

A FLIGHT PROJECTS DIRECTORATE PUBLICATION 2021 SPRING ISSUE

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FLIGHT PROJECTS DIRECTORATE | Volume 29 • Number 1

ENABLING EXPLORATION AND EARTH + SPACE SCIENCE BY TRANSFORMING CONCEPTS AND QUESTIONS INTO REALITY

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A FLIGHT PROJECTS DIRECTORATE PUBLICATION

PUBLISHED BY THE FLIGHT PROJECTS DIRECTORATE

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Code 400

WE'RE ON THE WEB!

http://fpd.gsfc.nasa.gov

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Let us know about it. Include your name, phone number and send it to:

 \sum_{a}

Code 460



Ext. 6-9125

The deadline for the next issue is July 1, 2021





Message from the **DIRECTOR**

As 2021 kicks off, I want to express my gratitude to everybody who helped support the mission of Flight Projects as we navigate numerous challenges and changes within the Directorate. As I stated on my Day 1, I want to congratulate Dave Mitchell on becoming the Director of the Engineering and Technology Directorate (ETD). His leadership and guidance to all of us has been a constant positive force in our workplace and his shoes will be hard to fill, and most importantly, we know where to find him.

I want to welcome both Cynthia Simmons and Cathy Richardson to their new roles as our Deputy Director and our Deputy Director for Planning and Business Management, respectively. I am looking forward to working this them as they bring their expertise and counsel to help me run our directorate. I also want to thank Michelle Gates for her rotation into our front office to help with the transition activity in our office.

We continue to maneuver through a global pandemic and keep our missions moving forward and, most importantly, keep our people safe. We are very saddened to hear of the passing of some of our team members and their families and friends are in our thoughts and prayers. Our challenges and successes this past year have happened as a community and I appreciate you all working together to make the most of these trying times.

Despite all the obstacles of the last year, we are in the position to launch five Goddard missions this year: the Laser Communication Relay Demonstration (LCRD) payload; Landsat 9, Lucy, James Webb Space Telescope (JWST), and



Geostationary Operational Environmental Satellite (GOES)-T. Another mission from Marshall Space Flight Center, the Imaging X-ray Polarimetry Explorer (IXPE), being managed out of our Explorers Program, will also launch this year. It is shaping up to be a historic year of launches for the directorate and Goddard.

It is through our diverse community that we are succeeding in Flight Projects and we look forward to showing our appreciation for the community this year. We started 2021 celebrating Black History month and that work is continuing to ensure every voice is heard through the "Do You Hear us?" series. Next, we focused on lesbian, gay, bisexual, transgender and gueer (LGBTQ) history month with virtual speakers and great presentations in the directorate. In March, we celebrated Women's History Month with peers nominating outstanding women for the "I'm Every Woman" campaign. The Women of Flight (WoF) hosted Cynthia Simmons in a discussion on her career. Cynthia has also volunteered to be the senior champion for Women of Flight. Cathy will be the senior champion for the Directorate's Diversity and Inclusion program. These celebrations and information are just the start of an amazing year to come.

Our operations, networks, and space communications teams are continuing the outstanding job of supporting and flying missions without missing a beat. Space network Ground Segment Sustainment (SGSS) is in the process of transferring over to the Advanced Communications Capabilities for Exploration and Science Systems (ACCESS), the Hubble Space Telescope (HST) continues providing us with awesome science data. Mars Atmosphere and Volatile EvolutioN (MAVEN) successfully recorded the Mars 2020 Perseverance rover entry, descent, and landing event, the Technology Enterprise and Mission Pathfinder Office (TEMPO) kicked off preformulation activities for the Lunar GNSS Receiver Experiment (LuGRE) pathfinder mission, the Near Space Network's Kongsberg Satellite Services (KSAT) completed site acceptance testing of a new antenna in Norway, and our Search and Rescue (SAR) technologies helped first responders locate and rescue 302 people in the United States alone in 2020, and more worldwide.

Other development milestones over the past few months included the delivery of numerous instruments such as L'Ralph, Lucy LOng Range Reconnaissance Imager (L'LORRI), and Lucy Thermal Emission Spectrometer (L'TES) to Lucy. Solar Ultraviolet Imager (SUVI) and Cross-Track Infrared Sounder (CrIS) were integrated to Joint Polar Satellite System (JPSS)-2. Geostationary Lightning Mapper (GLM) was

shipped to Lockheed Martin for JPSS-2. Lucy completed its Pre-Environmental Review. GOES-T completed vibration and acoustics testing. JWST completed a comprehensive systems test. Plankton, Aerosol, Cloud, ocean Ecosystem's (PACE's) flight spacecraft structure is in build. Landsat 9's observatory is in thermal vacuum. On-orbit Servicing, Assembly, and Manufacturing (OSAM)-1 completed the SPace Infrastructure DExterous Robot (SPIDER) Critical Design Review. The Exploration and In-Space Services (ExIS) division architecture development team completed a Mission Design Lab study for the Dexterous Robotic Extended Assembly Mission (DREAM). All of our other projects and instruments, including Explorers, Heliophysics, Astrophysics, and Earth Science continue to make progress even during these trying times. Our heartfelt thanks go out to all of you for continuing NASA's mission. We were also happy to announce

that the National Oceanic and Atmospheric Administration (NOAA) new Low Earth Orbit (LEO) program successfully passed its Milestone 0. A **Program Authorization Letter** (PAL) is to be generated to start formulating a Sounder project. Geostationary Extended Observations (GeoXO) is working with NOAA's National Environmental Satellite, Data, and Information Service (NESDIS) to define the program to fit into their cost cap and define phasing. We are also working on defining Landsat NeXt.

The pandemic has not slowed the great work that our New Business teams are executing. Already in 2021, we have completed and submitted the Astrophysics Dorado concept study report and two Earth Venture Mission proposals that have been in process for nearly two years. The final report and presentation for the Earth Science decadal study, Aerosol and Cloud, Convection and Precipitation (ACCP), was delivered to NASA Headquarters. The delivery of this final report was a victory all in itself, the culmination of over two years of work. Finally, the Planetary Discovery Phase A study, Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging Plus (DAVINCI+), completed its virtual site visit. Congratulations to all these teams maintaining such high levels of accomplishment while working remotely.

Our Flight Projects Development Program (FPDP) participants have been successful in their assignments and are getting ready to move to new positions for their second year assignments. They are also preparing to work on the Capstone projects and are on track to complete the program next year.

The directorate also held numerous Let's CONNECT listening sessions, partnering with the Office of the Chief Financial Officer (OCFO), on childcare and eldercare challenges. The sessions were well attended, and tools and resources were shared to help

navigate work life and home life. We are planning our next listening session with our Center's Asian Pacific American Advisory Committee on May 10th and look forward to how we, It is the quality of giving more as a community, can be an ally.

I am looking forward to recognizing those nominated for Peer Awards within FPD, as the most important part of this directorate is the people. We plan on having a ceremony on August 4th, either in person or remotely, to celebrate the great things that our people are doing. For this I want to thank each of you and wish you continued health and happiness as we move through 2021.

I'd like to close my first Critical Path message with a few personal observations from my new seat in the directorate.

Having been to Tom Griffin's funeral and Dave Parker's celebration of life, one of their qualities, of the many that were spoken of, was their generosity. then you receive. It a quality that reflects going one step beyond for another person. And just the other day in one of our tag-ups with Center management, in a discussion about a particular hardware schedule issue, I heard of a technician postponing their paternity leave to execute a critical engineering build process to support a colleague's absence who was out on bereavement leave. Generosity. It's an important quality in all human endeavors and is one that we will be remembered for, both in our personal lives as well as our professional ones. Please

take the time to practice and recognize these moments of generosity as we do our work each day.

And lastly, throughout this year, being isolated at home, and making periodic visits to the office with no one around, I have struggled to normalize not seeing all of you in person. The only thing I can think of to make up for all this lost time, reaching back to a much earlier stage in my life, is a Beer Blast in the 400 front office when we all return. Well, maybe, or something like that. I'll run it by Ray!

Stay safe and take care of one another.

Tom McCarthy

Director, Flight Projects thomas.v.mccarthy@nasa.gov

A Farewell Message from Dave Mitchell





It is such an odd experience to change jobs while full time teleworking! I am sure many of you know the feeling of leaving a position without a full sense of closure, not being able to say thank you and goodbye in person and then beginning the next day with new people and a new routine. I started officially as the FPD Deputy Director for Planning and Business Management on April 11th, after a 6-week detail with FPD. I worked my first day from the same spot in my dining room as have been for over a year.

I am excited to bring my project and program management experience to this new position where I'll be focused on the institutional and business side of flight projects. There are many challenges to be addressed, including a new cyber security environment, shrinking institutional budgets, and space constraints, just to name a few. My emphasis will be to streamline processes, identify areas to improve efficiency, be responsive to and supportive of our projects, promote diversity and inclusion, and communicate clearly and with transparency.

A WORD FROM THE DEPUTY

Cathy Richardson

I look forward to getting to know more of the people in FPD. To share a little about myself, I live in Columbia with my husband, Mark, and my 16-year-old son, Kyle. I enjoy bowling and golf and have continued these as safely permitted throughout the pandemic. Being at home full time, I have enjoyed creating an oasis of flowers and herbs on my deck and front porch. I am always happy to hear about you, receive feedback, provide advice and mentoring, or just chat. I believe it is the people you work with that make a job fun and rewarding.

There have been many changes in the FPD leadership over the last several months and I am very happy to be a part of the permanent leadership team. I look forward to working with Tom and Cynthia to chart our course into Stage 2 and ultimately define our new normal. I cannot wait to see everyone again in person and to celebrate the accomplishments, both personal and professional, that we've all achieved over the past year.



MAVEN SUPPORTS MARS 2020 EDL

MAVEN's meet up with Mars 2020 as it made its entry, descent, and landing (EDL) marked the beginning of a data relay relationship with the potential to last through 2030.





(left) MAVEN's solar array and (right) members of the MAVEN spacecraft operations team, pictured here after MAVEN's Mars Orbit Insertion in 2014. CREDIT: LOCKHEED MARTIN

While the world watched on February 18, 2021, Mars 2020 EDL," says John Nagy, MAVEN Mission Director at NASA Goddard Space Flight Center. 2020 made its entry, descent, and landing onto the surface of the Red Planet. There to greet Mars 2020 "We were told by the Mars Program Office that as it endured the "Seven Minutes of Terror" was MAVEN would be one of two missions (the other MAVEN, the Mars Atmosphere and Volatile EvolutioN being the Mars Reconnaissance Orbiter) receiving mission. MAVEN recorded data from the entire event, the data as the lander entered the atmosphere starting just before Mars 2020 entered the upper and touched down. If something were to go wrong atmosphere until shortly after the Perseverance Rover during EDL, the data collected by the orbiters would touched down on the planet's surface. be vital to determining the issues."

This rendezvous positioning MAVEN above Mars 2020 at precisely the right time and altitude has **Tightening MAVEN's Orbit** been years in the making, but it was never part of MAVEN's original mission. While MAVEN has an When MAVEN was designed, the team chose a Electra ultra-high frequency (UHF) radio transceiver very specific orbit for its instruments to achieve to communicate with Mars ground assets for relay the science mission. While MAVEN was already purposes, the spacecraft was not automatically in serving as an occasional communication liaison an orbital position to support Mars 2020 EDL. with the Curiosity Rover, it would need a new position to support Mars 2020 EDL. The original MAVEN orbit was not naturally conducive to meeting those requirements.

