National Aeronautics and Space Administration

THE CRITICAL PATH

A FLIGHT PROJECTS DIRECTORATE PUBLICATION ■ 2020 WINTER ISSUE

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

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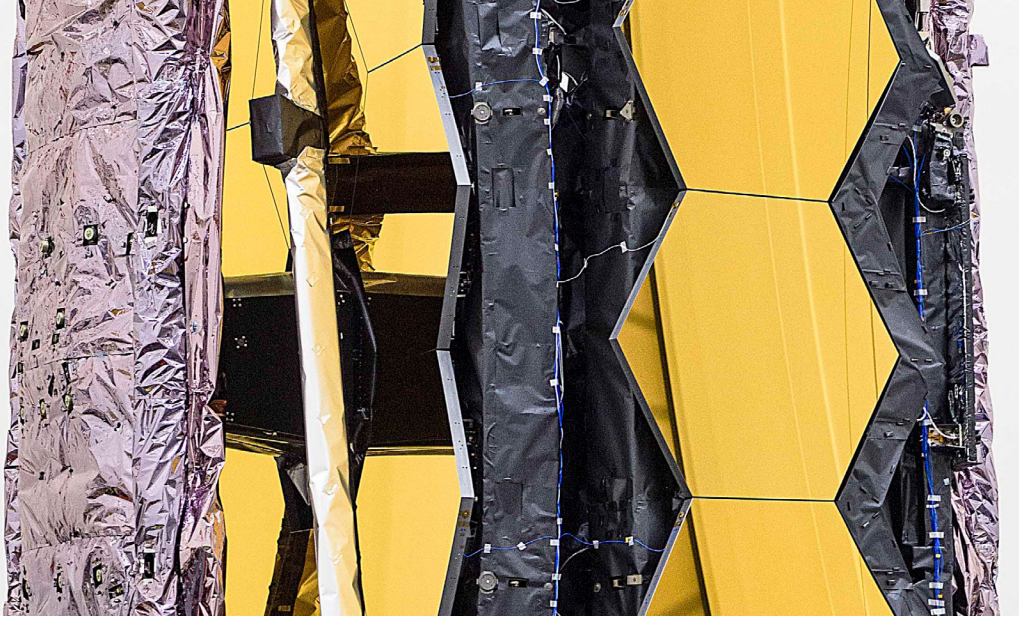

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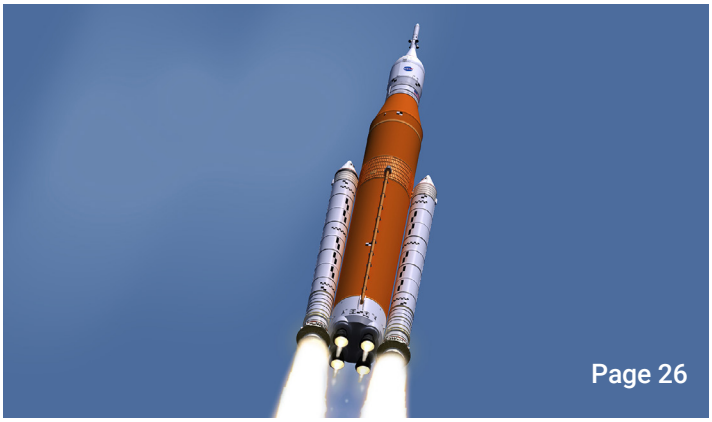
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THE CRITICAL PATH

A FLIGHT PROJECTS DIRECTORATE PUBLICATION ■ 2020 WINTER ISSUE

PUBLISHED BY THE FLIGHT PROJECTS DIRECTORATE

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The deadline for the next issue is **March 17, 2021**

DOWNLOAD ISSUE

Message from the DIRECTOR

As 2020 wraps up, I want to express my gratitude to everybody who helped us get through a most challenging year. We continue to maneuver through a global pandemic and keep our missions moving forward and, most importantly, keep our people safe. Currently, about one-third of the Goddard workforce is coming through the gates at the six campuses. The rest of us, myself included, continue to telework the majority of our time from home.
While we can't be 100% efficient in this mode, the progress we have made has enabled us to be in a position to launch five Goddard missions in 2021: Laser Communication Relay Demonstration payload; Landsat 9, Lucy, James Webb Space Telescope (JWST), and Geostationary Operational Environmental Satellite (GOES)-T. Another two missions from the Applied Physics Laboratory and the Marshall Space Flight Center (GUSTO and IXPE missions, respectively) are being managed out of Goddard's Explorers Program Office and will also launch in 2021. It is setting up to be a truly historic year of launches for the Flight Projects Directorate (FPD) and Goddard.

Meanwhile, our operations, networks, and space communications teams continue to fully staff the flying missions without missing a beat. There are so many accomplishments that we made in these areas but a real highlight for me was the OSIRIS-REx tag of the asteroid Bennu and the successful sample stow as a precursor to its return to Earth in 2023. You think about the work that the team did over the past 15 years to get to the point of a 5-second tag/sample collection event in October – it's astonishing. What a feat as it slid past "Mount Doom" on the asteroid surface and safely hit its target point to within one meter!

Other development milestones over the past few months included the completion of JWST environmental testing, the start of instrument integration of the Joint Polar Satellite System (JPSS)-2 observatory, and the Exploration and In-Space Services work (all profiled in this edition of The Critical Path).

In other news, as of October 16, 2020, the Exploration and Space Communications (ESC) projects division has reorganized its portfolio to execute the bold commercialization plan set forth by NASA's Space Communications and Navigation (SCaN) program.

In the new business arena, we had many highlights. Most notably, the SETH heliophysics mission virtual site visit and the DAVINCI+ mission to Venus concept study report were completed. As everybody knows by now, one must work so much harder in the virtual environment in order to get things right because of the loss of face-to-face interactions.

On the personnel front, we welcome Cynthia Simmons to the front office as the new Deputy Director for Planning and Business Management. Director for Planning and Business Management. I've worked a number of years with Cynthia across the directorates and am very happy to now have her rejoin the FPD family in January. I greatly appreciate

Nick Chrissotimos for, yet again, stepping up and helping out in the front office over the past few months during the leadership transition.

Also noted in The Critical Path are the Agency Honor Award recipients for 2020. Congratulations to all and thanks to everybody who took the time to nominate these deserving individuals.

In conclusion, it is my sincere hope that all of you can take some time off during this upcoming holiday season to relax and enjoy time with family and friends. Thank you for everything you do to make the Flight Projects Directorate a successful and great place to work. Happy holidays! ■

David F. Mitchell
Director, Flight Projects
david.f.mitchell@nasa.gov

The Flight Projects Directorate welcomes

Cynthia Simmons

as the new Deputy Director for Planning and Business Management!

FPD Director, Dave Mitchell, recently welcomed Ms. Cynthia Simmons to the Flight Projects Directorate as the Deputy Director for Planning and Business Management. Ms. Simmons will be taking the position previously held by Dr. Wanda Peters, who transferred to NASA Headquarters' Science Mission Directorate in September. Cynthia brings to the directorate a wealth of experience gained in more than 31 years working in military, commercial and NASA space flight with two decades working in senior leadership positions at Goddard and in project management positions in the Engineering and Technology Directorate (ETD / Code 500) and the Flight Projects Directorate (Code 400). She has had a diverse history at Goddard since joining NASA as a contractor in 2000, providing thermal design and systems engineering support for several instrument and spacecraft projects including the Space Technology 5, Lunar Reconnaissance Orbiter, Global Precipitation Measurement, Messenger and Sample Analysis at Mars. She has also worked space flight projects for NTSpace (Japan), classified Department of Defense and Defense Advanced Research Projects Agency spacecraft programs. In March 2010, she was recruited into the civil service as an instrument manager to lead the DESDyNI instrument team. After DESDyNI, she led the NASA Soft X-ray Spectrometer instrument project for the Astro-H mission, and then served as the instrument project manager for the ATLAS instrument on the ICESat-II mission. Most recently, Cynthia served as the Code 550 Division Chief and then the ETD Deputy Director for Planning and Business Management. Cynthia holds a B.S. in Biological Sciences and Engineering from the U.S. Air Force Academy, a Master of Engineering degree in Aerospace Engineering from the University of Maryland., and is currently pursuing a PhD in Applied Math at the University of Maryland Baltimore County. Her wide range of experience in project management, systems engineering, technology, discipline engineering and business management will be a great asset to the directorate. She will complete her work in Code 500 over the next month and then transition over full time to Code 400 at the beginning of January. Dave asked the entire FPD community to join him in welcoming Cynthia to her new position in Code 400!

A WORD FROM THE DEPUTY

In the ~~Field~~ home with Tom McCarthy

WOW, what year this has been. I couldn't imagine accomplishing the work we have since March of this year, when we entered Stage 4 in the NASA framework. We safely navigated through Stage 4 and moved to Stage 3 in July, as we optimized our restart process through the Strategic Restart Working Group (SRWG), the Restart Planning Team (RPT), and the Restart Readiness Review (RRR) Board (inventing new acronyms that became part of our common vernacular), approving over 400 restart packages with thousands of individual activities, not only on the Greenbelt campus, but across our campuses at Wallops Flight Facility, Columbia Scientific Balloon Facility, White Sands Complex, Goddard Institute for Space Studies (GISS), and the Katherine Johnson Independent Verification and Validation (IV&V) Facility. As I reflect on what we have accomplished in a pandemic, from the everyday mundane work of kitting parts for our hardware to the extraordinary event of landing on an asteroid 300 million miles away, and submitting an exceptional proposal for a Venus mission, and whether working from home or on campus, I am humbled to be part of such a great group of people. The qualities exhibited during this challenging period, from extraordinary resilience to caring about one another, have demonstrated to me, once again, that we can do anything together as a team.

As we all know, we still have a long runway to normalcy and how that will be defined for us is anyone's guess. Our notional return to Stage 2 is targeted for the end of January and will remain a notional planning date as the data on the COVID-19 will ultimately dictate the date. If local conditions get worse, Stage 3 will be extended. Vaccines are beginning to roll out in December and January, and we are all anxiously awaiting our turn for access. GSFC may be receiving a limited quantity initially for our front-line workers. We are actively engaged with Center management in defining this group.

On how NASA will operate in the future, given the lessons learned from the pandemic and mandatory telework, Cathy Magnum at NASA Headquarters is leading an Agency-wide effort to define what this could look like. Dave Reth in Code 200 is leading this initiative at GSFC that involves three areas under consideration: hoteling space, employee computer kits that can be split between office and home, and collaboration space on Center, making the increased teleworking a normal part of how we do business going forward. We are currently working with our projects to identify participation in a hoteling space pilot on the Greenbelt campus. Change is coming our way for sure as we enter 2021.

In closing, our three operating principles of "Our People, Our Missions, Our New Business" continue to be well executed in this challenging period thanks to all of you. We look forward to a busy upcoming year with the launches of LCRD, Landsat 9, Landsat 9 ESPA Flight System (EFS) rideshare, Lucy, JWST, and GOES-T, as well as all the other exceptional work the Flight Projects Directorate will continue to accomplish. Stay safe. Stay healthy. Continue to follow the latest Center COVID-19 protocols if you need to come on Center. ■

Tom McCarthy
Deputy Director, Flight Projects
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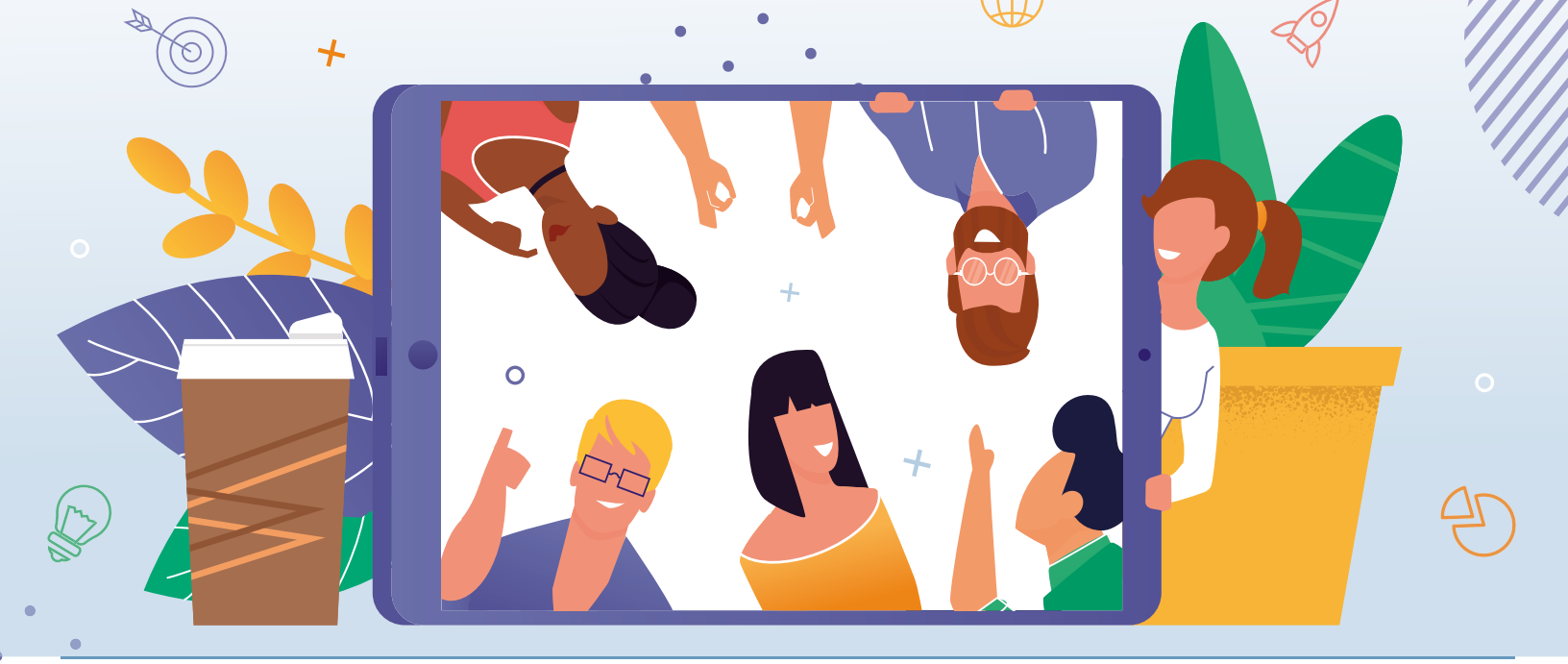

WE ARE IN THIS

TOGETHER

NASA Coronavirus information site

https://nasapeople.nasa.gov/coronavirus/

- Current Stage for each Center.
- Federal and NASA guidance.
- NASA Information Technology guidance.
- Travel guidance.

NASA Collaboration Services

https://nasa.sharepoint.com/sites/collaboration

- When to use what.

NASA Agency and Telework Resources

https://nasa.sharepoint.com/sites/collaboration/SitePages/Remote-Collaboration.aspx

- VPN User Guide.
- Team User Guide.
- Audio Conferencing Guide.
- NASA Telework Requirements Checklist.
- **Working virtually at NASA**
  https://searchpub.nssc.nasa.gov/servlet/sm.web.Fetch/Working_Virtually_at_NASA_v3.pdf?rhid=1000&did=6436603&type=released
- Training, to include SATERN and other training resources.

Code 400 COVID Information

https://fpd400.gsfc.nasa.gov/sites/400/FPD_Internal/SitePages/COVID-19.aspx

Employee Assistance Program

- NASA Center clinicians are available to help employees with a variety of challenges
- https://inside.nasa.gov/health4life/eap_center_contact_list

Thank you

OSIRIS-REx

SUCCESSFULLY STOWS SAMPLE OF ASTEROID BENNU

"This achievement by OSIRIS-REx on behalf of NASA and the world has lifted our vision to the higher things we can achieve together, as teams and nations"

NASA Administrator Jim Bridenstine

Artist's conception of NASA's OSIRIS-REx spacecraft collecting a sample from the asteroid Bennu. CREDIT: NASA/GODDARD/ UNIVERSITY OF ARIZONA

NASA's Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx) spacecraft unfurled its robotic arm on October 20, and in a first for the Agency, briefly touched an asteroid to collect dust and pebbles from the surface for delivery to Earth in 2023. Two days after touching down on asteroid Bennu, NASA's OSIRIS-REx mission team received images that confirm the spacecraft had collected more than enough material to meet one of its main mission requirements – acquiring at least 2 ounces (60 grams) of the asteroid's surface material. On October 28, the mission team sent commands to the spacecraft, instructing it to close the capsule – marking the end of one of the most challenging phases of the mission.

"This achievement by OSIRIS-REx on behalf of NASA and the world has lifted our vision to the higher things we can achieve together, as teams and nations," said NASA Administrator Jim Bridenstine. "Together a team comprising industry, academia and international partners, and a talented and diverse team of NASA employees with all types of expertise, has put us on course to vastly increase our collection on Earth of samples from space. Samples like this are going to transform what we know about our universe and ourselves, which is at the base of all NASA's endeavors."

