National Aeronautics and Space Administration

The Critical PATH

2014 Spring Issue / A Flight Projects Directorate Publication

TDRS Project Launches 2nd Satellite in Less than 1 Year

When NASA missions talk, there is a TDRS spacecraft close by, ready to listen. TDRS-L, the second child in the third generation of TDRS spacecraft, launched at 9:33 p.m. EST on Thursday, January 23, 2014 from Cape Canaveral Air Force Station in Florida. Now safely in orbit, TDRS-L joins its sibling, TDRS-K, to replenish spacecraft already flying in the TDRS constellation. TDRS spacecraft are the "go to" assets at the core of NASA's Space Network.

The NASA Space Network operates by sending data from a ground station to a TDRS, which then relays the data to the designated spacecraft. Return data from the spacecraft is relayed through a TDRS to a ground station, which in turn sends the data to a location designated by the spacecraft owner or customer. As a spacecraft moves in orbit around the Earth, its communication signal moves from one TDRS to another.

(TDRS continued on page 6)

MAVEN Launch is Picture-Perfect

An Atlas V 401 rocket carrying the Mars Atmosphere and Volatile Evolution (MAVEN) spacecraft roared off Launch Complex 41 at Cape Canaveral Air Force Station on November 18, 2013, at 1:28 p.m. EST. This event was a significant moment for many who had been working on the mission over the past decade. The launch occurred on the first opportunity of the tight planetary launch period. Missing the launch period, which closed in December 2013, would have required standing down for 26 months to attempt another launch when Earth and Mars were once again in their proper

(MAVEN continued on page 4)

Inside This Issue

NOTICE—THE CRITICAL PATH

Like so many other communications and newsletters, The Critical Path (TCP) will move to an electronic distribution with the next edition. Each edition will be sent as an attachment in individual e-mails to all our current recipients. If you are not a current GSFC employee and you wish to continue to receive The Critical Path, it is important that you contact Paula Wood, TCP Production Assistant with your updated e mail address. Paula's e-mail address is: Paula.L.Wood@nasa.gov, or she can be reached by phone at: (301) 286-9125.

Subsequent changes to e-mail addresses should be sent to Paula as well to receive future copies of TCP. Please see the back cover for a mail-in option.

Message from the Director Of

George Morrow

I wrote my Winter 2013 Critical Path message from Cocoa Beach the night of the successful launch of the Mars Atmosphere and Volatile Evolution (MAVEN) mission. Since then, all systems and instruments were checked out and are operational, two planned Trajectory Correction Maneuvers have been performed, and MAVEN is more than 50 million kilometers from Earth, more than half way to Mars. Reviews to begin to assess the readiness for Mars Orbit Insertion (MOI) on September 21, 2014, are now getting underway. MOI, of course, is as critical as the launch and will be an exciting but nerve-wracking event.

Tracking and Data Relay Satellite–L (TDRS-L) was launched successfully on January 23, 2014, on an Atlas-V from Cape Canaveral Air Force Station. TDRS-L on-orbit check-out has progressed as planned with all systems performing well. The last phase of check-out, the 2-week end-to-end system test phase, will begin in early May. Congratulations to Jeff Gramling and the entire TDRS team!

After quite an eventful shipment to Japan impacted by head winds, ice storms, ferry schedules and other uncontrollable events, the Global Precipitation Mission (GPM) launch flow proceeded as planned in Tanegashima, Japan to a successful launch on board an H-IIA on February 27, 2014 EST. With all systems and instruments performing as expected, the Post Launch Acceptance/Operations Transition Review is on track for May 15, 2014 and operations hand-over will occur on May 29, 2014. Congratulations to Art Azarbarzin and the whole extended GPM team!

The late winter and spring so far have also been quite busy with successful milestones for missions in development. For example, the Neutron Star Interior Composition Explorer (NICER), the Origins Spectral Interpretation Resource Identification Security Regolith Explorer (OSIRIS-REx), and the Mars Organic Molecule Analyzer–Mass Spectroscopy (MOMA-MS) completed Key Decision Point–C; the Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2) completed the Critical Design Review (CDR) and a rebaseline review and hardware is already being delivered; and Joint Polar Satellite System-1 (JPSS-1) completed CDR. The sheer magnitude of these accomplishments combined with all the other activities not mentioned is truly amazing.

I am pleased to report that the new Flight Projects Development Program (FPDP) is now underway with the inaugural class of participants (Beth Weinstein, Nylse Ortiz Collazo, Lateef Ajayi, and Don Whiteman) selected. Congratulations all! FPDP is the follow-on to the Project Management Development Emprise (PMDE) program that has been producing future project leaders since 1990. Congratulations to Valerie Mackritis on her successful PMDE graduation. Valerie was the last graduate of PMDE.

In closing, I want to express my sincere appreciation and gratitude to all the folks that make the success of Goddard projects possible. We accomplish amazing things because of your hard work, personal sacrifice, and dedication.