The MAVEN mission launched in November 2013 to explore Mars' upper atmosphere, ionosphere, and interactions with the Sun and solar wind as part of NASA's Mars Scout program. MAVEN As the MAVEN team began an investigation to completed its primary mission in November 2015 determine how to position MAVEN for Mars 2020 and has been operating in an extended mission EDL, the Mars 2020 Mission also asked for studies since then, continuing to investigate Mars' upper of how they could tighten MAVEN's orbit to make atmosphere while providing relay capabilities it an even better relay partner after EDL. With Mars for NASA. The MAVEN mission was designed to 2020 equipped with several color cameras, it can last 2 years in space, but with the spacecraft still produce ten times the amount of data the Curiosity operating normally and the mission managing Rover processed. NASA needs more of its orbiters to its fuel to last through 2030, NASA plans to use be able to relay all of that data home to Earth. Having MAVEN as long as possible to relay data between MAVEN closer in orbit to receive transmissions from Earth and rovers or landers on Mars. the rover would enable more data to be processed faster. Nagy likens it to a cell phone performing "The idea for MAVEN to support Mars 2020 started

better the closer it is to a cell tower or Wi-Fi source. in early 2016, approximately 5 years before Mars

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MAVEN Aerobraking to Achieve Science and Relay Orbit. CREDIT: NASA'S SCIENTIFIC VISUALIZATION STUDIO/KEL ELKINS AND DAN GALLAGHER

The team investigated how low the MAVEN orbit could dip closer to the Mars surface in a new orbit. without damaging the spacecraft or MAVEN's science instruments and without burning too much fuel in the process. The engineers determined that an aerobraking maneuver would work, skimming the spacecraft through Mars' upper atmosphere to slow it. In 2019, the MAVEN team's successful aerobraking campaign to tighten its orbit around Mars reduced the highest point of the MAVEN spacecraft's elliptical orbit from 3,850 to 2,800 miles (6,200 to 4,500 kilometers) above the surface, improving its capabilities as a data-relay satellite.

A stronger telecommunications antenna signal was not the only benefit. Now coming in nearly 1,000 miles (about 1,500 kilometers) closer enables MAVEN to circle Mars more frequently – 6.8 orbits per Earth day versus 5.3 orbits previously - allowing more frequent

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communication with Mars 2020 and future rovers. MAVEN originally carried out about one relay pass per week with one of the Mars rovers. This number could now increase to up to three relay passes a day. With the tighter orbit in place, the MAVEN team began planning a series of maneuvers in 2020 to position it for Mars 2020 EDL.

"Then COVID-19 hit, making everything more difficult," MAVEN Spacecraft Operations Lead Micheal Haggard says. Despite restrictions and safety precautions requiring social distancing and telework, Haggard notes the team did not have to scale back at all, accomplishing all of their work remotely while still supporting special science and all relay requests. The operations team, based at the Lockheed Martin facility in Littleton. Colorado. where the spacecraft was built, continued working closely with the Mars 2020 Mission team at NASA's Jet Propulsion Laboratory (JPL)

leading up to EDL, though the team has not been able to meet in person since February 2020.

Four maneuvers—taking place in the second half of 2020 into early 2021-were needed to sync MAVEN's orbit with Mars 2020's approach at the lowest altitude and necessary angle to capture the EDL data. The final maneuver took place just 2 weeks before the February 18 event. Haggard says after the January maneuver, "the atmosphere wasn't behaving as expected, putting MAVEN off by 70 seconds." The final February maneuver lined MAVEN up within 10 seconds of the desired mark within its 2¹/₂-minute window.

Ultimately the new elliptical orbit of MAVEN also allowed for a much longer recording of the EDL of up to 30 minutes. "After EDL, MAVEN spent 9 straight hours staring back at Earth sending data," says Haggard. Having MAVEN positioned to capture

EDL data along with the Mars Reconnaissance Orbiter enabled everyone at home to see the Mars 2020 landing in near-real time.

During the years and months leading up to the Mars 2020 EDL, the MAVEN flight team was performing testing on the ground and in flight. The ground testing required coordinated efforts with the Mars 2020 team, the JPL Electra operations team, and the MAVEN team. For flight testing, the Mars Science Laboratory mission (Curiosity Rover) was used as a surrogate for testing MAVEN capabilities for its planned Open Loop Recording during EDL.

An Open Loop Recording is a special mode that the MAVEN Electra is placed in to record a wide range of signals coming from a source (in this case Mars 2020). This mode has the greatest chance of collecting all the data. Nagy says, "It is like recording all your local radio stations at once and then transmitting that recording back and then pulling out just your favorite from all the rest. For Mars 2020 EDL, MAVEN recorded 7.65 Gb of raw data. and less than 12 Mb was actual Mars 2020 telemetry from the Open Loop Recording. That's about 0.2%!"

In addition to testing the special modes for recording data, the Electra UHF software was updated for Mars 2020. This had not been done in flight previously with the MAVEN Electra. Many iterations and ground tests were performed in 2020 to certify this new software for flight. In early November 2020, the

of its successful aerobraking new software and firmware campaign, the MAVEN Mission were ready and uploaded to the MAVEN spacecraft. This new firmware provides a new International SpaceOps Award capability for the Mars 2020 mission that will enable it to send 2020. a higher volume of data back Both Haggard and Nagy say to Earth than the previous Mars the MAVEN team takes pride in Science Laboratory mission. seeing the images and hearing MAVEN has the potential to relay audio from Perseverance on the 20 percent more data during up news. Haggard says, "You see to 3 data relays per day and has a new Mars panoramic image already set a record with sending and vou wonder-did MAVEN 1.8 gigabytes back to Earth. transmit that one back?"

When not conducting relay communications, MAVEN will continue studying the upper atmosphere of Mars. The aerobraking campaign and new orbit has already benefitted MAVEN's science mission, enabling 8 weeks of consecutive science as MAVEN reached the lower atmosphere. In recognition



MAVEN

MAVEN is the first Mars mission managed by NASA Goddard Space Flight Center, which provides mission systems engineering, mission design, and safety and mission assurance. The MAVEN mission is a collaboration among:

Operations Team is receiving the for Outstanding Achievement for

Michelle Birdsall / Code 470 Senior Communications Specialist



- NASA's Goddard Space Flight Center
- University of Colorado, Boulder/LASP
- University of California, Berkeley/SSL
- NASA's Jet Propulsion Laboratory
- Lockheed Martin Space Systems



Instrument and Special Projects Division (ISPD)



imagery of internal components prior to flight blanket installation. CREDIT: NASA/GSFC/DESIREE STOVER

discussions began as IPD was already expanding In recent years, a number of small, yet technically challenging and complex projects have been its responsibilities by assisting the Engineering directed or awarded to Goddard Space Flight Technology Directorate with the development Center (Goddard). Some project locations are of the Europa Propulsion subsystem for Johns easily determined, such as those that align with the Hopkins University Applied Physics Laboratory and Science Mission Directorate (SMD), corresponding helping Goddard and the Agency with rideshare science disciplines, and Goddard-located program policies, specifically for the Landsat 9 Evolved offices; others, such as those directed from the Space Technology (STMD) or Human Exploration and Operations (HEOMD) Mission Directorates, are more complex. This provided an opportunity for **ISPD FACTS** the Flight Projects Directorate (FPD) to assess its Divisions and those that align closely with these Do you know the difference types of projects.

Due to its experience managing some of the Agency's largest and most complex instrument projects, Code 490, previously called the Instrument Projects Division (IPD), entered these discussions almost immediately. Many IPDmanaged instruments range in size and scope, some comprising that of entire missions. Its track record for delivering in-house instruments and payloads on time (or early) and under budget provides a strong foundation for additional complex projects, as seen with the deliveries of the OSIRIS-REx Visible and near-Infra-Red Spectrometer (OVIRS), Neutron star Interior Composition Explorer (NICER), Global Ecosystem Dynamics Investigation (GEDI), X-Ray Imaging and Spectroscopy Mission (XRISM) Resolve, and Thermal Infrared Sensor-2 (TIRS-2). These

ISPD photographer, Barbara Lambert, prepares to capture LCRD integration. CREDIT: NASA/CHRIS GUNN

(left) XRISM Resolve X-ray calorimeter in test at GSFC. (right) ISPD photographer and LRALPH engineer capture critical closeout

between an instrument and a payload?

A **payload** is a mission-enabling system that is not an integral part of the carrier vehicle. An **instrument** is a device that measures the present value of a quantity under observation; it is a payload that collects scientific data to meet mission objectives.

A payload isn't always an instrument. For example, a technology demonstration communication system doesn't collect scientific data, but it does transmit the collected data to its intended recipient.



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 These codes will be deactivated following project commissioning and available for other use. Duplication will be eliminated following LCRD code deactivation.

'Ralph)	Lucy Ralph (L'Ralph) is a high-heritage version of the New Horizons Ralph instrument optimized for Trojan asteroid science.
(TIRS-2)	The Thermal InfraRed Sensor (TIRS-2) instrument measures land surface temperatures in two thermal

bands using quantum well infra-red photodetectors to detect heat with a spectral resolution of 120 meters.

The Ocean Color Instrument (OCI) is the primary instrument on the PACE mission, whose goal is to take global measurements of ocean color and atmospheric aerosol properties to advance Earth system science and applications.

ISPD is managing the Do-No-Harm qualifications and integration of 15 cubesats to be delivered as a secondary spacecraft and launched with Landsat 9 this year.

ISPD's Artemis Office is in its initial set-up phase and will provide project management for a portfolio of multiple small efforts for

Continued on page 16 me 29 Number 1 SPRING 2021 15

Expendable Launch Vehicle Secondary Payload Adapter ring Flight Systems.

The Center then decided to formally expand the Division to include in-house technical demonstration projects and lunar instruments, renamed as the Instrument and Special Projects Division (ISPD). This realignment provides better support of NASA's lines of business, including Earth, Heliophysics, Planetary, and Astrophysics, while also utilizing its established infrastructure to meet ISPD commitments with Goddard's other directorates. The reorganization was strategically implemented, utilizing an innovative approach to numbering organizational codes and minimizing any impacts to its existing projects. ISPD implemented four parent organizations that map directly to SMD lines of business. A fifth organization focuses on special projects that align to STMD and HEOMD and also serves as a catch-all for any other special projects, while the final parent organization is allocated for rideshare projects. This method also enables each parent organization to support up to nine individual projects, with the remaining parent organizational codes eventually unassigned, providing flexibility to expand as needed in the future. The reorganization

is being implemented in phases so that as existing projects are commissioned and therefore, their codes are deactivated, the full code realignment will be complete.

ISPD continues its responsibility for the management, coordination, development, and implementation of an expanded scope of scientific instrument and payload projects in support of NASA Headquarters and its Directorates. Specifically, ISPD provides technical leadership for the full life cycle of instrument and payload development in support of system definition, analysis, and implementation.

The ISPD is extremely excited for its future and is grateful to the entire Division, its projects, and the other directorates for their outstanding teamwork, which has enabled Goddard to adapt in support of new and exciting opportunities. ISPD is critical to the Center and its support of these complex instruments and payloads. This reorganization enables increased capacity and efficiency for project management.

Rachel Brinson / Code 420 Senior Technical Writer



ISPD's Artemis Office is in its initial set-up phase and will provide project management for a portfolio of multiple small efforts for the Artemis program. CREDIT: NASA



ISPD Captures

ISPD is extremely dependent on its photo documentation team to capture the moments and details critical to the development of every in-house instrument and payload. The team has worked diligently in recent years to capture not only the beautiful and detailed images of spaceflight development, but also designed a narrative and evidence that is integral to developing hardware. The team works closely with Goddard engineers and scientists to photograph engineering parts, tests, and the integration of flight components during all

The team's photographs have been used by project personnel for real time analysis, training, and anomaly resolution. A few examples include:

ATLAS



Photos for the Advanced Topographic Laser Altimeter System (ATLAS) instrument enabled a failure review board to determine the cause of an inadvertent door actuation that resulted in a design change to the door mechanism.

L'RALPH



L'Ralph instrument imagery of the Linear Etalon Imaging Spectral Array (LEISA) Opto-Mechanical engineering test unit was enhanced for evaluation. Like CSI detectives, the photo team used processing software to modify shading and shadows, colors and hues to determine if pre-existing cracks were a factor in the H2RG ceramic multilayer board (CMLB) bond failure. Results definitely showed a small vertical line that was inconsistent with the rest of the part surface.