The mission team spent two days working around the clock to carry out the stowage procedure, with preparations for the stowage event beginning October 24. The process to stow the sample is unique compared to other spacecraft operations and required the team's continuous oversight and input over the two-day period. For the spacecraft to proceed with each step in the stowage sequence, the team had to assess images and telemetry from the previous step to confirm the operation was successful and the spacecraft was ready to continue. Given that OSIRIS-REx is currently more than 205 million miles (330 million km) from Earth, this required the team to also work with a greater than 18.5-minute time delay for signals traveling in each direction.

Throughout the process, the OSIRIS-REx team continually assessed the Touch-And-Go Sample Acquisition Mechanism's (TAGSAM) wrist alignment to ensure the collector head was being placed properly into the Sample Return Capsule (SRC). Additionally, the team inspected images to observe any material escaping from the collector head to confirm that no particles would hinder the stowage process. StowCam images of the stowage sequence show that a few particles escaped during the stowage procedure, but the team is confident that a plentiful amount of material remains inside of the head.

"Given the complexity of the process to place the sample collector head onto the capture ring, we expected that it would take a few attempts to get it in the perfect position," said Rich Burns, OSIRIS-REx project manager at Goddard. "Fortunately, the head was captured on the first try, which allowed us to expeditiously execute the stow procedure."

This mosaic image of asteroid Bennu is composed of 12 PolyCam images collected on December 2, 2018 by the OSIRIS-REx spacecraft from a range of 15 miles (24 km). CREDIT: NASA/GODDARD/ UNIVERSITY OF ARIZONA

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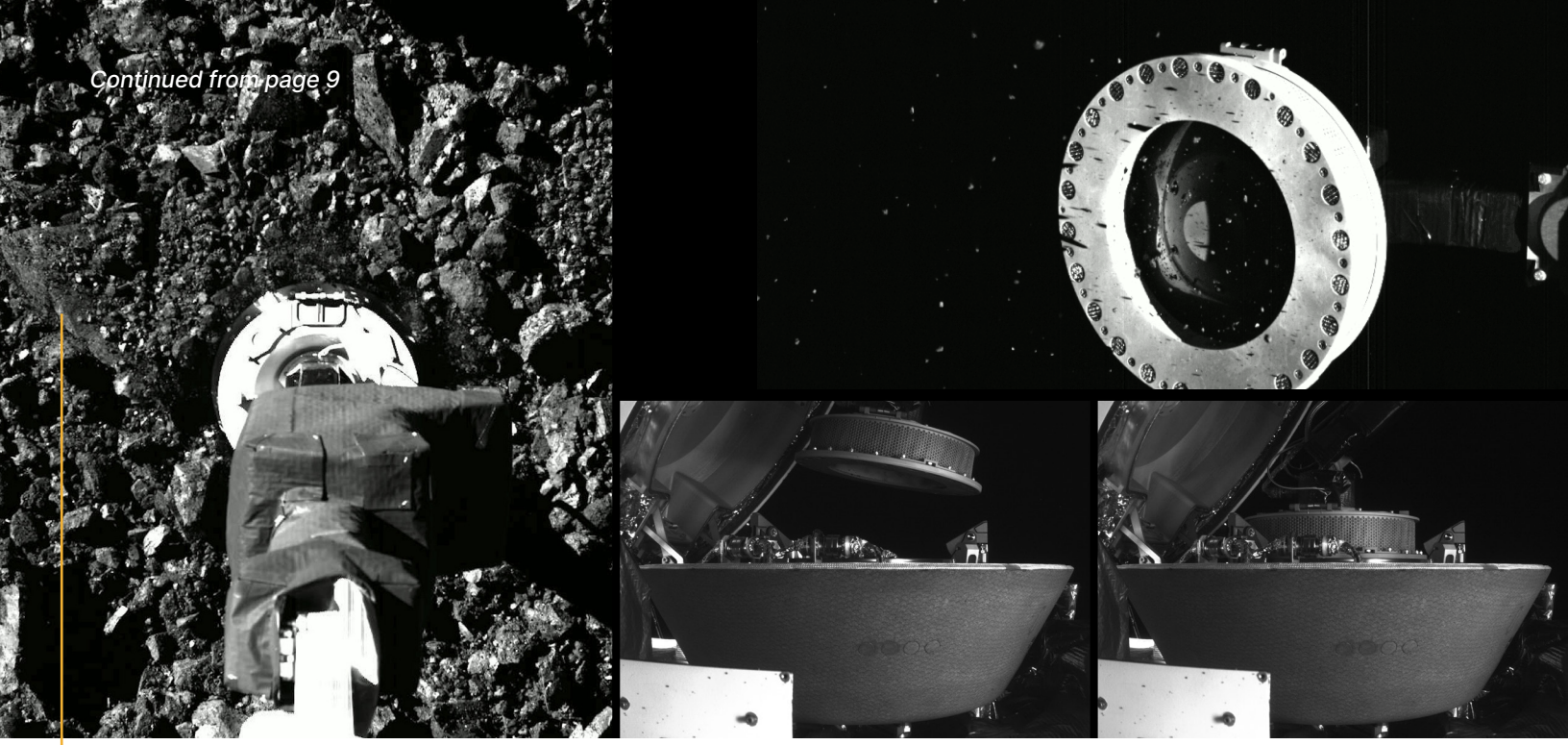


Far left: Captured on October 20, the OSIRIS-REx SamCam imager touches down on asteroid Bennu's surface. Top: OSIRIS-REx sampler head collects rocks and dust from the surface of the asteroid Bennu, showing some small particles slowly escaping. Above left: OSIRIS-REx collector head hovers over the Sample Return Capsule (SRC) after the TAGSAM moves it into the proper position for capture. Above right: Shows collector head secured onto the capture ring in the SRC. Both images were captured by the StowCam camera. CREDIT: NASA/GODDARD/UNIVERSITY OF ARIZONA/LOCKHEED MARTIN

By the evening of October 27, the spacecraft's TAGSAM arm had placed the collector head into the SRC. The following morning, the OSIRIS-REx team verified that the collector head was thoroughly fastened into the capsule by performing a "backout check." This sequence commanded the TAGSAM arm to attempt to back out of the capsule – which tugged on the collector head and ensured the latches are well secured.

"I want to thank the OSIRIS-REx team from the University of Arizona, NASA Goddard, Lockheed Martin, and their partners, and also especially the SCaN and Deep Space Network people at NASA and JPL, who worked tirelessly to get us the bandwidth we needed to achieve this milestone, early and while still hundreds of millions of miles away," said Thomas Zurbuchen, NASA's associate administrator for science at the agency's headquarters in Washington. "What we have done is a real first for NASA, and we will benefit for decades by what we have been able to achieve at Bennu."

On the afternoon of October 28, following the backout check, the mission team sent commands to disconnect the two mechanical parts on the TAGSAM arm that connect the sampler head to the arm. The spacecraft first cut the tube that carried the nitrogen gas that stirred up the sample through the TAGSAM head during sample collection, and then separated the collector head from the TAGSAM arm itself.

That evening, the spacecraft completed the final step of the sample stowage process – closing the SRC. To secure the capsule, the spacecraft closed the lid and then fastened two internal latches, safely storing the sample of Bennu ready for its journey to Earth.

"I'm very thankful that our team worked so hard to get this sample stowed as quickly as they did," said Dante Lauretta, OSIRIS-REx principal investigator at the University of Arizona, Tucson. "Now we can look forward to receiving the sample here on Earth and opening up that capsule."

The stowage process, originally scheduled to begin in early November, was expedited after sample collection when the mission team received images that showed the spacecraft's collector head overflowing with material. The images indicated that the spacecraft collected well over 2 ounces (60 grams) of Bennu's surface material, and

Mission Control staff celebrates the successful TAGSAM execution. CREDIT: LOCKHEED MARTIN

that some of these particles appeared to be slowly escaping from the head. A mylar flap designed to keep the sample inside the head appeared to be wedged open by some larger rocks. Now that the head is secure inside the SRC, pieces of the sample will no longer be lost.

The OSIRIS-REx team will now focus on preparing the spacecraft for the next phase of the mission – Earth Return Cruise. The departure window opens in March 2021 for OSIRIS-REx to begin its voyage home, and the spacecraft is targeting delivery of the SRC to Earth on September 24, 2023.

Goddard provides overall mission management, systems engineering, and the safety and mission assurance for OSIRIS-REx. Dante Lauretta of the University of Arizona, Tucson, is the principal investigator, and the University of Arizona also leads the science team and the mission's science observation planning and data processing. Lockheed Martin Space in Littleton, Colorado, built the spacecraft and provides flight operations. Goddard and KinetX Aerospace are responsible for navigating the OSIRIS-REx spacecraft. OSIRIS-REx is the third mission in NASA's New Frontiers Program, which is managed by Marshall Space Flight Center for the Agency's Science Mission Directorate in Washington.

Grey Hautaluoma / Alana Johnson / NASA Headquarters

Nancy Neal Jones / Code 130

Erin Morton / University of Arizona, Tucson

Watch the video

OSIRIS-REx Touches Asteroid Bennu.

- https://youtu.be/xj0O-fLSV7c

More Information

- https://www.nasa.gov/osiris-rex
- https://www.asteroidmission.org

Goddard Celebrates the Historic Success of OSIRIS-REx!

Russell Carpenter, SSMO Deputy Project Manager/Technical, made a toast to the team. CREDIT: GSFC / AMBER JACOBSON

The OSIRIS-REx team at Goddard celebrated the historic Touch And Go (TAG) sample collection event of asteroid Bennu both in person and virtually on October 20th. At Goddard, Russell Carpenter, Space Science Mission Operations (SSMO) Deputy Project Manager, Technical and Jason Dworkin, OSIRIS-REx Project Scientist, hosted a small group of VIPs in the Building 3 auditorium to watch the TAG event live on NASA television, while watching the live feeds of the STK visualizations and various control centers, listening to the mission voice line, speeches, and finally joining in a celebratory champagne toast with OSIRIS-REx cookies after the successful TAG. The VIPs included senior leadership from Goddard and NASA Headquarters and numbers were limited to maximize social distancing. A subset of the OSIRIS-REx operations team members remained in the secondary mission support area (sMSA) and were welcomed with a standing ovation for the toast after the TAG event.

The OSIRIS-REx Project Scientist, Jason Dworkin, gave a heartfelt toast, "Through furloughs, a fire, a blizzard, a train wreck, a rocket explosion, a nationwide internet outage, an unexpected surface, ejected rocks, and a global pandemic. Through marriages, divorces, and retirements. Through births and deaths, we have at last touched Bennu.

A toast. To the vision of Mike Drake, our first PI [*principal investigator*] who passed away in 2011. To the years of work by managers, engineers, scientists, technicians, analysts, admins, and taxpayers to make this achievement possible. And to you for your support and for joining us today."

Toasts and speeches were also given by Russell Carpenter and VIPs.

The Building 3 auditorium gathering included the NASA Headquarters Science Mission Directorate (SMD) Deputy Associate Administrator, Sandra Connolly, and FPD Director Dave Mitchell, who both congratulated the tremendous team effort.

Representative Steny Hoyer also congratulated the team by video. The guest list also included the following:

(John) Carl Adams/HQ Program Executive

Jeff Grossman/HQ Program Scientist

Nick Jedrich/SMD Deputy Chief Engineer, HQ

Joe Pellicciotti/Prelaunch Project Staff, SMD Chief Engineer, HQ

Joan Salute, PSD Deputy Division Director for Flight Programs

Dave Pierce/GSFC WFF Director

Sherri Corbo/GSFC CFO, Code 150

Jonathan Gal-Edd/GSFC Prelaunch Project Staff, Code 300

Jason Hair/GSFC Prelaunch Project Staff, Code 410

Robert Jenkens/GSFC Prelaunch Project Staff, Code 460

Juan Roman/GSFC Code 500

Samantha Hicks/GSFC Code 543

Joe Schepis/Prelaunch Project Staff, GSFC Chief Engineer, Electromechanical, Code 544

Brent Bos/GSFC Project Staff, Code 551

Dave Everett/GSFC Prelaunch Project Staff, Code 555

(left to right) Dave Mitchell, FPD Director, gave his thanks and congratulations for a tremendous team effort; Representative Steny Hoyer joined the VIP gathering remotely to offer congratulations; Project Scientist, Jason Dworkin, talks with Dave Mitchell and SMD Deputy Associate Administrator, Sandra Connolly, during the VIP event. CREDIT: GSFC / AMBER JACOBSON

Jim Garvin/GSFC Project Staff, Code 600

Joe Hill/GSFC Code 600

Danny Glavin/GSFC Project Staff, Code 690

Paul Mahaffy/GSFC Planetary Science, Code 690

Joe Nuth/GSFC Project Staff, Code 690

Lucy Lim/GSFC Project Staff, Code 691

Dennis Reuter/GSFC Project Staff, Code 693

At the sMSA at Goddard, the following persons were invited:

Kerstyn Auman, GSFC Code 444

Nayi Castro, GSFC Code 584

John Van Eepoel, GSFC Code 591

Jenny Donaldson, GSFC Code 595

Donald Ellison, GSFC Code 595

Jacob Englander, GSFC Code 595

Andrew Liounis, GSFC Code 595

Josh Lyzhoft, GSFC Code 595

The primary control center, located at the Lockheed Martin (LM) Waterton Campus in Littleton, Colorado, also hosted socially-distanced team members in the mission support area and surrounding rooms at LM. Goddard Project Manager, Rich Burns, and executives from NASA Headquarters, Goddard, LM and the University of Arizona celebrated the success of the historic endeavor.

The hosts of the Goddard celebration shared their thoughts after watching the historic event unfold on live television. Russell Carpenter, Goddard's SSMO Deputy Project Manager, Technical, said, "Operating this mission over the last four years, re-inventing it on the fly, time and again, to face new challenges, demanded a sustained level of intensity and flawless execution that I have rarely, if ever, seen in over three decades with this Agency.

OSIRIS-REx Project Scientist, Jason Dworkin agreed: "The success of TAG was due to a remarkable collaboration between the science and engineering teams; not only for the sample site selection, but the interpretation of hazards at the sampling site and the detailed shape model of the asteroid to enable the remarkable navigational feats performed. The supra-nominal performance of the navigation, sampling system, and flight system led to a sample collection likely near capacity. This means that the science team will be able to perform overguide science analyses for a deeper understanding of Bennu's lessons on the formation of the solar system. Furthermore, since 75% of the returned sample will be saved for future generations of scientists, there will be ample material for discoveries on topics beyond our imagination." ■

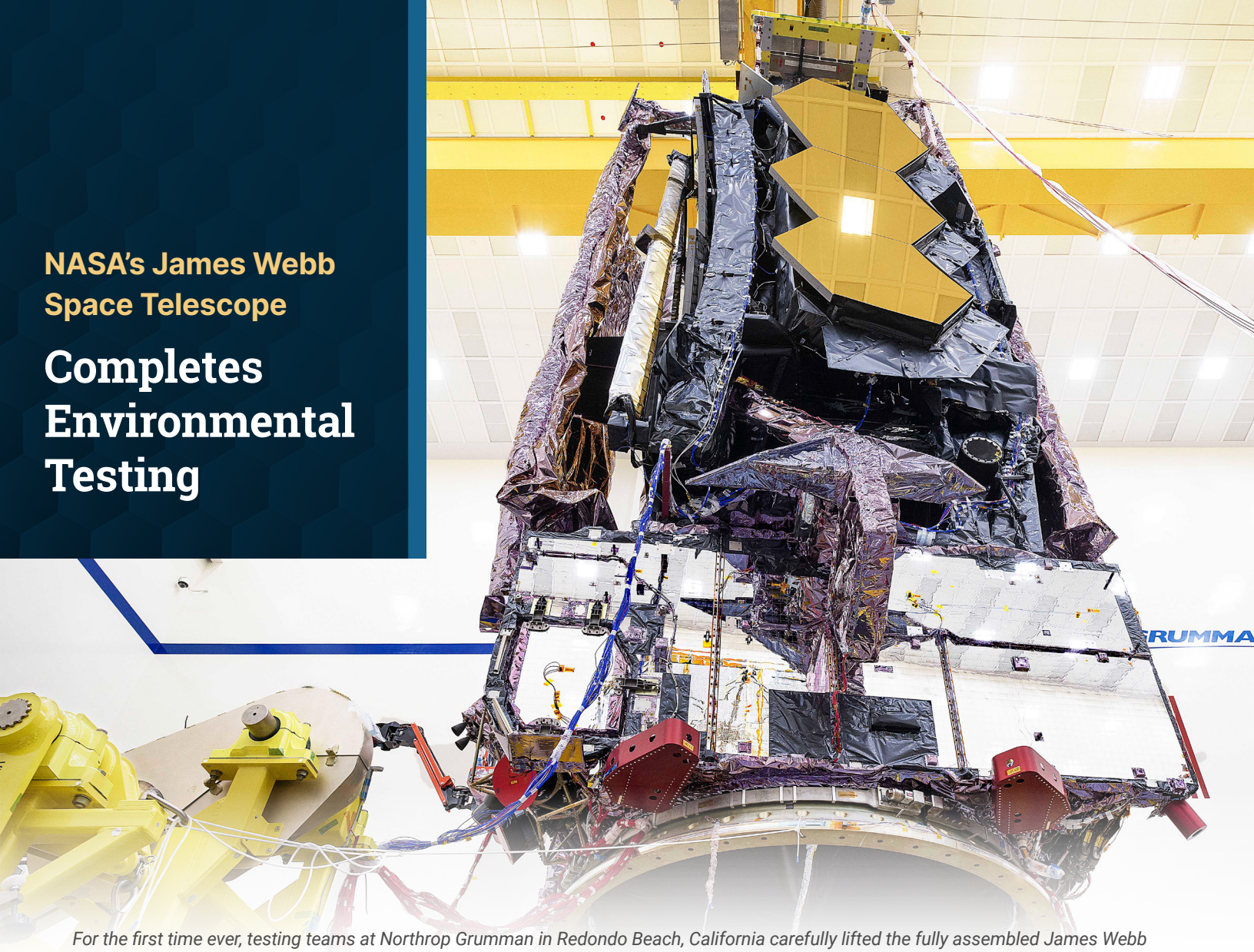
Kelly Hyde / Code 444
Project Support Manager

"A toast. To the vision of Mike Drake, our first PI who passed away in 2011. To the years of work by managers, engineers, scientists, technicians, analysts, admins, and taxpayers to make this achievement possible. And to you for your support and for joining us today."

