his career, applying his techniques to both sedans and spacecraft. Always favoring the hands-on approach, Jim was not the kind of person to call a mechanic or wait to see if the problem worsened.

Instead, he brought an oscilloscope home from his Goddard office one day and had Joe drive the car while he sat in the back seat. As he drove, he threw open the car door and held the instrument outside to measure the car's vibration patterns. Though unconventional, his solution worked. After fixing the problem, the car continued on its merry way, vibration free.

"He would always tell us, 'You have to feel it,'" says Bernadette Maertens, Jim's youngest daughter. "With him, it was always hands-on. He knew that was the best way to identify issues and come up with different ideas."

Jim infused innovation into everything he did. It didn't matter if he was building an elaborate set for a theater production or designing a scaffold for a rocket. Problems existed to be solved in creative and unusual ways. His inventiveness resulted in 25 U.S. patents and four Canadian patents to his name, spread out between the early years of running his own business, Kerley Engineering, and the decades that followed at NASA.

"The hallmark of engineering has always been creative, inventive design," Jim wrote in course materials for one of his NASA classes, published the year he passed away at age 73.

He designed different kinds of isolators, built to protect fragile components from vibration damage. The cable isolator was one of his signature designs that he adapted and updated throughout his career.

Jim joined the Goddard community in the mid-1960s, and his timing couldn't have been better. In 1969, Apollo 11 landed on the Moon, and the space program continued to push exploration boundaries in the decades to follow.

He applied his disciplined work ethic to NASA's biggest engineering problems. His expertise in vibration meshed well with NASA's needs – rocket launches violently shake spacecraft bound for orbit, risking damage to the complicated instruments inside. All NASA instruments and spacecraft undergo rigorous testing before launch, including vibration tests to verify the structure's stability.

In the later years of his life, he taught a NASA course that focused on mastering the process of innovative thinking. He wrote at length about the thinking process, applying his educational theories to inspire better outcomes.

"Modern education does not prepare the students for the real world because it trains the students to be deductive with convergent thinking, but it does not train them to be creative with inductive or innovative thinking," Jim wrote.

Jim's final decade at NASA focused on exploring the full range of applications for his innovations. Starting in 1988, Jim filed seven patent applications, and some of these inventions aimed to assist people with disabilities, including a "Compliant Walker" consisting of a harness and cable system that could provide support to patients during physical therapy.

Though Jim passed away in 1994, Goddard has celebrated Jim each year since, and his story continues to inspire the innovative at heart across the Goddard community.

STRATEGIC PARTNERSHIPS OFFICE

PARTNERSHIPS 2020

ACCOMPLISHMENTS REPORT **2020**

2020 SPACE ACT AGREEMENTS

BALL AEROSPACE AND TECHNOLOGY CORPORATION
Partnership Title: Amendment to High Accuracy, Cryogenic, Refractive Index Measurements

BALL CORPORATION
Partnership Title: GMI Bearing Life Test

BALL CORPORATION
Partnership Title: Amendment to GMI Bearing Life Test

EARTH NETWORKS, INC.
Partnership Title: Information and Data Exchange Related to the GLOBE Program

THE JOHNS HOPKINS UNIVERSITY
Partnership Title: Amendment to Fabricating Cryogenic Detectors for Cosmic Microwave Background Instrument

LAWRENCE LIVERMORE NATIONAL SECURITY, LLC LLNS
Partnership Title: Measurement of Effects of Radiation Exposure for Lawrence Livermore National Laboratory Supplied Devices

NATIONAL FOOTBALL LEAGUE PLAYERS ASSOCIATION
Partnership Title: Amendment to Collaboration to Commercialize NASA Technologies

NATIONAL RECONNAISSANCE OFFICE
Partnership Title: Collaboration on Technical Skill Development

NATIONAL SECURITY AGENCY/CENTRAL SECURITY SERVICE (NSA/CSS)
Partnership Title: Collaboration for Engineering and Technical Services

NAVAL RESEARCH LABORATORY
Partnership Title: Research and Proto-development of Spaceflight Hardware

NORTHROP GRUMMAN
Partnership Title: Access and Use of GSFC Environmental Test and Integration Facility

NORTHROP GRUMMAN
Partnership Title: Fiber Optic Cable Testing Activities

OFFICE OF THE ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE/STRATEGIC NATIONAL STOCKPILE
Partnership Title: COVID19 Enhanced Detection Technologies