TIRS-2



A recent evaluation of TIRS-2 harness configuration photos proved inconsistencies with fabrication resulting in significant re-work of many cables and harnesses. This effort required intensive macro photography of each connector and harness configuration. Approximately eleven work orders, each with nearly 400 events, and over 2,000 images required detailed reviews to validate correct association of imagery and metadata accuracy.

phases of spaceflight development. The team is kept extremely busy given the constant high volume of ongoing activity within ISPD.

This photo documentation specialty has evolved to require intensive storage/retrieval systems and training/certifications for electrostatic discharge, fall protection, confined spaces, laser safety, and all cleanroom activities. Additionally, these activities require travel across the nation to support all phases of development and delivery.

FPD **Project Support** Community Spotlight

The Project Support Community Spotlight seeks to recognize and connect members of the project support community across the Flight Projects Directorate. Additionally, resources and relevant information will be highlighted in each Critical Path publication. The Critical Path team looks forward to connecting with and highlighting the project support community.

How can we support you?

Contact FPD Project Support website for general information.

- Admin Space Station (AdSS) for Goddard Space Flight Center (GSFC)
- Flight Projects Directorate Project Support
- 0
- Ľ (301) 286-6307
- 0
- (301) 286-6567



Karla Kahler

Instrument and Special Projects Division (ISPD) **Project Support Manager**

Karla Kahler, a Project Support Manager for the Instrument and Special Projects Division (ISPD), has worked at Goddard Space Flight Center for 18 years. She has worked in her current role in the Instrument and Special Projects Division for seven years. As a Project Support Manager, Karla manages the space that is utilized for in-house instruments and for the division. In addition to her role in space management, she also coordinates several critical processes within the Instrument and Special Projects Division. This includes coordinating office moves, acting as a property custodian, providing launch support and training Project Support Specialists for the instruments projects. Karla also assists the Instrument and Special Projects Division in event planning and presentation preparation. When asked her favorite part about her role in the Goddard community, Karla says, "The people I work with and every day is different, because you never know what may need to be handled each day." Outside of her role at Goddard, Karla enjoys traveling and helping her family and friends decorate their homes. Karla is also an Emergency Medical Responder in the volunteer Fire Department, Essex, MD.

Sarah Harnish / Code 400

Flight Projects Directorate COVID-19 Updates

March marked a one-year anniversary of or common areas, regardless if you are alone or if mandatory teleworking for the Center. Despite you have been fully vaccinated. Violations will be many COVID-19 related obstacles, our Flight handled the same as any other conduct issue. If Projects continue to make a lot of progress and you notice someone without a mask and are not have accomplished many key milestones, as comfortable addressing the policy violator real documented in the monthly FPD Highlight charts. time, you may report the incident to your direct Congratulations to all the teams for working supervisor, the Directorate on-site representative through COVID-19 related adversities and changing (Rich Burns, rich.burns@nasa.gov), or the Code the way we do business to adapt to the situation. 300 Anonymous Safety Concern form: https:// As a result, we look forward to the launches of safety1st.gsfc.nasa.gov/form/report-a-covid-19-LCRD this summer and Landsat 9, ESPA Flight safety-concern. System, Webb, and GOES-T later this year. The Center has now offered two on-site vaccination Though the Center is currently still in Stage 3, a events through Safeway. Initially, the Center had notional date in June has been set for transitioning adopted the Agency's tier approach to vaccinations to Stage 2 and planning is underway. The timing but moved to a first come, first serve lottery system of the transition will depend upon the local for efficiency. The first successful event was held COVID-19 conditions and infection rates, local on April 8 and all slots were filled within 14 minutes. The second event will be held May 7 with a prehospitalizations, the availability and percentage of vaccinations, etc. Each GSFC campus may registration priority given to those who need to transition to Stage 2 at different times. However, work onsite three or more days per week. Given the Stage 2 will probably not look much different for popularity of these events, which fill up quickly, and most of us. The current NASA framework for the increased supply of vaccines in the community, Stage 2 states that employees who must be onit is recommended that employees who want a site to perform their work may return on-site with vaccine don't wait to get vaccinated at Goddard, if you can be vaccinated elsewhere. approval and that all other employees will continue to telework. The Center is operating close to those And a final reminder, stay home if you are sick guidelines now, though the approval process will and/or someone in your household is sick or you probably change. It is still expected that employees are waiting for results from a COVID-19 test. To will continue to telework, unless they need to report a COVID-19 case or potential case use perform "hands-on" work. Additionally, by Executive the email distribution (gsfc-dl-covid-reporting@ Order, federal facilities can only operate at a 25% mail.nasa.gov) found on the Center COVID-19

capacity right now. The Greenbelt campus is homepage https://nasa.sharepoint.com/sites/ already operating around a 25% capacity.

If you do need to come on-site, Goddard has a mandatory mask policy. Center management is taking this policy seriously. All employees must wear a mask (3-ply recommended) in all shared GSFC/SitePages/GSFC-COVID-19-Information-and-Updates.aspx to notify GSFC medical personnel.

Sharon Straka / Code 400

FPD Associate Director

LANDSAT9

The Million Scenario March to Launch

Landsat 9 is a successor mission to the highly successful Landsat series, which have continuously acquired multispectral images of the global land surface since the launch of Landsat 1 in 1972.

Artist rendering of L9 satellite above the Earth. CREDIT: NASA/GSFC

The Landsat 9 mission is guickly approaching its planned launch in September 2021. To date, the Landsat 9 team has made excellent progress despite technical challenges, situational complexities, and Sensor-2 (TIRS-2), have been supply chain delays. Completing a mission **SEPTEMBER 202** shipped and integrated. during a global pandemic has provided a number The observatory has also of additional, wide-ranging challenges due to the demonstrated excellent constantly-evolving environment. These range from performance to date during its observatory employee bandwidth hurdles, burnout concerns, and environmental campaign. health obstacles, to finding new ways to conduct remote operations for traditionally all-hands on-site Most notably, the team successfully implemented support activities. remote networks to ensure observatory testing was completed reliably and safely with the majority of The Landsat 9 team continues to demonstrate

OLI-2

The Landsat 9 team continues to demonstrate its resilience and strength, having implemented effective solutions month after month for the past year. Both Landsat 9 instruments, the Operational Land Imager (OLI-2) and Thermal Infrared

(top) A fully integrated OLI-2 Instrument Assembly before the application of the thermal blankets; the two silver radiator panels provide cooling for the Focal Plane electronics and detectors. Credit: Ball Aerospace. (right) Technicians attach the Earth shield to TIRS-2 prior to vibration testing. It will help keep the telescope in a stable thermal environment. Credit: Northrop Grumman. (bottom) Engineers work on the TIRS-2 instrument, which will measure surface temperatures on Earth from the Landsat 9 satellite. CREDIT: DESIREE STOVER, NASA/GSFC.



networks to address information technology (IT) challenges has kept the project on its toes.

Team members developed and are in the process of implementing innovative methods of remote participation to ensure the mission reaches success. One of many examples has been the project's mission operations elements. The current operating environment has required several extensive preparations for exponential launch and operations scenarios in addition to the standard mission operations processes, all of which require a heightened level of execution, rehearsal, and planning. The team is now preparing for mission simulations and detailed rehearsals with most personnel at home, with limited presence on Center.

Landsat 9 mission operations were previously designed as an integrated 'holy trinity' of collaboration. This trinity provided side-by-side communication for vendors (Northrop Grumman as the spacecraft provider and the Ball Aerospace OLI-2 and Goddard TIRS-2 leads), NASA engineers, and the flight operations team. The project had organized entire control centers for in-person collaboration and engagement. The team has since reassessed this strategy and continues to look forward, anticipating scenarios for what the

launch will look like in September-potentially the first off-site mission operations launch in NASA history. The team is preparing for a huge range of eventualities and for any scenario with voice loops, remote links, and distributions of NASA laptops around the country to ensure access to Government networks for mission operations personnel. For those that may be required to be on-site, the team has worked with stakeholders to complete distancing and capacity analysis, as well as plans for plexiglass placement to improve safety. These similar exercises are being completed at the launch site for protection and safety planning.

Landsat 9's launch campaign preparations have also required the same levels of preparation and flexibility as its road to launch. Normal preparations include guest estimates and corresponding guest operations processes, which in themselves require intensive planning. Landsat 9 is preparing for a range of guests, anywhere from all virtual to a thousand well-spaced attendees at Vandenberg Air Force Base.

The project's management team is working diligently to support its workforce and the increased amount of COVID-



The Landsat 9 Mission

Landsat 9 is a successor mission to the highly successful Landsat series, which have continuously SLI program codifies the acquired multispectral images of the global land surface since the launch of Landsat 1 in 1972.

A partnership with the United States Geological Survey (USGS), Landsat 9 is the first component in the Sustainable Land Imaging (SLI) program that was established in 2013 as a national commitment to provide another 30+ years of continuous, consistent, multispectral, global data. The Landsat program provides routine monitoring of land-cover characteristics, naturally-occurring and humaninduced land-cover change, water resources, and more. All Landsat data is also fully compatible with the 45-year record of Landsat observations.

The establishment of the

stable continuity that has been the hallmark of the Landsat series. Previously, a continued desire to maintain two Landsat satellites at all times occasionally resulted in chaotic and timelimited developments. As the Landsat 7 satellite prepares for decommissioning due to limited fuel, Landsat 9's development has been well planned and, despite COVID impacts, it is imperative that Landsat 9 takes to the sky.

The Landsat data archive constitutes the longest continuous moderate-resolution record of the global land surface as viewed from space.

related work, worried of the burden on the team and morale. All this aside, team dedication is higher than ever as they progress daily toward a successful launch. Landsat 9 and its team have proven the value of flexibility and innovation, and its remote operations and testing will change how NASA works from here on out. While overcoming numerous challenges and disadvantages, and recognizing the value of informal social hallway interactions, the team has also discovered the value of the many advantages, new ways to do business, and potential cost savings of remote operations. Many of the methods implemented by the Landsat 9 team are likely to be used for generations to come and

have clearly demonstrated the capacity and flexibility of the Agency and its teams.

The Landsat series continues to lead the world in a number of ways and the Landsat 9 team is excited to bring the next iteration to fruition in the coming months. From *Midnight Sky*, the recent George Clooney movie, to Kong: Skull Island, to nearly every History Channel or Discovery Channel series referencing the Earth's surface, Landsat's importance is known worldwide. Add this to the amazing scientific discoveries and assessments made daily using Landsat data, and it is easy to see why the Landsat 9 team works hard each day, even in the face of a global pandemic.

Rachel Brinson / Code 420 Senior Technical Writer. Earth Science Projects Division



Landsat-9 Observatory being pushed into the thermal vacuum chamber. CREDIT: NORTHROP GRUMMAN

Landsat 9 vs. Landsat 8

Although Landsat 9 was initiated as a rebuild of Landsat 8. the project must change with the times by making critical improvements beyond Landsat 8's capabilities.

Landsat 8 provided significant benefits to the user community above and beyond previous Landsat iterations, including improved radiometric performance, additional spectral bands, excellent calibration, and 735 scenes acquired per day. Landsat 9 inherited these contributions while continuing to deliver substantial improvements, including: continued support for new applications, 14-bit vs. 12-bit reflective band data, and thermal stray light corrections to improve atmospheric correction.

The Landsat 9 project team has worked diligently to balance implementing the rebuild while minimizing changes and risks against updating architectures to meet new requirements and improvements.

Given the generational differences from Landsat 8, Landsat 9 also required building to increased specifications in several areas to meet the requirements of a new generation of NASA spacecraft. This evolution of NASA requirements includes significant upgrades to spacecraft electronics and software. Additionally, TIRS-2 has also benefited from full redundancy for TIRS-2 in comparison to previous requirements. In some cases, Agency standards have become more substantial. This is particularly true of orbital debris protections, which were still evolving during Landsat 9 development. All of these elements had to be thoroughly addressed, many of which required extensive assessment of previously unaccounted-for unintended consequences.

