National Aeronautics and Space Administration

THE INNOVATION CATALYST

STRATEGIC PARTNERSHIPS OFFICE
NEWSLETTER
APRIL 2020

NEW TECHNOLOGY REPORTING AND REMOTE WORK

With all NASA centers requiring remote work apart from essential personnel, offices across the agency have made progress in adapting to these new circumstances. The Strategic Partnerships Office (SPO) staff has moved to a full-time telework schedule, but we're still here to support you. Many parts of the technology transfer process still can move forward, even if SPO isn't physically on center. To address any of your concerns, we've compiled some information that you might find useful. If you have any outstanding questions, please reach out to us. We've included our contact information for you in this newsletter. It's a difficult time, but we know as well as anyone that Goddard is full of incredible, innovative people, and we will get through this together.

GODDARD IS AT LEVEL 4 OF THE NASA RESPONSE FRAMEWORK. WHAT DOES THAT MEAN FOR TECHNOLOGY TRANSFER?

All SPO personnel are equipped with the necessary teleworking equipment. We will continue working our job functions as normal, and the technology transfer process is unaffected.

I'M HAVING TROUBLE WITH THE NEW TECHNOLOGY REPORTING FORM – WHAT SHOULD I DO?

Starting in April, SPO is launching virtual office hours through Microsoft Teams to help troubleshoot issues and answer questions. You can find the link to those sessions in Dateline. Additionally, you can reach out directly to SPO – see the contact information at the bottom of this article.

I SUBMITTED AN NTR AND HAVEN'T HEARD ANYTHING FROM SPO YET. HOW CAN I MAKE SURE THAT MY NTR HAS BEEN REVIEWED?

SPO is working on its normal NTR case pendency. NTR reviews have not been affected, and you should hear from your technology manager once your technology has been assigned a case number. New Technology Assessment (NTA) meetings will continue as scheduled through Microsoft Teams. If you have any questions regarding the status of your case, please reach out to the technology manager assigned to your organization.

MY TECHNOLOGY HAS A PENDING PATENT APPLICATION. HOW DO I CHECK ITS STATUS? WILL PATENTS STILL BE ISSUED?

The U.S. Patent and Trademark Office (USPTO) falls under the U.S. Department of Commerce. At the time of this newsletter's publication, the USPTO is still operating. If you would like to check the status of your patent application, please reach out to the Office of Patent Counsel (OPC).

I'M INVOLVED IN A SPACE ACT AGREEMENT. HOW CAN I CONTINUE TO HONOR THE TERMS OF THAT AGREEMENT DURING THIS TIME?

This needs to be reviewed by SPO on a case-by-case basis. Please reach out to the agreement manager assigned to your organization to discuss the details of your partnership.

Each code has an assigned agreement manager, who you can find here:

Dennis Small (*dennis.a.small@nasa.gov*): Codes 300, 550, 580, 700

Eric McGill (*eric.s.mcgill@nasa.gov*): Codes 540, 560

Kerry Leonard (*kerry.w.leonard@nasa.gov*): Codes 100, 500, 590

I'M NOT SURE IF MY TECHNOLOGY QUALIFIES TO BE PATENTED. HOW CAN I FIND OUT?

Reach out to your technology manager to discuss the details of your case. When in doubt, it's best to submit an NTR. SPO's team of technology managers works with Goddard's Office of Patent Counsel to evaluate the commercial potential of reported technologies. Even if there isn't an obvious commercial use, you should still report your inventions.

WILL THERE BE ANY IMPACT TO LICENSE AGREEMENTS?

SPO is working as normal, and license agreements will be routed digitally for signature. All reviewers can sign off using a digital signature with their PIV badge.

WILL THERE BE ANY IMPACT TO THE SOFTWARE RELEASE PROCESS?

The software release process is automated and can be initiated via the Software Release System (SRS). If you have any questions regarding the status of your request, please email the Goddard Software Release Authority (SRA) at *gsfc-softwarerequest@mail.nasa.gov*.