OFFICE OF THE ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE/STRATEGIC NATIONAL STOCKPILE
Partnership Title: 7600B to COVID19 Enhanced Detection Technologies

OFFICE OF NAVAL RESEARCH
Partnership Title: Amendment to Developing a Compact Submillimeter Polarimetric Radiometer for CubeSat Cloud Ice Observations

THE OFFICE OF THE UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING
Partnership Title: Radiation Effects Research and Support for Spaceflight Technologies

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Partnership Title: Sustaining Women in STEM Roundtable

UNITED STATES AIR FORCE
Partnership Title: Annex to Space Technology Development and Capability Expansion

UNITED STATES AIR FORCE SPACE COMMAND SPACE AND MISSILE SYSTEMS CENTER
Partnership Title: Amendment #1 to Annex 3 to Goddard Mission Services Evolution Center (GMSEC) Software and Engineering Support

UNITED STATES AIR FORCE SPACE COMMAND SPACE AND MISSILE SYSTEMS CENTER
Partnership Title: Amendment to Annex to Goddard Mission Services Evolution Center (GMSEC) Software and Engineering Support

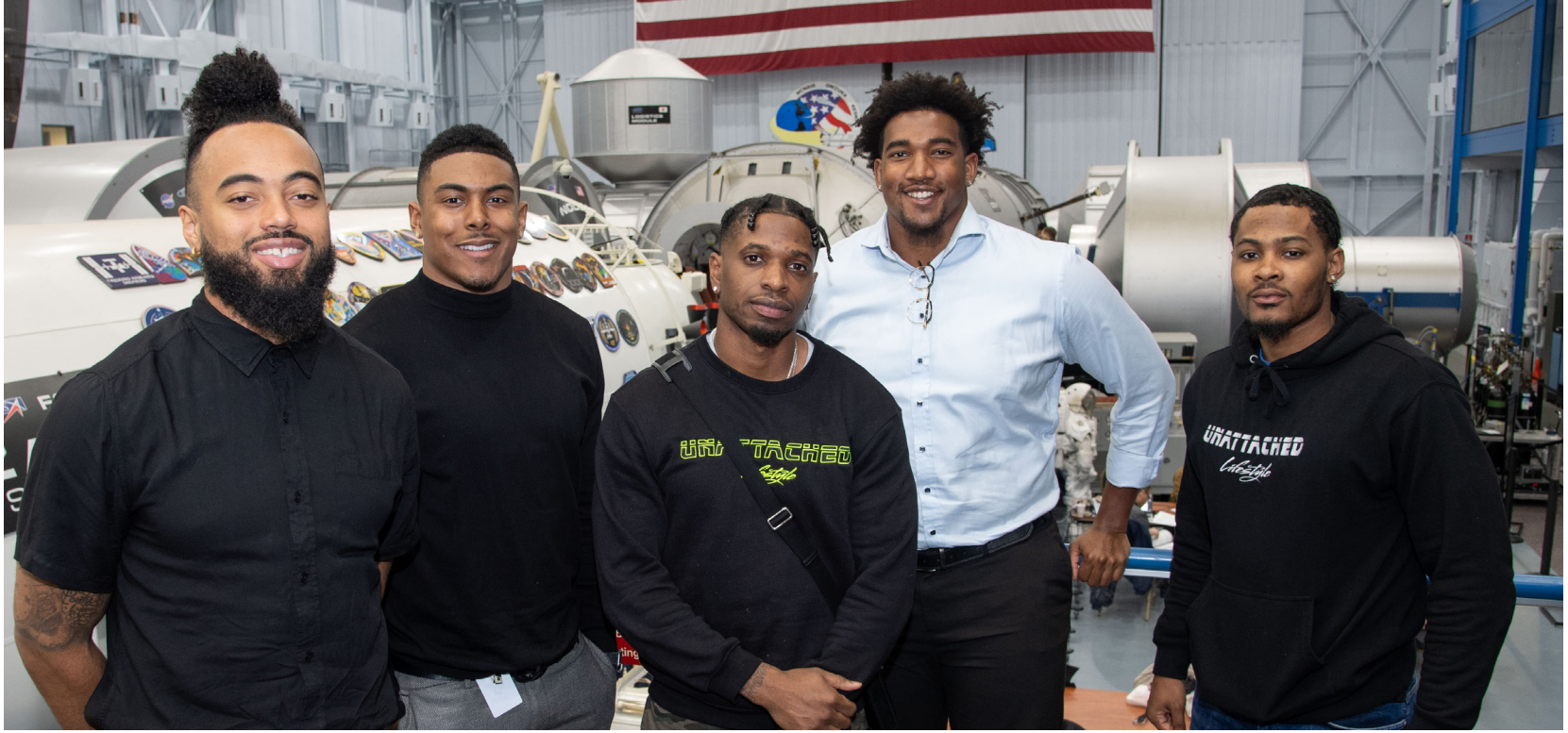
UNITED STATES SPACE FORCE SPACE COMMAND SPACE AND MISSILE SYSTEMS CENTER
Partnership Title: Amendment to Goddard Mission Services Evolution Center (GMSEC) Software and Engineering Support