LUC9'S PURSUIt °F DIAMONDS IN the sky

One of the principal roles that NASA plays in our society is to help us understand how the world in which we live came to be - how a swirling mass of gas and dust, in orbit around the Sun, turned into a complex planet like the Earth that can support life. One thing that we now understand is that the Earth did not form in a vacuum (pun intended), but instead grew as part of a system; where the young planets pushed each other around, fighting for resources in order to grow. What is left of these resources are what we today call asteroids and comets. While these so-called small body populations witnessed, and were shaped by, the planet formation process and the early evolution of our Solar System, they have remained relatively unchanged since then. Thus, they contain vital clues to our origins. If we want to understand the Earth, we must first understand these little worlds. Given their enormous value to unraveling our history - asteroids are truly diamonds in the sky.

Lucy, which is lucky number 13 in the Discovery program, will be the first space mission to explore a population of small bodies known as Trojan asteroids. As the artist conception on the next page shows, the Trojans are outer Solar System asteroids that orbit the Sun "in front of" and "behind" the gas giant Jupiter. Jupiter is massive enough that normally it scatters away all bodies in its vicinity, but due to the combined gravitational influences of the Sun and Jupiter, these Trojan asteroids have been trapped on stable orbits since the era when the planets formed.

The Lucy mission is named after the fossilized skeleton of an early hominin found in Ethiopia in 1974. That Lucy was named during a celebratory evening spent dancing and singing to the Beatles' song "Lucy in the Sky with Diamonds." Just as that Lucy fossil provided unique insights into the origin of humanity, the Lucy mission promises to revolutionize our knowledge of the origin of humanity's home world.

One important clue from the Trojans is that they are physically different from one another. In order to determine what this hint is telling us about the history of the Solar System, we need to examine objects that sample this diversity. Enter the Lucy mission. Lucy will study a total of seven Trojan asteroids and one main belt asteroid. No other space mission in history has been launched to as many different destinations in independent orbits around the Sun!

Lucy is slated to launch from NASA's Kennedy Space Center at Cape Canaveral, Florida on an Atlas V 401 rocket during a 21-day launch period starting October 16, 2021. It will first fly by the

Earth for two gravity assists before it begins its journey out to the Trojan asteroids.

On its way to the Trojan asteroids, Lucy will travel through the Main Asteroid Belt and fly by its first asteroid in April 2025. It will fly by (52246) Donaldjohanson, an asteroid that the Lucy team named after one of the codiscoverers of the Lucy fossil.

Lucy will continue outwards into the leading swarm of Trojan asteroids, the L4 Trojan swarm. This is also known as the "Greek camp" of Trojan asteroids as most of the asteroids in this swarm (other than the Trojan "spy" Hektor) are named after Greek characters from around the time of the Trojan war. Lucy will fly by four of these "Greek" Trojans: (3548) Eurybates with its satellite Queta in August 2027, (15094) Polymele in September 2027, (11351) Leucus in April 2028, and (21900) Orus in November 2028.

The spacecraft's orbit will then take Lucy back towards the orbit







ORUS

PATROCLUS



LEUCUS



An artist conception of Lucy flying by a target in the L5 Trojan Swarm. CREDIT: NASA

of Earth. When its orbit takes the spacecraft outwards again, Jupiter and the Trojan swarms will have rotated so that the spacecraft will pass through the trailing L5 swarm of Trojan asteroids, otherwise known as of 2033, Lucy will fly past the Greek "spies" in the Trojan camp,

(617) Patroclus and its binary companion Menoetius. The flyby of this binary asteroid pair will be the grand finale of the mission. However, Lucy will be on a stable orbit and can continue flying through the Trojan swarms for the "Trojan camp." Here, in March many years to come.

> ARTIST CONCEPT Lucv's seven targets: the binary asteroid Patroclus/ Menoetius, Eurybates, Orus, Leucus, Polymele, and the main belt asteroid DonaldJohanson. CREDIT: NASA

FURYBATES



ONALDJOHANSON

POLYMELE

Continued on page 26 Volume 29 Number 1 SPRING 2021 25

Lucy is over 14 meters (over 46 feet) from tip to tip, but most of that is the huge solar panels (each over 7 meters (almost 24 feet) in diameter) needed to power the spacecraft as it flies out beyond the orbit of Jupiter. It will reach 5.7 AU, which is farther than any solar powered spacecraft has traveled from the Sun – another record for Lucy. All of the

instruments, and the 2-meter (6.5 foot)-high gain antenna needed to communicate with Earth, are located on the much smaller spacecraft body.

Lucy's instrument pointing platform, shown on the next page, will carry the suite of instruments for remote-sensing science to study the Trojan asteroids:

L'RALPH



L'Ralph, built at Goddard, is two instruments in one. The Multi-spectral Visible Imaging Camera (MVIC) will take visible light color images of the Trojan asteroids. L'Ralph also has an infrared imaging spectrometer, or Linear Etalon Imaging Spectral Array (LEISA). LEISA will allow us to look for the absorption lines that serve as the fingerprints for different silicates, ices, and organics that may be on the surface of the Trojan asteroids.

L'LORRI



L'LORRI, the Long Range Reconnaissance Imager is the high spatial resolution panchromatic visible imager, built at the Applied Physics Laboratory (APL). This camera will provide the most detailed images of the surface of the Trojans. It will also be used for navigation.

L'TES



L'TES, the Thermal Emission Spectrometer, was built at Arizona State University. This far infrared spectrometer will allow the Lucy team to learn more about the properties of the Trojans such as their thermal inertia and how well the bodies retain heat. This insight will help us to understand the composition and structure of material on the surface of the asteroids.

In addition to these instruments, Lucy will use its high gain antenna to determine the masses of the targets by using the Doppler shift of the radio signal. Lucy will also use its terminal tracking camera (T2CAM) to take wide-field images of the asteroids to better ascertain the asteroids' shapes.

Assembly of the Lucy spacecraft is practically complete. As of this writing, environmental testing

is scheduled to begin mid-March, putting it one step closer to launch and its 12-year journey in pursuit of "diamonds" in the sky.

Hal Levison / Southwest Research Institute Principal Investigator



(Left) Lucy's Instrument Pointing Platform. (Right) One of Lucy's 7.3 m solar arrays. CREDIT: NASA

The mission is led by principal investigator (PI) Hal Levison and Deputy PI Cathy Olkin of Southwest Research Institute, and is managed by NASA Goddard. The spacecraft is being built at Lockheed Martin Space in Littleton, Colorado. Instruments have been contributed by Goddard, Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland, and Arizona State University in Tempe, Arizona. KinetX in Simi Valley, California, will provide mission navigation. Launch operations will be conducted by NASA's Kennedy Space Center. As a Discovery Class mission, Lucy is overseen by the Planetary Missions Program Office at NASA's Marshall Space Flight Center in Huntsville, Alabama, for NASA's Planetary Science Division.

The completed Lucy spacecraft with the solar arrays in the stowed position. CREDIT: NASA

Hubble's Treasure Trove of Less-explored Data

Over Hubble's 30 years in space, the telescope's images and discoveries have become a science news staple. Its striking cosmic pictures have made their way into movies, decorated the walls of classrooms and museums, and been plastered across phones and computer screens.

But Hubble has also spent those decades quietly building up a treasure trove of lessexplored data in its archives. Recent projects, an online feature showcasing unreleased astronomical images and a new ebook on the history of Hubble operations, dig into that mountain of information.

In celebration of its 30th anniversary in 2020, Hubble added 50 newly processed images of 30 galaxies, nebulae and star clusters to its Hubble's Caldwell Catalog website

feature. The Caldwell Catalog is a famous skywatcher's guide featuring astronomical objects in the Northern and Southern hemispheres that can be seen with telescopes, binoculars, or even the naked eye. Hubble's version provides the space telescope's view of each Caldwell object along with a description, skymap, and instructions on how to find the object in the night sky. The project's audience was primarily amateur astronomers, but its appeal extended farther.

"My main hope is that even if people aren't amateur astronomers and don't have a telescope, this will inspire people to go outside and look up and try to find these objects themselves," says Vanessa Thomas, Hubble science writer and one of the creators of Hubble's Caldwell Catalog. "Once you've seen the object with your own eyes, you

feel more of a connection to it. and this was a way to connect Hubble's images to our audience in a new way."

The catalog garnered over 300,000 views online after the additional images of the 30 objects were released on December 11, 2020, and was shared extensively on social media. The images were also featured on dozens of morning and news shows.

To find the unreleased images, data analyst and image processor Gladys Kober delved into the public Barbara A. Mikulski Archive for Space Telescopes to collect exposures of Caldwell objects that had been observed by the telescope. The first iteration of Hubble's Caldwell Catalog, made available in 2019, primarily featured images that had already been released, but the anniversary celebration's

additional images in December 2020 had to be processed by Kober from the raw, black-andwhite data to create striking cosmic vistas.

The objects appearing in binoculars or backyard telescopes will often be faint, fuzzy patches of light – but that's part of the appeal of the Hubble version of the catalog, says Thomas, an amateur astronomer. "You may see some details in a backyard telescope but when you see Hubble's image you just say 'Wow' and realize how incredible Hubble's resolution is and what it can do."

Hubble's unique abilities, and the people behind them, are the focus of "Not Yet Imagined: A Study of Hubble Space Telescope Operations." Published through the NASA Headquarters History Office, the downloadable ebook explores Hubble history from its launch through its first 30 years of operation, focusing on the decisions that made the telescope what it is today as

well as Hubble's contributions to advancing space science. After being made available on January 6, 2121, the book's web page had more than 23.338 visitors over the course of the month. breaking records for NASA history ebooks.

Author Chris Gainor refers to the book as an "early draft of history," written to capture a mission in motion. "When we have 30 years of operations under our belt there's still a lot to talk about." he says, noting that the documents collected and interviews he conducted for the book over the course of 5 years have been preserved for future researchers. "Hubble is still going strong so it's kind of history on the run."

The Hubble project worked closely with Gainor to provide him with contacts, historic documents, access to facilities, interviews and more. It was important to capture the historical record now because people who originally worked on the project have departed and information can be lost to time - especially since Hubble was launched in a pre-internet world. The book explores such decisive events as the Hubble mirror flaw and repair, and dives deep into the telescope's servicing missions, probing the decisions behind keeping the telescope not just functioning but on the edge of technological advancement. Hubble has endured both urgent repair missions and a cancelled mission that was eventually restored, and the book relays the considerations and decisions that undergirded each move in

a fascinating behind-the-scenes look at operations in action.

The book also tackles lesserknown successes. "One of the big arguments I made in this book is that astronomy is much more of a team activity today than it was 30 years ago and Hubble was a big driving force in that," Gainor says, noting such developments as the creation of Hubble's open online archive of data and publicly released digital images. "Hubble had a big role in freeing up information and happened to come along at a time when the internet was exploding. Some of the first things people were downloading were things like the Hubble Deep Field. So Hubble was one of the early stars of the internet."

Gainor hopes the book will help readers understand how astronomy happens today and how connected it has become. "People think of Hubble as a big satellite in space, but there's this huge infrastructure on the ground, all sorts of people working at Goddard, astronomers around the world. You can be sitting here in Victoria (Canada) or Maryland or Afghanistan or India and you can get time on Hubble, which is amazing. Part of the idea behind the book was to kind of put it in one place, the whole story of Hubble operations and how it all happened. I view the book as part of NASA's institutional memory."

Tracy Vogel / Code 440 Astrophysics Projects Division **Technical Writer**

NASA's Laser Communications Relay Demonstration showcasing the benefits of optical communications from space. CREDIT: NASA

NASA's Laser Communications Relay Demonstration (LCRD) is blasting off this year!

The mission will showcase the unique capabilities of optical communications, which uses infrared lasers to send and receive data. LCRD will be NASA's first two-way optical communications relay system, transmitting information between ground stations in Hawaii and California and eventually between orbiting missions and Earth.