SOMEONE FROM ACUITY EDGE OR RTI HAS CONTACTED ME AND WANTS TO TALK ABOUT MY TECHNOLOGY. IS THIS SPAM OR SHOULD I RESPOND?

The NASA Technology Transfer Program has contracted with Acuity Edge and RTI to support NASA's technology assessment and marketing efforts. If you receive communications from Acuity Edge or RTI representatives, please coordinate with them to discuss the details of your technology and help them to accurately represent the technology's potential applications to licensees.

WHAT IS THE BEST WAY TO KEEP IN CONTACT WITH SPO? HOW DO I GET IN TOUCH?

Each code has an assigned technology manager, who you can find here:

Dennis Small (*dennis.a.small@nasa.gov*): Codes 100, 200, 300, 580, 590, 670, 700, 800

Eric McGill (eric.s.mcgill@nasa.gov): Codes 400, 410, 420, 440, 470, 500, 540, 600, 603-606, 610, 660, 690

Hossin Abdeldayem (*hossin.a.abdeldayem@nasa.gov*): 490, 550

Kerry Leonard (*kerry.w.leonard@nasa.gov*): Codes 450, 480

Manohar Deshpande (*manohar.d.deshpande@nasa.gov*): Code 460, 551, 554, 560

IS THERE A PHONE NUMBER I CAN CALL?

Following Goddard's recommendation, SPO did not forward its main office phone to another number. However, SPO's executive assistant does have access to +1 (301) 286-5810 via Cisco Unity Connection. Alternatively, please reach out to us via email at *techtransfer@gsfc.nasa.gov*.

Featured Goddard Technology: Robust Waveguide Millimeter Wave Noise Source

Engineer Negar Ehsan says she never planned to have her name on a patent, but when you're working at NASA's Goddard Space Flight Center, it can be a perk of the job. Ehsan works in the Microwave Instrument Technology Branch at Goddard, where she develops technologies that help Earth-facing satellites collect information about our planet.

As an electrical engineer, Ehsan has devoted her career to harnessing the microwave range of the electromagnetic spectrum, designing instruments for NASA's satellites that orbit Earth. With an interest in math and science starting when she was a child, Ehsan says she chose to major in electrical engineering because she enjoyed physics and math.

"I knew electrical engineering had more math than other engineering disciplines," Ehsan explains.

Even though she chose a math-heavy major, she found inspiration in a high school literature teacher, whose rigorous style of teaching left an impression on her.

"She was detail-oriented and posed very difficult questions," Ehsan says. "She basically taught me how to study."

Ehsan moved from Iran to the United States to attend college at the University of Colorado at Boulder. She enjoyed her studies, but it wasn't until she took a class on electromagnetic fields that knew she had made the right choice of major. She says the mathematics and physics behind these fields fascinated her, helping her to visualize the invisible electromagnetic domain.

After completing her Ph.D. with CU Boulder Professor Zoya Popovic as her advisor and mentor, Ehsan accepted a position at Goddard, where she has worked since 2010. In her work as an electrical engineer, Ehsan exercises her penchant for analytical thinking, tackling challenges, and coming up with solutions.

"I get to problem-solve all the time as a microwave designer," Ehsan says.

She has worked on several NASA missions, including a CubeSat called IceCube and a larger mission called Soil Moisture Active Passive (SMAP). Designed to measure moisture levels in Earth's

Caption: Engineer Negar Ehsan works in her lab at NASA's Goddard Space Flight Center. *Photo Credit: NASA/Samantha Kilgore*

Featured Goddard Technology cont'd

soil, SMAP uses a radiometer to measure faint amounts of blackbody radiation emitted from soil. The highly sensitive radiometer informs NASA researchers back on Earth about soil conditions, which has a bearing on agriculture, drought and flood forecasting, and more.

For the SMAP mission, Ehsan designed the satellite's L-band radiometer's internal calibration circuitry. Engineers calibrate instruments to make sure their measurements are accurate – for example, if you were trying to calibrate a scale, you would weigh something with an already established weight. If the scale gives a different measurement, you know it's wrong and needs adjustment.

