



The Critical PATH

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Ending the Year in Space: Goddard Network Maintains Communications from Space to Ground

Spending nearly a year in space, 249 miles from Earth, could be a lonely prospect, but an office at the Goddard Space Flight Center (GSFC) made sure astronaut Scott Kelly could reach home for the entire 340-day duration of his mission. Not only could Kelly communicate with mission control in Houston, but GSFC's Network Integration Center (NIC) connected him with reporters and even family.

Reliable space-to-ground communication is critical to all missions – when astronauts venture outside the [International Space Station](#) (ISS) to install new equipment

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*Employees monitor communications between the ISS and NASA in the Network Integration Center at Goddard.
(Image credit: NASA/GSFC/Rebecca Roth).*

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New Tool Provides Successful Visual Inspection of Space Station Robot Arm

Gas station attendant, electronics installer, home inspector: is there any fix-it job that the Goddard-built [Robotic Refueling Mission](#) (RRM) can't tackle during its four-year career? As NASA takes a break in RRM operations, it's looking back on past achievements and celebrating one of its latest accomplishments - the successful inspection of Canadarm2, the [International Space Station's](#) robotic arm. In time, this visual inspection capability may help future servicing ventures at other orbits inspect for damage and failures on their spacecraft.

Launched to the space station in 2011, the RRM experiment has long served as a modular, instructive

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David Mitchell

Message from the Director

There are a lot of exciting things happening this quarter in the Flight Projects Directorate (FPD). If you haven't already seen it with your own eyes, I encourage you to stop by the viewing window in Building 29 to see the progress made by the James Webb Space Telescope (JWST) Project with a fully assembled optical telescope. We're still a couple years from launch but the progress being made is amazing, and tracking right on plan several years running.

With our Japanese partners leading the Astro-H (Hitomi) mission, it was great to see a successful launch on February 17, 2016, from Japan and the on-orbit checkout of the mission which includes Goddard's Soft X-Ray Spectrometer instrument. Kudos to everybody on the team for their years of effort.

We've had a high profile key decision point (KDP)-A review with the WFIRST mission and the team is now in the thick of Phase A. This mission enables a significant in-house work component which is very much welcome news as recent large in-house missions have launched (GPM, MMS, DSCOVR) and we are not far from shipping the major Goddard JWST elements out west. Other good news includes the work on the PACE, Restore-L, and Landsat 9 directed missions which are on the verge of or in the midst of Phase A. Regarding competed missions, our DAVINCI, Lucy, and PRAXyS teams will be submitting their Phase A (Step 2) proposals to NASA Headquarters later this year. These teams are hard at work maximizing the probability for successful selections with executable missions.

On the other end of the spectrum, several of our projects are moving fast towards launch, including Raven in August, OSIRIS-REx in September, GOES-R in October, followed by planned 2017 launches of JPSS-1, GOLD, NICER, ICON, TESS, TSIS, TDRS-M, and ICESat-2. It is a busy time for many of our teams.

In recognition of the great work performed in all areas, many FPD personnel received Robert H. Goddard (RHG) awards on March 22nd. For details, see the list of names later in this newsletter. Congratulations to all RHG award recipients!

Lastly, regarding the Flight Projects Development Program (FPDP), I want to give a warm welcome to our newly selected FPDP class (aka "Cohort #2"): Mellani Edwards, Wen-Ting Hsieh, Obadiah Kegege, Vanessa Soto Mejias, and Brian Thomas. The FPDP is a two-year program designed to accelerate learning and growth in flight project management. The program develops both technical and resource/business participants through the completion of relevant coursework, work assignments, varied development opportunities, comprehensive mentoring, and a Capstone project. Congratulations to our new cohort! And speaking of FPDP cohorts, Cohort #1, comprised of Lateef Ajayi, Nylse Ortiz-Collazo, Beth Weinstein, and Don Whiteman is in the final stretch of the program. They are finishing up their Capstone project and looking forward to graduation this summer.

Dave

David F. Mitchell
Director, Flight Projects
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Personality Tintypes

Mansoor Ahmed



Mansoor (Moonie) Ahmed
at the launch site for
Hubble Servicing Mission 4

Mansoor (Moonie) Ahmed is currently serving as the Associate Director of the Astrophysics Projects Division, Code 440, as well as the program manager for two of the three programs within Astrophysics, namely the Physics of the Cosmos program and Cosmic Origins program.

Born

Abbottabad, Pakistan

Education

B.S Mechanical Engineering, University of Maryland

M.S. Mechanical Engineering, George Washington University

Life Before Goddard

After graduating from the University of Maryland, Mansoor started his career in the heating and air conditioning industry, where he was responsible for independent verification and testing of residential air conditioning systems to certify their performance as advertised by the manufacturers. It was the time of the energy crisis and the Department of Energy (DOE) had established a Solar Energy Demonstration Program to show that solar heating and hot water heating systems could meet the residential and commercial needs of the country. Mansoor joined the contractor organization responsible for implementing the program. NASA was developing the Hubble Space Telescope (HST) at that time, with GSFC having the responsibility of developing the science instrument. The High Speed Photometer (HSP) was being developed by the University of Wisconsin and they had no thermal engineering experience. The GSFC thermal branch required contractor support to help the university. Mansoor was hired by the GSFC thermal engineering branch as a contractor to help the University of Wisconsin.

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Kieran Hegarty



Kieran Hegarty

Kieran Hegarty currently serves as a project support specialist for Code 408, Satellite Servicing Capabilities Office (SSCO). He is the property custodian and also assists with new hire on-boarding, as well as workforce tracking. Kieran is employed on the PAAC IV contract under ASRC/InuTeq.

Born

Silver Spring, Maryland

Education

Bachelor of Arts, double major in Communications and Criminology / Criminal Justice, University of Maryland, College Park, Maryland

Life Before Goddard

Kieran grew up in Davidsonville, Maryland. An avid lacrosse player, Kieran was captain of a State Championship team in high school and president of the club lacrosse team at the University of Maryland.

Life at Goddard

Kieran started as a summer hire with ASRC in 2010. He scheduled his classes to only be on certain days of the week so that he could work during the school year. This allowed him to easily transition to a full-time position after graduating in 2013.

Kieran started a Project Management Professional (PMP) preparation class run by ASRC in April through October 2015. After finally being accepted to take the test in November 2015, Kieran scheduled the test in March 2016, as he wanted to take the newer version of the test, which changed in January 2016. This gave him plenty of time to study (allowing for a busy time around the holiday season and moving home in February, which took away from study time). The last 3 weeks before the test were very hectic, studying for 3 to 4 hours a day, which increased to 5 or 6 hours during the last week before the test.

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(NIC continued from page 1)

NASA's GSFC monitored the landing of NASA astronaut Scott Kelly and Russian cosmonaut Mikhail Kornienko from their Year in Space mission. GSFC's NIC, pictured above, leads all co-ordination for space-to-ground communications support for the ISS and provides contingency support for the Soyuz TMA-18M 44S spacecraft, ensuring complete communications coverage through NASA's Space Network. Both Kelly and Kornienko have spent 340 days aboard the ISS, preparing humanity for long-duration missions and exploration into deep space.

(Image credit: NASA/GSFC/Rebecca Roth)

and perform important maintenance, as well as for any other on-orbit needs.

Data collected in space, like video transmission of a spacewalk, travel as radio signals from antennas on spacecraft to much larger antennas on Earth, some with diameters up to 230 feet. From there, they travel via cables underground, or even under the ocean, to data centers around the world where scientists collect and analyze the data.