Currently, NASA missions primarily rely on radio frequencies for space communications. Radios have a proven track record of success, providing mission-critical services since the advent of space exploration. However, as space missions collect more data, the need for enhanced communications capabilities is paramount.

Optical communications will provide significant benefits for missions, including data rates 10 to 100 times higher than comparable radio frequency systems. LCRD will prove the capabilities and benefits of optical communications while providing engineers with an opportunity to experiment with optical capabilities in an operational environment.

Both radio waves and infrared lasers are forms of electromagnetic radiation with wavelengths at different points on the spectrum. Missions encode their data onto the electromagnetic signals to send back to Earth. The infrared light used for optical communications differs from radio waves because it packs

the data into significantly tighter waves, resulting in more data at once. More data yields more information and increased discovery about space.

LCRD will demonstrate data rates of 1.2 gigabits per second - faster than what most Americans experience through high-speed internet links, which usually top out at 900 megabits per second. The LCRD mission will demonstrate these capabilities from the U.S. Department of Defense's Space Test Program Satellite 6. The spacecraft will be located in geosynchronous orbit, 22,000 miles from Earth's surface.

Through the mission's experimenters program,

LCRD will spend its first two years testing optical communications capabilities with experiments from NASA, other government agencies, industry, and academia. These tests will help the aerospace community refine optical technologies, increase knowledge, and identify future applications. Some of the experiments include studying atmospheric disturbances on laser signals, demonstrating reliable relay service operations, and learning more about optimetrics, a navigation technique that judges distances over optical links.

SUMMER 2021

After its experiment phase, LCRD will transition to mission support, sending and receiving operational data to and from satellites. LCRD's first in-space user will be the Integrated LCRD Low-Earth Orbit User Modem and Amplifier Terminal (ILLUMA-T) on the International Space Station. The terminal will transmit high-resolution science data from experiments onboard to LCRD, which will then relay the data to ground stations. Optical terminals are ideal for missions like the space station because they require less size, weight, and power – a key benefit when designing mission concepts.

The knowledge gained through LCRD will help NASA prepare for optical terminals going farther into space than ever before. Through the Artemis program, NASA plans to create a sustained lunar presence and journey on to Mars. When astronauts are living and working on the Moon, they will need reliable communications with mission control. LCRD will pave the way for future optical communications missions by demonstrating and testing the unique capabilities of this technology near Earth.

Katherine Schauer / Code 450 Technical Writer, Exploration and Space Communications

LCRD transferring critical data over laser beams, leveraging the power of infrared light. CREDIT: NASA

Combined Federal Campaign (CFC) 2020

Over 50 years of making a difference

Thank you to the FPD co-captains, Susan Wright and Karen Rogers.

Code 400s final donation total is \$54,823. The center reached its goal and beyond with 167%.

THANK YOU FOR SUPPORTING THE COMBINED FEDERAL CAMPAIGN!

Instruments Complete Integration

Technicians installed the fourth and final instrument, the Cross-track Infrared Sounder, on the JPSS-2 spacecraft in late January. CREDIT: NORTHROP GRUMMAN

satellite is running as it would in space.

On January 28, 2021, three technicians at a spacecraft facility in Gilbert, Arizona, finished bolting the fourth and final instrument to the Joint Polar Satellite System 2 (JPSS-2) spacecraft. The instrument was the Cross-track Infrared Sounder, known as CrIS, and the moment marked the completion of mechanical integration, a major milestone for the JPSS mission.

JPSS-2 is the second in a series of four polarorbiting observational weather satellites developed by the National Oceanic and Atmospheric Administration (NOAA) and NASA. Like its predecessors Suomi-NPP and NOAA-20, JPSS-2 will provide critical data used in daily weather forecasts and severe weather events, and it will monitor the environment into the 2030s.

While onboard JPSS-2, CrIS will "measure energy at various heights in the atmosphere within the infrared spectrum," said Keith Walyus, JPSS Flight Project Manager. CrIS then "translates this energy into water vapor and temperature readings, which are used in weather models to create forecasts."

After years of preparation, "we now have a complete satellite," said Mike Bruckner, JPSS Deputy Observatory Manager for JPSS-2, 3, and 4. "The satellite is in its final state of build that it will be when launched," Bruckner said.

Starting in early April, the satellite will undergo a rigorous series of performance and environmental tests. Compatibility tests are conducted to make sure each individual instrument is functioning, the

Environmental testing generally consists of three types of tests – an electromagnetic interference (EMI) test, a vibration test, and a thermal vacuum test. The EMI test ensures that the instruments are operating within the correct frequencies and not interfering with one another, the JPSS-2 spacecraft, or any other spacecraft in nearby orbit. During this test, the JPSS-2 satellite will be enclosed in an EMI chamber to "test the susceptibility of the various parts of the spacecraft by bombarding it with different electromagnetic frequencies," Walyus said.

instruments are working together, and the entire

The vibe test, also known as a jitter, shock or acoustic test, involves shaking the spacecraft on all three axes to simulate the JPSS-2 launch environment.

The thermal balance and thermal vacuum tests begin in October and wrap up the JPSS-2 environmental testing in early 2022. The thermal vacuum (TVAC) test cycles the satellite through the lowest and highest expected temperatures it will encounter in the vacuum of space.

Finally, a comprehensive performance test will be conducted to make sure the satellite and its instruments are operating properly. Then JPSS-2 will be packed up and shipped to Vandenberg Air Force Base in California where it will launch in 2022.

Brian Frey / Code 470 JPSS Information Security Analyst

FOCUS ON FACILITIES

will feature improved accessibility and increased If you have visited Goddard recently during the Center's Stage 3 COVID-19 protocol, you may parking capacity. have noticed a significant amount of construction The Code 224 Energy Management Team was occurring at the South Gate and Building 17. These involved to ensure that the new equipment installed projects are part of an ongoing modernization was Energy Star certified and eligible for rebates. effort, consistent with the Center's Master Plan, The selection and installation of energy efficient to showcase the Center's focus on 21st century equipment provides a measurable cost savings to research and development by rerouting incoming the Government by reducing the amount of energy traffic to ICESAT Road and through the newest consumed by necessary building functions. This part of the Center. Building 17 will serve as the equipment includes packaged heating, ventilation first point of entry to the Center for both staff and and air conditioning (HVAC) units, variable visitors. All of the functions currently located in frequency drives (VFDs), and lighting fixtures and Building 9, such as the badging office, locksmith controls. and key shop, and protective services will be relocated to Building 17. The execution of this project was performed

The renovation of Building 17 is scheduled to be Technical Services (FaCETS) contract with incompleted in late 2021, with occupancy occurring house Code 224 Architectural and Engineering in the first two guarters of 2022. When completed, (A/E) services as a major repair project. This in addition to relocating the functions currently approach provided a significant cost savings to housed in Building 9, the 30,345-square-foot NASA, and showcases the abilities of Code 224 renovation will also rehouse the Offices of the in-house staff to execute a full-scale restoration Inspector General and Office of Human Capital project from planning to the completion of Management (OHCM), which are being relocated to construction. Retaining in-house A/E services Building 17 from Building 1 as part of the Center's ensured that a high level of understanding was Greenbelt Rehousing Initiative. brought to the modernization and improvement

Design enhancements include significant improvements to controlling and enabling access to GSFC. The new Badging Area (2,700 square feet) date. 🔳 will be more than 2.5 times the size of the current Bill Glenn / Code 400 badging lobby (999 square feet) in Building 9 and Mission Support Manager

using the Facilities Construction Engineering and

to GSFC access, while maintaining the safety and security to all that pass through the main center

IN MEMORIAM

Kristopher L. Copple, Site Manager at the Guam Remote Station (GRS) recently paid tribute to the life and service of Mrs. Aurora Martinez.

Aurora Marie Arriola Martinez resigned from a prestigious law firm in Guam as a legal secretary to join Peraton on June 25, 2012. Assigned to GRS as an administrative assistant, Mrs. Martinez soon proved to be more valuable to NASA by taking on the challenging responsibility of COMSEC Account Manager. Aurora provided 100% accountability, controlling inventories, audits and physical security of all COMSEC material and equipment, recognized by the Central Office of Record as a leader in the industry.

Aurora served in numerous additional roles extremely important to the success of GRS, including the primary budget manager, responsible for an annual material and contract budget of approximately \$375K. Aurora Martinez

She served as a Government purchase cardholder and purchase requisition manager, provided essential support to personnel responsible for management of maintenance, vehicle support and cleaning services, and maintained operating procedure catalogs, training requirements, recordkeeping systems and database administration. She voluntarily assumed mission-critical roles as an alternate logistics specialist responsible for shipping and receiving, as Alternate Precision Marine Environmental Laboratory (PMEL) calibration coordinator, and as the Physical Security Manager responsible for maintaining visitor requests, security clearance and access control to the site.

Aurora received special recognition from NASA on four occasions during her tenure. On October 30, 2020, Aurora earned the Copper Award for ensuring the Space Network procured missionessential equipment through

a newly defined procurement system. On March 22, 2020, Aurora received a Platinum Award for providing exceptional administrative support to both the Peraton and NASA teams who met the highest level of customer satisfaction. On July 23, 2019, she received the Bronze Award for maintaining GRS' equipment calibration process and for reconciling two databases of test equipment between the White Sands Complex (WSC) and GRS. On January 1, 2015, Aurora received the Lightning Award for exceptional service and commitment.

Aurora's generosity touched everyone at GRS as she made every effort to boost everyone's morale by distributing greeting cards, donating homemade baked treats to the Operations team, and by hand sewing protective masks during the COVID-19 pandemic.

How does one express the amazing essence and spirit of Mrs. Martinez and her selfless generosity, uncompromising belief in all that is good and her unwavering commitment to family and friends? Aurora exemplified life, love, laughter and was faithful to her God, her family and everyone at GRS. We remember her as an amazing person who played a unique and special role in all of our lives.

Extracted from Women of SENSE tribute

Kristopher L. Copple GRS Site Manager

December 29, 1954 to April 17, 202⁻

It is with a heavy heart we share with you that Greg Smith died on Saturday, April 17, 2021. Greg had only recently retired, and this news is challenging for many of us to process. His last day of civil service was January 29, 2021, marking the completion of more than 47 years of service to NASA and the Federal Government. Greg started his Federal service career in 1973 when he entered the United States Air Force Academy (USAFA). Upon graduation in 1977, he began his active-duty military career as a 2nd Lieutenant, was assigned to the USAF Strategic Air Command at Grand Forks Air Force Base (AFB), North Dakota, and rose in rank and responsibility over the next 4 years.

After promotion to Captain in 1981, Greg accepted an assignment to USAF Air Training Command Communication-Electronics Officer School at Keesler AFB, Mississippi. He served as the class leader and achieved the highest ever grade point average at the school. In 1982, Greg accepted an assignment to the USAF Systems Command Space Division Shuttle Test Group at Vandenberg AFB, California. After learning and implementing the communications subsystems for the Vandenberg Space Shuttle Launch and Landing Site, Space Division asked Greg to support the NASA Goddard Meteorological Satellites Office in 1987. Here, Greg served as an Instrument Manager (IM) for the Energetic Heavy Ion Composition Experiment (EHIC), the Magnetospheric

Atmospheric X-Ray Imaging Experiment (MAXIE), and the Remote Atmospheric and Ionospheric Detection System (RAIDS) instruments.

Upon his separation from the USAF in 1989, Greg joined NASA and continued on as IM for these instruments. He also became the IM for the Advanced Microwave Sounder Unit-B (AMSU-B) and his aptitude earned Greg a position in GSFC's 1990 inaugural class of the Project/Program Management Development Emprise (PMDE). In 1995, Greg became the deputy project manager the of the Ice, Cloud, and land Elevation Satellite (ICESat). He served in this position until 2002 when he was promoted to the role of Chief of the Rapid Spacecraft Development Office (RSDO). Greg adeptly led the RSDO for more than 18 years, personally serving as the Source Evaluation Board Chair for 19 main contracts and their extensions and overseeing the procurement of eight mission spacecraft.