Sincerely,

George W. Morrow
Director of Flight Projects
george.w.morrow@nasa.gov

Personality Tintype

Param Nair

Param Nair

Param is the Lead for the FPD Business Change Initiative (BCI) Cost Estimating Action Team (CEAT) and advocate Joint Confidence Level (JCL) assessments. The BCI CEAT is a team with members from several directorates that is attempting to recommend solutions to various cost management challenges facing Goddard. The advocate JCL assessments promote the project's perspective of cost and schedule completion taken together after incorporating various sources of risk and uncertainty.

Education:

B.S Mathematics, University of South Carolina

M.A. Economics, University of South Carolina

B.S. Computer Science, University of Maryland University College

Life at Goddard:

Param came to Goddard in 2002 to join the Resource Analysis Office (RAO). The group was part of Code 300 then and his first assignment was to identify different data artifacts in a workforce planning construct. He then assisted in Independent Assessments while developing a method to assess the likelihood of success of proposals submitted by Goddard in response to various Announcements of Opportunity. His most recent role with RAO was with the Division's data collection and normalization team.

In 2012, Param was asked to lead the FPD BCI Cost Estimating team. The first phase was to standardize the advocate JCL assessments performed at the Center. After this, he was asked to assist the Space Launch System (SLS) team at the Marshall Space Flight Center with their JCL assessment.

Currently, the CEAT is finalizing recommendations for Payload Suite Instrument Cost Capture and Variance Analysis Reporting. Other topics in the pipeline include the treatment of WBS structures and cost Basis of Estimates.

Param has also initiated cost and modeling support for the architectural study of the Agency's next generation integrated networks.

Life outside Goddard:

Param and his wife Emi met within a month of his arrival at Goddard and were married less than two years later. Several friends from Goddard attended the wedding. Emi is a demographer at The World Bank in Washington, D.C. and is a native of Japan. They have two sons Siddhartha, 9 and Tomohito, 5. Sid is a graduate of the Goddard Child Development Center while Toto attends the Kindergarten there.

Param and his family enjoy traveling together to visit friends and family members in Asia. Locally, he enjoys taking the boys for hikes on local trails. Home life is a mish-mash of different languages and foods. He also enjoys watching cartoons with his kids and reading both individually and with the children. Emi is an avid skier and the family has taken to it with Param providing entertainment rivaling America's funniest home videos.

MAVEN team, night before launch at Cape Canaveral, Florida, November 17, 2013

(MAVEN continued from page 1)

relative positions in orbit. So it was of great excitement and relief when the team witnessed a picture-perfect countdown and launch, despite threatening weather conditions, right at the opening of the launch period.

"After 10 years of developing the mission concept and then the hardware, it's incredibly exciting to see MAVEN on its way," said Bruce Jakosky, Principal Investigator, shortly after launch. "But the real excitement will come in 10 months, when we go into orbit around Mars and can start getting the science results we planned."

MAVEN is traveling to Mars to explore how the Red Planet may have lost its atmosphere over billions of years. In fact, MAVEN will be the first mission devoted to the study of Mars' upper atmosphere. By analyzing the planet's upper atmosphere and measuring current rates of atmospheric loss, MAVEN scientists hope to understand how Mars transitioned from a warm, wet planet to the dry desert world we see today. On its way to Mars, some of MAVEN's instruments have already been conducting science observations – analyzing the solar wind and measuring inter-planetary hydrogen.

MAVEN's eight science instruments are grouped into three packages - the Particles & Fields Package (including Goddard's Magnetometer), the Remote Sensing Package, and Goddard's Neutral Gas & Ions Mass Spectrometer. MAVEN also carries the Electra Ultra High Frequency communications package. Electra packages now fly on every Mars orbiter built in the United States, as well as those built in Europe. Its purpose is to relay data between the rovers on the surface of Mars (e.g., NASA's Curiosity and Opportunity rovers) and Earth, greatly increasing science data return from the Martian surface.