UNIVERSITY OF MARYLAND COLLEGE PARK
Partnership Title: Augmented Reality and Virtual Reality Development for NASA Science and Engineering

THE UNIVERSITY OF NORTH TEXAS
Partnership Title: Augmented Reality and Virtual Reality Development for NASA Science and Engineering

WOMEN'S NATIONAL BASKETBALL PLAYERS ASSOCIATION
Partnership Title: Collaboration on Awareness of NASA Technologies for Entrepreneurial Opportunities

NASA TRAINING CAMP



SPO FORGES TECHNOLOGY CONNECTIONS WITH ATHLETES

This fiscal year brought several new developments to SPO's ongoing collaborations with professional athletic organizations. At the end of 2019, SPO signed a Space Act Agreement with the Women's National Basketball Players Association, establishing a partnership to introduce basketball players to the realms of technology transfer and commercialization using NASA technologies. In Feb. 2020, SPO helped coordinate and implement the second NASA Commercialization Training Camp at NASA's Johnson Space Center in Houston, Texas. These pursuits spread the word about NASA's portfolio of licensable technologies to an audience of entrepreneurial, business-minded athletes with the drive and ambition to jumpstart new companies. Read on to learn about SPO's exploration of these collaborations in Fiscal Year 2020.

PARTNERSHIP WITH WOMEN'S NATIONAL BASKETBALL PLAYERS ASSOCIATION (WNBPA)

Founded in 1998, the WNBPA is the labor union for the basketball players of the WNBA. According to the WNBPA's website, the organization's core principles involve engaging members in "activities that will advance and safeguard the economic security and general social welfare of WNBA players both during and after their playing careers."

In collaboration with the WNBPA, NASA will organize a technology workshop for WNBPA members to learn more about existing patented NASA technologies and how those technologies can be transferred to the private sector through license agreements. NASA will invite guest speakers to address the foundational skills needed to start a business.

"Over the last few years, the union has worked hard to build relationships with a variety of businesses and organizations that support the interests and career aspirations of WNBA players after basketball," says Terri Jackson, executive director of the WNBPA. "This partnership with NASA allows our members to explore technology discoveries that start with space but could have applications in business."

In 2019, the WNBPA joined the NFL Players Association, the National Basketball Retired Players Association, and the National Basketball Players Association as the fourth professional players association to form a partnership with NASA in the past year.

PHOTO CAPTION: *Training camp attendees tour facilities at NASA's Johnson Space Center. NASA/Bill Stafford*

SECOND NASA COMMERCIALIZATION TRAINING CAMP IN HOUSTON, TEXAS

Through presentations, tours, panels, and one-on-one conversations, the second NASA Commercialization Training Camp welcomed members of the NFL Players Association to NASA's Johnson Space Center in Houston, Texas. The training camp, held from Feb. 12-14, 2020, introduced current and former professional football players to NASA technology, explaining how athletes could infuse NASA innovations into an existing business or new startup idea.

Professional athletes often launch second careers as entrepreneurs after retiring from sports. NASA has engaged with this unique group of motivated individuals because, due to their access to resources and connections made in the league, they have a high chance of overcoming the "valley of death," a common term in the startup world that refers to the difficulty in covering negative cash flow when beginning a company. Part of the NFL Players Association's mission involves helping members explore new career paths in the aftermath of their athletic pursuits.