Serving others brought Greg great joy and he recently shared with me he felt fortunate he was able to do so throughout his career. He was a great man with a kind heart and a gentle demeanor. He was also generous of his time and was patient with me as I learned how to lead the Project Formulation and Development Office (PFDO) where the RSDO resides. I will miss our conversations very much. Greg is survived by his wife, Jenny, who has our deepest sympathies during this challenging time.

Scott Schwinger / Code 401 Associate Director, Project Formulation and Development Office

Dave Parker supported Hubble through several servicing missions. CREDIT: ALL PHOTOS COURTESY OF CHRISTY HANSEN

Remembered for his pioneering spirit to advance NASA missions, especially Hubble Space Telescope servicing missions, we Dave's NASA accomplishments said goodbye to our colleague and friend, Dave Parker. Dave's courageous journey as he fought Amyotrophic Lateral Sclerosis (ALS), Lou Gehrig's disease, was nothing short of inspiring. His remarkable engineering contributions to the NASA/ Goddard community since 1992 and his ability to adapt to personal challenges while undergoing treatment for ALS were featured in the summer 2020 publication of The Critical Path. Thomas Zurbuchen, Associate Administrator for NASA's Science Mission Directorate, acknowledged Dave's passing and the dedication of one of his favorite Hubble images - the celestial snow angel - in his honor.

Dave's wife, Christy Hansen, Code 400, held an outdoor

Celebration of Dave's Life on April 10th at Centennial Park in Ellicott City, MD. It highlighted and adventures, his brave battle against ALS, his friendship, and his love of family. Dave survived ALS longer than most and amazingly worked and contributed to his NASA mission up until his last day! Christy acknowledged her gratitude to the Code 400. Code 500. and Headquarters leaders for attending. She also appreciated the long-term tremendous support of Dave's Goddard "family" of co-workers in Code 480. The entire NASA family, Dave and Christy's family, neighbors, and friends have been supporters of Team Dave from the very beginning of Dave's battle with ALS.

As Dave's energetic advocate and devoted caregiver, Christy said that she wished that there was a NASA "Tiger Team" assembled to

combat ALS. She knows firsthand that the focus, technical excellence, never-say-no attitude, passion, and creativity which are required of Tiger Teams to tackle the toughest challenges would be able to cure ALS in the spirit of failure is not an option.

Christy and Dave's family were touched by the outpouring of support when presented with a generous contribution for Dave's Memorial Fund from the "Team Dave" supporters to honor his memory and valiant battle against ALS.

marked by kindness and compassion for others, and certainly a life worth emulating. Dave Parker was special; he will be missed by the many NASA family members whose lives he touched.

Russ Werneth / Code 480

Maureen Disharoon / Code 443

Colleen Ponton / Code

He lived a life of many activities and great accomplishments, a life

An outdoor celebration of Dave's life was held on April 10.

Thomas Zurbuchen 7.841 Tweets

Thomas Zurbuchen 🥝 @Dr_ThomasZ · Mar 22 I'm sad to hear of the passing of @NASAHubble Engineer Dave Parker after a long battle with ALS. He was an influential & diligent member of the @NASAGoddard team & I learned a lot from him. #NASAScience leadership dedicates this image in his honor: hubblesite.org/image/2932

Follow

Michigan native. University of Michigan College of Engineering graduate. Bachelor and Master of Science degrees in

Master of Science degrees in Atmospheric Sciences. Car enthusiast. Amateur pilot. Sailor. World traveler. STEM (Science, Technology, Engineering, and Mathematics) advocate. Scientist. Engineer. Proud father. Proud grandfather.

Very sadly, Tom passed away on March 3rd from a heart attack. The combination of his great personality and his leadership for many technical and managerial accomplishments are surely missed by his many co-workers and friends.

Most recently, on the Roman Space Telescope (RST) project, Tom served as Observatory Manager during the crucial years of development leading up to the Mission Preliminary Design Review. He was Deputy Project Manager, where he helped advance the telescope design through its confirmation. Tom was the project interface to the European Space Agency and the Japanese Aerospace Exploration Agency, responsible for many key international contributions. The Roman Space Telescope Project Manager, Jamie Dunn, stated that, "It was a pleasure working with Tom over the years on both Hubble and Roman. He always did whatever it took to get the job done, and his enthusiasm for NASA's mission was motivational to everyone he interacted with".

Tom was a team builder, always showing his care for the development of his team members and for encouraging young people. During the pandemic, he organized a socially distanced 5K run/walk for charity to bring together his RST team.

As Deputy Program Manager for the Astrophysics Projects Division, Tom was instrumental in getting the program office started at Goddard for the Physics of the Cosmos and Cosmic Origins programs.

Tom Griffin and Dave

Parker with some of

their former Hubble

colleagues. CREDIT:

COURTESY OF THE

GRIFFIN FAMILY

Tom also worked in many engineering and management positions on the Hubble Space Telescope (HST) project for five successful servicing missions. He was the manager for the Space Shuttle Carriers that were critical for safely carrying flight hardware and scientific instruments to and from space. He was responsible for the crucial development and testing of very sensitive gyroscopes as well as flexible and rigid solar arrays as the HST Observatory Manager. During the preparations for the first servicing mission in 1993, he paved the way for a very successful working relationship between the HST and the European Space Agency teams. He made very meaningful contributions to design improvements. These were successfully installed by astronauts to greatly improve the operation of the telescope. He

led cooperative efforts with the European Space Agency, Johnson Space Center, and Kennedy Space Center. Most significantly, Tom was a proud "Hubble Hugger".

An avid adventure seeker, Tom went to the corners of the world in pursuit of his hobbies. Whether it was skiing the Alps, sailing - and winning! - the Caribbean 1500, flying a plane over the Great Lakes, or hang gliding above Grandfather Mountain, adventure was out there and Tom made it his mission in life to find it. From European food to American cars and an impeccable taste in bourbon, he enjoyed the finer things in life. He will be remembered for his great sense of adventure, appreciation of travel, and above all else, his unwavering love for his family.

Tom was a valued and respected member of his team, always making himself available for mentoring and guidance; providing the knowledge and wisdom gained from his decades of spaceflight experience. Tom was an ardent supporter of outreach activities and STEM. He relished volunteering his time whenever he could in ventures like the Conrad Challenge for student innovation. Bevond Tom's outstanding technical efforts and leadership at NASA, he was special to so many as a great friend.

Tom organized a 5K run with his Roman team last summer.

Dr. Thomas Zurbuchen, Associate Administrator of NASA's Science Mission Directorate, stated, "Godspeed Tom Griffin, longtime Hubble and Roman Space Telescope manager. We embrace his legacy of technical excellence and personal warmth that brought teams together for the challenging work of space exploration".

Tom Griffin will always be remembered - and greatly missed - by his many Goddard "family" members and friends.

Russell L. Werneth / Code 441 Hubble Space Telescope Outreach Engineer

NV2VE SA2 VV2V

And the Results are in...

The U.S. Office of Personnel Management (OPM) recently released the 2020 Federal Employee Viewpoint Survey (EVS) results. The EVS serves as a tool for employees to annually share their perceptions in many critical areas including their work experiences, their agency, and leadership.

Due to the COVID-19 pandemic in 2020, OPM delayed the launch of the survey twice, having civil servants complete it in September instead of May. The survey consists of six key categories, frequently called dimensions, which include: My Work Experience, My Work Unit, My Agency, My Supervisor/Team Leader, Leadership, and My Satisfaction. Key changes to the 2020 survey consisted of streamlined core content from 73 guestions to 38, including new COVID-19 guestions relating to working conditions.

and in Code 400, employee engagement increased during a time when most were teleworking. There was also an increase in immediate supervisors and agency

Across the Federal Government, at Goddard The Flight Projects Directorate's response rate increased from 67% in 2019 to 68% in 2020. Although faced with many challenges in 2020, Code 400's numbers increased in each of the six dimensions, with all scores leadership scores, with possible positive links in the high 80s to 90s, leading the center in to how agencies responded to the pandemic. positive survey results. One dimension to highlight within the Code 400 directorate is Goddard's participation rates increased in an impressive 95.5% in the My Supervisor/ 2020 from 63.4% to 63.8 %. Goddard's overall Team Lead dimension – during a time when average survey scores closely mirrored our work and personal lives were disrupted NASA's overall average (Goddard 83.2% vs. by the pandemic, this score reflects the NASA 83.3%) and Goddard's overall average overwhelming availability of support from our score increased from 80.3% in 2019 to 83.2% leaders. Congratulations to all and keep up in 2020. the good work!

Average Overall Trends by Directorate

Thank you to all who responded to the **EVS**!

2020 Summary of EVS Dimensions

Dimensions	Gov't-wide 2020	NASA 2020	Goddard 2020	Code 400 2020	Code 400 2019	Difference	Code 400 2018	Code 400 2017
My Work Experience	72.9%	85.1%	85.2%	89.8%	88.1%	1.6%	88.6%	86.3%
My Work Unit	64.8%	77.5%	77.6%	84.6%	75.5%	9.1%	75.7%	73.6%
My Agency	67.3%	86.5%	86.5%	90.0%	89.3%	0.7%	89.3%	86.7%
My Supervisor/Team Leader	80.7%	91.7%	91.8%	95.5%	92.1%	3.4%	90.8%	90.2%
Leadership	61.7%	81.6%	80.8%	87.8%	86.1%	1.7%	84.0%	83.5%
My Satisfaction	63.1%	80.6%	80.6%	86.2%	81.9%	4.3%	82.7%	81.1%
Overall Average	68.4%	83.8%	83.8%	89.0%	85.5%	3.5%	85.2%	83.6%

At A Glance				
Below 65%	Between 65%- 80%	80% and Above	IMPROVED from 2019	DECLINED from 2019

WHAT'S UP WITH OUR **Flight Projects Development Program?**

-FPDP Leadership Training and Development Workshop

(top to bottom, left to right) Tom McCarthy, Bob Cabana, Charles Elachi, Dava Newman, John Grunsfeld, Phil McAlister, Pam Melroy, Ellen Stofan, Alan Stern, Doug Cooke, Wanda Sigur, Sandra Connelly, Dennis Andrucyk, Walt Falconer, Donna Swann (FPDP Program Manager). CREDIT: NASA

Goddard's Flight Projects Development Program (FPDP) hosted a virtual Leadership Training and Development Workshop April 6-8, 2021. After a welcome from the Flight Projects Directorate's new director, Tom McCarthy, subject matter experts from NASA, government, and industry gave the 60 attendees insights into NASA leadership and

project management, as well as an abundance of lessons learned.

Donna Swann / Code 400 **FPD Assistant Director** FPDP Program Manager

Walt Faulconer, the FPDP facilitator, arranged impressive and engaging speakers including:

- Bob Cabana, Astronaut and Director, NASA Kennedy Space Center
- Charles Elachi, Professor emeritus. California Institute of Technology and former Director, NASA Jet **Propulsion Laboratory**
- Dava Newman, Apollo Professor of Astronautics, MIT and former Deputy Administrator, NASA
- · John Grunsfeld, Astronaut and former Associate Administrator, Science Mission Directorate, NASA
- Phil McAlister, Director for Commercial Spaceflight, NASA

• Pam Melroy, Astronaut and Member of the Biden Transition Team and former Deputy Director, Tactical Technology Office at Defense Advanced Research Projects Agency (DARPA)

• Ellen Stofan, Under Secretarv for Science and Research. Smithsonian Institution and former John and Adrienne Mars Director, National Air and Space Museum and Member of the Biden Transition Team and former Chief Scientist, NASA

The FPDP participants facilitated breakout sessions each of the three days and summarized the sessions to all the workshop attendees on the final day of the workshop.