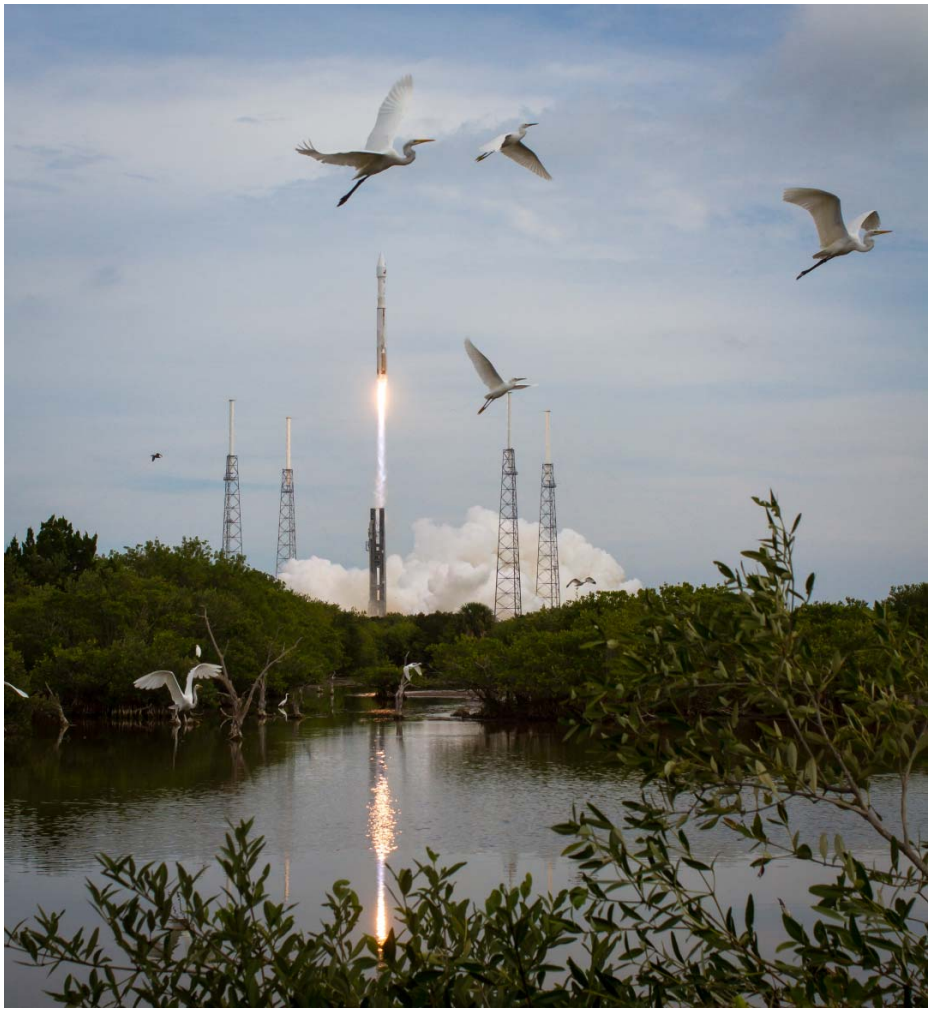
Since launch, MAVEN has passed a series of check-outs of the spacecraft subsystems and payloads. The spacecraft successfully performed two trajectory correction maneuvers, in December 2013 and February 2014. As of April 19th, MAVEN was 46.6 million kilometers (28.9 million miles) from Earth and

(MAVEN continued on page 5)

(MAVEN continued from page 4)

52.5 million kilometers (32.6 million miles) from Mars. MAVEN reached the half-way point, time wise, on April 19th (5 months, 1.5 days from launch, with that amount to go before Mars Orbit Insertion).

Upon arrival at Mars in September, the spacecraft will execute an orbit insertion maneuver, firing six thrusters that will allow it to be captured into Mars orbit. In the following 5 weeks, MAVEN will establish itself in an orbit where it can conduct science operations, deploy science appendages, and commission all instruments before starting its 1-Earth-year primary science mission. The "Mars Orbit Insertion" (MOI) event will occur on September 21, 2014, at approximately 10 p.m. EDT. Since launch the team has been hard at work preparing for MOI. Like the launch event, the team only has one shot for success with MOI. The MAVEN team is preparing itself with dress rehearsals and continued testing of the spacecraft in flight and on the ground with simulators.



MAVEN's picture-perfect launch

MAVEN's Principal Investigator is based at the University of Colorado at Boulder's Laboratory for Atmospheric and Space Physics. The university provided science instruments and leads science operations, as well as education and public outreach for the mission. Goddard manages the project and provided two science instruments. Lockheed Martin in Denver, Colorado built the spacecraft and is responsible for mission operations. The University of California, Berkeley's Space Sciences Laboratory provided science instruments. NASA's Jet Propulsion Laboratory in Pasadena, California, provides navigation support, Deep Space Network support, and Electra telecommunications relay hardware and operations.

David F. Mitchell / Code 460
MAVEN Project Manager & Deputy Associate Director for Planetary Science Projects Division

(TDRS continued from page 1)

TDRS-L Launch on January 23, 2014

The Network consists of the on-orbit telecommunications TDRS satellites, placed in geosynchronous[1] orbit, and the associated TDRS ground stations, located in White Sands, New Mexico and Guam. The TDRS constellation is capable of providing nearly continuous high bandwidth (S, Ku, and Ka band) telecommunications services for expendable launch vehicles and user spacecraft in low Earth orbit. Examples include the Hubble Space Telescope, the Earth Observing Fleet and the International Space Station. Other Government agencies, including the Department of Defense and the National Science Foundation, and commercial entities also rely on the Space Network to communicate with various spacecraft.

The first ground terminal at the White Sands Complex became operational in April 1983 with the launch of TDRS-1. As NASA launched more of the TDRS fleet, the second White Sands ground terminal went live in December 1994 to provide redundancy and update the original ground station's 1970s technology. The Network completed construction on the ground terminal in Guam in 1998 to provide better coverage over the Indian Ocean region. Every year, the Network performs more than 175,000 hours of tracking to support 25 to 30 missions.