For a radiometer, one type of calibration involves exposing the instrument to a module known as a noise source that simulates microwave radiation. Ehsan built a custom noise source for the SMAP radiometer, since a commercial-off-the-shelf version was not available.

Once the SMAP mission launched, "we were doing a lot of millimeter and sub-millimeter work," Ehsan says, referring to the high-frequency wavelengths she and her team were using in their instruments. Ehsan found that in the millimeter to sub-millimeter range, noise sources weren't easy to find commercially, and her colleague Jeffrey Piepmeier proposed that they create their own noise source designed specifically for millimeter to sub-millimeter wavelengths.

"Right off the bat, we knew this wasn't something that had been done before," Ehsan says.

In 2018, Ehsan and her fellow inventors Piepmeier and Edward Wollack received a patent for their invention, a "Robust Waveguide Millimeter Wave Noise Source" that can generate noise power at millimeter-wave frequencies.

With Ehsan's first patent under her belt, she's continuing to work on noise sources, this time for planetary missions using instruments in the 500-600 GHz range. These tiny noise sources can be integrated into the internal system of a radiometer, resulting in lower size, weight, and power strains on the spacecraft.

As she continues her design work, more patents might be in her future. But the primary motivation for Ehsan, she says, is solving Goddard's technology challenges and helping send new satellites into space.

"Problem-solving can be stressful, but it's so rewarding when you discover the answer. It's like an adrenaline rush," she adds.

For more stories, see the Winter 2020 edition of The Spark, previously known as Tech Transfer magazine.

Photo Credit: NASA/Samantha Kilgore

Recent SPO Activities

REMEMBERING JAMES KERLEY – REFLECTIONS ON A PROLIFIC GODDARD INVENTOR

At SPO's annual celebration of Goddard innovators on Feb. 27, the office highlighted the work of James Kerley, a Goddard engineer who made great contributions to technology transfer. Though he passed away in 1994, SPO has honored him each year since by presenting the James Kerley Award to Goddard innovators who display an extraordinary commitment to NASA's technology transfer activities. For the event, SPO put together an article about James Kerley's life, crafted from interviews with members of the Kerley family. We're happy to share that story with you here.

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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., who was an engineer at NASA's Goddard Space Flight Center 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 Kerley 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 Kerley'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."

As an inventor, husband, father, and involved member of his community and church, Jim Kerley 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. Ideas sprouted from his mind one after the other in quick succession. 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.

Despite his robust portfolio of inventions, Jim Kerley never sought the spotlight. Instead, he reflected the light on others by teaching them and inspiring them to seek patents for their own work.

"The hallmark of engineering has always been creative, inventive design," Jim Kerley wrote in course materials for one of his NASA classes, published the year he passed away at age 73. True to his words, he embraced creativity and encouraged others along the way.

EARLY DAYS

Born in 1920, Jim Kerley grew up in Pennsylvania, where his father, James. J. Kerley, Sr., worked on bridges and post offices as an engineer. Jim Kerley's mother, a teacher, helped him with his schoolwork and church memorization. Full of pent-up energy, young Jim Kerley found it challenging to sit still in a chair until he finished his homework.

Jim's eldest daughter, Catherine Castellan, remembers her father commiserating with her when she worked on her own assignments. "He said that he technically sat in that chair, but he was up over the chair, under the chair, around the chair, and through the chair," she laughs.

Jim Kerley and his brother, Tom, moved around Pennsylvania for their dad's engineering work. They spent their free time roaming through the woods and climbing trees. The brothers' frequent moves across the state meant that by the time they graduated high school, they had perfected the art of making new friends, a skill Jim carried with him for the rest of his life.

Jim Kerley followed in his father's footsteps by attending Dartmouth College and graduating with an engineering degree. Jim and his brother Tom both served in World War II, Jim in the Navy and Tom as a bomber pilot with the Army Air Forces. After the war, Jim Kerley held several engineering jobs, first with Lockheed in California, then with two other firms in the Washington, D.C. metro area.

In the late 1940s, Jim Kerley met Mary Bier as part of a theater group at Sacred Heart Church in Washington, D.C. Initially bond-

Recent SPO Activities cont'd

ing over their love of theater, they married within a few years of meeting.