The training camp in February brought together 10 athletes and a collection of NASA technology professionals, members of the Texas startup community, entrepreneurs, and others adjacent to the commercialization and business realm. Throughout the three days, attendees heard from members of NASA's Technology Transfer Program, including Commercialization Services Lead Chris Romig and Technology Manager Eric McGill. Romig shared his experiences as both an entrepreneur, engineer, and technology transfer professional, and McGill talked about programs such as I-Corps and FedTech that can help entrepreneurs evaluate government and university technologies for commercialization.

Attendees left the training camp with new insights about NASA technology and how it can help them create new products and services to address unmet needs in various markets that interest them. Additionally, players received a list of NASA technologies that they can consider for licensing.

PHOTO CAPTION: *Training camp attendees tour Johnson's Neutral Buoyancy Lab in Houston, Texas. NASA/Bill Stafford*

GODDARD PARTNERSHIP

A VIRTUAL
EVENT SERIES
IN PARTNERSHIP
WITH TOR
BOOKS





PHOTO CAPTION: *Three Tor Books authors and two Goddard science writers participated in Goddard Reads.*

TOP LEFT: *Kasha Patel; Courtesy Kasha Patel*
TOP RIGHT: *Karen Osbourne; Credit: Josh Snitkoff*
MIDDLE LEFT: *Ellen Gray; Courtesy Ellen Gray*
MIDDLE RIGHT: *Mary Robinette Kowal; Courtesy Mary Robinette Kowal*
BOTTOM: *Martha Wells; Credit: Igor Kraguljac*

TOR BOOKS PARTNERSHIP UNITES SCIENCE FICTION AUTHORS AND NASA

Humanity traveled to the Moon in science fiction stories long before actually setting foot there, and fictional tales of exploration and discovery continue driving NASA's workforce to dream big. Goddard's partnership with science fiction and fantasy publisher Tom Doherty Associates LLC (Tor-Forge or Tor Books) took on new life in 2020 with a virtual event series called "Goddard Reads." That took place in late summer.

"Like so many other challenges we faced this year, we had to figure out how to bring authors to Goddard through online platforms," says SPO Chief Darryl Mitchell. "In a way, it made the event even more accessible. Hundreds of members of the Goddard community tuned in to hear these authors share their experiences with science and science fiction."

"Goddard Reads" celebrated nine years of partnership between NASA and Tor Books. Using a Space Act Agreement to promote the science and minimize the fiction in "science fiction," Goddard has connected subject matter experts in science and engineering with Tor Books authors. Through this collaboration, not only will the NASA-inspired works of fiction promote public awareness of NASA's programs and missions, but they will also inspire young minds to embrace careers in science and technology as exciting and fulfilling opportunities.

The "Goddard Reads" virtual event series explored how Tor Books authors and their reader base can benefit from subject matter expertise from NASA and other sources, while also featuring Goddard internal science communicators, who shared their experience working at the intersection of writing and STEM.

The first event, "A Conversation on Science Fiction Writing with Tor Books Authors Martha Wells and Mary Robinette Kowal," brought two Tor Books authors to an interactive Goddard audience. After reading excerpts from their work, the authors discussed how subject matter experts have informed their work and how they might interact with subject matter experts for future projects. Kowal shared her experience talking to astronauts at the Neutral Buoyancy Lab at NASA's Johnson Space Center, explaining how their input helped her craft realistic scenes in her "Lady Astronaut" series of novels. Wells answered questions about the originals of her snarky "Murderbot" character, and both authors discussed their writing process as well as their favorite writers.

The next installation of the series, "Bringing Comedy into Science," featured Goddard science writer Kasha Patel, who also performs standup comedy with a science spin. She shared her perspective on infusing science communication with comedy and explained how she crafts a stellar science joke. Patel answered questions about how she deals with hecklers, her standup comedy inspirations, and her experience as a woman in male-dominated industries.

Next, Goddard science writer Ellen Gray talked about how she crafts a good science story, and in the last installment of the series, Tor Books author Karen Osborne read an excerpt from her debut novel, "Architects of Memory," and discussed her approach to using science as a storytelling tool.

SPO looks forward to collaborating with Tor Books to promote science and science fiction in the coming years.

goddard reads

A VIRTUAL EVENT SERIES IN PARTNERSHIP WITH TOR BOOKS

STRATEGIC PARTNERSHIPS OFFICE

SBIR/STTR

2020

ACCOMPLISHMENTS REPORT **2020**

NASA'S SBIR/STTR PROGRAM

The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs are highly competitive programs that encourage American small businesses to engage in federal research and development with the potential for commercialization. Through a competitive awards-based program, SBIR and STTR enable small businesses to explore their technological potential and provide the incentive to profit from its commercialization. By including qualified small businesses in the nation's research and development arena, high-tech innovation is stimulated, and the U.S. gains entrepreneurial spirit as it meets its specific research and development needs.