GSFC's TDRS Project, established in 1973, is responsible for the development, launch, and on-orbit test and calibration of TDRS spacecraft. There have been four procurements of TDRS spacecraft, which include the Basic Program (TDRS F1-F6), the Replacement Program (TDRS F7), the TDRS H,I,J Program, and the TDRS K,L,M Program. TDRS Flight 7 was a replacement for Flight 2, which was lost aboard Challenger in 1986. The first seven spacecraft (TDRS F1-F7) are referred to as the First Generation, the H,I,J series are called the Second Generation, and the K,L,M series are known as the Third Generation. TDRS F1-7 spacecraft were built by TRW (now Northrop Grumman) in Redondo Beach, California. The TDRS F8-10 (H,I,J) spacecraft were built by Hughes in El

(TDRS continued on page 7)

[1] A geosynchronous orbit is one in which the satellite is always in the same position with respect to the rotating Earth. The satellite orbits at an elevation of approximately 35,790 kilometers to allow time for one orbit equal to the period of rotation of the Earth (23 hours, 56 minutes, 4.09 seconds). By orbiting at the same rate in the same direction as Earth, the satellite appears stationary (synchronous with respect to the rotation of the Earth).

(TDRS continued from page 6)

Segundo, California. NASA awarded a fixed-price contract for TDRS-K and L to Boeing Space and Intelligence Systems (formerly Hughes) of El Segundo, California in December 2007, with an option to purchase two additional satellites (M and N). In November 2011, NASA exercised the option to purchase TDRS-M.

The second-generation satellites improved the Network's communication capabilities by the addition of Ka-Band services, increasing the bandwidth available to users of the network. The primary difference between the second and the third-generation satellites is that for third-generation satellites the processing of the communications signals for Multiple Access Return (MAR) Services occurs on the ground rather than on the satellite. Ground processing of these return signals enables Demand Access Services (DAS) to be provided similar to the DAS services provided by the F1-F7 spacecraft. In addition, unlike earlier versions, third-generation TDRSs were designed to be compatible with either an Atlas or Delta launch vehicle to maximize launch opportunities.

To be fully operational and cover the entire planet, the Space Network requires six active TDRSs in orbit at any one time. In addition, NASA keeps at least one other operational TDRS in on-orbit storage in the event an active satellites fails. TDRSs were designed to operate for 15 years, including 4 years of on-orbit storage during which they are not in active service but available if needed to replace another satellite. However, the satellites have generally outlasted design expectations. TDRS-1 was in orbit for 26 years before needing to be retired from service life in 2009.

Since its launch, TDRS-L has been in good health and is undergoing the process of being checked out

(TDRS continued on page 8)

TDRS-L Payload Fairing being mounted to Atlas-V/401 Launch Vehicle

(TDRS continued from page 7)

by its manufacturer, Boeing. On-orbit acceptance is currently scheduled for the summer of 2014. After acceptance, TDRS-L will be configured for on-orbit storage.

The NASA Administrator, Charles Bolden, was at the launch site to view the launch of TDRS-L. "TDRS-L and the entire TDRS fleet provide a vital service to America's space program by supporting missions that range from Earth-Observation to deep space discoveries," said Mr. Bolden. "TDRS also will support the first test of NASA's new deep space spacecraft, the Orion crew module, in September. This test will see Orion travel further into space than any human spacecraft has gone in more than 40 years."

TDRS-L (renamed TDRS-12 on-orbit) is seven days shy of being a full year younger than its sibling, TDRS-11; launched on January 30, 2013. The TDRS flight project is extremely proud of its new addition. "This launch ensures continuity of services for the many missions that rely on the system every day," said Jeffrey Gramling, TDRS Project Manager.