Jason Dworkin

NASA's James Webb Space Telescope

Completes Environmental Testing



For the first time ever, testing teams at Northrop Grumman in Redondo Beach, California carefully lifted the fully assembled James Webb Space Telescope in order to prepare it for transport to nearby acoustic and sine-vibration testing facilities. CREDIT: NASA/CHRIS GUNN

With the completion of its latest series of milestone tests, NASA's James Webb Space Telescope has now survived all of the harsh conditions associated with a rocket launch to space.

Webb's recent tests have validated that the fully assembled observatory will endure the deafening noise and the jarring shakes, rattles and vibrations that the observatory will experience during liftoff. Known as "acoustic" and "sine-vibration" testing, NASA has worked carefully with its international partners to match Webb's testing environment precisely to what Webb will experience both on launch day, and when operating in orbit.

Though each component of the telescope has been rigorously tested during development, demonstrating that the assembled flight hardware is able to safely pass through a simulated launch environment is a significant achievement for the mission. Completed in two separate facilities within Northrop Grumman's Space Park in Redondo Beach, California, these tests represent Webb's final two, in a long series of environmental tests before Webb is shipped to French Guiana for launch.

The next environment Webb will experience is the ride to space.

"The successful completion of our observatory environmental tests represents a monumental milestone in the march to launch. Environmental testing demonstrates Webb's ability to survive the rocket ride to space, which is the most violent portion of its trip to orbit approximately a million miles from Earth. The multinational group of

individuals responsible for the execution of the acoustic and vibration test is composed of an outstanding and dedicated group of folks who are typical of the entire Webb team," said Bill Ochs, Webb project manager for NASA Goddard.

Testing began by first encapsulating the entire telescope in a mobile clean room built to shield it from the outside world. Technicians then carefully guided it to a nearby acoustic testing chamber where it was intentionally blasted by sound pressure levels above 140 decibels, with a spectrum tuned to the specific signature of the Ariane 5 rocket it will ride to space. During the tests, nearly 600 individual channels of motion data were carefully observed and recorded. Typical acoustic and vibration tests measure approximately 100 channels of data, but the complex size and shape of the observatory required considerably more measurement to ensure success. The data was then thoroughly analyzed and marked as a complete success.

Upon successful completion of its final acoustics tests, Webb was again packed and transported to a separate facility to simulate the low frequency vibrations that occur during liftoff. While inside, Webb was placed on a specialized shaker table capable of precise vertical and horizontal acceleration. Where acoustic testing simulates the high-frequency dynamics of launch, vibration testing covers the lower frequencies experienced. With the combination of the two the entire mechanical environment Webb will experience during launch is accounted for.

Webb is now scheduled to move forward into the last full extension of its iconic primary mirror and sunshield, followed by a full systems evaluation before being encapsulated in a specialized shipping container for transport to South America. Deploying the observatory after experiencing a simulated launch environment is the best way to replicate the true series of events the observatory will experience during launch, and when performing its complex deployment sequence in space. Initial analysis suggests the observatory passed through observatory-level acoustic and vibration testing successfully, but the full verification of flight worthiness will occur after Webb has successfully completed final deployment tests.

Known as "acoustic" and "sine-vibration" testing, NASA has worked carefully with its international partners to match Webb's testing environment precisely to what Webb will experience both on launch day, and when operating in orbit. CREDIT: NORTHROP GRUMMAN

Webb is NASA's next great space science observatory, which will help in solving the mysteries of our solar system, looking beyond to distant worlds around other stars, and probing the mystifying structures and origins of our universe. Webb is an international program led by NASA, along with its partners ESA (European Space Agency) and the Canadian Space Agency. ■

Thaddeus Cesari / Code 443
JWST Technical Writer

Engineers at Ball Aerospace wheeled the shipping container containing the Ozone Mapping and Profiler Suite (OMPS) instrument for JPSS-2 to the truck to depart for integration and test. CREDIT: BALL AEROSPACE

Joint Polar Satellite System-2 Instruments Integrated to the Spacecraft

The second Joint Polar Satellite System spacecraft (JPSS-2) is one step closer to launch this fall, as its instruments have nearly all arrived at the Northrop Grumman spacecraft facility in Gilbert, Arizona, to be integrated with the spacecraft bus.

JPSS-2 is the nation's next polar-orbiting observational weather satellite, which is scheduled to launch in 2022 and provide critical data for predicting severe weather and monitoring the environment into the 2030s.

Over the course of the fall, vendors across the country have delivered three of JPSS-2's four instruments to Gilbert: the Visible Infrared Imaging Radiometer Suite (VIIRS), the Ozone Mapping and Profiler Suite (OMPS), and the Advanced Technology Microwave Sounder (ATMS). Each of these instruments collects a diverse set of data that is used by meteorologists, scientists, and other users all over the world.

As each instrument arrived at the facility, it was unboxed and inspected, then lifted by crane and attached to its respective place on the spacecraft bus. Then technicians hooked up their electrical connections and tested them to make sure they were operating as expected.

"Over the past several months, JPSS-2 has transformed from a set of components and instruments into a true satellite that will continue the critical lifeline of weather and environmental data," said Keith Walyus, JPSS Flight Project Manager. "It's a tremendous accomplishment for the JPSS team and our partners. We still have a great deal of work to accomplish before launch, but based on our progress to date, it's without question that we can overcome any challenges we might face."

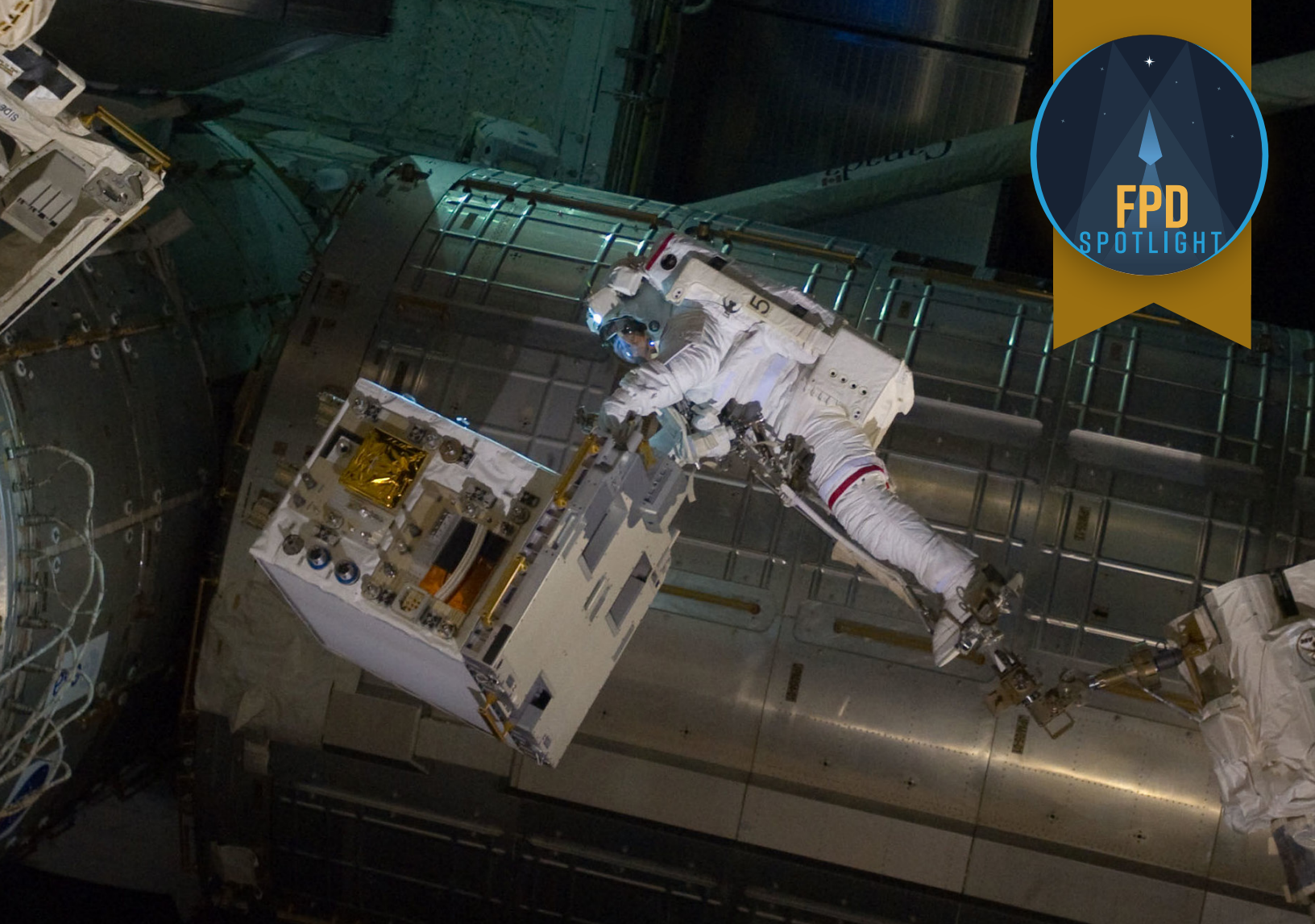
In early 2021, the entire observatory will be fully assembled and ready for the next phase, environmental testing, which will ensure the fully integrated spacecraft can survive the harsh environments of launch and space.

JPSS-2 is the second in a series of four spacecraft in the Joint Polar Satellite System. The first, JPSS-1 (now called NOAA-20), launched in November 2017. JPSS-2 will be renamed NOAA-21 after a successful launch and on-orbit checkout. JPSS-3 and -4 are both also in production and are scheduled to launch in 2027 and 2032, respectively. This ensures a continuous stream of weather and environmental observations for more than a decade to come.

JPSS is the nation's advanced series of polar-orbiting environmental satellites, representing significant technological and scientific advancements in observations used for severe weather prediction and environmental monitoring. These data are critical to the timeliness and accuracy of forecasts three to seven days in advance of a severe weather event. JPSS is a collaborative effort between the National Oceanic and Atmospheric Administration (NOAA) and NASA. ■

Ashley Hume / Code 470
JPSS Technical Writer

Technicians prepare to attach the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument to the JPSS-2 spacecraft bus at Northrop Grumman's spacecraft facility in Gilbert, Arizona. CREDIT: NORTHROP GRUMMAN



FPD SPOTLIGHT

NASA'S EXPLORATION & IN-SPACE SERVICES PROJECTS DIVISION (NExIS)

USHERING IN AN ERA OF MORE SUSTAINABLE, AFFORDABLE AND RESILIENT SPACEFLIGHT NEAR EARTH, THE MOON, AND DEEP INTO THE SOLAR SYSTEM

Through its work, NExIS is ushering in a new sustainable era of spaceflight by developing an on-orbit servicing, assembly, and manufacturing (OSAM) capability for the Nation. Rather than disposing of a satellite when it reaches the end of its operational life due to a lack of fuel or repairable issues, the technologies NExIS is developing will allow for prolonged operations and technology upgrades. These groundbreaking technologies to service spacecraft, as well as those needed for in-space assembly and manufacturing, will help enable sustainable exploration of our solar system and beyond.

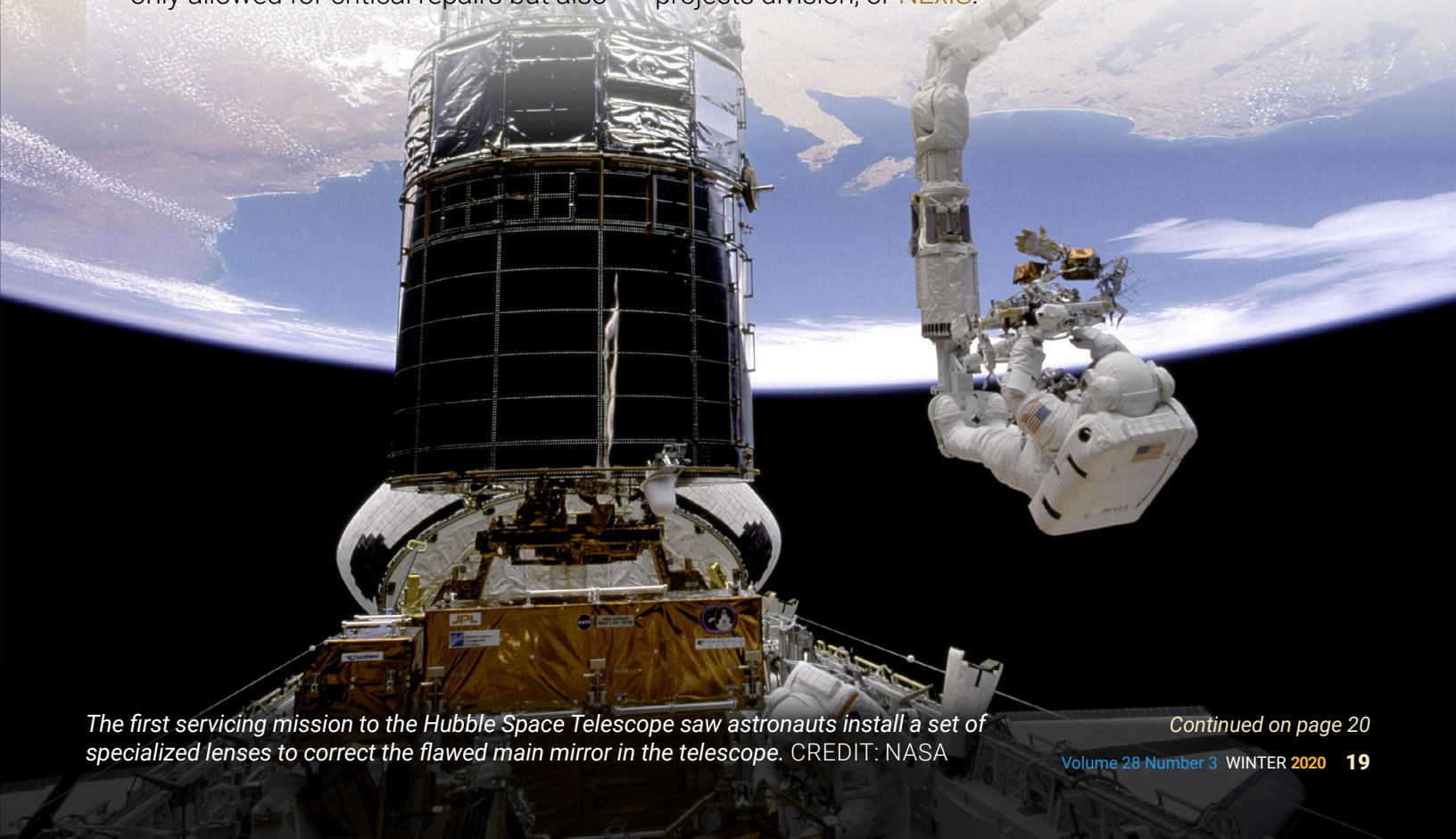
NExIS promotes U.S. leadership and new industries by collaborating with and transferring these technologies to civil, security and commercial stakeholders.

Spacewalking astronauts successfully transferred the Robotic Refueling Mission module from the Atlantis shuttle cargo bay to a temporary platform on the ISS' Dextre robot. CREDIT: NASA

Satellite servicing has not always been an element of spaceflight, but ever since it was first conceived, Goddard has played a critical role. During NASA's first launches, the focus was simply on getting spacecraft to orbit, and only in the 1970s did the Agency begin to shift to more modular designs and to realize servicing spacecraft was possible. From the Solar Maximum Repair Mission in 1984 to the golden age of servicing of the five successful Hubble Servicing Missions from 1993-2009, Goddard and satellite servicing have always gone hand in hand. Though the name of the organization within NASA responsible for these missions has changed over the years, the commitment to making spaceflight more sustainable, affordable, and resilient has remained the same.