Jim opened Kerley Engineering in the mid-1950s, coinciding with a flurry of patent applications. From 1959 to 1968, the United States Patent and Trademark Office issued 16 patents with Jim Kerley's name on them.

GOOD VIBRATIONS

A glance at his many patent titles reveals one key word: vibration. Much of Jim Kerley's work focused on the concept of vibration and how to stop it from interfering with a machine's function. In a car, too much vibration can break delicate instrumentation or cause discomfort to the driver. In a spacecraft, unwanted vibration can shake nuts and bolts loose, causing parts to come unfastened.

Jim Kerley 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.

"He always told me that you can get strength and flexibility from cables," says Bernadette Maertens, an engineer like her father. "Those tend to be two contradictory properties. These days, it's very common in engineering to use cables in isolator designs, but back then it was groundbreaking."

The Kerley kids say that Jim built prototypes of his designs in the family basement. It wasn't unusual to hear him drilling through the concrete floor with a prototype jackhammer as he perfected the efficacy of his isolation mechanism.

"There'd be 20 to 30 holes in the basement floor where he tested his final solution," says Vincent Kerley, Jim's eldest son.

As the Kerley family grew – Vincent was soon joined by siblings Mary (who recently passed away), Catherine, Joe, and Bernadette – Jim questioned his decision to open his own business. His true passion dwelled in the grand process of invention, and the mundane aspects of running a business lacked the same appeal.

"He was an inventor, not a businessman," says Joe Kerley. "He went through some struggling years and got to the point where he said, 'I can't do this anymore.'"

The private sector lost a business, but as a result, NASA gained a prolific inventor.

'IF YOU'VE GOT A JOB TO DO, DO IT'

Jim Kerley 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.

Now free from the business world, Jim Kerley 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.

Jim Kerley lived by the motto, "If you've got a job to do, do it," and he brought that ethos to NASA.

"The government had never seen the likes of him," Joe Kerley laughs. "He didn't know what a regular schedule was. If things needed extra attention, he was just there."

Jim Kerley sported a distinctive look in the office that featured several kinds of plaid and a big bow tie. When solving a problem at work or at home, he would jump into projects head-first, even if it meant getting plaster or photography dye on his clothes.

Instead of keeping up with the latest fashion, he focused on his engineering prowess. From test chambers to rocket scaffolding and bolted joints, Jim Kerley seemed interested in everything going on at NASA.

He jumped into the fray wherever he could make a difference. During the testing of the Hubble Space Telescope, Jim Kerley found a cost-effective way to build an addition to Goddard's test chamber, allowing it to accommodate the giant spacecraft.

When Jim was asked to produce a report on the mechanism by which nuts and bolts shake loose during vibration, Peter Zemanick with the American Society of Mechanical Engineers praised Jim's expertise and experience. "The work to date shows strong evidence of Mr. Kerley's background as a dynamicist and a careful experimentalist," Zemanick wrote.

Recent SPO Activities cont'd

INVENTIVE DESIGN

Ever modest, Jim believed that inventiveness could be taught. He developed his own theories on education from studying the teachings of Aristotle and Socrates, an intellectual journey he took when teaching his daughter Catherine reading and math after she struggled with the subjects in school.

"It was because of his legacy that I earned my Ph.D. in education," Catherine Castellan says. "Not only did he teach me how to read and do math, but he taught me how to teach."

In the later years of his life, he taught a course at NASA that focused on mastering the process of innovative thinking. In the course materials for his class, he wrote at length about the thinking process, applying his educational theories to inspire better science and engineering outcomes. In his view, American thinking had lost some of its ingenuity, and he was determined to reverse the trend.

"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.

He challenged the idea that invention is a process "left to chance or happenstance," and his course introduced a methodical approach to invention that harnessed the human mind's ability to think.

TECHNOLOGY TRANSFER

Jim Kerley's final decade at NASA focused on exploring the full range of applications for his innovations. Starting in 1988, Jim Kerley filed seven patent applications with diverse titles, including "Robot Cable-Compliant Devices" and a "Page Turning System." 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.