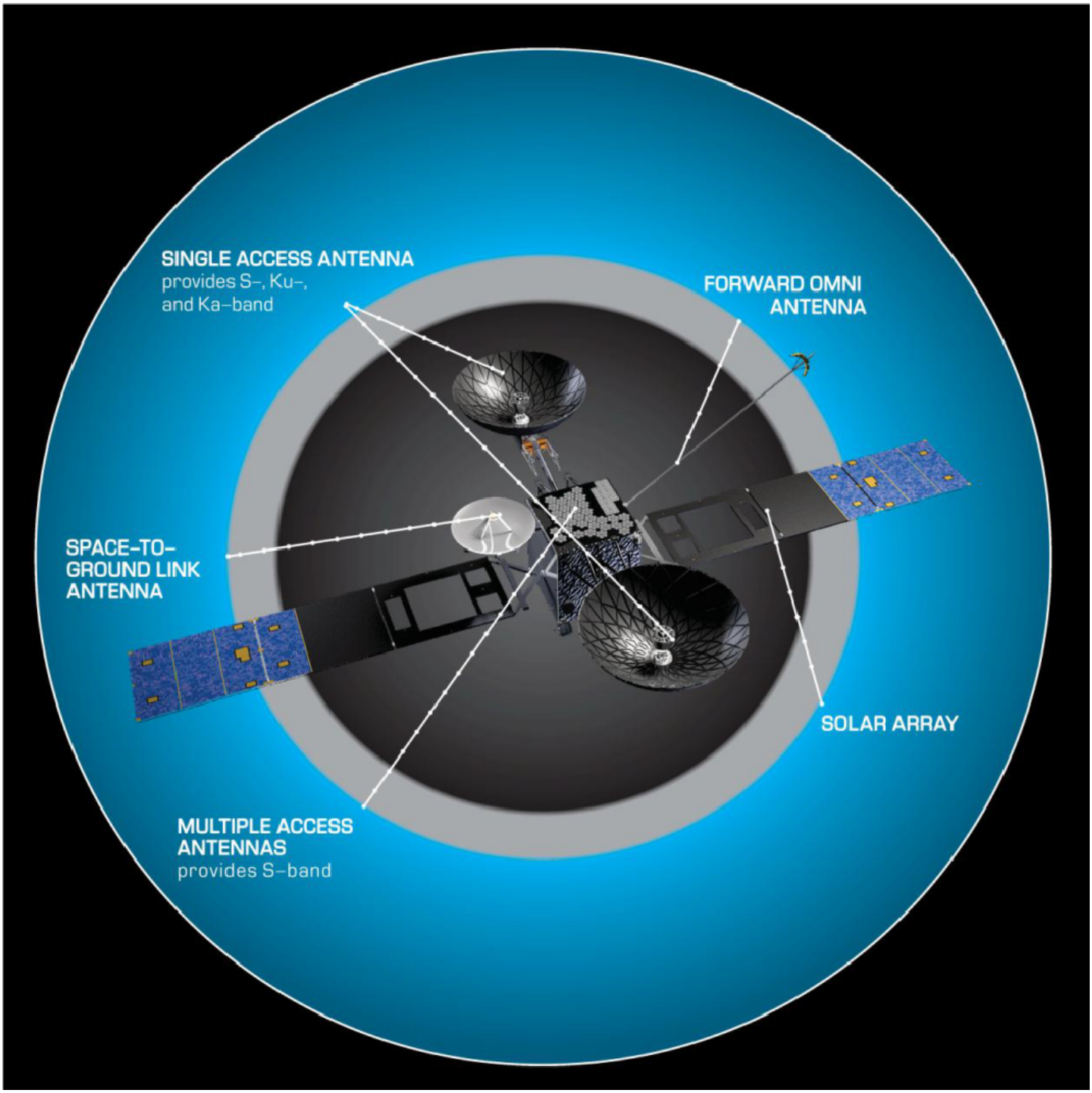
TDRS-M, the next spacecraft in the series, is on track for launch readiness in late 2015. TDRS-M will benefit from the project's lessons learned obtained during the development of its two previous spacecraft (TDRS K and L). With an operational life of 15 years, TDRS-M could help ensure continuity of services well into the 2030s so that whatever new NASA missions are out there and talking, a TDRS satellite is close by and ready to listen.

TDRS Team / Code 454

TDRS Spacecraft by Launch Date

Spacecraft Name Before Launch	Launch Date	Spacecraft Name After Launch	Age of Spacecraft at Decommission or as of January 2014
First-Generation TDRS			
TDRS-A	April 4, 1983	TDRS-1[a]	26 years[a]
TDRS-B	January 28, 1986	(lost in the Challenger accident)	N/A
TDRS-C	September 29, 1988	TDRS-3[b]	25 years
TDRS-D	March 13, 1989	TDRS-4[a]	23 years[a]
TDRS-E	August 2, 1991	TDRS-5[c]	22 years
TDRS-F	January 13, 1993	TDRS-6[c]	21 years
TDRS-G	July 13, 1995	TDRS-7[c]	18 years
Second-Generation TDRS			
TDRS-H	June 30, 2000	TDRS-8	13 years
TDRS-I	March 8, 2002	TDRS-9	11 years
TDRS-J	December 4, 2002	TDRS-10	11 years
Third-Generation TDRS			
TDRS-K	January 30, 2013	TDRS-11[b]	1 year
TDRS-L	January 23, 2014	TDRS-12[d]	0 year
TDRS-M	2020s[e]	TDRS-13	N/A

a -TDRS-1 was decommissioned in October 2009 while TDRS-4 was decommissioned in December 2011.
b - TDRS-3 and 11 are in on-orbit storage until needed for service.
c - TDRS-5, 6, and 7 are operating beyond their design life
d - TDRS-12 is in on-orbit testing by Boeing.
e - NASA has not established a confirmed launch date.
Source: NASA



TDRS Artist's Concept
Source: NASA

Mission Updates

Global Precipitation Measurement (GPM)

The Global Precipitation Measurement (GPM) Core Observatory calibration continues normally. The GPM, a joint Earth-observing mission between NASA/GSFC and the Japan Aerospace Exploration Agency (JAXA) successfully launched from Tanegashima, Japan on February 27, 2014.

NASA Administrator Charles Bolden stated that "with this launch, we have taken another giant leap in providing the world with an un-precedented picture of our planet's rain and snow." Initial images show precipitation falling inside a March 10 cyclone over the northwest Pacific Ocean. The GPM will provide observations of rain and snow every 3 hours worldwide.

Goddard's GPM Flight Project was responsible for the design, development, manufacturing, integration/testing as well as operations of NASA-provided instruments, spacecraft, ground validation and data processing systems for the GPM mission.

Public Service Recognition Week

The week of May 10th celebrates Public Service Recognition Week (PSRW). The theme for 2014 is: "Proud to Serve." PSRW honors the men and women who serve our nation as government employees. It is organized by the Public Employees Roundtable and its member organi-zations.

PSRW's goal is to highlight the services that public servants in America provide and to educate the public about the work of their governments (Federal, state and local). There will be many events occurring during the week in Washington D.C. and around the nation.