With hundreds of satellites operating in orbit around Earth and elsewhere in the solar system, it's easy to imagine that communication channels might become overwhelmed with data from the satellites. To prevent this, NASA manages and maintains three large communications networks. A spacecraft's distance from Earth decides which network it will use. Spacecraft in the far reaches of our solar system, such as New Horizons, just past Pluto, communicate via the Deep Space Network, while spacecraft closer to home, such as the ISS, use the Space Network or the Near Earth Network. Spacecraft utilizing the Space Network communicate using a constellation of geosynchronous Tracking and Data Relay Satellites, known as TDRS. The Near Earth Network consists of ground-

based stations located around the Earth. While the Space Network generally services spacecraft in low-Earth orbit, the Near Earth Network can service spacecraft in low-Earth orbit, geosynchronous orbit, and even in orbit around the moon.

The [Space Communications and Navigation](#) (SCaN) program office is located at NASA Headquarters. Engineers and technicians at GSFC are primarily responsible for the management and operation of the Space Network and the Near Earth Network. The Deep Space Network is managed at NASA's Jet Propulsion Laboratory in Pasadena, California.

GSFC's NIC is the primary operations center for coordinating the communications for missions using the Near Earth Network and Space Network. Capabilities include robotic satellite missions as well as all human spaceflight missions. Service capabilities typically begin with the preflight testing of a spacecraft's communications systems prior to launch and culminate with the launch and initial in-orbit activities of

the spacecraft.

Human spaceflight missions are the NIC's specialty. The NIC has been operational in one form or another since Project Mercury, NASA's first human spaceflight program. Maintaining communications with human-occupied spacecraft is essential for mission success regardless of whether it is in low-Earth orbit or beyond. Today the NIC is involved in all human space missions and regularly supports the ISS and the visiting cargo and crew transport vehicles that service the ISS. The NIC will provide similar communication and navigation to the new commercial crew spacecraft being built by Boeing and SpaceX.

Communication and navigation for most spacecraft in low-Earth orbit is relatively straightforward, said Human Spaceflight Network Director Mark Severance, who manages the communications services from all networks during human spaceflight missions. Most low-Earth-orbit spacecraft connect with and maintain communications with one or two NASA communications networks. Future exploration missions will be more complicated.

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NIC continued from page 4)

“Typically when you fly a mission beyond Earth orbit, you launch and go around Earth a couple times, and you communicate through the Near Earth Network and the Space Network,” Severance said. “Then you do a big rocket firing, you depart from Earth orbit and you’re not going to return. You’re then on the Deep Space Network forever. However, the return trips of human missions will require not only network handovers as the spacecraft leaves Earth, but return handovers between networks as well.”

Because of this, future exploration missions will use all three of NASA’s space communication’s networks at various times during the mission. Not only must the NIC team ensure that all networks are functioning correctly, but that the handovers between networks are orchestrated to maintain communications between the spacecraft and mission control as it leaves Earth or approaches on its return journey. These plans can change rapidly due to in-flight complications, leaving the team to coordinate a new handover plan between the networks.

A preview of this type of mission capabilities occurred during the Orion Exploration Flight Test-1 (EFT-1) in December 2014. The flight orbited Earth twice to test NASA’s new Orion spacecraft, designed to carry astronauts to destinations in deep space, including an asteroid and Mars. EFT-1 flew the Orion capsule to more than 15 times further from Earth than the ISS, about 3,600 miles above the planet’s surface. Data collected during the flight will help finalize Orion’s designs and show how the capsule performs during, and returns from, deep-space journeys. This includes testing Orion’s communications capabilities with the Space Network, which was overseen by Severance’s team in the NIC.

The NIC Human Space Flight team at GSFC is already planning the communications for Exploration Mission-1, the first flight of the Agency’s new Space Launch System rocket and Orion spacecraft to demonstrate the integrated system performance prior to the first crewed flight. Severance said this mission would be the biggest communications challenge moving forward into the next several years.

As NASA soars into space beyond Earth orbit once more, a legacy of space communications that began at GSFC more than 50 years ago continues.

To see video – transmitted to Earth via the NIC – of a new commander taking over control of the ISS from returning astronaut Scott Kelly on February 29, please visit:

- <https://www.youtube.com/watch?v=p-SzXTKWS0>



GSFC’s NIC, pictured here, coordinated the communications support for both the Orion vehicle and the Delta IV rocket during Exploration Flight Test 1, ensuring complete communications coverage through NASA’s Space Network and TDRS.

(Image credit: NASA/GSFC/Amber Jacobson)

For more photos of the NIC at work, please visit:

- <https://www.flickr.com/photos/gsfcalbums/72157662995690923>

***Ashley Morrow / Code 130
Office of Communications***

Howard Ottenstein – The Final Chapter



*Howard Ottenstein,
Founding Editor of The Critical Path*

Those of us who knew him well were deeply saddened to hear of the recent death of the founding editor of The Critical Path (TCP), Howard Ottenstein, on March 4, 2016, at age 85. Howard retired quite recently, in the Fall of 2014, after a career spanning more than 50 years at GSFC. Howard and his wife Marcia had moved from their home in Baltimore County, Maryland to Long Island, New York, to be near their two youngest grandchildren.

They spent the winter months in Delray Beach, Florida.

A native of Brooklyn, Howard graduated from Brooklyn College, served in the Marines from 1951 to 1953, and later received a master's degree in history from New York University. Howard worked with several aviation companies in the New York area until 1964, when he was offered the chance to move south to begin work at GSFC in the Resources field. He worked with Code 600 for several years and then moved to the FPD, where he worked as a program analyst from 1989 until 2005.

In 1990, Howard approached Vern Weyers, then Code 400 Director, about the idea of creating a Code 400 newsletter that would allow FPD employees to share work-related achievements, personal highlights, and items of interest. Operating on a shoestring budget, Howard pulled together the magazine three to four times a year, working with one editorial assistant and one layout person. After 25 years, it's still going strong!

After retiring from the government, Howard continued to work under a support services contract as TCP editor and as a facilitator for the Project Management Development Emprise which began in 1990 and was recently replaced by the Flight Projects Development Program (FPDP) (see article on page 14). He found that most rewarding and loved the interaction that role brought him with up-and-coming management trainees.

Always quick-witted and ready with a snappy response, Howard played the role of curmudgeonly old editor with great gusto. He was a fixture in the halls of Building 8 and was known by so many people around Center. Even after retiring, Howard kept in touch with his TCP colleagues and would call every so often to see what we were up to and to ask when his latest copy of The Critical Path would be arriving! We will miss his wit and dry humor and are grateful for the legacy he has left behind.

In addition to his wife, Marcia, Howard is survived by sons David and wife Patty, Steven and wife Karen, and daughter Meryl, as well as his cherished grandchildren, Cori, Jared, Isla, and Mason.

Kevin McCarthy

It is with a very sad heart that I announce the passing of Kevin McCarthy. Surprised, sad, unsettled ... all of these emotions and more come to mind when we hear of the loss of someone who has been a fixture in our community for such a long time. All I can do, however, is share this news with our community, extend my sincerest condolences to Kevin's family, and provide my unwavering support to those of you who were fortunate enough to know Kevin and call him your friend and colleague.

Several leaders and many of Kevin's friends and colleagues from the NASA family attended his memorial service on Saturday, April 16, 2016 where his family was presented with a plaque in honor of his service. It was a memorable service and a fitting tribute to Kevin's life. He will truly be missed in the NASA community.

A feature on Kevin's 36 years of federal service will be included in the next issue of The Critical Path.

Bob Menrad / Code 450
Associate Director for Exploration and Space Communications Project Division.