Central to the STTR program is the partnership between small businesses and nonprofit research institutions. The STTR program requires the small business to formally collaborate with a research institution in Phase I and Phase II. STTR's most important role is to bridge the gap between performance of basic science and commercialization of resulting innovations.

The general structure of the program begins with Phase I, then Phase II, and finally post awards (Phase IIE, Phase IIS, Phase III, and CCRPP). Phase I focuses on idea generation, while Phase II is concerned with prototype development, and post awards encourage infusion into NASA projects and missions, commercialization, and further research and development efforts.

GODDARD'S SBIR/STTR PROGRAM

With a renewed focus on internal communication and outreach marketing, Goddard's SBIR/STTR team has emphasized reaching subject matter experts within NASA and external small businesses that can help meet NASA's technology needs. We've been able to achieve award increases in every mission directorate, with a substantial increase in the Science Mission Directorate of 25 percent. In Fiscal Year 2020, these efforts resulted in well over $30 million in awards to directly support Goddard missions, research, and flight projects. Notably, these figures are above the agency average.

Goddard's SBIR/STTR team implemented several new processes to streamline and improve systems. Additionally, the team developed internal software tools, which enabled them to efficiently manage the increase in awards while also making the program more resilient in the face of disruptions, such as the 2019 government shutdown and the 2020 COVID-10 pandemic, both of which affected all Fiscal Year 2020 program schedules.

The SBIR/STTR team's internal communication activities have include bringing NASA SBIR/STTR program leadership to Goddard, hosting SBIR/STTR town halls, conducting a SPO SBIR/STTR Coffee Break, and participating in the poster sessions with the science and engineering directorates. The team also initiated the development of a System for Collaborating on Otherwise Unknown Technologies (SCOUT) SBIR/STTR programs. The SCOUT process itself is complete, and the accompanying software tool is in development.

In terms of outreach, the SBIR/STTR team participated in multiple conferences (some targeting Historically Black Colleges and Universities and Minority Serving Institutions) and many one-on-one sessions with firms. Twenty-six one-on-one meetings were conducted in the last quarter of Fiscal Year 2020 alone. By participating in these meetings, the team is able to assure that small businesses know they need to address specific NASA technology needs to be considered for an award. Many companies establish relationships with the SBIR/STTR program and receive awards from multiple centers. It is this relationship with the small business community and the hard work of those who participate in the SBIR/STTR program every year that allow the program to be such a success. If it weren't for the NASA community of reviewers, subtopic managers, topic managers, tech monitors and Contracting Officer's Representatives, the program would not be where it is today.

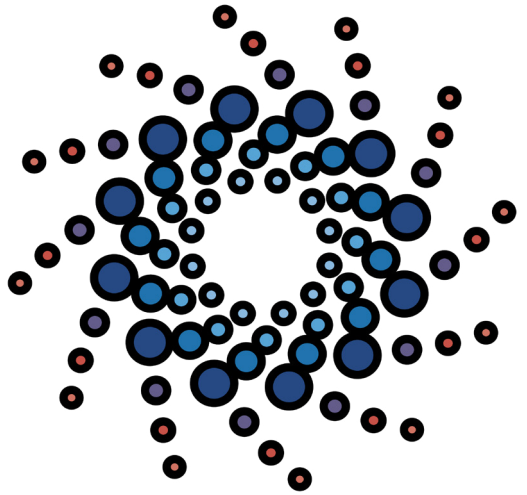


PHOTO CAPTION: *The official logo of the national SBIR/STTR program.*

FISCAL YEAR 2020 SBIR/STTR AWARDS

SBIR PROGRAM YEAR 2020 PHASE I AWARDS

AdValue Photonics, Inc.
Arizona
100s of kW Peak Power Fiber Amplifier for Next-Generation Lidar Application

Advanced Scientific Concepts, LLC
Santa Barbara, California
Flash Lidar Spatial Resolution and Range Improvements for EDL Applications

American GNC Corporation
Simi Valley, California
Neuro-Cognitive Radar-Imagery Segmentation and Identification