Lunar Atmosphere and Dust Environment Explorer (LADEE)

The Lunar Atmosphere and Dust Environment Explorer (LADEE) successfully launched from a Wallops launch pad on September 6, 2013. Its mission ended, as designed, when it crashed into the Moon's surface on April 17, 2014 running its science instruments almost to the very end. All science files apparently were downloaded just prior to LADEE's impact. It is hoped that it will show increased dust density on the surface of the moon among other anticipated results.

Quotes to Think About

"A gaffe is when a politician tells the truth."
Warren Buffett

"You can observe a lot by watching."
Yogi Berra

"It's not that I'm afraid to die.
I just don't want to be there when it happens."
Woody Allen

"There are some remedies worse than the disease."
Publilius Syrus

"Please accept my resignation.
I don't care to belong to any club that will accept me as a member."

Groucho Marx

"It's not that easy being green."
Kermit the Frog

Social News

- Congratulations to Anna Keller (ASRC/425) on the birth of her grandson, Brantley Alexander Schofield, born on February 11, 2014 at 9:01 a.m., weighing 7 lbs., 5oz.
- Maggie Hagen (Code 441) is the proud Grandma of a beautiful baby girl Scarlett Elane Hagen, born February 16, 2014, weighing in at 7 lbs., 14 oz. and 22 inches long, to Chad and Holly Hagen. Scarlett joins three sisters: Summer, Taylor and Piper; and one brother, Hunter. Mommy and baby are doing well.
- Colleen and Joseph Krygiel (ASRC/425) welcomed their first baby, Calvin Joseph Krygiel, born at 5:13 p.m. on February 3, 2014. Calvin weighed 7 lbs., 9 oz. and was 21 inches long.
- Congratulations to Ricardo Martinez-Serrano (Code 470) and Jeannelle Zayas-Bazan Ayala, who were married on December 11, 2013.
- Congratulations and best wishes to Helen Sullivan (Code 451) and John Baniszewski, who are marrying in August.
- Dr. Steve Benner (Code 401) has written a detective novel called "The Stiff in the Five Hundred Dollar Suit". You can see it at the link https://www.smashwords.com/books/view/430848.

The Critical Path

Late in the year of 1992, Vern Weyers, then Director of Flight Projects, determined that Code 400 was in need of a publication describing the efforts of the Directorate. Noting that Howard Ottenstein had some writing background (weekly article for two years in the Baltimore Evening Sun and author of a published book), he quickly appointed him as Editor of the yet untitled publication. Two now retired DPM/Rs, George Barth and Richard Long, were assigned to assist him. George indeed selected the name of the new publication: The Critical Path. But both were soon to leave for other more important activities. Howard remains Editor to this day through nearly 22 years of highlighting the activities of the Flight Projects Directorate.

During that time frame, The Critical Path has grown from an initial issue of ten pages to as many as 40, even as the editor has maneuvered his way through the regimes of Code 400 Directors Vern Weyers, Jim Moore, John Campbell, Dolly Perkins, Rick Obenschain and George Morrow. Somehow he has survived to remain as editor of a publication that has grown to approximately 1,700 copies, including not only all Code 400 Civil Servants and contractors, but to most organizational offices on Center, as well as to recipients at all NASA Centers and Headquarters, retirees, and those in the private sector who have requested copies.

It is coincidental that the first issue in early 1993 highlighted the successful launch of TDRS F-6 on 1-13-93 even as the current spring issue of 2014 speaks to the successful launch of TDRS-L on 1-23-2014; almost 21 years to the day of the F-6 launch. The years in between have addressed a host of successes that have made Flight Projects a symbol of excellence in the space age.

To keep up with advances in technology and to save some money while we are at it, The Critical Path is moving primarily to future e-mail delivery (see the notice on page 1 of this issue). We have also changed the masthead of the publication. We hope that you continue to enjoy each issue in the years to come. As a side note, the Editor, coincident with this issue, celebrates his 50th year at the Center.

Knowledge Management Corner

NICER and the Class D Constitution – Some Initial Lessons Learned

Rationale for the Class D Initiative and Intent of the Class D Constitution

NASA payloads are assigned a risk classification level early on, allowing program and project managers to "develop and implement appropriate mission assurance and risk management strategies and requirements and to effectively communicate the acceptable level of risk." Class A payloads accept the least amount of risk, requiring that "all practical measures [be] taken to achieve minimum risk to mission success, while Class D payloads permit "medium or significant risk of not achieving mission success." Class B and C fall in between. (See NPR 8705.4 – Risk Classification for NASA Payloads for details).

Recognizing the importance of Class D missions to GSFC and NASA, Center Director Chris Scolese convened a small team led by Colleen Hartman, Deputy Director for Science Operations and Program Performance, to streamline the approach to in-house Class D missions. The activities of this team resulted in the Class D Constitution, finalized in the Fall of 2013. The Class D Constitution is a GSFC document, developed by GSFC, for GSFC.