(top to bottom, left to right) Corina Koca, Chetan Sayal, Andrea Poulin, Joe Hickman, Kristen Brown, Milton Davis, Freda Kagere Melanie Crespo-Ramos, Adam Matuszeski. CREDIT: NASA

• Alan Stern, Principal Investigator for the New Horizons mission and former Associate Administrator,

Science Mission Directorate. NASA

- Doug Cooke, former Associate Administrator, Human Exploration and Operations Mission Directorate, NASA
- Wanda Sigur, former Vice President and General Manager, Civil Space System, Lockheed Martin
- Sandra Connelly, Deputy Associate Administrator, Science Mission Directorate. NASA
- **Dennis Andrucyk**, Director, Goddard Space Flight Center, NASA

FPDP partnered with other Goddard Directorates and NASA Centers to enable three days of learning and networking through large group discussions, presentations from senior leaders, and facilitated breakout sessions.

Lessons learned

- All programs come to an end. When will you know you are done?
- Ending programs enables starting others, which reduces the fear of ending
- Respect your industry partner and be transparent

Former astronaut, Pam Melroy, shared her career journey and lessons learned during the workshop. Several days after the workshop, President Biden nominated Pam to serve as NASA's deputy administrator! We are honored we had the opportunity to hear her vision!

For more information about the FPDP, please look for an overview on the FPD hub, or contact Donna Swann at:

Mana.j.swann@nasa.gov

Coming and Goings

Benjamin Anderson (External) to 450.2/Technology Enterprise and Mission Pathfinder Office (TEMPO)

Mike Seablom (HQ) to 407/Earth Science Technology Office (ESTO)

Angela Hodge (External) to 450.2/ TEMPO

Daniel Motto (External) to 4502/ TEMPO

Matthew Vincent (External) to 457/ Near Space Network (NSN)

Philip Francis (273) to 460/ Explorers and Heliophysics Projects Division (EHPD)

Risha George (581) to 459/ Advanced Communications Capabilities for Exploration and Science Systems (ACCESS)

Nidhin Babu (External) to 451/ Laser Communications Relay Demonstration (LCRD)

Devin Bitner (External) to 457/NSN

Mark Lupisella (581) to 450.1/ Commercialization, Innovation and Synergies (CIS)

Glenn Iona (599) to 460/EHPD

Cathy Peddie (300) to 451/ Integrated LEO LCRD User Modem and Amplifier Terminal (ILLUMA-T)

EHPD

Cynthia Simmons (500) to 400/ Deputy Director for Planning & **Business Management**

Ben Reed (480) Resignation John Vanblarcom (420) to 383 Joy Henegar-Leon (4902)

Retirement

Steve Pszcolka (429) Retirement Haydee Maldonado (464)

Retirement

Greg Smith (401.1) Retirement

Robin Krause (401) Retirement

David Larsen (453) to 457/NSN

November 1, 2020 through March 31, 2021

Tony Scaffardi (External) to 428/ **Global Precipitation Measurement**

Jonathan Burroughs (383) to 460/

Ryan Turner (581) to 460/EHPD

Goinas

David Mitchell (400/Director) to code 500/Director

Reassignments/ **Realignments Details** within Code 400

Tony Cazeau (492) to 435/Mars Sample Return Capture Containment & Return System (MSR CCRS)

Charles Bacon (484) to 435/MSR CCRS

Carrie White (458) to 457/NSN

Brandon Bethune (459) to 457/ NSN

Cathy Barclay (450) to 440/APD

Jim Simpson (499) to 460/EHPD

Betsy Park (456) to 460/EHPD

Derek Otermat (451) to 457/NSN

Caleb Noblitt (405) to 460/EHPD

Jill McGuire (482) to 480/ **Exploration & In-Space Services** (ExIS)

Tom Gitlin (458) to 4501/CIS

Tom McCarthy (400/Deputy Director) to 400/Director

Cynthia Simmons (400/Deputy Director for Planning & Business Management) to 400/Deputy Director

Cathy Richardson (420) to 400/ Deputy Director for Planning & Business Management

Karen Rogers / Code 400 Administrative Officer

KNOWLEDGE MANAGEMENT Insights

Good Practices

Have you ever considered whether recently completed work would constitute a best practice, a good practice, or something else? Classifying outcomes in this way can be unclear.

The Cynefin sense-making framework can help address why a good practice is applicable in some cases and a best practice in others. Cynefin, a decision support tool is focused on the underlying nature of the problem being addressed. It helps us decide what method or approach to adopt for a given situation and when to change that approach. Dave Snowden, a researcher in knowledge management developed Cynefin, which in Welsh means 'place of multiple belongings.'

The Cynefin framework consists of five domains with three system types defined by constraints:

- 1. An ordered system has a high level of constraints thus behavior is predictable. Clear and **Complicated** domains are in the ordered systems category.
- 2. A complex system is one of dynamic and entangled causal relationships. Cause and effect relationships are only known in hindsight. It is difficult to predict actions in advance.
- 3. A chaotic system is turbulent, without constraints and immediate stabilizing action is required.

Exaptive Clear Chaotic sense-categorise-respond act-sense-respond **Fixed** constraints no effective constraint Best Novel

DAVE SNOWDEN, COGNITIVE EDGE, 2020

Clear

Constraints are rigid and the relationship between cause and effect is self-evident and clear. There is a right answer. This is the Best Practice context.

Examples:

- Pilot's Checklist
- Surgeon's pre-op ritual
- Medication Dosing

Complicated

Causal relationships with governing constraints. Subject matter experts are needed to perform analysis; multiple solutions or approaches are feasible. This is the domain of most engineering and technical problems and is the Good Practice context.

Examples:

- Engineering solutions
- Writing software code
- Technical root cause analysis

	COMPLEX	COMPLICATED
Cause and effect	Apparent only retrospectively, does not repeat – no root cause	Knowable or predictable
Evidence	Pattern-based – looking for stable patterns to transition	Fact-based
Activities	Probes, Safe-to-fail experiments, prototypes, pilots	Logic models, implementation plans
Knowledge	Lived experience	Subject matter expertise
Disciplines	Design, epidemiology, ecosystem science	Empirical research using scientific method, engineering

Complex

No linear causality. If it appears, it is only in retrospect and does not repeat. If causality repeats, move to Complicated. There are many levels of entanglement and enabling constraints resulting in emergent practices. This is the Exaptive (or Innovation) context.

Examples:

- Culture Change
- Chronic Disease Management
- Poverty, Homelessness

Chaotic

Everything is entangled with everything else. There are no effective constraints with little to no repetition and high levels of uncertainty. Action must be taken first to stabilize the situation. This is the **Novel** context.

Examples:

- Volcanic Eruption
- Pandemic
- Terrorist Attack

A/C - Aporia/Confused is a state of not knowing what domain your situation should reside in.

Most engineering and technical problems will be managed in the Complex or Complicated domains. Good Practices will result from expert analysis and KERRY ANN O'CONNOR, CHIEF INNOVATION OFFICER, AUSTIN, TX

Exaptive (Innovative) **Practices** will emerge from experimentation. The table aboove compares the **Complex** and **Complicated** domains.

The distinction between **Best Practice** and **Good Practice** is important. Only the safest practices should be moved into Best Practices. During times of rapid change, best practices may quickly become irrelevant. There is not always a best practice, there can be multiple Good Practices. In the **Complicated** domain there are multiple ways of doing things, all of which can be legitimate.

Judy Dickinson / Code 400 FPD Knowledge Management Lead

"How do we make sense of the world so that we can act in it?"

- Dave Snowden

For more information:

- o The Cynefin Framework Dave Snowden
- o The Cognitive Edge

FPD Mission Updates

OSIRIS-Rex

OSIRIS-Rex's PolyCam camera captured an image of Bennu from ~300km, as the observatory approaches Bennu in preparation for a

TESS

Transiting Exoplanet Survey Satellite (TESS) discovers first Sextuply-Eclipsing

Sextuple Star System (TYC 7037-89-1).

SWFO-L1

Space Weather Follow On Lagrange 1 (SWFO-L1) Solar Wind Plasma Sensor (SWiPS) held a successful Preliminary Design Review.

TEMPO

Technology Enterprise and Mission Pathfinder Office (TEMPO) and Code 595/ Navigation kicked off preformulation activities for the Lunar GNSS Receiver Experiment (LuGRE)

pathfinder mission to obtain the first GNSS fix on the lunar surface.

OSIRIS-REx and MMS

The OSIRIS-RExand MMS teams were selected as prestigious 2020 American Astronautical Society

award winners. OSIRIS-

REx received the Space Technology Award and MMS received the Earth Science and Applications Award. Congrats!

JWST

The JWST Flight Operations Review was conducted on April 13-15.

Landsat 8

The Harmonized Landsat Sentinel-2 (HLS) dataset is now available from

the Land Processes DAAC and imagery is available to view in NASA Worldview. The HLS project brings 30-meter resolution true color surface reflectance imagery from the Operational Land Imager instrument aboard the NASA/USGS Landsat 8 satellite, and the Multi-Spectral Instrument (MSI) aboard the European Space Agency Sentinel 2A and Sentinel 2B satellites. This Sentinel 2A and 2B/ MSI image shows the DC and Greenbelt region on October 7, 2020.

ACCESS

On January 6, Advancing **Collaboration Connections** for Earth System Science (ACCESS) supported the Cygnus NG-14 unberth/

release from the International Space Station (ISS) with 100% proficiency. The release occurred at 1510z with destructive reentry scheduled for January 26 at 1800z. On January 12, the ACCESS space relay service supported the undocking and departure of SpaceX Dragon CRS-21 from the ISS.

Commercialization. Innovation, and **Synergies**

LaNetra Tate. Commercialization. Innovation, and Synergies ARTEMIS

office chief, participated in an Artemis video shown to the National Space Council. The video introduced NASA's new Artemis astronauts.

Hubble and Lego

Lego announced its latest space exploration set that features HST (reflecting the STS-31 mission) created in partnership with NASA to mark the 40th anniversary of the first space shuttle launch.

GOES-T

The GOES-T spacecraft completed post-vibe solar array and antenna deployment, as well as shock separation testing

and launch vehicle payload adaptor match mate.

GOES-R

The GOES-R Program, in partnership with the JPSS Program, National

Environmental Satellite, Data, and Information Service (NESDIS), NASA Goddard, and the Cooperative Institute for Research in the Atmosphere (CIRA), debuted a new video series, "This Week in Weather," which highlights a significant weather event or environmental phenomenon.

ExIS

The Extreme Ultraviolet and X-ray Irradiance Sensors (ExIS) architecture development team completed a Mission Design Laboratory study for the

Dexterous Robotic Extended Assembly Mission. This study evaluated the concept of operations for a potential mission that utilizes the On-orbit Servicing, Assembly, and Manufacturing (OSAM)-1 spacecraft, an Evolved Expendable Launch Vehicle Secondary Payload Adapter Grande, and an inspace assembly demonstration payload.

Near Space Network

Hubble

Near Space Network commercial provider KSAT completed installation and site acceptance testing of a new antenna in Norway as part of their Ka-band advancement project.

posted on the effects of the pandemic on Hubble operations entitled Hubble Adapts to COVID-19-related

Challenges and discusses the changes to the operations workflow and how the HST team has adjusted to ensure there is no effect on science data collection.

Optical Communications System

The telescope relay assembly for the Orion Artemis II Optical Communications System was built, tested, and delivered to MIT/ Lincoln Labs.

Tara Dulaney

Integrated Program Team Lead & Chief Learning Officer, PAAC V Contract

Born Baltimore, MD

Education B.S. Industrial Engineering, Penn State University M.B.A. Johns Hopkins University

In these roles, Tara serves as the deputy manager for Code 450 work, manages efforts at Langley, and helps the growth of individuals on the PAAC contract.

Life Before Goddard

Tara didn't know what she wanted to do when she started college at 17 and didn't know much more when she graduated – but knew that she wanted to use her math and science strengths to solve problems. After college, she took a position in Marketing & Production for the Rams Head Group. She supported the opening of a new venue in Baltimore and was able to focus on supporting new artists and jazz at the Annapolis venue.