Amphionic, LLC
Dexter, Michigan
Radiation-Resistant High-Resolution Particle Sensors from Composites of Semiconductor Nanoparticles and Aramid Nanofibers

Applied Material Systems Engineering, Inc.
Schaumburg, Illinois
Advanced Survivable Thermal Control Material Systems for Aggressive Planetary Dusty Environments

Apre Instruments, LLC
Tucson, Arizona
High-Speed, Mode-Hop Insensitive SCI Source for Low Coherence Wavefront Probe for Nanometer Level Free-Form Metrology

Ascending Node Technologies, LLC
Tucson, Arizona
Advanced Science Modeling for Mission Planning and Analysis

Aster Labs, Inc.
Shoreview, Minnesota
Multi-Target Tracking Using Random Finite Sets for Rendezvous and Proximity Operations with Non-Gaussian Uncertainties

Atmospheric & Space Technology Research Associates, LLC
Louisville, Colorado
Ocean Stabilized Ionospheric Remote Imaging Sensor

Bridger Photonics, Inc.
Bozeman, Montana
Autonomous DIAL-Based Tropospheric Ozone Profiler

CoolCAD Electronics, LLC
Tacoma Park, Maryland
Silicon Carbide Data Logger for a High Temperature Smart Sensor Platform

CrossTrac Engineering, Inc.
Mountain View, California
Optical Precision Navigation, Timing, and Communications System for Small Spacecraft Swarms

CU Aerospace, LLC
Champaign, Illinois
Suite of Lagrangian Coherent Structure (SuiteLCS) Software

Engenix, Inc.
Huntsville, Alabama
Expedient Formulator for Generative Evaluation

Ensemble Government Services, LLC
Hyattsville, Maryland
Kamodo Containerized Space Weather Models

Freedom Photonics, LLC
Santa Barbara, California
Watt-Class Diffraction-Limited Narrow Linewidth 8xx nm Diode Lasers

Freedom Photonics, LLC
Santa Barbara, California
High-Power Tunable 852nm Laser Source and PICs for Atom Interferometry Based Gravimetry

Gloyer-Taylor Laboratories, LLC
Tullahoma, Tennessee
Ultralight Dewar

Great Lakes Crystal Technologies
East Lansing, Michigan
Radiation Tolerant High-Voltage, High-Power Diamond Electronics

LoadPath
Albuquerque, New Mexico
Collaborative and Rapid Engineering System-Modeling Toolkit

Lowell Digisonde International, LLC
Lowell, Massachusetts
A CubeSat Based System for Topside Ionospheric Sounding

Lunar Resources, Inc.
Houston, Texas
In-Space Vacuum Deposition Joining

Magma Space, LLC
Washington, DC
Semi-Active Magnetically Levitated Reaction Wheel

Michigan Aerospace Corporation
Ann Arbor, Michigan
Miniaturized Nightglow Interferometer for Monitoring Emissions from a CubeSat

Nanovox, LLC
Beaverton, Oregon
Infrared Freeform Gradient Index Optics

Omitron, Inc.
Beltsville, Maryland
Maneuver Characteristics of Autonomous Non-Cooperative Spacecraft

Optimax Systems, Inc.
Ontario, New York
Force Responsive Manufacturing for Light-Weighted Optics

Opto-Knowledge Systems, Inc.
Torrance, California
AquaFLoat: A Near-Surface Hyperspectral Radiometer System for Improved Ocean Color Measurements within the UV-VIS-NIR Spectral Region

Photonics Automation Specialties, LLC
Tucson, Arizona
Hyperspectral VSF and Polarization Instrument

Physical Sciences, Inc.
Andover, Massachusetts
Deep Neural Network Algorithms for Upsampling of Surface Images

Pioneer Astronautics
Lakewood, Colorado
Gas Replacement System (GRS)

Predictive Science, Inc.
San Diego, California
Time-Dependent Connectivity Mapping of the Solar Magnetic Field

QmagiQ
Nashua, New Hampshire
INAS Detectors for Infrared Astronomy

QorTek, Inc.
Linden, Pennsylvania
Rad-Hard ASIC-Controlled GaN-Based Multichannel POL Converter

Quinstar Technology, Inc.
Torrance, California
V-band Solid-State Power Amplifier (65-71 Ghz)

Radiation Monitoring Devices, Inc.
Watertown, Massachusetts
Radiation Hard Diamond Particle Detector for Heliophysics