NICER as a pilot Class D project under the new Constitution

While the Neutron Star Interior Composition Explorer (NICER) started before the Class D Constitution was finalized, it became the first "pilot' under the Class D Constitution. The initial lessons learned highlighted below were discussed at a recent workshop organized by the Flight Projects Directorate (FPD), with the participation of Jeanne Davis, Program Executive (PE) for NICER, Keith Gendreau, NICER

(KM continued on page 13)

Underpinnings of the Class D Initiative

1. Early development - well before submission of a proposal - of a Preliminary Project Implementation Plan (PPIP) containing sufficient detail to enable reasonable and credible resource, cost, and schedule estimates that are consistent with the customer's Class D project definition; the PPIP will also contain a well-defined performance floor.
2. Clear and focused lines of accountability with technical and programmatic authority residing at the Project level wherever feasible.
3. Short reporting and communication channels within the Project and between the Project and Center decision makers to support timely decisions, with an urgency to protect the schedule using a design- and build-to-cost approach.
4. Ownership by the team of a product-oriented approach, streamlined processes, minimum distractions, and low overhead.
5. An Advisory Group and GSFC Code 100 Senior Executive Champion, designated by the Center Director, provides stewardship and advice to the Project team and facilitates the interface to stakeholders.

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Principal Investigator (PI), Sridhar Manthripragada, NICER Project Manager (PM), and some of the members of the Class D Initiative Working Group, including Chuck Clagett, Tony Diventi, William Cook, Fernando Pellerano, and Matthew McGill.

Some initial lessons

- **Push Back Required**: A strong PI is needed to push back against "traditional approaches" that are part of the Goddard culture. While the Class D Constitution is fully compliant with NPR 7120.5E, and takes advantage of the tailoring that is suggested in NPR 7120.5E, there is no reason for Class D projects to have to follow other Goddard processes that are unnecessary for Class D projects.

  "A primary guiding principle is that GSFC shall not impose requirements on a Project that are not clearly stated in the PPIP/PIP". Colleen Hartman

- **Buy-in Needed at All Levels**. Buy-in starts within the project team, with a strong PM/PI team, and clear guidance/directions to the rest of the team in terms of the Class D approach; beyond the project team itself, the FPD, the Safety and Mission Assurance Directorate, and Center Management need to be fully on board; at HQ, the PE serves as the project's champion and needs to ensure that all levels of HQ are on board with the specific Class D approach taken by the project. Governance issues need to be addressed upfront.

- **Strong Risk Management is Key**. The project leadership team needs to clearly understand all the risks and be able to explain the risks to senior leadership at the Center level and at Headquarters. This is essential for the Center and for HQ to be willing to accept more risk, which is by definition, what a Class D project is expected to do. The challenge is that while Class D projects are expected to accept more risk, the expectation that they will succeed has not changed. Making this work requires a strong working relationship with the Chief Safety Officer.

- **No one-size-fits-all Class D**. There is no template Preliminary Project Implementation Plan or Project Implementation Plan (PPIP/PIP) for a Class D project and while there is a standard Mission Assurance Requirements document (MAR), the MAR should be developed almost from scratch for a Class D project, to ensure that everything that is done is done for a good reason and not because that's the way things have been done in the past. This is not at all about cutting corners; it is about cutting down on unnecessary overhead.

  "This can be accomplished, without compromising the Class D technical integrity, by removing or modifying the high overhead processes and procedures that are associated with more complex and/or higher visibility projects." Chris Scolese.

- **Time is precious**. Be efficient with meetings and communications, be inclusive, and make expectations clear in terms of attendance at key meetings and review of documents; some processes (sequential document review, for example) which are out of the control of the project, are not adapted to fast-paced Class D projects.

Looking Forward

NICER is one of two Class D Projects treated as pilot projects under the Class D initiative. The recent workshop, attended by more than 50 participants from around the Center, focused on NICER's experience under the Class D initiative and was an opportunity to discuss initial lessons learned and to have an open conversation about some of the challenges involved in trying to change some aspects of the GSFC culture that have hampered successful implementation of Class D projects. Moving forward with lessons learned, subsequent

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Class D projects will benefit from improved processes.

In addition, other efforts in the FPD, such as the Business Change Initiative and its emerging Best Practices, are paying increased attention to the scalability of Best Practices to the needs and requirements of smaller projects. For example, the Earned Value Management group is working with the Instrument Division (Code 490), to develop a Class D Earned Value approach so that Class D projects can leverage Earned Value tools and techniques without necessarily having to deploy a full-fledged Earned Value Management system.

Related Resources/References

- Class D Initiative web page - http://director.gsfc.nasa.gov/classd.html
- Constitution for In-House NASA Goddard Space Flight Center Class D Projects http://director.gsfc.nasa.gov/docs/Class%20D%20Constitution%20Rev%20A%203_26_2013.pdf
- NICER Knowledge Maps (within the FPD Knowledge Exchange – NDC login required) https://fpdspi.gsfc.nasa.gov/sites/400KE/SiteAssets/wiki/Maps/NICER%20-%20Overview.html
- NPR 7120.5E – NASA Space Flight Program and Project Management Requirements http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=7120&s=5E
- NPR 8705.4 – Risk Classification for NASA Payloads http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8705&s=4

Barbara Fillip, Code 400
Knowledge Management Project Manager

Cultural Tidbits

Did you Know……

... That March was Women's History Month? In 1981, Senators Barbara Mikulski and Oran Hatch cosponsored a joint resolution proclaiming a "Women's History Week." The celebration was later extended to a whole month in 1987. The month pays tribute to the generations of women who have made society a better place for everyone. It is a great opportunity to celebrate the many women leaders and their contributions.