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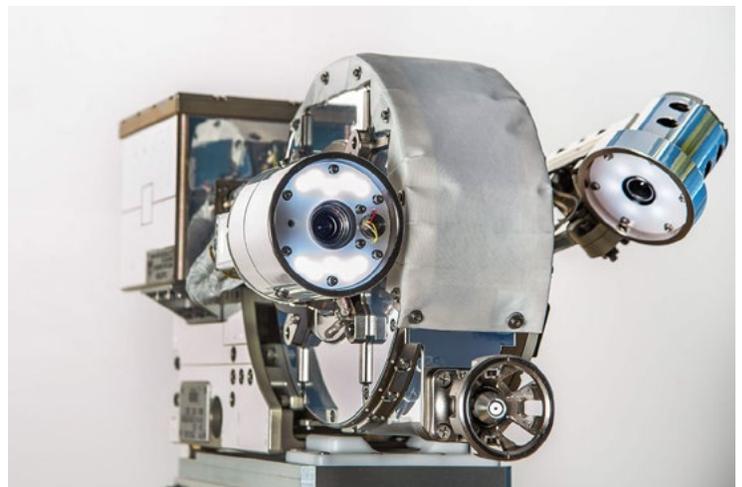


Satellite Servicing team tests new robotic technologies, tools and techniques using the Robotic Refueling Mission module (center, white platform, bottom left) on the ISS. (Image credit: NASA)

proving ground to try out groundbreaking satellite-servicing tools, technologies and techniques. NASA engineers carefully curate the RRM investigations so that they can identify and mature the critical technologies needed to robotically refuel, diagnose and upgrade satellites – and then prove that these technologies work in orbit.

In October 2015, one of RRM's latest technological debuts, the [Visual Inspection Poseable Invertebrate Robot](#) (VIPIR), had an opportunity to move from the training camp of RRM to helping a real client. This is a big moment for the team that developed these technologies, says Benjamin Reed, deputy project manager of NASA's Satellite Servicing Capabilities Office (SSCO) at NASA Goddard.

“It’s very rare for a demonstration tool to be used as part of day-to-day operations on a real mission,” Reed said. “We were thrilled to have this opportunity.”



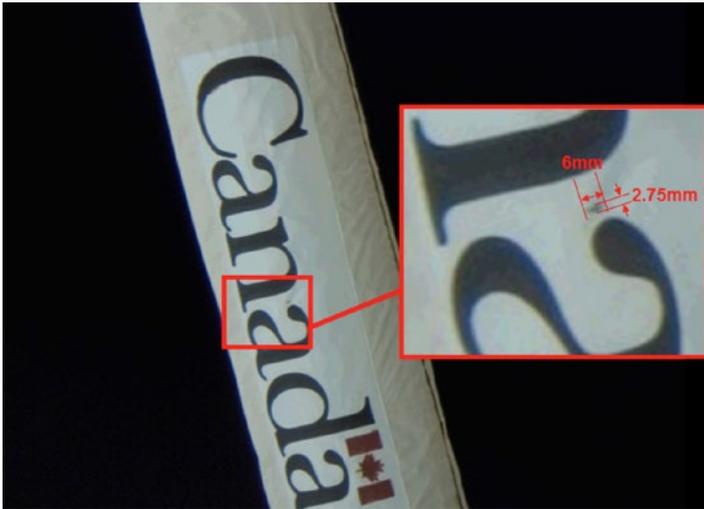
On October 9, NASA used the zoom lens (left) on VIPIR, a new inspection space tool, to examine an unexplained discoloration on the SSRMS, the Space Station Remote Manipulator System.

(Image credit: NASA/GSFC/Chris Gunn)

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The tool's client was the Canadarm2 space station robotic arm, known as the Space Station Remote Manipulator System (SSRMS). Since 2003, mission directors have been mystified by an unexplained black mark that appeared next to the "a" in the "Canada" logo that stretches across the robotic workhorse.



An unusual black mark on the Space Station Remote Manipulator System - a robotic arm on the ISS - had mystified mission directors.

(Image credit: NASA/JSC - Image Science and Analysis Group)



VIPIR captured imagery that confirmed that there was a raised mass (center) on the SSRMS. The lighting conditions cast a shadow (extending to right of the mass site) that showed the presence of the object.

(Image credit: NASA)

"The space station's fixed cameras could only tell us so much," says Ron Ticker, former space station manager for development, and current deputy program manager for the Asteroid Redirect Mission. "We suspected that it may have been a micro-meteoroid strike, but without a closer look, we couldn't conclusively determine what had happened to create this marking."

The ISS office found its answer in VIPIR, a multi-camera inspection tool that the SSCO had built and then tested as part of the RRM program in May 2015. Its zoom lens provided the perfect avenue for a closer look at the mysterious black mark. On October 9, 2015, robotic operators at NASA's Johnson Space Center in Houston commanded the Canadian Space Agency's Dextre – a twin-armed robot attached to the SSRMS – to maneuver VIPIR into position for an inspection.

"The results from VIPIR were phenomenal," said Ticker. "From a distance of approximately eight inches, VIPIR was able to resolve details as small as three-thousandths of an inch (.003") – about ten times thinner than the thickness of a credit card. From VIPIR's footage, we were able to discern that the black mark was in fact a raised mass at the inspection site."

The resolution from VIPIR is so clear and focused that a viewer can count the individual fiber weaves of the thermal blanket material. The RRM team kept VIPIR's camera trained on the area for more than two hours so they could take footage in both glaring sunlight, and during orbit night under the glow of the softer LED lights incorporated into the VIPIR tool itself.

"We were fascinated by the difference in the imagery under the dynamic lighting conditions found in low-Earth orbit," said Ross Henry, the Vision Lead for VIPIR. "During the majority of the inspection, the imagery looked relatively the same with a limited amount of detail visible. However, at one point the sun illuminated the inspection site from the side (at an oblique angle), and the imagery changed completely. A shadow that was cast showed clearly the raised mass at the inspection site. This exercise helped us learn even more about what VIPIR can observe in orbit."

The Image Science and Analysis Group at Johnson Space Center has been analyzing the results from

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VIPIR's inspection to determine the cause.

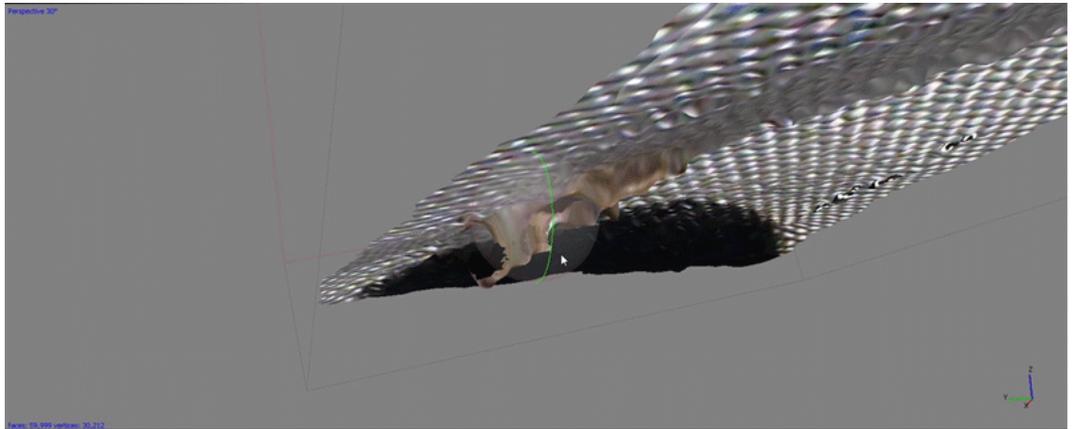
As part of the October RRM operations, NASA also tested a new collection of satellite-servicing technologies and techniques. SSCO's to-do list included practicing techniques leading up to coolant replenishment, testing electrical connection for "plug and play" space instruments, and working with decals that could help operations guided by machine vision go more smoothly. All RRM activities were declared a success.

RRM activities wrapped up in January with one of the experiment's task boards reentering the space station via Japanese Experiment Module airlock. With that step done, the RRM investigation in its current form is now complete.