Radiation Monitoring Devices, Inc.
Watertown, Massachusetts
High-Efficiency, Hybridized Semiconductor Array Modules for Hard X-Ray Imaging

Radiation Monitoring Devices, Inc.
Watertown, Massachusetts
ASP: The AlGaas Solid-State Photomultiplier

RC Integrated Systems, LLC
Torrance, California
Miniature Optical Proximity Sensor

Remote Sensing Solutions, Inc.
Barnstable, Massachusetts
Next Generation Radar-Radiometer Space Qualified Digital Receiver and Processor

sdPhotonics, LLC
Richardson, Texas
Ultralow Bit Energy VCSEL-Based Transceiver for High Efficiency, Radiation-Hardened Optical Data Links

Sequoia Scientific, Inc.
Bellevue, Washington
In-Situ Hyperspectral Absorption Instrument in Support of Ocean Color and Biogeochemistry

Silicon Space Technology Corporation
Austin, Texas
NN_Co-Processor

Skyhaven Systems, LLC
Steamboat Springs, Colorado
Zero Net Stress Coating Method for X-Ray Mirrors

Space Environment Technologies, LLC
Pacific Palisades, California
Machine Learning Enabled Thermosphere Advanced by HASDM

Spectrum Magnetics, LLC
Wilmington, Deleware
An Innovative Submillimeter WAVE/THz Noise Chip Using PIC Technology

Spectrum Scientific, Inc.
Irvine, California
Blazed Holographic Gratings with Aberration Correction on Freeform Mirror Surfaces for DUV Instruments

Speqtral Quantum Technologies, Inc.
Denver, Colorado
Quantum Clock Synchronization

Thermal Expansion Solutions, Inc.
College Station, Texas
Negative Thermal Expansion ALLVAR Alloys for High Temperatures

ThermAvant Technologies, LLC
Columbia, Missouri
High Performance Cryogenic Two-Phase Heat Spreader

ThermAvant Technologies, LLC
Columbia, Missouri
Oscillating Heat Pipe Enhanced Thermal Wadi

Twinleaf, LLC
Plainsboro, New Jersey
Scalar Atomic Magnetometer for CubeSats

UES, Inc.
Dayton, Ohio
Probability of Detection and Validation for Computed Tomography Processes for Additive Manufacturing

Vector Atomic, Inc.
Pleasanton, California
Comb Using Photonically Integrated Devices

STTR PROGRAM YEAR 2020 PHASE I AWARDS

ADVR, Inc.
Bozeman, Montana
University of Illinois at Urbana-Champaign
Champaign, Illinois
Tunable Narrow-Band Bi-Photon Source in IR Spectral Region for Calibration of High-Performance Transition-Edge Sensors

Alphacore, Inc.
Tempe, Arizona
Arizona State University
Tempe, Arizona
Metamaterials

Amethyst Research, Inc.
Ardmore, Oklahoma
University of California – Santa Barbara
Santa Barbara, California
Ultra-Efficient Integrated Photonic Quantum Transceiver for High-Speed Quantum Communications

CTEN Global Strategies, LLC
Gainesville, Florida
Kennesaw State University
Kennesaw, Georgia
Hedera Gashgraph Based Distributed Ledger for Aerospace Applications

Nanohmics, Inc.
Austin, Texas
The University of Texas at Dallas
Richardson, Texas
On Demand Single-Photon Sources for Correlated Calibration of Single Photon Detectors

Orbit Logic, Inc.
Greenbelt, Maryland
Fraunhofer Center for Experimental Software Engineering
Riverdale, Maryland
Space Communication Reconstruction and Mapping with Blockchain Ledgering

Streamline Automation, LLC
Huntsville, Alabama
Alabama A&M University
Normal, Alabama
Testing of COTS Systems in Space Radiation Environments

SBIR PROGRAM YEAR 2019 PHASE II AWARDS

Advanced Cooling Technologies, Inc.
Lancaster, Pennsylvania
Variable Conductance Cold Plate for Spatial and Temporal Temperature Uniformity

Advanced Space, LLC
Boulder, Colorado
Neural Net Control for Electric Propulsion in 3-Body Orbits

Ascending Node Technologies, LLC
Tucson, Arizona
Interactive Rapid Generation of Simulated Science Data

Astrobotic Technology, Inc.
Pittsburgh, Pennsylvania
Ultra-Compact Standalone Visual Relative Navigation