According to an article in the 2003 edition of NASA's Spinoff publication, Jim Kerley worked with Goddard engineers Wayne Ecklund and Allen Crane to adapt the design from his work on cable-compliant mechanisms for sounding rocket assemblies and robotics.

"Suffering from severe arthritis himself, Kerley knew that alleviating the weight on the legs was an important part of pain management," the article says. "The technology allowed the harness to control the pelvis, providing support and stability with compliance that mimicked the movement of the hip joint."

In 2002, Enduro Medical Technology licensed the design and created the Secure Ambulation Module for commercial use. Five years later, the company adapted the design for veterinary medicine. Their device for horses supports the animal's weight and gives it time to recover in an upright position post-surgery.

Even though Jim Kerley didn't love running his own business, he saw immense value in NASA's technology transfer program.

"He wanted people to realize that the technologies developed to build the space program and land a man on the Moon directly benefit citizens today," Bernadette Maertens says. "He was always so enthusiastic about the whole program and he shared all of that with us kids."

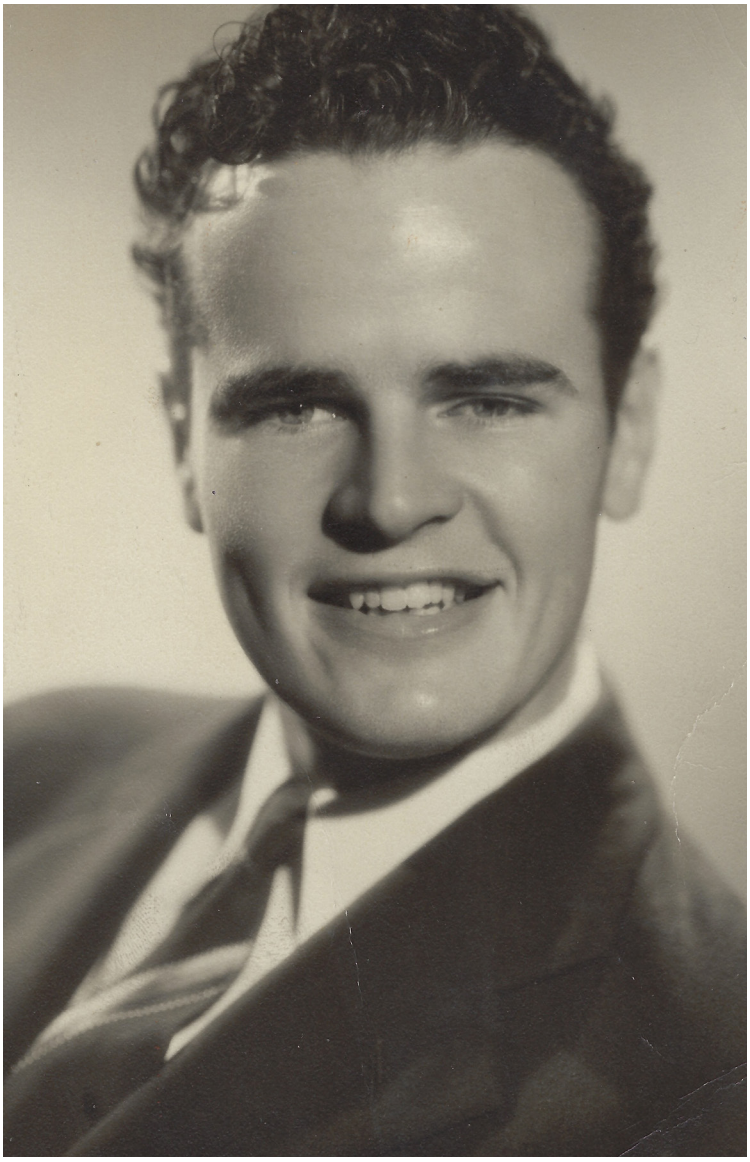
Jim Kerley passed away in 1994. A pamphlet from his memorial service at NASA includes a favorite quote of his: "The inventor never quits."