At a to-be-determined time, the original RRM module will be loaded onto a return vehicle from the ISS to be burned up during atmospheric re-entry. It is a bittersweet thought for the team, but already, they are looking forward to their next big projects on the ISS.

Plans are well underway for RRM3, a new, separate module with experiments to demonstrate tools, technologies and techniques for cryogen replenishment and xenon recharge. These technologies are an important part of maintaining in-space capabilities that will take crew and cargo on the [journey to Mars](#), said Ticker.

"Keep on watching the Satellite Servicing team," said Frank Cepollina, associate director of SSCO. "The best is yet to come."



http://www.nasa.gov/sites/default/files/thumbnails/image/vipir_cropped_small_video.gif

The Image Science and Analysis Group at Johnson has been analyzing the results from VIPIR's inspection. 3D models (as shown in the GIF above), built from VIPIR imagery and supplemental data, are helping the team better understand the raised mass on the space station's arm.

(Image credit: NASA/JSC – Image Science and Analysis Group)



http://www.nasa.gov/sites/default/files/thumbnails/image/taskboard_removal.gif

NASA astronaut Tim Kopra and ESA astronaut Tim Peake remove the RRM task board from the slide table of the Japanese Experiment Module (JEM) airlock.

(Image credit: NASA)

***Adrienne Alessandro / Code 408
Satellite Servicing Capabilities Office***

Governor Hogan Inducts Swann Farms into Maryland's Agriculture Hall of Fame



Above are two of the many rows of peach trees that produce fruit each year at Swann Farms. Peach blossoms resemble those of the popular cherry blossoms in Washington DC. Both bloom in early spring. Lots of people stop along the roadside to take pictures to capture the pink blooms at their peak. During the summer, 100 to 150 half-bushels of peaches and 1,000 to 1,200 dozen ears of corn are hand-picked daily!

On February 4, 2016, Swann Farms, located in Calvert County, Maryland, was awarded the state's most prestigious award at the annual "Taste of Maryland Agriculture" event held at Michael's Eighth Avenue in Glen Burnie, Maryland in front of 700 agricultural leaders and legislators from across the state. Donna Swann, Assistant Director for the Flight Projects Directorate, proudly joined her husband Jody, and partners, J. Allen and Joe-Sam Swann and their wives, as they accepted the honor from Governor Larry Hogan and Agriculture Secretary, Joe Bartenfelder. This award was created in 1991, to honor agricultural leaders who exemplify high standards of achievement and commitment to the industry and their communities.

Swann Farms spans more than 360 acres along the Patuxent River in Calvert County. For more than 160 years and six generations, the Swann family has grown crops such as tobacco, corn, wheat, barley, peaches, tomatoes, water-

melon, and cantaloupe. Recently, the family farm opened its U-pick operation, an attraction which allows consumers to pick their own fresh strawberries and soon blackberries, blueberries, and raspberries too. The Swann family has been active as stewards of the environment, noting best practices in the nutrient management program and consistently working with the University of Maryland Extension's educational programs. Beyond the work on the farm, many hours are devoted to engaging the local community and raising awareness of local food production and issues affecting family farms. The Swanns have been involved with, and have donated fresh produce to, several charities including Maryland Food Bank, End Hunger Calvert, local churches, youth programs, fire departments, and non-profits. The family also remains dedicated to the Calvert County Farm Bureau and Young Farmers.

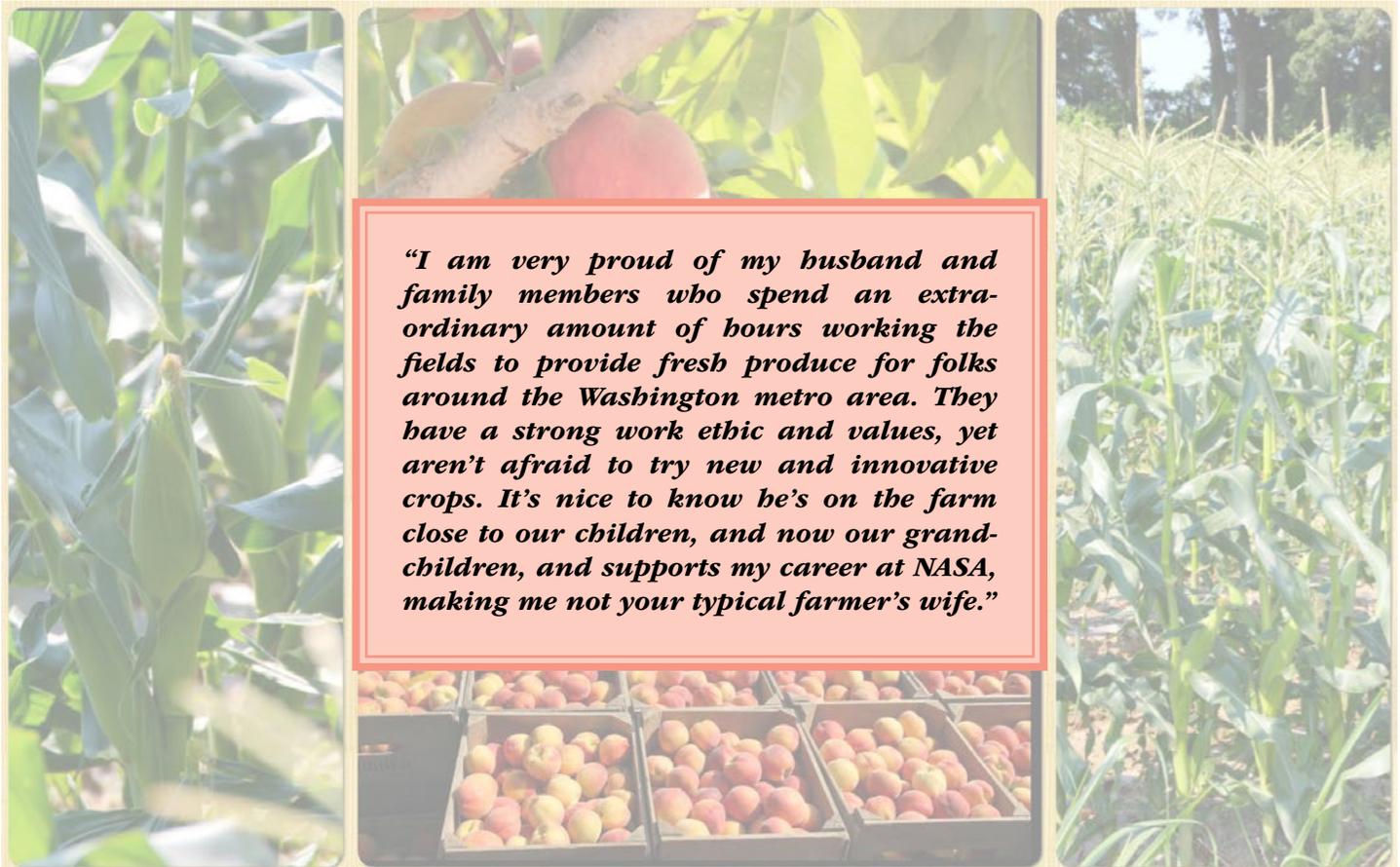
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(Swann Farms continued from page 10)



Maryland Governor Larry Hogan presents the Swann family with a plaque as Swann Farms is inducted in the Maryland Agriculture Hall of Fame

(Image credit: Executive Office of the Governor)



“I am very proud of my husband and family members who spend an extraordinary amount of hours working the fields to provide fresh produce for folks around the Washington metro area. They have a strong work ethic and values, yet aren’t afraid to try new and innovative crops. It’s nice to know he’s on the farm close to our children, and now our grandchildren, and supports my career at NASA, making me not your typical farmer’s wife.”