The many name changes of the Goddard organization reflect the growing importance and scope of satellite servicing as a capability at the Agency. The immense success of the Hubble Servicing Missions which not only allowed for critical repairs but also for technology refreshes, proved beyond a shadow of a doubt that servicing was a worthwhile endeavor. With that in mind, and with the subsequent retirement of the Space Shuttle program in 2011, Goddard established the Satellite Servicing Capabilities Office (SSCO) which built on the legacy of Hubble to develop state-of-the-art robotic servicing technologies. Many years later, after a number of technology demonstration missions, in 2016, the office was re-established as a division, changing its name to the Satellite Servicing Projects Division (SSPD).

2019 saw another name change for SSPD, once again as a result of the burgeoning importance of satellite servicing. Beyond just extending the lifespan of or repairing satellites, the technologies required for servicing have applications to multiple other endeavors—chief among them exploration of our solar system and beyond. With that focus in mind, SSPD's name was officially changed to NASA's Exploration and In-space Services projects division, or NExIS.



The first servicing mission to the Hubble Space Telescope saw astronauts install a set of specialized lenses to correct the flawed main mirror in the telescope. CREDIT: NASA

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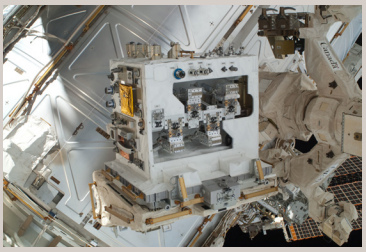
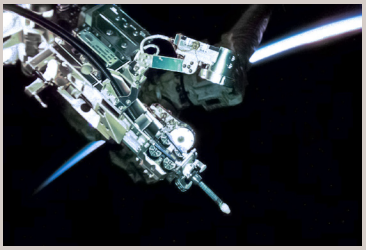
Robotic Refueling Mission 1 & 2 — 2011-2017



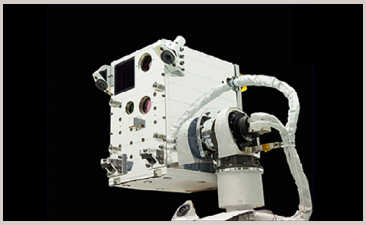
The Robotic Refueling Mission (RRM) was a multi-phased International Space Station (ISS) technology demonstration that tested the tools, technologies, and techniques to refuel and repair satellites in orbit – especially satellites not designed to be serviced. Consisting of a module or box affixed to the outside of the ISS and robotic tools, RRM Phase 1 & 2 used ISS' Dextre robot to operate tools and test servicing tasks such as cutting and peeling back protective thermal blankets, unscrewing caps, turning valves, transferring fluid, inspection, and intermediary steps leading up to coolant replenishment.

Robotic Refueling Mission 3 — 2018 – present



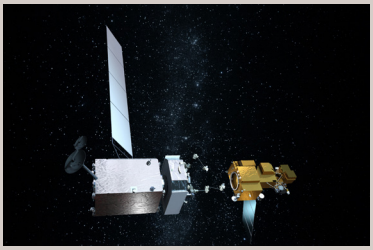
RRM3 built on RRM Phases 1 & 2 to demonstrate the tools and techniques needed to replenish cryogenic fluid in space. The mission launched to the ISS in December 2018 where it successfully stored cryogenic fluid for four months with zero boil off, representing the longest-ever cryogen storage with no loss of fluid in space, and demonstrating the efficient use of these important consumables, which can act as coolants or propellants. NExIS conducted two sets of robotic operations using ISS' Dextre robot and RRM3's three tools, the most recent of which took place in October 2020. The recent operations were the first time Dextre simultaneously operated both of its robotic arms to complete a task. Since fuel is critical to any long-duration journey, the capabilities developed by RRM3 have the potential to not only help spacecraft live longer but also journey farther.

Raven — 2017 - present



Raven is a technology-filled module on the ISS that helped NASA test key elements of a new spacecraft autopilot system. Since launching to the ISS in February of 2017, Raven has imaged over 20 incoming and departing spacecraft using its visible, infrared, and LIDAR cameras, and processing that data to determine the spacecrafts' relative distance and positioning. Engineers at NExIS observed Raven's performance to develop and perfect a relative navigation system that will later be incorporated in the division's On-orbit Servicing, Assembly, and Manufacturing 1 mission, with the potential to be incorporated in other NASA missions as needed.

On-orbit Servicing, Assembly, and Manufacturing 1 (OSAM-1) — 2024

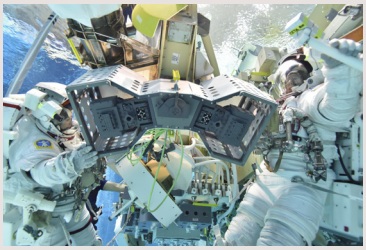


OSAM-1 is NExIS' flagship mission which will, for the first time ever, refuel a satellite not designed to be refueled. Developed in collaboration with Maxar Technologies, OSAM-1 will use robotic arms to rendezvous with, grasp, refuel and relocate another satellite to extend its operational life. Following refueling, a payload onboard called Space Infrastructure Dexterous Robot (SPIDER) will assemble a communications antenna and manufacture a beam, demonstrating these critical capabilities. This revolutionary technology demonstration, which will carry out many firsts, will help make what was thought to be impossible a reality. Future applications of the technologies demonstrated by OSAM-1 range from robotically repairing satellites, to assembling large telescopes, to refueling spacecraft on journeys to distant locations, and more.

Robotic External Leak Locator (RELL) — 2015 – present

RELL is a robotic, remote-controlled tool that helps mission operators detect the location of an external leak and rapidly confirm a successful repair. It is used on the ISS to detect external ammonia leaks, which is important since ammonia is used to maintain the ISS' cooling system. NExIS launched a first RELL unit in 2015, and after the tool proved itself successful and useful, launched a second unit in 2019.

Robotic Tool Stowage (RiTS) — 2019 – present

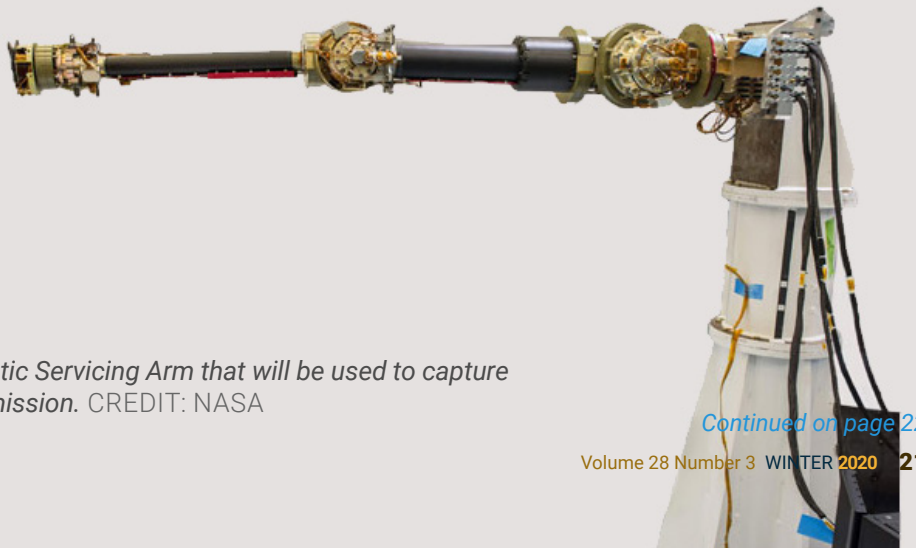


RiTS is an aluminum container that was installed on the outside of ISS in in July of 2020. It houses two RELL units, which were also developed by NExIS. RiTS provides thermal and physical protection for the tools and allows them to be more quickly and efficiently deployed by the station's Dextre arm to detect external ammonia leaks that could compromise the efficiency of the station's cooling system.

Together, RELL and RiTS eliminate the need for astronauts to perform the same leak-location tasks. RiTS and RELL's capabilities could be employed beyond the station in the future to detect leaks occurring from future human habitats in space.

AMS Repair — 2019-2020

In November 2019, NExIS provided 10 specialized tools to assist in the repair and subsequent life extension of the Alpha Magnetic Spectrometer (AMS) instrument aboard the International Space Station. The Johnson Space Center sought NExIS' assistance because of the Division's extensive background providing specialized repair tools, both for the Hubble Space Telescope Servicing Missions, and for robotic servicing missions. For the AMS Life Extension Mission, space station astronauts performed extra vehicular activities (EVAs) and used the tools to remove covers and shields, perform the repairs, and replace the parts that were removed. With its capabilities restored, AMS is now able to continue detecting and measuring antimatter in cosmic rays, helping us understand more about the formation of the Universe and search for evidence of dark matter.



An engineering development unit of the Robotic Servicing Arm that will be used to capture and refuel a satellite as part of the OSAM-1 mission. CREDIT: NASA

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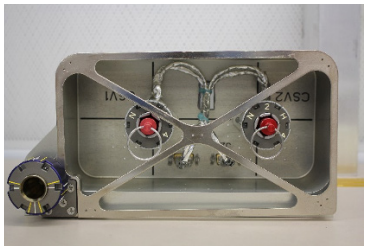
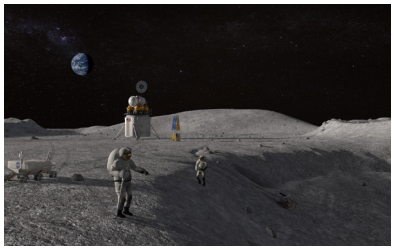
Cooperative Servicing FUTURE



NExIS envisions a world where satellites are designed to be serviced, therefore making life extension through refueling and repairs much easier. With that in mind, the division works to develop and promote the use of cooperative service aids, or elements that can be incorporated into satellites being designed or assembled today, allowing them to be more easily serviced in the future. These can range from simple fiducials, or what are essentially robot targets, that make grappling satellites in space easier, to sophisticated valves designed for cooperative refueling, all the way to grapple fixtures that make capturing a satellite simpler. Cooperative service aids break the "one and done" paradigm and help to make OSAM the norm in a low-mass and low-cost manner.

Artemis and Exploration FUTURE

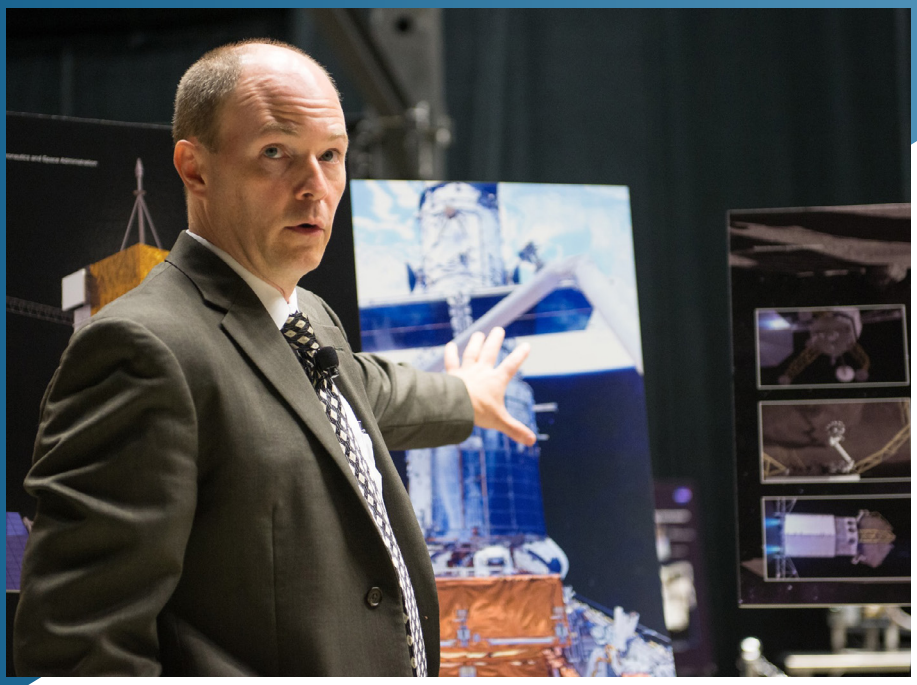


The basic formula for sustainable space exploration is: consumable replenishment and component repair (servicing), construction of large and precise structures (assembly), and creation of components from feedstock or in-situ resources (manufacturing) to break the dependence on earth supply chain logistics.

OSAM capabilities are critical to developing sustainable space architectures that allow spacecraft to live longer and journey farther, as well enabling a sustained human presence in space. Robotic OSAM technologies facilitate the replenishment of supplies that run out from spacecraft fuel, to coolant, to oxygen. They can help in ensuring the longevity and operability of spacecraft and life support systems with unplanned repair and planned maintenance.

OSAM is an important building block to enabling humans to explore beyond where we've ever gone before. ■

Vanessa Lloyd / Code 480
NExIS Communications Lead



As SSPD Deputy Director and NExIS Division Chief, Ben Reed frequently gave tours of the divisions' Robotic Operations Center at NASA's Goddard Space Flight Center. CREDIT: NASA/AUBREY GEMIGNANI

A Thank You and Godspeed to **Ben Reed**

You can't talk about satellite servicing without talking about Ben Reed. Ben's work on satellite servicing began with the Hubble Space Telescope, for which he was the Chief Materials Engineer from 1998 to 2010. From 2010 onwards, he served as the Deputy Director for the Satellite Servicing Capabilities Office and later the Satellite Servicing Projects Division, guiding the Division through various organizational changes, including the transition to NASA's Exploration and In-space Services projects division (NExIS), for which he was the Division Chief.

Ben devoted his 20-plus-year career at NASA to promoting and establishing an enduring satellite servicing capability for the Nation, developing many associated technologies and capabilities along the way. His work over the years paid off with the funding of the Restore-L mission, which later became OSAM-1. When it launches in the mid-2020s, OSAM-1 will be the first-ever, free-flying, robotic refueling, precision assembly, and in-space manufacturing mission. Recognizing the importance of OSAM, NASA also recently established an OSAM National Initiative Strategy to advance OSAM missions. Ben consistently pushed the boundaries of technologies and helped position the U.S. as a global leader in satellite servicing.

"As the leader of the Division, Ben worked tirelessly to empower the team," said Jill McGuire, Exploration Platforms Office Head, who worked with Ben for over 15 years. "This allowed team members to utilize their diverse skills to develop innovative solutions and technologies that will help usher in a new era of spaceflight and exploration," she added.

In November 2020, Ben accepted a position as the Vice President of Engineering of a company called IBX. There, he will continue his innovating work in the space arena, but his contributions to NASA will not be forgotten.

FPD

Administrative Support Community Spotlight

The Administrative Support Community Spotlight seeks to recognize and connect members of the administrative 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 administrative support community.

How can we support you?

Contact FPD Administrative Support website for general information.

- Admin Space Station (AdSS) for Goddard Space Flight Center (GSFC) https://fpdsp13.gsfc.nasa.gov/sites/100/SitePages/Admin_Portal.aspx
- Flight Projects Directorate Project Support https://fpd400.gsfc.nasa.gov/sites/400/FPD_Internal/SitePages/ProjectSupport.aspx

jacqueline.seymore@nasa.gov
(301) 286-6307
sarah.a.harnish@nasa.gov
(301) 286-6567

Ayanna Roberts

Exploration and In-Space Services Projects Division (NExIS)
Project Support Specialist

Ayanna Roberts, a project support specialist in the Exploration and In-Space Services Projects Division (NExIS), has worked at Goddard Space Flight Center for 4 years. She joined the Goddard community after working at NASA Headquarters for 2 years. In her current position, Ayanna coordinates domestic and international travel for the NExIS division and multiple projects including the Mars Organic Molecule Analyzer (MOMA) and the Mars Sample Return-Capture, Containment, and Return System (MSR-CCRS). She has extensive knowledge of Goddard's travel processes and shares her experience planning travel across the directorate. The dynamic role of coordinating domestic and international travel is critical and there is always something new to learn, Ayanna says, "There is never a dull moment in my role, that's what makes it exciting and challenging at the same time." Outside of work, Ayanna enjoys watching college basketball and football with her family. ■

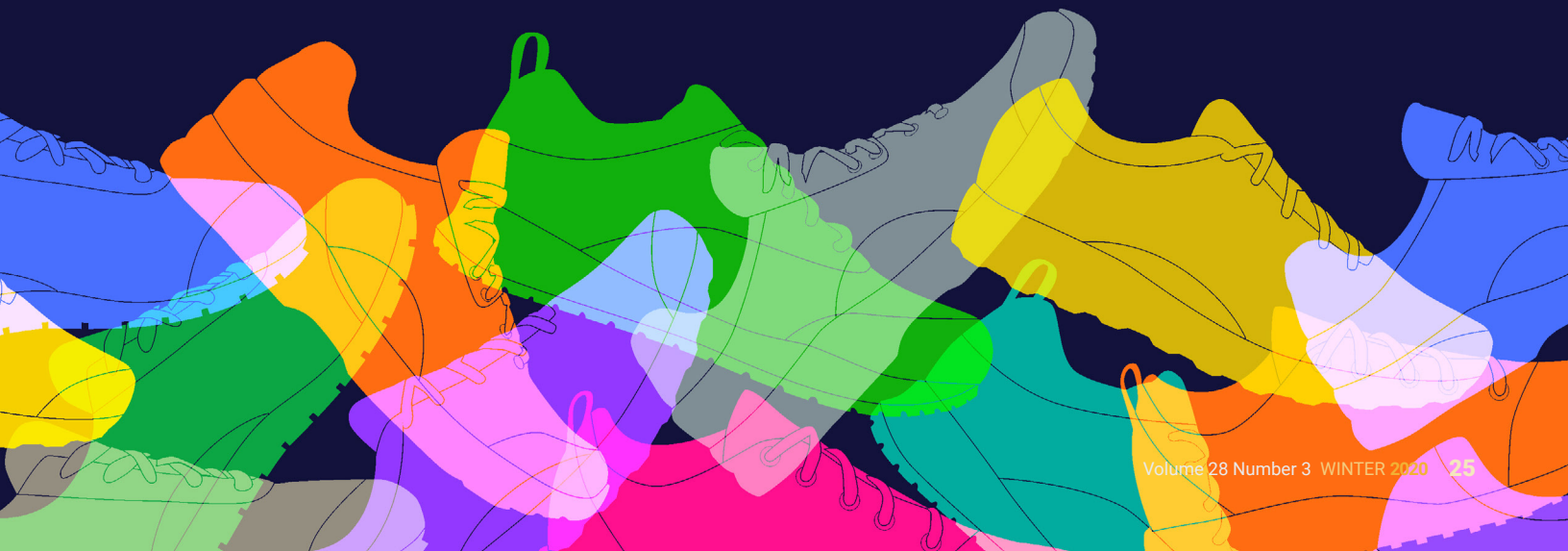
Sarah Harnish / Code 400

Dave Parker's family and friends from Goddard and NASA Headquarters joined the Walk to Defeat ALS on October 17, 2020.
CREDIT: PHOTO COURTESY OF CHRISTY HANSEN

Walk to Defeat ALS with Team Dave!