ATLAS Space Operations
Traverse City, Michigan
Cognitive Constellation Management Scheduling

Digital Optics Technologies, Inc.
Rolling Meadows, Illinois
Compact and Highly Sensitive Multi-Axes Gyroscope Using Large Momentum Transfer Point Source Atom Interferometry

DornerWorks, Ltd.
Grand Rapids, Michigan
High Assurance Virtualization for the HPSC

AT A GLANCE

Freedom Photonics, LLC
Santa Barbara, California
Widely Tunable Fast Semiconductor Laser Seed Source at 1030 nm for Lidar Remote Sensing

GeoVisual Technologies, Inc.
Westminster, Colorado
Multi-Resolution Deep Learning for Land Use Applications

Heliospace Corporation
Berkeley, California
Helical Booms for Space Applications

Impossible Sensing, LLC
St. Louis, Missouri
HARPOON – High Access Raman Probe with Onboard Optical Numerization

Litespar, Inc.
Tucson, Arizona
MOPA Laser Transmitter with Passive Q-Switch for Space Lidar

Nabla Zero Labs
San Marino, California
A Networked Flight Dynamics Platform for Collaborative Design and Optimization

OptiPro Systems, LLC
Ontario, New York
Advanced Nanometer Coordinate Measuring Machine

OptiPro Systems, LLC
Ontario, New York
Chromatic Interferometric Probe

Predictive Science, Inc.
San Diego, California
An Extensible Tool for Estimating Space Weather Benchmarks

QorTek, Inc.
Linden, Pennsylvania
Fast Transient Response High Voltage Power Converter for Space Applications

SciGlob Instruments & Services, LLC
Ellicott City, Maryland
Advanced Hyperspectral Remote Sensing Radiometer for Trace Gas and Aerosol Observations

SeeQC, Inc.
Elmsford, New York
Two-Dimensional Cryogenic Readout for Far IR Bolometers

Space Hazards Applications, LLC
Golden, Colorado
A Tool for Defining Solar Particle Access to the Magnetosphere (SPAM) for Satellite Anomaly Attribution: Phase II

STTR PROGRAM YEAR 2018 PHASE II AWARDS

Aktiwave
Rochester, New York
Rochester Institute of Technology
Rochester, New York
Integrated Mid-Infrared Sources Enabled by Waveguides Written with Femtosecond Lasers

Nexus Photonics, LLC
Goleta, California
University of California – Santa Barbara
Santa Barbara, California
Chip-Scale THz Generator

POST PHASE II AWARDS

Advanced Space, LLC
Boulder, Colorado
Cislunar Autonomous Positioning System

AOSense, Inc.
Sunnyvale, California
Cold Atom Laser Module

Applied Technology Associates
Albuquerque, New Mexico
DRG-Based CubeSat Inertial Reference Unit

Fibertek, Inc.
Herndon, Virginia
Lasercom Terminal for Deep Space Communication Phase A Study for SETH Mission

Fibertek, Inc.
Herndon, Virginia
Asteroid Lidar with Fiber Lasers and RZPN Code Modulation

Freedom Photonics, LLC
Santa Barbara, California
Integrated Optical Transmitter for Space Based Applications

Lambda Consulting/Advanced Nanophotonics
Harwood, Maryland
COVID-19 Nanotube Forest Deposition on Conductive Traces for E-Nose

MMA Design, LLC
Loveland, Colorado
Antenna for Global L-band Active/Passive Observatory for Water Cycle Studies

MMA Design, LLC
Loveland, Colorado
P-band 1 Meter by 1 Meter Deployable Antenna for CubeSats

Nexolve Holding Company, LLC
Huntsville, Alabama
Development of Membrane-Based Deployable Telescope Technologies

Pacific Microchip Corporation
Culver City, California
Low-Power Radiation Tolerant 4 GHz Bandwidth 16k Channel Spectrometer ASIC

Quest Thermal Group
Arvada, Colorado
LEMS IMLI (Integrated MultiLayer Insulation)

Virginia Diodes, Inc.
Charlottesville, Virginia
Integration and Test Support and Receiver Transient Response Measurements

Virginia Diodes, Inc.
Charlottesville, Virginia
SSOLVE 500-570 GHz Front-end Submillimeter Wave Receiver

“THE INVENTOR *NEVER* QUITS.”

— JAMES KERLEY

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