*Donna J. Swann / Code 400
Assistant Director, Flight Projects Directorate*

Knowledge Management Corner

Technical Expertise AND Team Culture – Great NASA Teams Have Both!

What makes a great team? Is it primarily technical expertise or is it team culture? One without the other is often not sufficient to ensure mission success.



While successful teams tend to be made up of people with the right technical expertise, the team culture aspect should not be overlooked when looking at factors that made the teams successful. Putting together the ideal team (the “A” team) with only the top experts in every discipline does not guarantee success if the team is unable to develop a positive team culture. On top of that, few projects are ever in a position to pull together all the top technical experts they would want on the team -- due to availability and costs. Under such conditions, a balance between technical expertise and a supportive team culture will yield the best results.

To put together a GREAT team requires identifying individuals who are skilled at working in teams. No team is “GREAT” until it has firmly established a supportive team culture. This may sound obvious but a team made up of highly experienced individuals who do not work well as a team will not perform as well as a team made up of less experienced individuals who are more skilled at working together as a team. Research in team intelligence (sometimes referred to as collective IQ) suggests, for example, that higher team intelligence can lead to higher performance. A team, as a whole, is smarter than its smartest individual member. Team intelligence is enhanced by factors such as “speaking in turns,” the proportion of women on a team, and social sensitivity (Bear & Wooley).

What does it mean to be working well as a team and to have a positive, supportive team culture?

A team that works well is a team that has established positive group norms and developed a positive team

culture. In that sense, a team that has worked well in the past has established positive group norms that are likely to be quickly leveraged when the same people are placed on a new project. That explains the tendency to keep good teams together as they move from one project to another. Good teams are often effective as they move from one project to another because they have established effective team dynamics, communication norms, and in essence, a team culture.

Research shows that psychological safety is a critical element of team culture and ultimately team success. Psychological safety is “a shared belief that the team is safe for interpersonal risk taking” (Edmondson). Psychological safety is based on a number of components, including conversational intelligence and social sensitivity. Conversational intelligence is measured in terms of the distribution of conversational turn-taking. Equality in conversational turn-taking (i.e., all members of the team take turns contributing to the conversation and listening) suggests higher conversational intelligence. Social sensitivity, on the other hand, is related to team members’ skill at intuiting how others feel. For example, with more women on a team, team intelligence increases. This is not because women are necessarily smarter (though some may be), but because women tend to bring with them different processes and ways of communicating. In a broader sense, team diversity, including demographic diversity, increases collective intelligence.

Successful GSFC teams have a good sense of what made them work. Their insights match research findings across industries. The following are a sample of insights gathered from GSFC project teams over the years (for more, visit the Flight Projects Directorate Knowledge Exchange, Team Dynamics KMAP – Goddard Internal only): <https://fpdsp.nasa.gov/sites/400/400fpdoffice/FPD/SitePages/Home.aspx>

- *One of the best things a new project can do is get the entire organization to get to know each other on a personal level, align expectations, and set the tone/rules for interactions [Geostationary Operational Environmental Satellite (GOES)-N].*
- *Tear down barriers to open communication and talk to the people who actually do the work [Solar Dynamics Observatory (SDO)].*
- *Find opportunities to team build at frequent intervals and schedule in lessons learned opportunities during every phase of development [Mars Atmosphere and Volatile Evolution Mission (MAVEN)].*

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(Team Culture continued from page 12)

- *The team lead must cultivate an environment where outside reviews and internal minority opinions are not only acceptable but actually sought out as part of the normal process of doing business (SDO).*
- *Open, honest communications can be tough at times. Staff need to feel free to push back and get help when they are struggling with something [Solar Orbiter Collaboration (SOC)].*

Google's Project Aristotle

Google undertook research to find out how to build the perfect team. The data-driven research disproved a few assumptions and started honing on factors related to team culture, eventually concluding that “understanding and influencing group norms were the keys to improving Google’s teams.”

Source: “What Google Learned From Its Quest to Build the Perfect Team,” The New York Times, February 25, 2016, written by Charles Dubigg.

Team Behavior and Norms Exhibited in Pause and Learn Sessions

If we consider that a significant component of team intelligence is demonstrated by the types of conversations team members have, and in particular, the extent to which team members “speak in turns,” there are many opportunities to observe team intelligence within a project. Observing how teams behave in the context of pause and learn sessions can yield some insights into the team culture.

The way teams behave (communicate) during a pause and learn session can be expected to demonstrate established team norms. A pause and learn session is a team reflection activity meant to generate a conversation around lessons learned by the team. The main difference between a pause and learn session and other team meetings is that a third party facilitator guides the conversation. The facilitator is neutral and his/her role is to ensure that everyone in the team has a voice and feels comfortable speaking up and expressing their ideas about what worked, what didn't work, what may need to be changed, etc.

Great teams with higher than average collective intelligence will leverage the pause and learn as an opportunity to get team members' perspective in an open forum. This will not be much of a stretch for them because open communication is already part of their team culture. A great team is a secure team. Its members are able to talk about their weaknesses and mistakes without fear of retribution. A less successful team will require more effort to fully benefit from a Pause and Learn session. It becomes the facilitator's role to try to demonstrate conversation intelligence by enforcing speaking in turns and other ground rules for empowered interactions within the team.

What's the verdict? Can team culture trump technical expertise?

Technical expertise will remain important for GSFC project teams, but team norms are critical in enabling a strong technical team to leverage its strength as a collective. On the other hand, team norms are also critical in teams that may have technical weaknesses because positive team norms will allow the team to recognize such weaknesses early, discuss them openly AND find ways to address them – including asking for help if needed. In short, a supportive team culture is critical regardless

of the technical expertise available.

Barbara Phillip / Code 400
FPD Knowledge Management Lead

References

Edmondson, Amy, “Psychological Safety and Learning Behavior in Work Teams,” Administrative Science Quarterly, 44 (2), June 1999.

Bear, J.B., & Wooley, A.W., “The Role of Gender in Team Collaboration and Performance,” Interdisciplinary Science Reviews, 36(2), 2011.

What's Up ...

with the Flight Projects Development Program?



Please welcome the following individuals to the Flight Projects Development Program (FPDP) Cohort #2, effective April 3, 2016:

Mellani Edwards / Code 424
Wen-Ting Hsieh / Code 401
Dr. Obadiah Kegege / Code 566
Vanessa Soto Mejias / Code 433
Brian Thomas / Code 423

The FPDP is a two-year program that develops highly-motivated employees to meet the demands of flight project management positions through a focused, rigorous and structured curriculum. The program incorporates classroom course work, hands-on work assignments, formal mentoring, a team project, known as the Capstone, and other development opportunities that are designed to accelerate learning and advance opportunities and networks. For more information on the FPDP, please refer to the materials at the following link: [FPDP Cohort #2 presentation](#) or contact Cecilia.A.Czarnecki@nasa.gov.



FPDP Cohort #2 participants (left to right): Mellani Edwards, Wen-Ting Hsieh, Obadiah Kegege, Vanessa Soto Mejias, Brian Thomas



FPDP Cohort #1 participants (left to right): Lateef Ajayi, Nylsevalis Ortiz Collazo, Beth Weinstein, Don Whiteman

Mellani, Wen-Ting, Obadiah, Vanessa and Brian will be very busy over the next two years and will interface with many of you throughout the course of the program. Please extend a warm welcome and best wishes for success in FPDP and for their future careers in the Flight Projects Directorate.

FPDP Cohort #1 is busy working on their Capstone Project and will present their work and recommendations to the FPDP Governance Board on April 19. Lateef, Nylse, Beth and Don are eagerly anticipating graduation from the FPDP in June 2016. More to follow on Cohort #1 in the next edition of the Critical Path.