On October 17, 2020, friends and family of Dave Parker (Code 480) supported him in the Walk to Defeat Amyotrophic lateral sclerosis (ALS). Friends and colleagues from NASA Goddard and Headquarters joined him on this amazing day. The ALS Association facilitates this walk annually to raise awareness about ALS, and the struggles families face every day.

Goddard friends who attended included Dave Mitchell (400), Nathan Kurtz (615), Willie Davies (480), Justin Cassidy (480), Stan Krol (441) and Christy Hansen (400). They were joined by colleagues from NASA Headquarters Science Mission Directorate (SMD), including Sandra Connelly (SMD Deputy Associate Administrator), Nicky Fox (Heliophysics Division Director), Charles Webb (Earth Science Division (ESD), Associate Director for Flight), Bruce Tagg (ESD, Airborne Science Program Manager), Alan Zide (Heliophysics Program Executive), and Aly Mendoza-Hill (Heliophysics Program Executive).



Goddard To Play Pivotal Role in Artemis I Communications

The Orion spacecraft is the human-rated space vehicle that will help NASA to establish a sustained presence on the Moon. During Artemis I, Orion will venture thousands of miles beyond the Moon during an approximately three week mission. CREDIT: NASA

On our journey forward to the Moon and on to Mars, NASA must test technologies and capabilities to ensure astronaut safety. The Artemis I mission will be an uncrewed flight test of the Orion spacecraft that places a human-rated crew vehicle in lunar orbit for the first time since the Apollo missions of the 1960s and 70s. The mission will showcase the capabilities of both Orion and the Space Launch System (SLS), NASA's powerful new rocket, which will launch Artemis missions from Kennedy Space Center in Florida.

Artemis I will demonstrate NASA's networks' comprehensive services for journeys to lunar orbit. Communications services allow flight controllers in mission control centers to send commands to the spacecraft and receive data from Orion and SLS systems. Tracking, or navigation, services enable the flight controllers to see where the spacecraft are along their trajectory through space.

The Artemis I mission will require all of NASA's networks to work in tandem, providing different communications and tracking service levels as Orion leaves Earth, orbits the Moon, and returns safely home. At NASA's Goddard Space Flight Center, the Flight Projects Directorate's Exploration and Space Communications (ESC) projects division will provide critical direct-to-Earth and communications relay services for Artemis I.

NASA Direct-To-Earth Services

NASA's direct-to-Earth communications services rely on ground stations worldwide to facilitate links directly from the spacecraft to the ground. These stations will provide communications and navigation services during launch and navigation services at various points on Artemis I's journey to the Moon.

The Launch Communications Segment (LCS) will provide critical links to both Orion and SLS before and during launch of Artemis I. Three ground stations along Florida's space coast comprise LCS, which was designed to meet the specific needs of the SLS launch vehicle and will grow to support other missions after Artemis I.

Specifically, the first two stations along the rocket's flight path will provide uplink and downlink communications between the rocket and mission controllers. In the final phases of ascent, the third station will downlink high rate telemetry and

SLS Block 1 Crew

video from SLS while Orion connects to the satellites in NASA's Tracking and Data Relay Satellites (TDRS) constellation.

These direct-to-Earth links will also provide navigation services on Orion's journey from low-Earth orbit to the Moon and back through commercially owned and operated ground stations in Santiago, Chile and Hartebeesthoek, South Africa. These stations will support navigation data before and after the outbound trajectory correction burns that ensure the spacecraft stays on a path towards the Moon. They will also provide navigation services during Orion's outbound powered flyby burn that occurs at the mission's closest approach to the Moon, setting the stage for final insertion into lunar orbit.

For Orion's return from the Moon, the ground stations will provide navigation data for departure from lunar orbit and the return power fly-by burn that will place Orion on a course back for Earth, during which the stations will also provide navigation services.

NASA Communications Relay Services

NASA's communications relay satellites can provide near-continuous services to spacecraft through the constellation of TDRS. Located about 22,000 miles above Earth, TDRS relay data from spacecraft at lower altitudes to ground antennas. Relay services will play a critical role during launch and low-Earth orbit phases of the Artemis I mission.

Beginning at the launch pad, TDRS will maintain a connection with Orion and the Interim Cryogenic Propulsion Stage (ICPS). ICPS provides the power to accelerate the spacecraft fast enough to overcome the pull of Earth's gravity and set it on a precise trajectory to the Moon. TDRS will continue service until Orion and ICPS leave TDRS coverage, when NASA's Deep Space Network (DSN) takes over.

On Orion's return to Earth, TDRS will facilitate communications from the final return trajectory correction burn through splashdown in the Pacific Ocean and recovery of the capsule. The return trajectory correction burn ensures Orion enters the atmosphere at just the right moment, allowing NASA to land the craft safely.

NASA's Deep Space Network

After handover from TDRS, the DSN, managed by NASA's Jet Propulsion Laboratory in Southern California, will handle communications for Artemis I beyond low-

This 111.5-foot Deep Space Network antenna at the Goldstone Deep Space Communications Complex in California's Mojave Desert can send and receive communications from the farthest reaches of the solar system. The Deep Space Network will be integral to lunar phases of the Artemis I mission. CREDIT: NASA/JPL-CALTECH

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This rendering shows three Tracking and Data Relay Satellites (TDRS) alongside two of the flagship missions they support: the International Space Station and the Hubble Space Telescope. The TDRS constellation can provide near-continuous communications services for launch vehicles and spacecraft in low-Earth orbit. They will be integral to the near-Earth phases of the Artemis I mission. CREDIT: NASA

Earth orbit. This includes the mission's outbound trajectory corrections, outbound powered flyby, return powered flyby burns, and return trajectory corrections, while the Near Earth Network (NEN) provides supplemental navigation data.

The near-space and deep space ground stations tag team navigation for Orion so that engineers can employ a technique called three-way Doppler tracking. Using this method — with two ground stations on Earth in contact with Orion simultaneously — NASA can triangulate Orion's location relative to the ground stations.

At the Moon, DSN will enable insertion into distant retrograde orbit (DRO). The DRO is a highly stable orbit in which Orion travels retrograde, or opposite, from the direction the Moon travels around Earth. The DSN will maintain communications with Orion while in DRO and during the burns for DRO departure, return power fly-by, return transit and the final return trajectory correction burn, with assistance from TDRS.

The DSN will also help facilitate communications for all three of the mission's CubeSat deployment stops. The CubeSats are small satellites that will be deployed along Orion's trajectory to provide additional research opportunities for scientists and engineers. After deployment, many of the CubeSats will also communicate through the DSN.

Goddard communications services will play a pivotal role in all Artemis missions to the Moon. The Flight Projects Directorate and ESC will empower NASA to return humans to the Moon and establish a sustained presence there. Collaborating with our partners at the Jet Propulsion Laboratory, they will ensure the safety and success of these missions.

The networks supporting Artemis receive programmatic oversight from NASA's Space Communications and Navigation (SCaN) program office. In addition to providing communications services to missions, SCaN develops the technologies and capabilities that will help propel NASA to the Moon, Mars and beyond. ■

Danny Baird / Code 450
ESC Technical Writer

CODE 450

ESC

DIVISION REORGANIZATION

FUELING THE COMMERCIAL SPACE ECONOMY

As of October 16, 2020, the **Exploration and Space Communications** (ESC) projects division has reorganized its portfolio to execute the bold commercialization plan set forth by NASA's Space Communications and Navigation (SCaN) program. This plan cements the U.S. government's commitment to engage with private industry to build a commercial space economy.

The reorganization supports SCaN's vision of transferring 100% of Earth-proximity, direct-to-ground communications services to commercial industry. For 60 years, NASA has relied on government-managed infrastructure for space communications, but private industry has now matured to a level where companies can provide robust space communications services to NASA spacecraft.

ESC has created three new projects and offices to help guide these burgeoning service providers into the space communications marketplace while continuing to provide unparalleled mission support services to customers.

CIS

The **Commercialization, Innovation, and Synergies** (CIS) office nurtures diverse relationships across government, academia and the aerospace industry, offering ESC's expertise in communications and exploration systems. The office identifies opportunities for collaborative solutions to the communications challenges of tomorrow. CIS will develop up-and-coming commercial partners into robust and reliable options for use by the Near Space Network and link those partners with Goddard subject matter expertise.

CODE 450.1

NSN

The **Near Space Network** (NSN) is a single point of contact for mission-support service fulfillment, connecting user missions to both government and commercial communications services. They offer a comprehensive set of services including mission planning, integration, spectrum management, communications scheduling, and critical operations launch support. The NSN will also work with space communications vendors, garnering a diverse and competitive marketplace that can support NASA's large fleet of missions in near-Earth space.

CODE 457

ACCESS

The **Advanced Communications Capabilities for Exploration and Science Systems** (ACCESS) project will operate, maintain, and sustain government-owned, contractor-operated ground and flight-based space communications systems like the Tracking and Data Relay Satellite constellation. By placing all of Goddard's network infrastructure into one project, NASA can find efficiencies that reduce cost overall. Consolidating management will allow for unified leadership in IT security, technology development, and the infusion of new network capabilities.

CODE 459

LEARN MORE ABOUT THE REORGANIZATION:
https://go.nasa.gov/2VqW0Md

2020 AGENCY HONOR AWARDS

Code 400 Awardees

Congratulations to all of the 2020 Agency Honor Award recipients. Due to COVID-19, the Center is looking at other options to virtually recognize employees.

Below are the recipients from Code 400.

DISTINGUISHED SERVICE MEDAL

Bryan Fafaul

For exceptional service throughout more than three decades leading projects and programs at NASA.

DISTINGUISHED PUBLIC SERVICE MEDAL

Bobby Williams

For distinguished contributions to space navigation enabling NASA planetary exploration initiatives spanning the reaches of our solar system from Mercury to the Kuiper Belt.

OUTSTANDING LEADERSHIP MEDAL

Gregory Mandt

For outstanding leadership overseeing the launches of the GOES-R and JPSS satellites while facilitating relationships between NASA, NOAA and the National Weather Service.

Haydee Maldonado

For superior leadership of the Solar Orbiter Collaboration mission, overcoming a number of challenges and providing exceptional team motivation, for a successful launch.

OUTSTANDING PUBLIC LEADERSHIP MEDAL

Carl Starr

For exemplary leadership in forming and leading the JWST Mission Operations Team.

Daniel Gall

For extraordinary commitment and leadership in the development, integration, test, and post-delivery support of the GOES-R Advanced Baseline Imagers.

Mark Edison

In recognition of your leadership, dedication, and exemplary performance in delivering the Resolve CSI ahead of schedule and 10% under budget.

William Craig

In recognition of William Craig's outstanding leadership as the ICON Project Manager, which resulted in a successful launch of ICON on October 10, 2019.

EXCEPTIONAL SERVICE MEDAL

Beth Keer

For exceptional work in advocating for emerging technologies, and securing new strategic partnerships to fulfill the agency's future exploration goals.

Craig Keeler

For exceptional service to NASA and NOAA program and projects including his service as the GOES-R deputy systems engineer.

Frank Stocklin

For exceptional sustained performance and positive impact to space communications, benefiting missions past, present and future across the agency.

Ronald L. Williams

For exceptional performance leading the development, build, integration, test, and delivery of the GOES-R Advanced Baseline Imagers.

Ronald Miller

For exceptional performance leading the development, build, integration, test, and delivery of the GOES-R Advanced Baseline Imagers.

Sergey Krimchansky

For exceptional and sustained support for a number of NASA missions, including the TSIS-2 project through critical pre-formulation and formulation activities.

EXCEPTIONAL PUBLIC SERVICE MEDAL

Curtis Fatig

For 20 years of outstanding service and technical achievements to the JWST Ground Segment team.

Erin Robinson

For exceptional, sustained, and creative community building among NASA and its collaborators, significantly enhancing NASA investments in data, technology, and applications.

Justin Cassidy

For incredible and innovative engineering that contributed to the completion and success of EVAs in the Hubble Servicing, AMS Repair, and other missions over 30 years.

Michelle Smith

For exceptional and sustained leadership of the GOES-R communications team.

EXCEPTIONAL BRAVERY MEDAL

John Byard

For bravery demonstrated to protect and preserve human life and vital flight hardware during the Agency's ambitious and perilous journey to unlock mysteries of the universe.

EXCEPTIONAL ENGINEERING ACHIEVEMENT MEDAL

Chris May

For exceptional leadership and innovation in modeling the OSIRIS-REx spacecraft thermal subsystem, enabling more precise navigation and additional science collection.

Dolan Highsmith

For exceptional leadership during the planning and execution of the unprecedented and challenging OSIRIS-REx survey and reconnaissance campaigns.

Joseph Cerullo

For outstanding technical and programmatic support to the Solar Orbiter (SO) Collaboration Mission.

Continued on page 32

Continued from page 31

EQUAL EMPLOYMENT OPPORTUNITY MEDAL

David F. Mitchell

For your exceptional efforts in championing and promoting equal employment opportunities and diversity and inclusion at GSFC and NASA.

EXCEPTIONAL ACHIEVEMENT MEDAL

Jason Hair

In recognition of your leadership and determination in exceeding all technical, cost and schedule commitments for the delivery of the TIRS-2 instrument.

Lillian Reichenthal

For outstanding leadership of NASA's contribution to the XRISM mission, displaying technical excellence and diligence to bridge cultural divides and ensure mutual success.

Otilia Rodriguez-alvarez

For exceptional support of the CLARREO-PF mission as it successfully completed KDP-C and prepared for CDR while simultaneously assisting a number of other NASA initiatives.

Paul Buchanan

For exceptional leadership of the SENSE contract procurement team, leading to the successful selection of the Peraton Company.

Renan Borelli

For outstanding leadership of the ICON mission, displaying technical excellence and diligence during times of mission uncertainty.

Vicki Dulski

For exceptional efforts to deliver the Landsat 9 spacecraft with its Earth-imaging instruments successfully mechanically integrated for observatory integration and test.

William J. Potter

For exceptional Leadership and Management of the LCRD Payload Project throughout development, integration, environmental testing and delivery to Northrop Grumman.

EXCEPTIONAL PUBLIC ACHIEVEMENT MEDAL

David Alexander

For exceptional electrical systems engineering achievements, significantly contributing to the technical and programmatic success of TIRS-2.

David Baran

For your outstanding achievements to seamlessly solve many technical challenges during the complex integration and test phases for JWST.

Donald W. Gates

In recognition of Donald W. Gates' significant contributions in support of the launch-site activities for the ICON mission.

Francis Wasiak

For outstanding leadership in the area of concept of operations and ground system development for the Lucy mission.

John Satrom

For your outstanding support as the technical liaison for the Solar Orbiter mission launch services, working with a multi-organization international team.

Mary Reden

For your outstanding performance as instrument manager for NASA's Heavy Ion Sensor instrument and programmatic support during launch processing for the Solar Orbiter mission.

Mykal Lefevre

For exceptional leadership and innovation in streamlining OSIRIS-REx Operations contributing to the successful proximity operations campaign at Bennu.