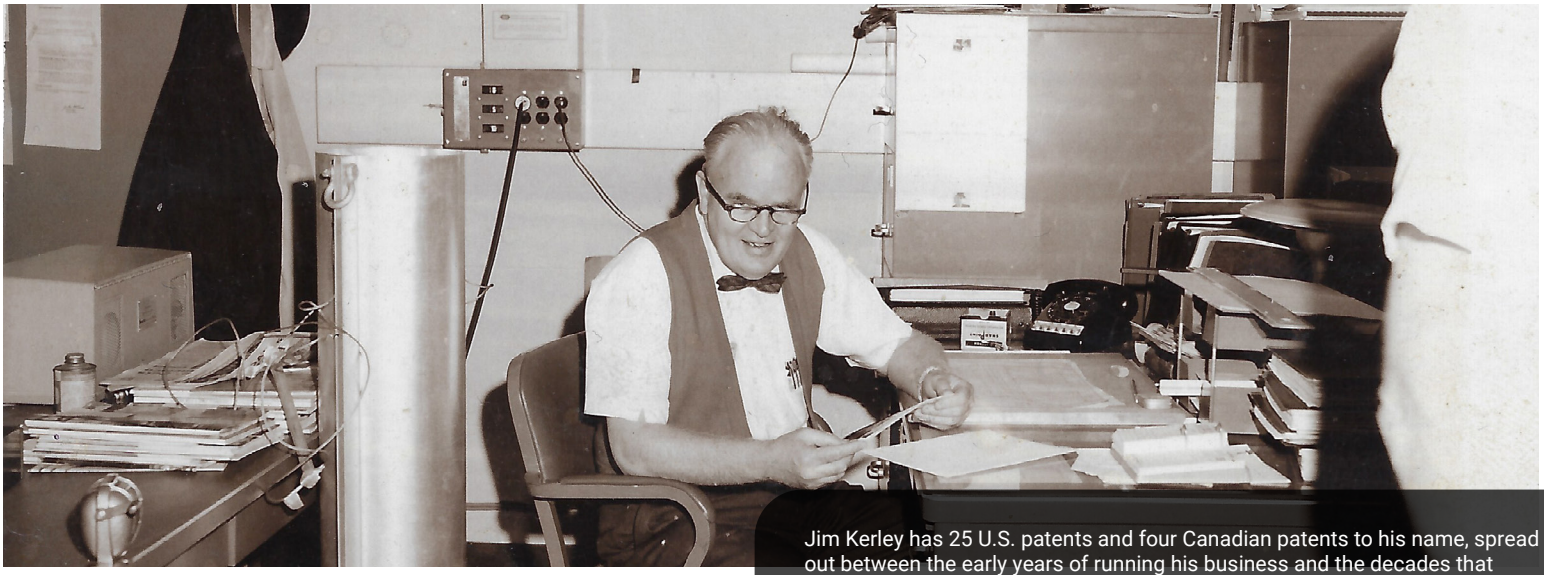
Goddard has celebrated Jim's legacy each year since his passing with the James Kerley Award, given annually to Goddard inventors who demonstrate extraordinary commitment to technology development and commercialization. His passion for invention lives on in the minds of NASA's most innovative thinkers.

"NASA allowed Jim Kerley to be Jim Kerley," Catherine Castellan says. "That was a gift to us as his children, because we had a dad who got to do what he loved."

Thank you to Vincent Kerley, Catherine Castellan, Joe Kerley, and Bernadette Maertens, whose generous contributions of their time and memories made this story possible. Quotes have been edited for clarity.

Recent SPO Activities cont'd





Jim Kerley has 25 U.S. patents and four Canadian patents to his name, spread out between the early years of running his business and the decades that followed at NASA. *Photos courtesy of the Kerley family*.

Guess The Patent Drawing!