Cecilia Allen Czarnecki / Code 400
Assistant Director

Cultural Tidbit

Did you know... March 8 is annually recognized as International Women's Day? Progress has been made over the last several decades for women, but many still face economic inequities. The gender-wage gap is about 16 percent and some countries still limit paid employment opportunities for women. International Women's Day is an opportunity to celebrate the achievements of women and to recognize that more efforts are needed to achieve gender equality.

Do you have a cultural tidbit to share? Send it to Code 400 Diversity and Inclusion Committee, c/o Matthew Ritsko at: matthew.w.ritsko@nasa.gov and we'll include it in a future issue of The Critical Path.

(Hegarty continued from page 3)

Passing the test was very rewarding, but the knowledge gained from it has already paid dividends as he is able to see how the project management process is incorporated into missions at GSFC. He is especially interested now that SSCO has the Restore-L project starting and he is able to get insight into a project in its beginning phases.

Life Outside Goddard

Kieran and his 2-1/2-year-old dog Harper live in Annapolis, Maryland and are avid fans of the local DC professional sports teams.

(Ahmed continued from page 3)

Life At Goddard

Mansoor applied to become a civil servant and was hired by the thermal engineering branch. President Reagan had just been elected and he put a government-wide hiring freeze into effect, proactive from the date of his election. So Mansoor's offer for government employment was rescinded. Mansoor continued as a contractor in the thermal branch until 1989, when he finally joined the ranks of civil servants. Mansoor Ahmed has spent most of his career in serving the HST program in different capacities, including as the lead of the HST thermal team, the Flight Operations Manager, and the Project Manager

for HST Operations. He participated in all but one Hubble servicing missions. During a short stint away from HST, Mansoor served as the Mission Manager for the Compton Gamma Ray Observatory De-Orbit mission, the deputy project manager for the James Webb Space Telescope during Pre-Phase A, and as the project manager for the Laser Interferometer Space Antenna (LISA) mission, a collaborative endeavor between NASA and the European Space Agency with the goal to detect gravitational waves generated by massive objects in our universe, as predicted by Einstein.

He has received NASA's Group Achievement Award in 2001, GSFC's Group Achievement Award in 1995, and NASA's Exceptional Service Medal, also in 1995. Mansoor was selected as a member of the U.S. government Senior Executive Service (SES) in 2007.

Life Outside Goddard

Mansoor lives in Glenn Dale, Maryland with his wife Hema and son Emil. His daughter, Pial, is married and she and her husband Cesar now live in Tennessee. Mansoor's hobbies include tennis and filmmaking. He is a member of GSFC's tennis club and plays competitive tennis in the United States Tennis Association (USTA) leagues. He has also organized a group of filmmaking enthusiasts who produce short films, starting with an original story idea and bringing it to the silver screen. Their film, *The Ring*, won the Audience Award for the best short film in the 2014 DC South Asian Film Festival. His films, including *The Ring*, can be viewed at: www.vimeo.com/channels/storytellersdc.



Moonie having fun in the 'iFly' simulated sky diving facility in Florida

Records Management

I spent one summer in college working on an archaeological dig. The site had many stacked layers of human occupations over several thousand years – I think 23 were known at that time. We started with rough tools – pick axes and shovels – and gradually moved to finer and finer hand tools – trowels and small paint brushes – to isolate items from the dust of ages. Every detail was noted, as we never knew what might be a clue to the secrets of the past. The work was painstaking, exacting, and, at times, tedious.

It would have been a lot easier if those civilizations long ago had left a detailed record, but we were left to piece together whatever we could with the information we could find.

In a modern-day twist, we are often faced with combing through file cabinets full of paper when employees retire or move to new positions. Without a road map, it isn't easy to evaluate the significance of each item.

Here at NASA, we are leaving behind a legacy of engineering and scientific breakthroughs and data that is likely to be relevant and interesting for many years to come. We owe it to ourselves and to future generations to document that legacy. In fact, we are legally bound to do so.

In a democracy, records belong to the people. The National Archives and Records Administration (NARA) is the U.S. agency charged with establishing regulations and policies regarding government records. Our role as a government agency requires us to identify, organize, retain, and preserve records of historical interest. Records can be in any form: electronic, paper, film, and so on. Those records and their retention requirements are indexed in the NASA Records Retention Schedules (NRRS), which is a document approved jointly by NARA and NASA.

Not all records are created equal. Many records have temporary retention periods, after which they may be destroyed. But some records are considered so important that they are flagged as permanent. For many space flight projects, most of the records associated with the formulation and implementation life cycle phases are permanent.

All employees who either generate or use records have responsibilities for those records. This includes both preserving records that are still “active,” and purging records that have expired. Fortunately, every FPD organization has a records manager who has been trained in records requirements. In addition, each organization has an annually updated organization file plan that identifies your organization's records, custodians, retention schedules, and locations.

Each employee is responsible for keeping records segregated from non-records and personal documents. In addition, if you move to a new project, any record associated with the project needs to stay with the project.

Part of good records stewardship is knowing what is a record, what needs to be kept, and what can and should be tossed. For those who are moving to the new building, there is an added incentive to clean house, as the new building has a lot less physical storage space.

Thinking back to my days on the dig, it was a challenge to tell whether a piece of dirt was an artifact or just a piece of dirt. For government records, however, there are a few rules of thumb to help you evaluate what you have.

Possible records:

- Original signed copy of a document
- Original work order, report, document, or film
- Document where you or your office was either the author or primary recipient

Probably not records:

- Copies of presentations, handouts, minutes, etc. where you were not the responsible party
- Drafts of published documents
- Database extracts where the data still exist in a database
- Personal notes or notebooks, or work papers used to prepare a finished document or report
- Copies of documents made or received for reference or supply.

Many of the papers you have in your office are likely not records. If you do think you have records in your possession, and you are not designated as the records custodian for those records, your first call should be to your records manager for further direction.

The ancients did not leave much to help us understand their world. Someday, our era will be historical and someone else will be trying to interpret what we have done. With effective record management, we will leave behind a solid archive for future generations.

***Nancy Rosenbaum / Code 400
Records Liaison Officer for the FPD***

2015 Robert H. Goddard Awards

Code 400 Recipients



Center Director Chris Scolese with awardee Linda Wunderlick



Diversity and Inclusion Committee



Chris Scolese with awardee Jolyn Russell

The Robert H. Goddard Awards ceremony was held on Tuesday, March 22, 2016 and recognized **exceptional achievement** in the following areas. Below are the recipients from Code 400:

Customer Service (Individual and Team Recognition)

400/**Linda Wunderlick** (InuTeq, LLC) – For your ability to balance activities and actions to ensure that the organization and Goddard remain compliant and continue to exceed standards.

461/**Keith Opperhauser** – For your outstanding customer service in support of the Magnetospheric Multiscale (MMS) Project.

Diversity and EEO (Individual and Team Recognition)

400/**FPD Diversity and Inclusion Committee** – To the FPD Diversity and Inclusion Committee, for your innovative efforts to increase inclusive behaviors through your speed networking events.

Engineering (Individual and Team Recognition)

408/**Jolyn Russell** (SGT Inc.) – For exemplary work in bringing the Raven project from preliminary design review to final shipment in less than 18 months.

426/**Kathryn Barthelme** (OMITRON) – In recognition of your outstanding management, development and execution of the DSCOVr Mission Readiness Testing and the mission operations timeline activities.



Chris Scolese with awardee Kathryn Barthelme

(Continued on page18)

(RHG Awards continued from page 17)



Chris Scolese with awardee Thomas Ajluni



Chris Scolese with awardee Tim Martin



DSCOVR Project Team

408/**Eric Holt** (SGT Inc.) – For tireless dedication in driving the completion and delivery of the engineering design unit of the NASA Servicing Arm.

433/**Thomas Ajluni** (AS and D, Inc.) – For your tireless leadership in securing additional launch mass that enabled the OSIRIS-Rex mission to fill the fuel tank, which opened up additional options during flight.