Sean Dreyer

For outstanding technical support to the Transiting Exoplanet Survey Satellite Mission.

EARLY CAREER PUBLIC ACHIEVEMENT MEDAL

Andrew H. Levine

For outstanding contributions and dedication to the historic OSIRIS-REx proximity operations through innovative trajectory design and maneuver planning.

David Waters

For your outstanding performance and technical contributions to the JWST Ground Segment from co-op student to career professional.

Jeroen Geeraert, PhD

For outstanding contributions to the unprecedented navigation performance achieved by the OSIRIS-REx spacecraft about the near-Earth asteroid Bennu.

SILVER ACHIEVEMENT MEDAL

Jennifer Brill

For outstanding contributions to graphic design and website development for a number of significant NASA missions and organizations.

Lisa Cacciatore

For outstanding support in representing NASA's interests at WRC 2019, and working tirelessly to protect critical science data from interference.

SILVER ACHIEVEMENT MEDAL (Team Award)

JWST TWTA / CTP Recovery Team

For excellence demonstrated in identifying and implementing corrective actions to two random failures in key spacecraft components to save JWST's launch schedule.

ESC PSC Team

For outstanding support of NASA objectives in space communications and navigation through outreach, workforce development, communication strategy and digital media.

Optical Ground Station-2 Development Team

For outstanding technical achievement in building the first NASA-owned optical communications ground station, which will support the Laser Communications Relay Demonstration.

NEN LCS Team

For exceptional contributions to NASA crewed exploration initiatives through development of new, cost-effective launch communications capabilities for the Kennedy Spaceport.

Human Space Flight Comm and Tracking Network

For outstanding support providing essential communications services to agency and commercial human spaceflight, including test demonstrations and crewed missions.

Laser Communication Relay Demonstration Project

For exceptional achievement delivering the LCRD payload and overcoming technical challenges, advancing the agency's and nations' space communications ability.

TIRS-2 Team

For stellar achievements to develop and deliver TIRS-2, successfully meeting requirements ahead of schedule and under budget while overcoming a number of obstacles.

Continued on page 34

Continued from page 33

TIRS-2 Systems Engineering, Development, and Calibration Team

For stellar achievements through excellence, teamwork, and integrity to yield high standards of science performance and mission success throughout the development of TIRS-2.

JPSS Polar Follow-On Baselining Team

For outstanding achievement conveying the technical and programmatic story of JPSS to baseline the project, leading to continued critical weather forecasting observations.

OSIRIS-REx Site Selection Team

In recognition of ingenuity and diligence of the Site Selection Board in evaluating the surface of asteroid Bennu to identify a sample collection site for OSIRIS-REx.

David Parker's Eye Gaze Work System Team

For the development of a novel eye gaze system for people with severe degenerative neurological disorders.

LCRD Modem Recovery Team

For exceptional engineering prowess and dedication, enabling NASA's first-ever optical communications relay.

GSFC Flight Projects Diversity and Inclusion Team

For an exceptional display of energy, talent, and commitment to making GSFC a welcoming and inclusive environment for all.

GROUP ACHIEVEMENT AWARD

JPSS Proving Grounds Website Team

For excellence in developing communications products to inspire multiple audiences to learn about and engage with real-world applications of Joint Polar Satellite System data.

Restore-L Propellant Transfer Subsystem Team

For the designing, assembly, and testing of the Hose Management Assembly for the Propellant Transfer Subsystem, creating significant risk reduction and improvements for Restore-L.

LunaNet Team

For outstanding technical expertise in rapidly developing a strategic proposal for communications and navigation infrastructure at the Moon.

SENSE Contract Procurement Team

For exceptional dedication in analyzing proposals for the management, sustainment and evolution of NASA's space communications networks.

NEN Ka-Arraying Development Team

For exceptional development of a high-rate, Ka-band antenna arraying system for NASA's Near Earth Network.

PACE Furlough Budget and Schedule Recovery Team

For outstanding support of the PACE mission in establishing new schedule and cost baselines following the Government shutdown.

SPIDER Accommodation Team

For exceptional dedication to accommodation of the assembly and manufacturing SPIDER payload on Restore-L.

LCRD Space charging Mitigation Team

For outstanding achievement in modifying the LCRD flight payload to include critical radiation protections prior to on time delivery to the USAF.

SSPD EVA Tools Team

For the design, development, and implementation of EVA tools to save and enhance the Alpha Magnetic Spectrometer aboard the International Space Station.

LandSat 9 OLI-2 Team

For exceptional development and delivery of the Operational Land Imager 2, demonstrating extraordinary quality, teamwork, and management of cost and schedule.

L'Ralph Scan Mirror Mechanism (SMS) Team

For outstanding performance in developing, testing and delivering the L'Ralph Scan Mirror System.

Earth Science Technology Office (ESTO) Observation Technologies Program

For outstanding vision and leadership in technology development for Earth Science remote sensing, displaying both technical and programmatic expertise to enable future missions.

TIRS-2 Scene Select Mechanism Anomaly Investigation Team

For outstanding accomplishments to resolve the TIRS-2 Scene Select Mechanism anomaly rapidly to enable the delivery of a reliable system ahead of schedule.

JWST Cryocooler Integration Team

For superior achievement in the integration of the Mid-Infrared Instrument Cryocooler with the James Webb Space Telescope Observatory.

Dragonfly Phase A and Proposal Development Team

In recognition of your expertise and dedication during the Dragonfly Phase A technology development and New Frontiers proposal development.

RRM3 Engineering Development Team

For exceptional innovation and perseverance in developing technologies to help spacecraft live longer and journey farther.

ADMINISTRATOR'S GEARS OF GOVERNMENT INDIVIDUAL AWARD

Faiza Hartnett

For stellar support of the Earth Science Projects Division and its associated programs with a level of excellence and proactivity that enable ease in logistics and execution.

ADMINISTRATOR'S GEARS OF GOVERNMENT INITIATIVE AWARD

Project Reference Database (PRD) Team

For your outstanding development and operation of the JWST Project Reference Database.

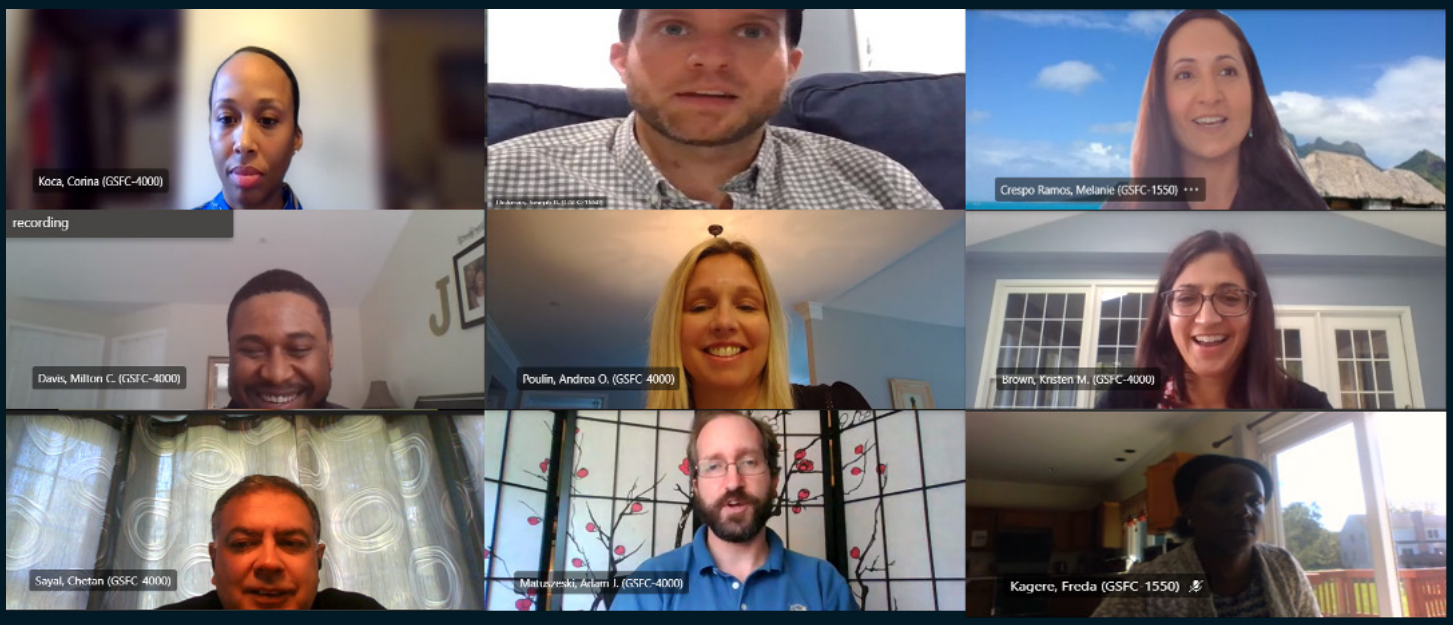
Honor Awards Program

Find out more about NASA's most prestigious honor awards program

- https://nasapeople.nasa.gov/awards/nasamedals.htm

WHAT'S UP WITH OUR Flight Projects Development Program?

FPDP Leadership Training and Development Workshop



(top) Corina Koca, Joe Hickman, Melanie Crespo, (middle) Milton Davis, Andrea Poulin, Kristen Brown, (bottom) Chetan Sayal, Adam Matuszeski, Freda Kagere. FPDP Cohort 4 presented their case studies to the workshop attendees. CREDIT: NASA

The Flight Project Development Program (FPDP) participants – Kristen Brown, Melanie Crespo Ramos, Milton Davis, Joe Hickman, Corina Koca, Freda Kagere, Adam Matuszeski, Andrea Poulin, and Chetan Sayal – attended their first FPDP Leadership Training and Development Workshop on September 28-30, 2020. The FPDP facilitator, Walt Faulconer, designed the workshop to give insights and lessons learned into NASA leadership, project management, and systems engineering from key NASA, as well as other government and industry, leaders and subject matter experts. Even in the virtual environment, the more than 60 workshop attendees participated in teambuilding and networking activities. The FPDP participants presented best practices learned from three Goddard project managers. ■

Donna Swann / Code 400
FPD Assistant Director
FPDP Program Manager

The impressive speakers (shown above) included:

- **Dr. Marla Perez-Davis,** *Director*, NASA Glenn Research Center
- **Nicola Fox**, *Heliophysics Division Director*, Science Mission Directorate, NASA
- **Steve Jurczyk**, *Associate Administrator*, NASA
- **Dr. Christyl Johnson**, *Deputy Director for Technology and Research Investments*, NASA Goddard Space Flight Center
- **Dr. John Horack**, *Senior Associate Dean of Research within the College of Engineering*, The Ohio State University
- **Jim Reuter**, *Associate Administrator*, Space Technology Mission Directorate, NASA
- **Kathy Lueders**, *Associate Administrator*, Human Exploration and Operations Mission Directorate, NASA
- **Dr. Lisa Watson-Morgan**, *Program Manager*, Human Landing System, NASA
- **Dave Mitchell**, *Director*, Flight Projects Directorate, NASA Goddard Space Flight Center
- **Chris Singer**, *Deputy Chief Engineer (retired)*, NASA
- **James Crocker**, *Vice President and General Manager of Civil Space (retired)*, Lockheed Martin Space Systems Company
- **Walt Faulconer**, *FPDP Program Facilitator*

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

donna.j.swann@nasa.gov

The Flight Projects Directorate's senior leaders hosted a Let's CONNECT session for the FPDP Cohort 4 participants on October 29. This informal, hour-long session was an excellent opportunity for Dave and Tom to stay engaged, both professionally and personally, with the participants.

LET'S CONNECT CODE 400

Dave, Tom, and the FPDP participants enjoyed their time together during their Let's CONNECT session.

CODE 400

(top) Joe, Melanie, Adam, Freda, (middle) Milton, Corina, Dave, Chetan, (bottom) Kristen, Tom, Andrea, Donna Swann (program manager) CREDIT: NASA

Combined Federal Campaign (CFC) 2020

Over 50 years of making a difference

This 2020 Combined Federal Campaign (CFC) is underway. It is the world's largest and most successful annual workplace charity campaign, raising millions of dollars each year. Pledges made during the campaign season support eligible nonprofit organizations that improve the quality of life for all and provide health and human service benefits throughout the world. Since its founding by President John F. Kennedy in 1961 as the main federal charitable campaign, it has raised more than $8.3 billion and made an incredible difference locally, nationally and internationally. All contributions are tax-deductible and it is easy to donate online.

CFC® Combined Federal Campaign

THANK YOU FOR YOUR SUPPORT OF THE COMBINED FEDERAL CAMPAIGN!

DONATE

AHA AGENCY HONOR AWARDS

The Agency Honor Awards is a special occasion to recognize those whose dedicated work has propelled NASA higher and has enabled humanity to take one more step to making the unthinkable possible. Even though 2020 has been a challenging year, there are many accomplishments that should to be recognized. Start thinking about who you'd like to nominate for the upcoming Agency Honor Award. The official call with details will be coming soon.

Category of Nominations

- Distinguished Service Medal
- Distinguished Public Service Medal
- Outstanding Leadership Medal
- Outstanding Public Leadership Medal
- Exceptional Service Medal
- Exceptional Public Service Medal
- Exceptional Bravery Medal
- Exceptional Engineering Achievement Medal
- Exceptional Scientific Achievement Medal
- Exceptional Technology Achievement Medal
- Equal Employment Opportunity Medal
- Exceptional Administrative Achievement Medal
- Exceptional Achievement Medal
- Exceptional Public Achievement Medal
- Early Career Achievement Medal
- Early Career Public Achievement Medal
- Silver Achievement Medal
- Group Achievement Award
- Space Flight Medal

KNOWLEDGE MANAGEMENT *Insights*

Working Remotely

COVID has been the poster child for dealing with uncertainty. For eight months it has required Goddard employees to think concretely and fight today's fires. Many project teams shifted suddenly, almost overnight, to full-time telework. It befits us to reflect on what has been learned so far about working remotely.

Several project teams have held Pause and Learn sessions to discuss what has worked for them in the current work environment and how they can improve upon it. The net is that each project team needs to mix and match strategies that work best for their needs. Following are their insights and recommendations.

Information Access

Getting the answer to what seems like a simple question can feel like an obstacle to remote workers. The added time and effort required to find information can also slow down decision-making.

"Project information is frequently repeated; prior topics are reiterated during meetings. Repetition has turned out to be a useful technique."

Recommendations

- Pair a new employee or team member with a mentor or sponsor.
- Update internal websites and portals.
- Record briefings so that those who cannot attend can view them later.

Team Meetings

Back-to-back meetings can increase the likelihood of screen fatigue. Given the team's meeting cadence, are employees even able to get their work done?

"It is harder to stay focused online; people are wired to pay attention when they are together."

"Adjusting meeting cadences and increasing spacing between meetings was effective."

"Microsoft Teams turned out to be critical and improved collaboration."

Recommendations

- Evaluate the necessity of recurring meetings.
- Consider changing default meeting lengths from 60 to 30 minutes.

- Assign someone to provide updates on new features for Teams or other collaboration tools.
- Have a dedicated "announcement" channel that team members can check for important information.

Communications

Impromptu water cooler conversations are being held via email. This growth in emails makes it hard to find relevant information and action items.

"There is a reason why we co-locate projects to create community. Some of the most significant engineering is done in hallway conversations."

"People should reach out and call one another more often. One-on-one conversations are superior to email."

Recommendations

- Reserve time before or during meetings for open discussions
- Pause before clicking "Reply All" ; include just those who need to be in the loop. List actions in a distinct email section with bold due dates. Preface long emails with an executive summary.
- Keep assessing if more communications are needed. When there is a void in communications and transparency, people create assumptions that may affect their choices of what to work on, as well as their productivity and morale.

Virtual Work Norms

"Having clear working guidelines helped in the switch to telework chaos."

"Setting aggressive goals was effective. If you aim at nothing you hit it every time."

"We kept learning and adapting and finished early."

Recommendations

- Create a one to two-page virtual work protocol for communication and meeting norms.
- Keep an eye on decision-making and cross-functional coordination. Adjust as needed to get back on track.
- Ask team members for their feedback. They have the clearest insights about processes and tools that are not helpful.

Team Dynamics

Social capital has been described as the grease that facilitates getting things done; shared norms and values foster strong teams. Built one interaction and one conversation at a time, it is the key to team engagement.

"It can be tough getting to know team members – I did not have a face to go with the voice."

"At meeting start, we had a check-in: How are you coping? What pressures do you have?"

"Playing jazz before the meeting and meeting team members dogs gave us a morale boost."