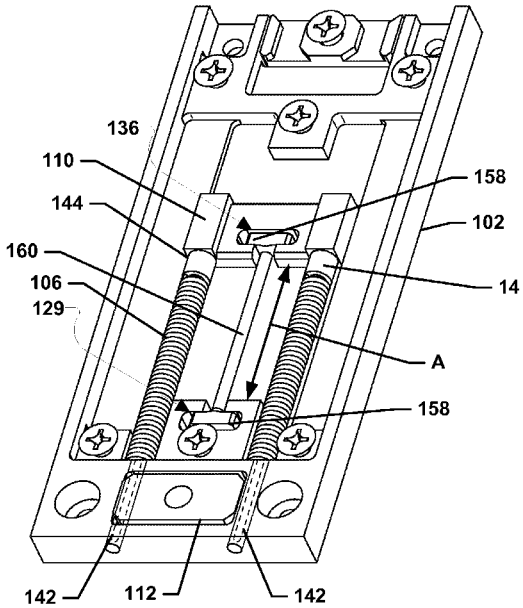
HERE ARE YOUR CLUES:

1. This invention was patented in 2017.

2. Thermal Management Technologies of Logan, Utah licensed this technology in 2018.

3. It was invented by NASA innovators Luis Santos Soto, Scott Hesh, and John Hudeck.

Can you guess the invention? Click here for the answer.



Tech Transfer Trivia

1. What Goddard technology transfer story was featured in the first edition of NASA's Spinoff publication in 1976?

   A. Transducers for artery screening B. Cables for generator efficiency

   C. Sensors for emissions testing D. Lasers for cauterizing wounds

2. What does "SAA" stand for?

   A. Space Access for All B. Spectrometer Accountability Act C. Sustaining Accelerometer Abilities D. Space Act Agreements

3. True or false: Your invention will be better protected if you file an NTR before speaking publicly about it.

   A. True B. False

Link To Answers

Goddard Tech 12

Each month the Strategic Partnerships Office tells the story of successful spinoffs at NASA's Goddard Space Flight Center and shows how these technological breakthroughs are brought from the labs to our lives. To see the full series, click here. *Photo Credit: NASA/SDO*

Scientist Antti Pulkkinen is in the midst of a project that will turn the nation's power lines into instruments capable of measuring space weather phenomena. The team is interested in measuring geomagnetically induced currents, which cause deadly solar winds. Even though the space between planets in our solar system seems fairly empty, the sun generates powerful magnetic elds that rise above the surface in giant loops. When these loops clash, super-hot, highly charged particles are sent out into space, creating intense solar winds.

These geomagnetic storms have caused widespread blackouts, the largest taking place on March 13, 1989 in Quebec, Canada. The millions of people that lived in the province found themselves in the dark for 12 straight hours. Airports closed, elevators stalled, and the metro was shut down. This is a dramatic example – storms of this magnitude are rather rare, but small storms do aect the world's power grids. According to the U.S. Geological Survey, had the blackout occurred in the Northeastern United States instead of Quebec, the economic impact could have exceeded $10 billion. This number doesn't even include the risk to public safety.

To better understand the impact space weather has on the U.S. power grid, the three companies above have allowed NASA's team to install scientic substations beneath their high-power transmission lines. The data gained from these substations will allow predictions of when space weather will aect power grids and how the problem can be mitigated. With the aim to make the equipment for the measuring these currents as inexpensive and versatile as possible, NASA hopes to achieve nationwide coverage.

Geophysical Imaging

After growing up in Finland and attending the University of Helsinki, Pulkkinen came to Goddard to do his post-doctoral research work in physics in 2003. Since then, he has stayed in the United States. After his post-doctoral research, Pulkkinen worked with the University of Maryland Baltimore College and was part of the Catholic University of America's Physics Department before returning to Goddard's civil service workforce.

Photo Credit: NASA/ Bill Hrybyk

Upcoming Events

NTR COFFEE BREAK

April 23, 2020

Microsoft Teams — see Dateline for link

Invented a new technology recently? Need help troubleshooting your NTR submission? Want to check the status of your NTR? Drop in for a virtual visit with our NTR experts through Microsoft Teams! We will have two SPO team members available to answer your questions and address any outstanding issues you may have regarding the technology transfer process. As always, you can reach us anytime by emailing techtransfer@gsfc.nasa.gov.