443/**Tim Martin** (Northrop Grumman Corporation) – For your unparalleled engineering expertise that contributed to the JWST instrument’s cryocooler delivery at a critical phase of the project’s lifecycle.

Engineering (Individual and Team Recognition)

426/**Deep Space Climate Observatory (DSCOVR) Project Team** – For your professionalism, dedication, and excellence demonstrated to ensure the successful development and launch of the DSCOVR mission.

450/**Earth Regime Network Evolution Study (ERNESt) Optical Comm-based Multiple Access Innovation Team** – In recognition of your contribution to the future of space communications and navigation through an original LASER-based multiple access capability for the ERNESt architecture.

460/**MMS Solving Magnetospheric Acceleration, Reconnection and Turbulence (SMART) Instrument Suite Team** – For the successful design, development, testing and commissioning operations of the MMS SMART Instrument Suite.

461/**MMS SDP Deployer Team** – For the exceptional development of a wire boom deployer for the MMS Spin-Plane Double Probe (SDP) instrument.



Don Boroson accepts on behalf of the ERNESt Optical Multiple Access Innovation Team

(Continued on page 19)

(RHG Awards continued from page 18)



Ron Black accepts on behalf of the MMS SMART Instrument Suite Team



Chris Scolese with DSCOVR Project Manager Al Vernacchio

Leadership

461/**Brent Robertson** – For outstanding leadership resulting in the successful development, integration, launch and commissioning of the four in-house MMS spacecraft.

426/**Albert Vernacchio** – In recognition of your dedication and exceptional leadership of the DSCOVR Project, leading to the successful launch on February 11, 2015.

494/**Jason Hair** – For outstanding leadership as the instrument project manager of the OSIRIS-REx Visible and Infrared Spectrometer (OVIRS), overcoming obstacles and delivering ahead of schedule.



MMS SDP Deployer Team, taken at the University of New Hampshire (UNH) in July 2012

(Continued on page 20)

(RHG Awards continued from page 19)



Chris Scolese with MMS project manager Craig Tooley



Chris Scolese with Astro-H SXS manager James Pontius



Advanced Concepts and Formulation Office Team

461/**Craig Tooley** – For your outstanding leadership resulting in the successful development, integration, launch and commissioning of the four in-house MMS spacecraft.

496/**James Pontius** – For outstanding leadership as the Astro-H Soft X-Ray Spectrometer instrument project manager.

New Opportunities Captured (Team Recognition)

401/**Advanced Concepts and Formulation Office (ACFO) Team** (Tim Van Sant) – For your dedication to and passion for identifying and capturing new work for NASA's Goddard Space Flight Center.

Professional Administrative (Individual and Team Recognition)

400/**Lisa Hoffmann** – For your significant contribution and continued excellence in analysis and organizational management in significant periods of restructuring the FPD.



Chris Scolese with awardee Lisa Hoffmann



Chris Scolese with awardee Walt Majerowicz

(Continued on page 21)

(RHG Awards continued from page 20)

Chris Scolese with awardee Theresa Parker-Quarles

403/**Walter Majerowicz** (InuTeq, LLC) – For your exceptional collaboration, development, and dissemination of Goddard Space Flight Center's Schedule Management Best Practices.

421/**Theresa Parker-Quarles** – For exceptional service in resolving interagency issues with expiring and canceling funding.

450/**Tracy Felton** – For your professionalism, work ethic, attention to detail, and devotion to the Exploration and Space Communications Projects Division, Flight Projects Directorate, and GSFC.

454/**Jane Liu** – For exceptional achievement as the Financial Manager for the Boeing spacecraft contract on the Tracking & Data Relay Satellite (TDRS) Project, Code 454.

400/**Flight Projects Data Analysis Support Team** – For your keen ability to provide analysis and insight into Goddard's flight projects' performance and provide value-added support without duplicating existing review processes.

461/**MMS Business Team** – For your support and dedication to the successful development, launch, commissioning, and operations of the MMS mission.



Chris Scolese with TDRS Financial Manager, Jane Liu

Quality & Process Improvement Award (Individual and Team Recognition)

496/**Keith Walyus** – For your exemplary efforts in eliminating stovepiped project configuration management systems within the Flight Projects Directorate.

*Image credit for all images:
Bill Hrybyk, Code 279
GSFC Photographer/Videographer*



MMS Business Team

Social News

- Velma Anderson (Code 566/453) is so very proud of her son, Dylan. Dylan is a 16-year-old high school sophomore who plays both classical and jazz cello. He participates in the Chesapeake and College Park Chamber Youth orchestras and is a founding member of the Cello Kids. He has performed at Carnegie Hall and played recitals in New York at the home of concert pianist Navah Perlman. Dylan received Superior ratings in all Maryland Music Educators Association (MMEA) adjudications and has played in the Maryland All-State Junior and Senior Orchestras. He has established relationships with professors of cello at Brown University, Dickinson College, Princeton, Julliard, and the New England Conservatory. He will be returning to the Greenwood Music Camp, a world-renowned chamber music camp, for the fourth year.

Dylan also plays lacrosse for Rockfish and Team Lacrosse Clubs travel teams and has recently participated in a number of invitation-only college recruiting events as a defender and (emergency) long-stick midfielder.

Dylan will be performing on Sunday, May 22, 2016, at 4 p.m., at the Maryland Hall for the Creative Arts in Annapolis, in the Concerto Winner Performance.



Cellist Dylan Anderson



Stephanie and Nolan Blade

- Best wishes to Stephanie Haskell, daughter of Barbara Haskell (Code 403). Stephanie and Nolan Blade were married October 17, 2015, in Annapolis, Maryland. They live in Austin, Texas, where Stephanie works for the American Heart Association and Nolan is the Executive Chef at Brio Tuscan Grille.



(Continued on page 23)

(Social News continued from page 22)

- Mark Hubbard was recently reminded of the time he brought his 11-year-old daughter, Meghan, to see the HST Servicing Mission hardware in Building 29. Meghan is now the Assistant Director for the Fusion Academy Brooklyn (NY) after getting her Master's degree in teaching at Liberty University a few years ago. Recently, Meghan and Mark coordinated a Q&A session between former astronaut, Paul Richards (also a fellow Hubble Hugger), and the Fusion Academy's New York District, (which involved several schools) via Web-Ex. Mark and wife Barb spent the weekend with Meghan and her husband, Jared Marinos, a West Point Academy graduate and former Black Hawk helicopter pilot (he had two tours in the Middle East). Jared says he won't sit with Mark on the Navy side any more after being present for two of the grueling football losses Army has faced against Navy in recent history (14 straight

*Meghan and Jared Marinos*

years for Navy being victorious over Army!!!). Jared and Meghan were married on Cinco de Mayo in 2012 at the Most Holy Trinity Catholic Chapel, West Point, New York.