Recommendations

- Visual cues allow for increased "mutual knowledge." Turn on video to get to know your team members. Video is useful for sensitive conversations as it is more personal than written or audio communications.
- There is a good chance your team members will be contending with more distractions during this time. The usual schedules may need to be adjusted on occasion due to other priorities.
- "Assume positive intent" - if someone on your team says or does something you feel is a problem, first hear their side of the story. Not seeing colleagues in the office makes it harder to know what else is going on that would provide useful context. ■

Judy Dickinson / Code 400
FPD Knowledge Management Lead

FOCUS ON FACILITIES

If you read the summer Focus on Facilities article, then you know we interjected a bit of humor into the very serious issue of COVID-19. We took a peek at what an alien who had been observing Earth might notice as we suddenly practiced social distancing in our facilities. We hope no one was offended. We based most of the described social distancing on current guidelines. Although, how we continue adherence to safety while meeting our housing demand can be paradoxical. This is especially so, considering potentially lingering fears around the virus, yet the positive lessons learned. With a more serious tone, this article discusses the concept of office hoteling that is under consideration, which could bring both benefits and challenges.

One positive lesson COVID-19 highlighted is that organizationally we are quite resilient and adaptive. Nearly on a dime, we successfully shifted our office workspaces to our homes. Magnanimously, some even thought about how to bring lab work home. And, many have teleworked exclusively during the pandemic. Meanwhile, we continue to manage access for critical mission work through a thoughtful re-start approval process, which limits physical presence according to the best pandemic guidance, yet meets the need for touch labor. We have demonstrated that quality work is possible even as we work remotely.

As we look forward to a complete return on all fronts, NASA leaders are considering new guidelines from what we learned and what could be some lasting changes to how we work, such as office hoteling. Before looking more closely at this idea, let us review how we currently manage office space.

If you are a civil servant or an on-site contractor, you are assigned a permanent seat. You may already understand that the amount of space allowed for that permanent seat is guided by GPR 8800.1A, AKA Facilities Utilization Program. In it, we specify office area allowances according to Federal Personnel Position Supervisory (FPPS) levels assigned to your position. The FPPS levels span from 11 through 34, plus classes M1, M2 and M3 for contractual personnel. A square foot "allowance" is set for a band of one or more levels. As an example, if your position falls within levels 29-33, you are allowed up to 150 square feet (SF). In contrast, level 34 and M classifications are allowed 75 SF with exceptions for M1 and M2 that have supervisory duties. Very often we forget the maximum allowable area is not an entitlement, though we try to meet it. Therefore, as we explain hoteling, keep in mind that implementing most guidelines warrants flexibility.

The office hoteling concept proposes some differences for allocating permanent space. Ostensibly, it will establish a workhour level at which we would not assign permanent on-site office space. This concept is something already embraced by commercial property facilities management companies as an effective and efficient means of managing the need for office housing.

So, how exactly would we apply office space hoteling. Well, hoteling means exactly what you likely understand; that we provide flexibly assigned workspace for finite periods of use when you need to be here…just like a stay at a motel/hotel while away from home! While the specific way that GSFC will actually structure hotel office space remains undefined, this kind of space often has a few key provisions.

The key provisions of the office hotel are: a desk or cubicle, temporary storage space and areas to collaborate. Additional elements may include standard information technology conveniences, most of which we already accommodate. Desk space may come in different sizes and configurations to address differing requirements

of job functions. For example, if your job requires work with large media, space and furnishing may be available nearby for layout. In hotel space applied with more sophistication, the spaces themselves may have different personalities recognizing the diversity of the workforce. One could potentially reserve available space according to how it inspires you, as well as how it meets your functional requirements. Perhaps some workstations have high walls, while others have no walls. The list goes on. Overall, numerous elements can be customized offering design professionals rich opportunities to exercise their crafts for solutions.

Yet, as often is the case, all change requires an adjustment period and we will no doubt encounter challenges adjusting to this concept. For starters, we will need to address new processes such as how we schedule and reserve seats, or how we consider appropriate durations for reserved space, maybe based upon the task that brings you on Center. Moreover, will we impose use restrictions and if so, what would they be?

After considering processes, we must adjust to use etiquette for space that you cannot call your own. Having experienced COVID-19, we will surely want users to help maintain workspace cleanliness; and there may be new on-going expenditures to maintain general housekeeping services. Lastly, users will need to adjust to coming and going and engaging only to disengage.

As you can see, there will be much to consider. But before we reject the concept out of hand, let's sum up some benefits and challenges.

Benefits:

- Reduces space needed for permanently assigned seating
- Increases potential for more efficient use of physical space, with more space assignable to collaboration (assuming no overall reduction of space)
- Offers opportunity for workspace in different locations on Center, which allows users to reserve space best suited for team collaboration where needed
- Allows on-site staff an opportunity to change perspective, assuming a reservation process that maintains adequate supply for those it is intended to serve
- Provides an opportunity to connect with others outside your functional work team
- Reduces the challenge of having sufficient office space or aid the transitional requirements of establishing new mission space
- Maximizes all the advantages that come from teleworking

Challenges:

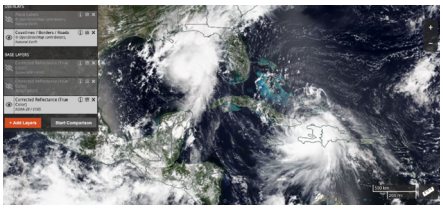
- Everybody is unique. Some people like consistency, predictability and routine. Not having a home base on Center will not be fun for some
- Possibly diminishes a sense of belonging that accompanies routine interaction in a commonly shared environment
- Introduces the need for additional processes and cost
- Initial investment could be substantial to create various hoteling areas

To recap, as dire as COVID-19 is, it gives us an opportunity to consider new ways of working. One new way takes aim at how we allocate permanent office space, while simultaneously offering greater flexibilities on staff engagement with workspace. Commercial office, building management and facilities management entities lead the way of using hoteling as a viable tool to manage space demand. Nevertheless, as with all good things, there are counter perspectives to consider. This article gives the reader a peek into the office hoteling concept, some of its benefits and some of its challenges. Most of all, it brings this concept to your awareness so you may begin thinking about how you might maximize it to your advantage, whether or not you may be directly impacted. Surely, as more planning and discussion occurs around this topic, the Center will bring us along. ■

Bill Glenn / Code 400
Mission Support Manager

FPD Mission Updates

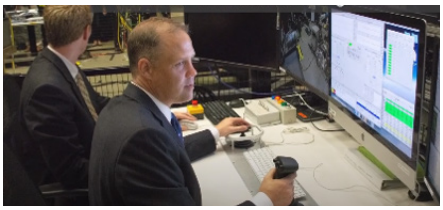
ESDIS



Due to Hurricanes Laura and Marco, seen in this image from August 23 and recent fires in California, Worldview's traffic has tripled and has been cited in dozens of media articles. Likewise, the Fire Information for Resource Management System (FIRMS) has seen over a 10x increase in traffic since August 18. Worldview/FIRMS are information systems operated by the ESDIS project.

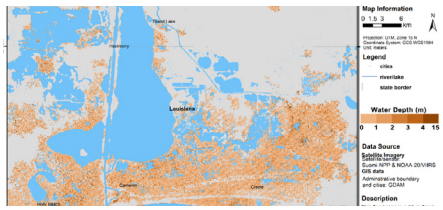
Also operated by ESDIS, the Socio-Economic Data and Applications Center, one of the NASA Earth science data archives, developed the Hazards mapper for users to investigate natural hazards and how they affect the population. This image depicts the smoke plume from the California fires as seen across the United States, even at GSFC, on September 16. This unprecedented health hazard is represented by aerosol optical thickness data from VIIRS.

ExIS



The ExIS team released the ninth episode of the second season of its series, Pass the Torque. The episode covered research and development and featured NASA Administrator, Jim Bridenstine. The episode was posted to YouTube, Facebook, and Twitter, and had 830 likes, 160 shares, 4,500 views.

Suomi-NPP



FEMA used flood maps derived from NOAA-20 and Suomi-NPP data for emergency response after Hurricane Laura.

MAVEN

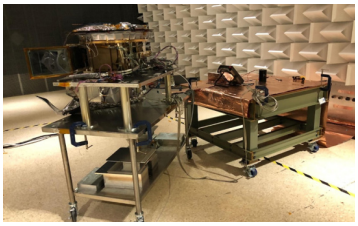
The Goddard Mars Atmosphere and Volatile EvolutioN (MAVEN) spacecraft team helped scientists discover that water vapor on Mars is lifted high into the atmosphere by gigantic dust storms and then escapes the planet. Better understanding the water cycle on Mars is critical to our future exploration efforts there.

Lucy

The Lucy instrument pointing platform (IPP) performed the initial mount to the flight forward deck. Lucy successfully completed gimbaled IPP range of motion testing.

The Lucy Long-Range Reconnaissance Imager Instrument was shipped and received at LM-Denver.

L'Ralph



L'Ralph completed its first thermal vacuum testing campaign and instrument-level vibration testing. The team is approaching completion of instrument-level EMI tests, to be followed by a second thermal vacuum testing campaign prior to shipment.

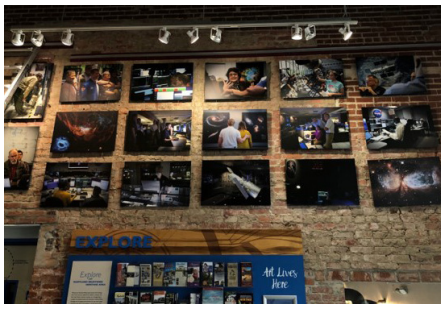
Landsat 9

The Landsat 9 fully integrated observatory passed its comprehensive performance test.

Landsat 9 successful mission Pre-Environmental Review was held October 13-15. Observatory level EMI/EMC testing is underway at Northrop Grumman Space Systems.

The Landsat 9 launch support room in building 32 now has personal protection equipment installed and is ready for 60% occupancy capacity.

Hubble



A new photographic exhibit developed by the Hubble project is now on display at the Maryland Milestones Heritage Center in Hyattsville, MD. "Behind the Scenes: Hubble at NASA Goddard," takes you into the mission operations of the Hubble Space Telescope through the photography of GSFC's Rebecca Roth.

As part of the Hubble 30th anniversary activities, a display on the Hubble and Webb missions was installed at Dulles airport.

Near Earth Network

The U.S. Space Force (USSF) announced that the tri-lateral USSF, NASA, and NOAA ground station project is officially operational. GSFC's Near Earth Network was the NASA partner that contributed directly to this major initiative to reposition C&N assets.

Roman Space Telescope

The Roman Space Telescope Instrument Carrier Engineering Critical Design Review was successfully conducted on September 16 and 17.

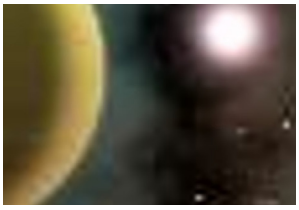
Roman Solar Array

The Roman Solar Array Support Structure mock up was completed in Building 10 High Bay.

Restart Readiness Reviews

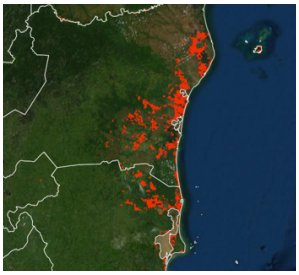
FPD supported the efforts of 81 restart readiness reviews in August to get projects back to work, while keeping the workforce protected.

TESS



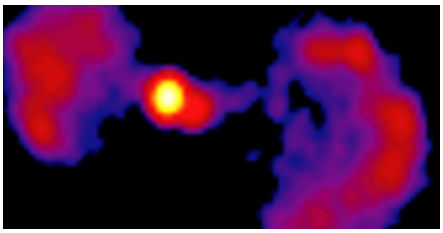
TESS data was used to discover warm Jupiter orbiting a dead white dwarf star.

GOES-16



The World Food Program (WFP) recently used flood maps created from GOES-16 and NOAA-20 data to assist with response to the humanitarian crisis created by Hurricane Eta in Nicaragua. The WFP is working to develop an automated system to support their workers in the field who are affected by floods and other natural disasters using these flood data products.

Fermi

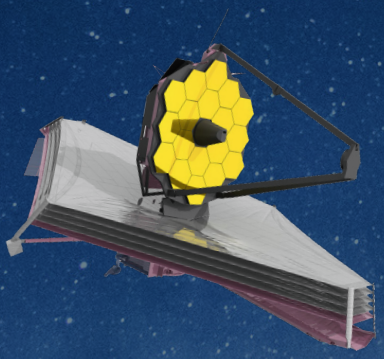


Fermi discovered a galaxy that looks like Star Wars Tie Fighter.

'Twas the Night Before Christmas Goddard-Style

'Twas the night before Christmas, when all through the house,
On occasion, at Goddard, you might see a mouse

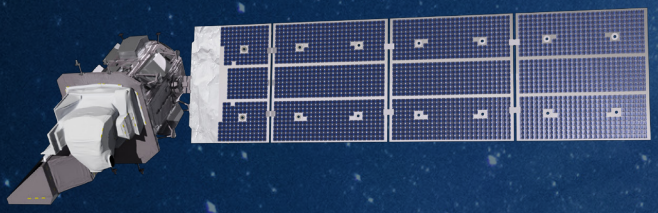
The stockings were hung by the chimney with care,
With Goddard's precautions, our COVID cases were rare



The children were nestled all snug in their beds,
While visions of sugar plums were viewed by James Webb.

And mama in her 'kerchief, and I in my cap,
Had just settled our brains on thoughts of Landsat

When out on the lawn there arose such a clatter,
I sprang from the bed to see evidence of dark matter



Away to the window I flew like a flash,
Procurement was struggling to find enough cash

The moon on the breast of the new fallen snow,
Gave the luster of mid-day to thee LRO.

When, what to my wondering eyes should appear,
But a miniature sleigh carrying a full case of beer.

With a little old driver, so lively and quick,
I knew in a moment, it was Dennis Andrucyk

More rapid than eagles his coursers they came,
And he whistled, and shouted, and call'd them by name:

Now Dasher, now Dancer, now Prancer and Vixen,
On Comet, on Cupid, don't mess up the mission

To the top of the porch! To the top of the wall!
Now dash away, dash away, launch away, AWE.

As dry leaves before the wild hurricane fly,
When they meet with an obstacle, we rely on GEDI.

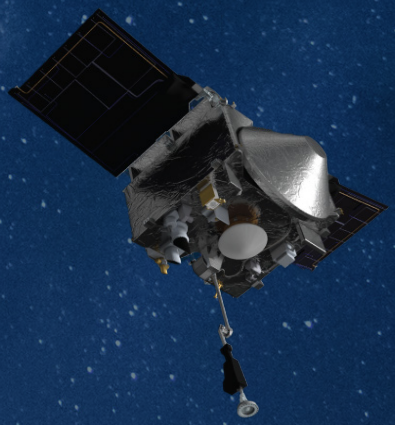
So up to the house-top the coursers they flew,
With the sleigh full of toys – Anne and Ray too;

And then in a twinkling, I heard on the roof,
To survive KDPs, we drink 80 proof

As I drew in my head, and was turning around,
Down the chimney Dave Mitchell came with a bound

He was dressed all in fur, from his head to his foot,
He was not allowed in the clean room, with his ashes and soot

A bundle of toys was flung on his back,
And he looked like a peddler with his electronics rack



His eyes, how they twinkled! His dimples how merry,
This was not at all like how our managers worry

His droll little mouth was drawn up like a bow
He knew well at heart, the risk classification was low

The stump of a pipe he held tight in his teeth,
And the smoke it encircled calmed the DPMC

He had a broad face, and a round little belly
O-Rex captured Bennu, like a bowl full of jelly

He was chubby and plump, a right jolly old elf,
Most of his sleigh parts came off of the shelf

A wink of his eye and a twist of his head,
The restart readiness reviews he did still dread

He spoke not a word, but went straight to his work,
Even though, at times, he was surrounded by jerks

And laying his finger aside of his nose,
The cost of this mission continues to grow

He sprung to his sleigh, to his team gave a whistle,
His payload would launch to space on a missile

But I heard him exclaim, ere he drove out of sight –
Happy Holidays to all, and remove before flight!

Christy Hansen / Code 400
Flight Projects Directorate Chief of Staff

Brett Sapper

Solar Dynamics Observatory (SDO) Flight Operations Team (FOT) Technical Lead (Code 444)

Born Baltimore, MD

Education BSEE from Widener University

As the lead engineer of the Solar Dynamics Observatory (SDO) Flight Operations Team (FOT), Brett is responsible for providing technical direction to the FOT to ensure all operations activities are scheduled and executed as described in the Flight Operations Plan.