After 3 years, Tara was recruited as a project manager for a software start-up (an alternative to Ticketmaster). As an experienced user, she was able to relate to customers and quickly instruct them on use of the product. The company was bought and sold a few times over her 9 years there and her career progressed to Director and then Vice President. Tara oversaw a team of 13 project and product managers, primarily remotely, with over 500 product installations. It was a great experience and she learned a lot about agility, business, and management – and also saw some incredible concerts which only increased her passion for live music!

Life at Goddard

In talking with someone from Goddard at a happy hour, Tara heard frustrations about how things were being managed and she would offer ideas from a startup perspective. That person said you cannot effect change from the outside – so when thinking about opportunities outside of the start-up world, Tara applied to and was hired on the PAAC contract.

Tara has primarily worked within the Exploration and Space Communications (ESC) projects division. Her first job was to help the Space Network with reporting and risk management. She loved both of these areas and learned a lot from the project manager

and leadership team. They were willing to spend time when she posed questions and worked together to ideate solutions. Tara then supported the Division with whatever was needed, learning everything she could about PAAC functional areas and NASA project management. She was recently able to use her experience with remote team management and internal engagement throughout 2020 to help the team.

Tara has also had unique experiences in Code 450 working with the Communications and STEM Engagement (CaSE) team. Working with a very small team, they quickly put together a touchscreen, educational game for the last Tracking and

(*left*): Tara engaging a future astronaut during an outreach event; (center): building houses with Rotary near Guayaquil; (right): making new friends in Ecuador. CREDIT: ALL PHOTOS COURTESY OF TARA DULANEY

Data Relay Satellite (TDRS) launch. She has also had the opportunity to work outreach with underserved communities in New Mexico and Alaska.

One of Tara's most rewarding experiences at Goddard has been supporting the FP Diversity & Inclusion (D&I) committee. As a safe space to talk about questions and topics, she has learned and appreciated perspectives from her peers. Tara and her husband had both experienced a 'values campaign' in college and she wanted to bring that to the Greenbelt campus to spur conversations around values and diversity. It was a great opportunity to work with the D&I team and have management support ways to prompt open conversations and to think about how we can all respect and appreciate diversity. Seeing people come together to make a more inclusive community is a very powerful experience!

Life Outside Goddard

Tara's passion for more than

a decade has been supporting advocates of abused and neglected children in the foster care system, to help the kids find a safe, stable, and loving home. She first volunteered for Anne Arundel County Court Appointed Special Advocates (AACASA) in their fundraising. She was asked to join the board in a movement to bring young professionals into non-profit leadership and increase their base of support. She served as Board Secretary and is now completing a 2-year term as Board President.

Getting through the pandemic was challenging at work; thankfully we have the technology and support systems in place to adapt. Small nonprofits like AACASA don't. Tara worked with them on modernizing everything from courthouse activities to working as a remote team, engaging with donors remotely, and supporting the advocates working directly with the children - now remotely. One of the larger fundraisers had to be canceled, but through some hard work they were able to pivot the annual gala to a

live in-home and online event. Additionally, they have been excellent stewards, finding efficiencies and applying for new grants to help organizations during the pandemic.

In addition to AACASA, Tara serves her community as a Rotarian. Through Rotary, she has traveled to Ecuador twice. The first visit was a conference and monitoring trip for a grant between the Annapolis Rotary Club and the Organization of American States to increase literacy in rural schools outside of Quito. During her second trip, the team built six houses in 3 days in a very rural area with a local partner in Guayaquil.

When not working or serving, Tara spends her free time visiting family out of state, traveling, golfing (not well), and hiking. She enjoys time with her husband and golden retriever named Tiberius, named after James Tiberius Kirk! ■

Milton Davis

On-orbit Servicing Assembly and Manufacturing Mission 1 (OSAM-1) (Code 483) Space Vehicle Manager

Born Gary, IN

Education B.S. Aerospace Engineering, Purdue University Masters in Project Management, Johns Hopkins University Masters in Robotics, Johns Hopkins University (In work)

Life Before Goddard

Milton was born and raised in Gary, Indiana. He is one of three children. Above all, Milton's parents instilled in him the passion for hard work, treating others like you would want to be treated, and service. Milton became interested in science, technology, engineering, and math (STEM) at an early age. He loved taking apart remote control (CR) vehicles to see how he could improve their speed and performance. When Milton araduated from high school. he enrolled at Purdue Calumet which is an extended campus of the main Purdue location. Milton pondered leaving college for a while and pursuing full-time work as he and his wife just had their first child. After completing his first semester, his guidance counselor challenged him in regard to his career path. "I knew there was a passion inside of me to pursue STEM. I was also very interested in theories of everything (TOEs) and space.

My guidance counselor thought aerospace engineering was a good path. We talked for a few hours about my STEM projects and string theory. That day, he called Frank Bauer at NASA Goddard Space Flight Center to set up an over-the-phone interview. So, I decided to remain in school. Nine months later I had my first child (Jordan) and a co-op internship with NASA. It really was a blessing and game changer in my life."

Life at Goddard

Milton started at GSFC as a Pathways Student in 2000 working with the Navigation & Mission Design (Code 595) and Components and Hardware Systems (Code 596) branches. As a coop intern, Milton received a co-patent for his work on a demise-able momentum exchange system (reaction wheel) which has flown on the Global Precipitation Measurement (GPM) and Lunar Reconnaissance Orbiter (LRO)

missions. Upon graduation from Purdue West Lafayette in 2004, Milton served in multiple roles in Code 500 including avionics deputy lead for the Magnetospheric Multi-Scale (MMS) mission; the mechanical lead of the Navigator GPS receiver on MMS and STP-H6; and the mechanical lead for the Payload Control Computer on OSAM-1 (formerly Restore-L). Milton has co-patents for the SpaceCube 2 and SpaceCube 3 Reconfigurable Data Processing System. Milton has also served as a star tracker and inertial measurement unit lead on MMS, NICER, GEDI and PACE. He has served as a co-lead, subject matter expert, and study lead of the Avionics Packaging Committee for the NASA Engineering and Safety Center (NESC). Milton served as an associate branch head of the Guidance, Navigation and Control (GNC) hardware branch from 2014 to 2018, focusing on new business, new technology, and re-chartering branch career

Left: (top): Future Innovative Rising Engineers and Entrepreneurs (FIRE) Ten80 Racing Team wins at the national competition (bottom): All-girls FIRE Team Competition invited to the White House. Right: (top and bottom): VEX Robotics Team competes at Baltimore robotics event. CREDIT: ALL PHOTOS COURTESY OF MILTON DAVIS

paths. Milton transitioned to OSAM-1 in 2019 to serve as the Space Infrastructure Dexterous Robotics (SPIDER) Payload Systems and Phase lead. After serving in this role for a year, Milton was excited to hear about the call for a new FPDP cohort. Milton started serving as the OSAM-1 Space Vehicle lead midway through 2020. Milton also serves as the National Society of Black Engineers (NSBE) Greenbelt Space Chapter (GSC) president.

Life Outside Goddard

Milton is a proud husband and father with kids ranging from six to twenty years of age. He very much enjoys supporting their many extracurricular activities and looks forward to board and video games time with them on Saturdays. He also enjoys serving in his community and church. Milton loves to teach and has taught an introduction to engineering course at the University of Maryland for the past 7 years. He is passionate about helping youth obtain an interest and path to STEM fields. Milton is the executive director of a non-profit, volunteer organization called Future Innovative Rising Engineers & Entrepreneurs (FIRE) which offers STEM and financial literacy programs to under-represented, underserved primary and secondary education schools.

"We are what we repeatedly do. Excellence then is not an act but a habit." Milton Davis

THE LATEST SAR SAVES

NASA'S SEARCH AND RESCUE (SAR) OFFICE CONTINUES ITS EFFORTS TO **DEVELOP AND IMPROVE ON LIFE-SAVING DISTRESS BEACON TECHNOLOGIES.**

COSPAS-SARSAT rescues from November 2020 through March 2021 are shown above.

Updates from the D&I Committee

As we saw in the message from Center Director Dennis Andrucyk in March, a noticeable increase in violence, hostility and racism toward the Asian-American and Pacific Islander (AAPI) community – especially the elderly - is occurring across our country. Our AAPI colleagues have shared that their families have found themselves grappling with senseless threats or hate crimes linked to the pandemic. They have shared that the racism behind these disturbing attacks is not new and we believe that no one should ever have to live in fear due to their race, ethnicity or national origin.

Did you know why May was selected for Asian American and Pacific Islander Heritage Month?

In 1978, a joint congressional resolution established Asian/Pacific American Heritage Week.

The first ten days of May were chosen to coincide with two important milestones in Asian/Pacific American history: the arrival in the United States of the first Japanese immigrants (May 7, 1843) and contributions of Chinese workers to the building of the transcontinental railroad, completed May 10, 1869. In 1992, Congress expanded the observance to a month long celebration that is now known as Asian American and Pacific Islander Heritage Month.

ships

(ELTs)

We want to be in the know!

If you have something to share, send it to Matthew Ritsko. Include your name, phone number and send it to:

matthew.w.ritsko@nasa.gov \sum_{α}

Code 400 Diversity and Inclusion Committee

Ext. 6-2515 ٢.

Barry Grofic proudly displays the Villa Rosa vaccination stats. CREDIT: BARBARA GROFIC

Barry Grofic, husband of Barbara Grofic (Code 440), was interviewed for an article that appeared in the Washington Post on February 7, 2021. As the administrator of Villa Rosa Nursing Home, he has been successful at vaccinating a much higher than average percentage, in comparison to Prince George's County overall, of staff and residents against COVID-19.

Join the Flight Projects Diversity & Inclusion committee as they host a listening session in partnerships with the Asian Pacific American Advisory Committee (APAAC) on May 10, from 11:00 a.m. to 12:00 p.m. During this session, we will amplify AAPI voices and find ways to uplift, empower and protect our AAPI colleagues, friends and neighbors against racism.

Please attend and learn what is happening - and how you can make a difference!

Join the Teams meeting here

Read the article

• Washington Post article

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OUT & ABOUT

Alicia Nunn (Code 448) and husband Michael Wilmoth welcome son, Arlo Roosevelt Wilmoth. Born December 17, 2020. 10 lbs 15.5 oz and 23 inches.

Congratulations to Laura Paschal (Code 443) who became a grandmother for the second time on March 16, 2021 with the birth of Abigail Rose, weighing 9 lbs. 13 oz.

Heidi Wood (Code 470) and her husband Brian are proud to announce the birth of their first grandchild, Isla Belle Wood. She was born on January 11, 2021, to parents Beau and Brooke Wood, weighing 6 lbs, 6 oz, and 19" long.

Congratulations to Phillip

Francis (Code 460) and his

wife, Jemila. They welcomed

their son, Michael Antonio on March 2, 2021. He weighed 6 Ibs, 8oz and was 20.5" long.

Please send your inputs to Paula Wood. Include your **name, phone number** to:

paula.l.wood@nasa.gov

- 🥪 Code 460
- Ext. 6-9125

Clark and big brother Owen welcomed their new baby, Gavin Vinson Clark on April 26th. Gavin weighed 8 lbs, 4 oz, and measured 20.5 inches.

Camille Madison Curtin, born 2/25/2021 at 7:04PMCongrats to Allen Fleishman (Code 480) and his7lbs 4 oz. Camille is the French pronunciation, like
Cam-ee, if that matters, Robert Curtin, (Code 400)
and wife Philippine.Congrats to Allen Fleishman (Code 480) and his
wife Marley (Code 690), who welcomed twin
girls! Olivia Wren and Ember Rae were born on
December 11, 2020.

Congratulations to Kendall Taylor Murphy (Code 450) and Eddie Mauckon, who were married October 31, 2020, in the backyard of their new home!

Sarah Harnish (Code 400) married Will Lerch on October 31, 2020 in Annapolis, MD.

FLIGHT PROJECTS LAUNCH SCHEDULE 2021