- Best wishes to Kerri Schappell (Code 420), daughter of Tina Schappell (Code 443). Kerri's boyfriend, Tyler Anderson, proposed marriage to her on March 26, at the Cherry Blossom festival in Washington, DC. The Washington Post just happened to be filming that day, so the memorable moment was caught on tape. You can see it at: https://www.washingtonpost.com/video/local/cherry-blossom-festival-draws-huge-crowds-and-a-proposal/2016/03/26/dee051e8-f371-11e5-a2a3-d4e9697917d1_video.html

*Kerri Schappell and Tyler Anderson*

Comings and Goings

January 1, 2016 through March 31, 2016

Comings:

- ❖ Kevin C. Hughes (from 543) to 496/ Global Ecosystem Dynamics Investigation (GEDI) Instrument Project, Deputy Instrument Project Manager
- ❖ Moon Kim (Pathways Hire) to 408/Satellite Servicing Capabilities Office, Student Trainee
- ❖ Zulma Phillips (Pathways Hire) to 442/HST Operations Project, Student Trainee
- ❖ Danny Battle (Pathways Hire) to 470/Joint Polar Satellite System (JPSS) Program Office, Student Trainee
- ❖ Saba Ashrafi (Pathways Hire) to 444/ Space Science Mission Operations (SSMO) Project, Student Trainee
- ❖ Keith A. Cleveland (from 383) to 448/Astrophysics Focused Telescope Assets (AFTA) Study Office, Wide Field Infrared Survey Telescope (WFIRST) Instrument Segment Manager
- ❖ Donya M. Douglas-Bradshaw (from 592) to 491/ Advanced Topographic Laser Altimeter System (ATLAS) Instrument Project Manager
- ❖ Michael D. Hill (from 490.5) to 497/OCI Instrument Project, Deputy Instrument Project Manager
- ❖ Phuc H. Nguyen (from 490.5) to 497/OCI Instrument Project, Deputy Instrument Project Manager
- ❖ Jason H. Hair (from 494) to 498/Thermal Infrared Sensor (TIRS) II Instrument Project, Instrument Project Manager
- ❖ Robert T. Caffrey (from 494) to 498/Thermal Infrared Sensor (TIRS) II Instrument Project, Deputy Instrument Project Manager
- ❖ Cathleen M. Richardson (from 491) to 420/ Earth Science Projects Division, Supervisory - Deputy Program Manager
- ❖ Sally M. Barcus to 490/Instrument Projects Division, Financial Manager
- ❖ Wen-Ting Hsieh (from 490) to 401/ACFO, Instrument Capture Project Manager
- ❖ Mark D. Brumfield (from 400) to 450/Exploration & Space Communications Projects Division, Supervisory - Deputy Program Manager for Flight Implementation

Goings:

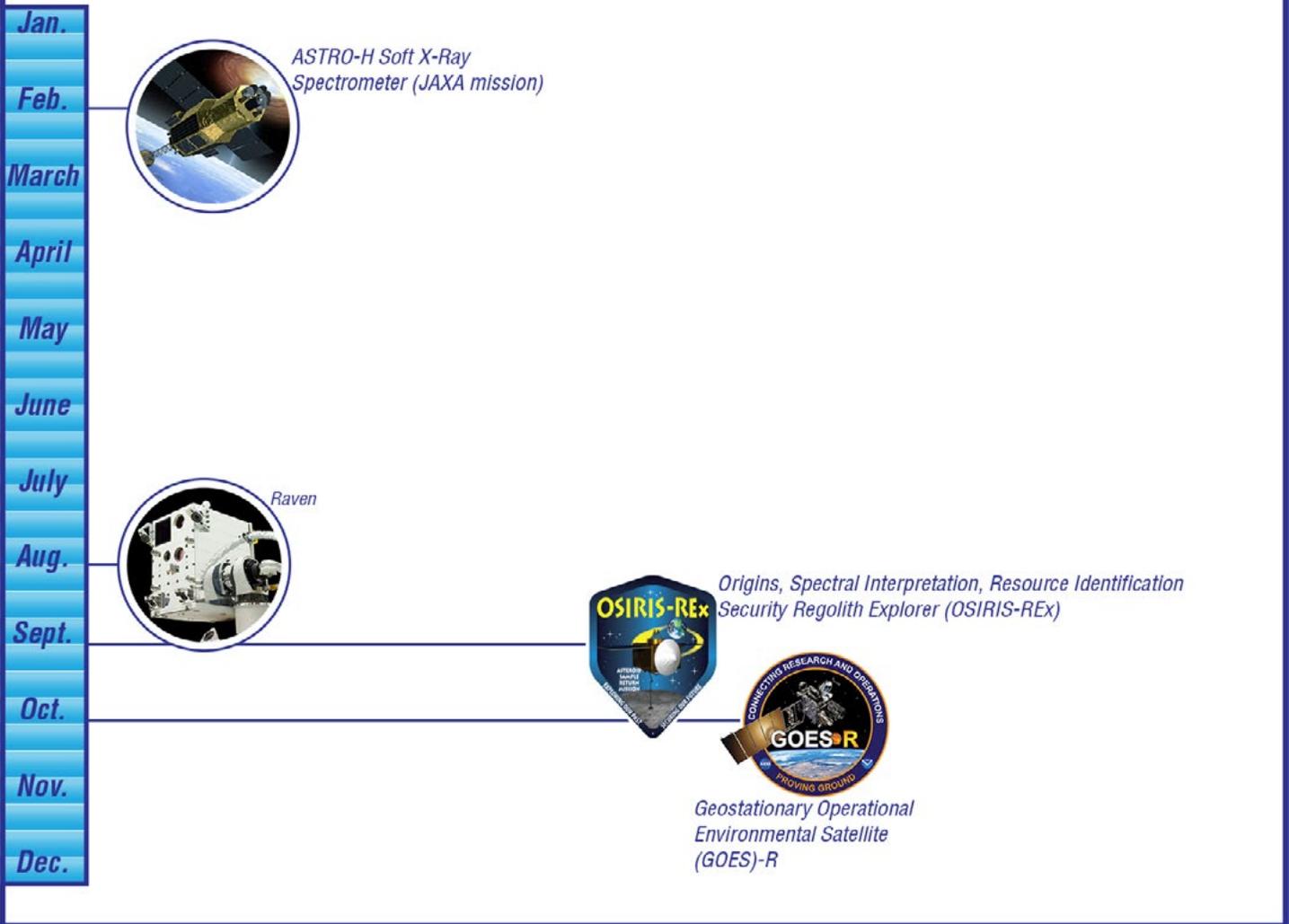
- ❖ Harry M. Born retired from 405/Resource Analysis Office, Supervisory Operations Research Analyst
- ❖ Steve M. Benner retired from 401/Advanced Concepts & Formulation Office (ACFO), Study Manager
- ❖ Hossin A. Abdeldayem (from 405) detail to 504/ Technology Transfer Discipline
- ❖ Edward J. Macie retired from 428/Earth Science Mission Operations (ESMO) Project, Mission Support Manager
- ❖ Sergey Krimchansky to 420/Earth Science Projects Division, Mission Manager
- ❖ Andrew E. Mitchell to 423/Earth Science Data and Information Systems (ESDIS) Project, Deputy Project Manager/Technical
- ❖ Christopher M. Greco to 427/ Pre-Aerosol, Clouds, and ocean Ecosystem (PACE), Deep Atmosphere of Venus Investigation of Noble Gasses and Chemistry with Imaging (DAVINCI) Financial Manager
- ❖ William J. Lehair to 417/ GOES-R Project, Instrument Systems Manager
- ❖ Robert T. Montgomery to 490/Instrument Projects Division, Mars Organic Molecule Analyzer (MOMA) Financial Manager

Reassignments/Realignments/Details within Code 400:

- ❖ David L. Littmann to 454/Tracking & Data Relay Satellite (TDRS) Project Office, Project Manager
- ❖ Robert H. Estep (from 490.5) to 497/Ocean Color Instrument (OCI) Instrument Project, Instrument Project Manager

*Lisa Hoffmann, Code 400
Administrative Officer*

Flight Projects Launch Schedule 2016



The Critical Path

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Supervising Editor:

Donna Swann

Prepared by:

Laura Paschal, Paula L. Wood, Herbert Eaton

If you have a story idea, news item, or letter for *The Critical Path*, please let us know about it.

Send your input to Paula Wood at Paula.L.Wood@nasa.gov,
Mail: Code 460, or phone Ext. 6-9125.

Don't forget to include your name and phone number.

The deadline for the next issue is July 15 2016

We're on the Web!

Visit the new Code 400 home page
<http://fpd.gsfc.nasa.gov>