Life Before Goddard

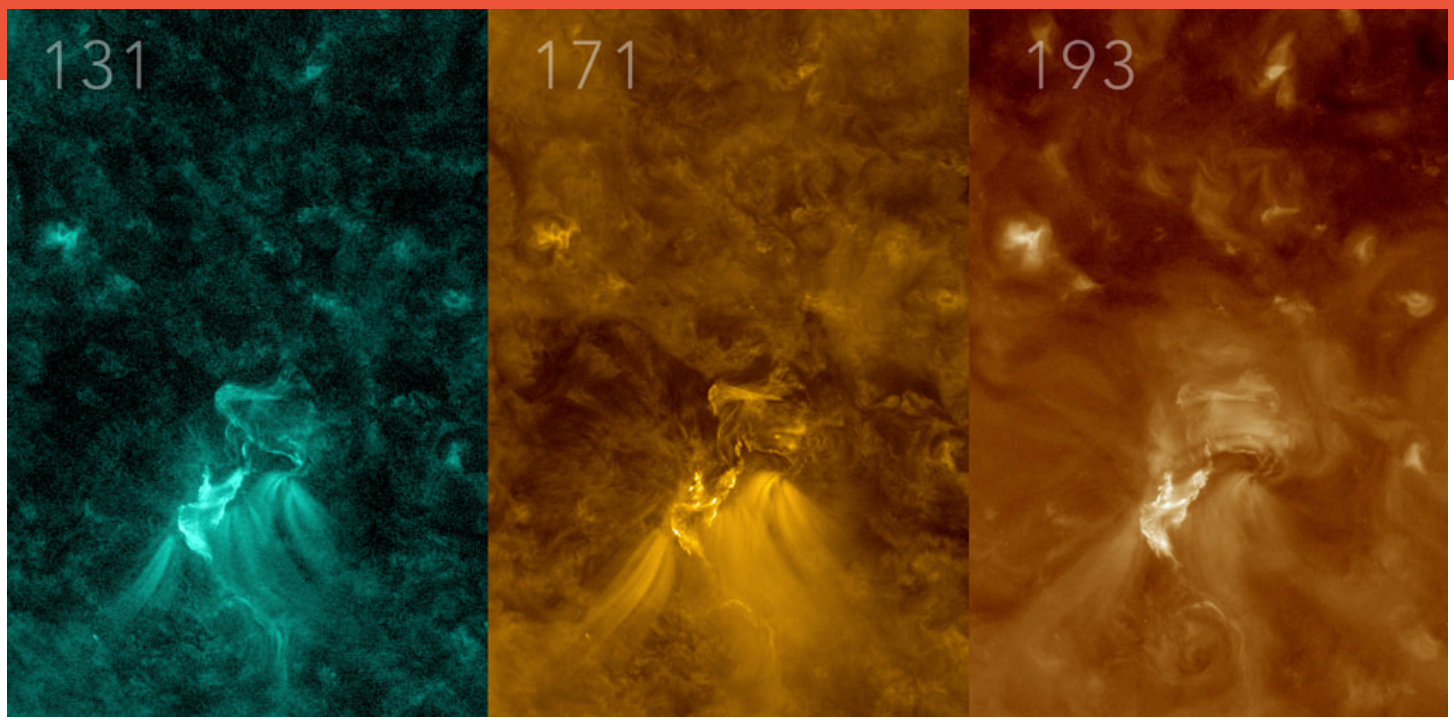
Brett Sapper grew up in Bowie, MD, playing many intramural sports, playing in the middle and high school bands, and earning the rank of Eagle Scout in the Boy Scouts of America. He graduated from Widener University in Chester, PA, with a Bachelor of Science degree in Electrical Engineering in 1991.

Life at Goddard

Brett came to Goddard in the fall of 1992, following in his father Larry's footsteps. Larry Sapper was a civil servant at Goddard until his passing in December 1987. Brett started his first engineering job with Bendix Field Engineering Corporation learning the ropes of flight operations on the Cosmic Background Explorer (COBE) Flight Operations Team. After the end of the COBE mission, and a brief 2-month stint on the Earth Radiation Budget Satellite (ERBS), he moved on to a pre-launch, real-time engineering position on the Solar and Heliospheric Observatory (SOHO) in 1994, a joint European Space Agency (ESA) and NASA mission.

SOHO is where Brett learned all the background work and preparations that go into launching and flying an observatory. He spent many weeks and months performing release testing against requirements documents; coding, compiling and testing flight procedures; and learning how to configure and test against the software simulator. He performed interface testing, radio frequency (RF) testing with the Deep Space Network (DSN) stations, and Ground Spacecraft Compatibility Testing. Brett stayed on SOHO from this pre-launch design phase through launch and commissioning, the prime mission, the mission interruption, and into the extended mission phase. His time on SOHO garnered his deep appreciation for the DSN schedulers that schedule the passes with the observatory, the hardware maintenance personnel and system administrators that kept all the machines in the Mission Operations Center (MOC) running, and the other project support staff that make flying a mission possible.

In 2004, Brett moved on to become the first member of the SDO FOT. After a year of working on operations concepts, the initial MOC design, and requirements definition, a change in team leadership allowed him to take the role of FOT technical lead. Brett led the team as the FOT



NASA's Solar Dynamics Observatory observes the August 16, 2020, B-class flare at 131, 171, and 193 angstroms. CREDIT: NASA/SDO

and others were building and validating the MOC, developing and verifying the many operations products (processes, procedures, display pages, and contingency trees) needed for operations, and planning and executing the many mission simulations to prepare the FOT and the spacecraft design team for a successful launch. SDO launched on February 11, 2010, in the middle of "Snowmageddon," when there was 3 feet of snow on the ground and Goddard was closed for the 2 weeks prior to the launch and the week of launch as well. After a successful commissioning and orbit-raising phase, SDO settled into its geo-synchronous orbit and started taking science data on May 1, 2010. The SDO science data isn't recorded on board the observatory, instead it is always transmitting to the two dedicated ground antennas in White Sands, New Mexico. The FOT remotely controls these antennas from the MOC here at Goddard. 1.2TB of science data (or 500,000 song downloads) pass from the observatory, through the antennas, the Data Distribution System (DDS), and to the Science Operations Centers (SOCs) every day of the mission, including today. Many things have to go right for the science data to get to the scientists for analysis. If it doesn't, Brett gets called. He is still the FOT technical lead today, leading the FOT as it plans and executes thruster maneuvers, instrument calibrations, operating the satellite through eclipse seasons and high-gain-antenna (HGA) handover seasons, and responding to anomalies when they happen.

Life Outside Goddard

When Brett isn't at work, you will most likely find him at home watching sports or The Voice; walking the Crofton Parkway, with or without his dogs, or enjoying time with his family and friends. He also enjoys roller coasters. His favorite trip is the one he and his daughter take every couple of years to Cedar Point. They visit the park two days in a row, riding coasters more than 20 times each day, enjoying the adventure. ■

"You have to know why things work on a starship!"

James T. Kirk, "Star Trek 2, The Wrath of Kahn"

Corina Koca

Geospace Dynamics Constellation (GDC) (Code 460)
Instrument Manager

Born Mays Landing, New Jersey

Education B.S. Mechanical Engineering, New Jersey Institute of Technology, NJ

Corina Koca (pronounced Kojah) is the instrument manager for Geospace Dynamics Constellation (GDC). The GDC recently successfully completed Mission Concept Review and Key Decision Point (KDP)-A. As instrument manager, Corina has been in charge of leading the project side effort in the preparation for the GDC instrument Announcement of Opportunity (AO).

Life Before Goddard

Corina was born and raised in Mays Landing, NJ, in the house her parents still live in today. She was one of five children, and surprisingly the only one who took a similar path as her engineer father. Corina says, "My father planted many seeds to get his children interested in engineering and I was the only one who took the bait. Growing up I had an affinity towards math, science and building things. I constantly had projects underway; as soon as one was over I already had plans in the works for the next. The concept of starting with nothing, and ending with something useful and meaningful, was always fascinating to me. What better place to work than at NASA GSFC, where we start off with something as simple as a question or idea that is then transformed into not only an engineer's ultimate masterpiece (the hardware), but also scientific discoveries that last lifetimes."

Life at Goddard

Corina started her career at Goddard in 2005 as a fresh-out hire in the electromechanical systems branch, where she worked for 15 years. The first project she worked on was the James Webb Space Telescope (JWST) Optical Telescope Element Simulator (OSIM). Corina says, "I was lucky to have OSIM as my first project. The team was a small subset of JWST, yet I had the opportunity to interface with numerous disciplines. I was on OSIM for a total of 8 years: from concept, to design, to build and test. When I joined the team I was a new hire, and by the time OSIM was delivered I left as the mechanical lead.

After OSIM, Corina worked on numerous small projects, Internal Research and Development (IRAD) efforts, and proposals until joining the Plankton, Aerosol, Cloud and ocean Ecosystem (PACE) Ocean Color Instrument (OCI) in 2016. On OCI, she worked on the opto-mechanical designs as the lead for the Rotating Telescope and the Collimator and Slit Assembly. Corina explained, "Just prior to the pandemic we were in the midst of building the flight hardware. Although I just recently transitioned off OCI, I am eager for the subassemblies I led to complete build and test. Go team PACE!!"

While simultaneously working on OCI, Corina was named Associate Branch Head for the Electromechanical Systems Branch. The branch is comprised of mechanical, electrical, aerospace and opto-mechanical

engineers. "As the Associate Branch Head," she said, "I had the pleasure of working with a diverse group of some of the finest and most talented individuals on center."

In April 2020, Corina joined the Flight Projects Development Program (FPDP) Cohort #4.

"What drew me to Project Management, and FPDP in particular, was the opportunity to be a part of the bigger picture. I wanted to participate in all phases of the project and interface with all aspects of the team. I have been in FPDP for only a little over 6 months yet I have learned, and been (positively) challenged more than I could have imagined. FPDP has been successful at getting us out of our comfort zone and pushing us in a way that our toes are just over the edge, yet our feet are firmly planted on the floor.

Life Outside Goddard

Corina and her husband Huseyin live in Hanover, MD with three young children aged 7, 5 and 2.

As a mother of three, it should come as no surprise that many of Corina's current favorite hobbies and activities involve and revolve around the family. During the fall and the spring, she is a soccer mom; during the winter, she is a basketball mom; and in the summer, a 'let's go to the beach' mom. What she most enjoys is exposing her children to new experiences and watching them get excited to learn new things. The family always has a new hobby going on in the house. The most recent examples are rock collecting and viewing the night skies. Additional activities they enjoy that never get old include outdoor activities, movie night, and visiting family and friends. ■

> "You'll never get bored when you try something new. There's really no limit to what you can do!"
> Dr. Seuss

Corina and her husband Huseyin with their three children.

CREDIT: PHOTO COURTESY OF CORINA KOCA

THE LATEST SAR SAVES

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

Each icon on this map represents one rescue event, though multiple saves may be involved with each event. The Search and Rescue Satellite Aided Tracking (SARSAT) system is able to detect three types of beacons:

Personal Locator Beacons (PLBs)

Used primarily by hikers and outdoor enthusiasts

Emergency Position Indicating Radio Beacons (EPIRBs)

Used by commercial and recreation ships

Emergency Locator Transmitters (ELTs)

Used by civilian aircraft

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

Human Rights Day is observed every year on December 10th. This is the day the United Nations General Assembly adopted, in 1948, the Universal Declaration of Human Rights (UDHR), which proclaims the inalienable rights which everyone is entitled to as a human being – regardless of race, color, religion, sex, language, political or other opinion, national or social origin, property, birth or other status. Available in more than 500 languages, it is the most translated document in the world. This year's Human Rights Day theme relates to the COVID-19 pandemic and focuses on the need to build back better by ensuring Human Rights are central to recovery efforts. For more information, please visit: https://www.un.org/en/observances/human-rights-day

DID YOU KNOW...?

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
Code 400 Diversity and Inclusion Committee
Ext. 6-2515

Updates from the D&I Committee

The Flight Project Diversity and Inclusion Committee (FP D&I) has been working on the next steps for supporting the community through this challenging year.

The team is planning to coordinate listening sessions to better understand the situation and struggles for parents who are working from home and who have their children completing virtual learning beside them or who have other challenges in childcare caused by the pandemic. The committee is also planning on hosting sessions for eldercare / caregiving for those who are facing difficulty with caring for their parents, grandparents, or other adult relations during the pandemic.

As the United States has topped 14,250,000 confirmed cases and deaths have exceeded 275,000, the support needed for one another through all of this is unwavering. We know by our community listening with empathy and assisting one another, we can get through this and will continue to drive our missions forward.

Tara Dulaney / Code 450

To learn more about GSFC's Diversity & Inclusion Program Office, please visit: https://diversity.gsfc.nasa.gov/

ROMAN SPACE TELESCOPE

Participants, listed from left to right: Christine Steeley; Dave Content; Maxime Rizzo; Emily Heiges; Tom Griffin; Missie Vess; Alexia Harper; Michele Valenti; Steve Harper; Jess Valenti.
CREDIT: NASA

The Roman Space Telescope team, family members, and friends participated in a 5K walk/run to raise money for the United States Feeding America hunger relief organization on July 18, 2020. The event occurred in conjunction with National Ice Cream Day; participants received ice cream treats at the finish line. Since the COVID-19 pandemic hit in early March, this was the first time Roman team members were able to interact in person while displaying responsible social distancing practices.

OUT & ABOUT

LIFE'S HIGHLIGHTS OFF CAMPUS

Congratulations to Nancy Ringel (443) on her first grandchild, Evelyn Grace. She was born on September 16, 2020, at 12:04pm, weighing 7 lbs., 3 oz, and was 21 inches long. Proud Mom and Dad are Kimberli and Anthony Knobel.

Best wishes to Taryn Stradford (155.7) on the birth of her daughter, Imara, born on October 2, 2020, at 9:54pm. Imara weighed 6 lbs., 14 oz., and was 19 inches long.

Patricia Aldridge (452) is proud to announce the birth of her eighth grandchild, Ember Lee Gregory. She was born on October 14, 2020, weighing 7 lbs., 3 oz. Ember joins her four siblings, Malaya, Aiden, Liam and Rory, and her parents are Michael and Keshia Gregory.

Share your news!
Weddings, births, interesting travel experiences...we want to know!

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

paula.l.wood@nasa.gov
Code 460
Ext. 6-9125

Coming and Goings

July 1 through October 31, 2020

Comings

John Blackwood (383) to 460/ Hermes Project

Jean Marie Denis (562) to 401/Project Formulation and Development Office (PFDO)

John McCabe (564) to 424/ Total and Spectral Solar Irradiance Sensor-2 (TSIS-2)

Theo Muench (552) to 496.1/ESPA Flight System Project

Richard Slonaker (HQ) to 456/ Laser Enhanced Mission Communication Navigation and Operations Services (LEMNOS) Pipeline

Tammy Brown (550) to 481/ Satellite Servicing Advanced Concepts Office (ACO)

Anthony Nicoletti (592) to 401/ PFDO

Edmonia Caldwell (545) to 490.1/ Mars Organic Molecule Analyzer-Mass Spectrometer (MOMA-MS)

Kent Gaylor (JSC) to 450.1/ Networks Integration Management Office (NIMO)

Cody Kelly (JSC) to 450.3/Search and Rescue (SAR)

Gary Letchworth (802) to 460/ Interstellar Mapping and Acceleration Probe (IMAP)

LaNetra Tate (HQ) to 450/ Exploration & Space Communication Projects Division (ESCPD)

Kevin Tewey (External) to 418/ Geostationary and Extended Orbits (GEO-XO)

Teresa Kauffman (External) to 407/ Earth Science Technology Office (ESTO)

Goings

Scott Galbraith (450) Retirement

Zulma Phillips (480) Transfer to new agency

Preston Burch (440) Retirement

Julia Owens (450.2) to 580

Wanda Peters (400) to HQ

Neil Mallik (450.1) to HQ

Art Unger (401.1) Retirement

Reassignments/ Realignments Details within Code 400

Wen-Ting Hsieh (492) to 427/ Pre-Aerosol, Clouds, and ocean Ecosystem (PACE)

Jesse Walsh (483) to 401/ Project Formulation and Development Office (PFDO)

Matt Strube (480) to 483/ On-orbit Servicing, Assembly, and Manufacturing 1 (OSAM-1)

Roberto Aleman (460) to 429/ Landsat 9

Jim Pontius (460) to 426/Landsat NeXt

Brian Roberts (480.1) to 480/ NASA's Exploration & In-space Services/NExIS

Joe Stevens (490) to 401/Project Formulation and Development Office (PFDO)

Vir Thanvi (450) to 450.2/ Technology Enterprise and Mission Pathfinder Office (TEMPO)

Paul Buchanan (450) to 429/ Landsat 9

Vickie Dulski (429) to 482/Space Infrastructure Dexterous Robot (SPIDER)

Barbara Grofic (440) to 440/ Associate Director, Astrophysics Projects Division (APD)

Jason Hair (460) to 418/GEO-XO

Karen Rogers / Code 400
Administrative Officer

FLIGHT PROJECTS
LAUNCH SCHEDULE 2021

FEBRUARY

2/2021
Laser Communications Relay Demonstration (LCRD)

SEPTEMBER

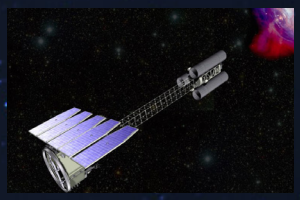
9/2021
Landsat 9

OCTOBER

10/2021
Lucy

10/2021
James Webb Space Telescope (JWST)

NOVEMBER



9/2021
Imaging X-ray Polarimetry Explorer (IXPE)

DECEMBER

12/2021
Geostationary Operational Environmental Satellite (GOES-T)

12/2021
Galactic/Extragalactic ULDB Spectroscopic-Stratospheric Terahertz Observatory (GUSTO)