Visit http://womenshistorymonth.gov/ for more information.

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

Flight Projects Development Program

Please welcome the following individuals to the Flight Projects Development Program (FPDP), effective April 6, 2014:

Lateef Ajayi/408

Nylsevalis Ortiz Collazo/210Y

Beth E. Weinstein/568

Donald E. Whiteman/592

The FPDP is a two year program designed to develop highly-motivated employees to meet the demands of flight project management positions through a focused, rigorous and structured program. The program incorporates classroom course work, hands-on work assignments, formal mentoring, a team project and other development opportunities designed to enhance and accelerate learning. For more information on the FPDP, please refer to the materials at the following link: http://fpd.gsfc.nasa.gov/fpdp.html or contact Cecilia.A.Czarnecki@nasa.gov.

Lateef, Nylsevalis, Beth and Don 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.

The first FPDP participants (left to right):
Lateef Ajay, Beth E. Weinstein, Nylsevalis Ortiz Collazo, Donald E. Whiteman

2014 Robert H. Goddard Awards

Code 400 Awardees

Exceptional Achievement Award for:

Engineering (Individual and Team Recognition)

408/Larry Green (Jackson & Tull, Inc.)

417/Jeffrey Kronenwetter (Chesapeake Aerospace LLC)

417/Gary Galica (Lockheed Martin Space Systems Company)

427/Travis Chezick (General Dynamics Corp.)

427/Edward Grems (AI Solutions, Inc.)

454/Megan Gorham (ASRC Management Services, Inc.)

472/David Uveges (MUNIZ)

401/LDCM Observatory Team (Del Jenstrom)

417/GOES-R Advanced Baseline Imager Development Team (William Lebair)

460/MAVEN Team (David Mitchell)

490/SMAP Microwave Radiometer Team (Robert Estep)

Professional Administrative (Individual and Team Recognition)

432/Belinda Barker (Aero Systems Engineering Inc.)

443/Sandra Sumner

450/Angela Schuler

460/Karilys Montanez

443/JWST Configuration and Data Management Team (Jamie Dunn)

Science (Individual and Team Recognition)

443/Marcia Rieke (University of Arizona)

Customer Service (Individual and Team Recognition)

420/Margery Rich

427/Karla Kahler (ASRC Research & Tech. Solutions)

(RHG Awards continued on page 17)

(RHG Awards continued from page 16)

400/KSC Propellant Transfer System Team (Thomas Aranyos)

405/Resource Analysis Office Team (Cynthia Fryer)

428/LDCM Ground and Operations Integration Team (Victor Gehr)

Leadership (Individual Recognition Only)

472/Andre Dress

476/Kevin Carmack

490/Robert Estep

492/Arthur Jacques

Robert H. Goddard Award of Merit (Individual Only)

400/John Decker

405/Harry Born

As it is too early to note the citations for the awards, they will be printed in the next issue of The Critical Path.

Congratulations Cynthia!

Cynthia Simmons (Code 491) competed for the U.S. in an international Tai Chi competition in Guangzhou China last November. There was a woman's and a men's division. There were 21 teams from 18 countries (150 athletes) that competed. Cynthia placed 3rd in short weapon (sword) from amongst 21 competitors (ages 18-55) and 5th in bare hands form against 19 competitors (ages 18 to 55) – she is 54. Kung Fu magazine did an article on the competition, and she is in that article in the March/April 2014 issue.

Cynthia Simmons' International Tai Chi award

There will be no article on "New Business News" appearing in this issue of The Critical Path. We regret this omission.

Comings & Goings

October 1, 2013 through March 31, 2014

Comings:

* Ronald J. Hooker (from 599) to 421/POES Project, Instrument Systems Manager
* Shahriar Etemad (from 505) to 401/ACFO, Instrument Capture Project Manager
* Elizabeth Forsbacka (from 505) to 401/ACFO, Instrument Capture Project Manager
* Debbie Clark (from 501) to 401/ACFO, Program Specialist
* Kaleem Kawaja (from 505) to 401/ACFO, Instrument Capture Project Manager
* Neil Martin (from 505) to 401/ACFO, Instrument Capture Project Manager
* Caleb Principe (from 505) to 401/ACFO, Instrument Capture Project Manager
* Diane Pugel (from 505) to 490/Instrument Projects Division (IPD), Instrument Project Manager
* Sally Barcus (from 501) to 490/IPD, Sr. Resources Analyst
* Robert Montgomery (from 501) to 490/IPD, Sr. Resources Analyst
* Dwight Norwood (from 501) to 490/IPD, Financial Manager
* Jacqualine Peterson (from 501) to 490/IPD, Sr. Resources Analyst
* Joan Rodriquez-Rivera (from 501) to 490/IPD, Resources Analyst
* Michelle Sohl (from 501) to 490/IPD, Resources Analyst
* Robert Estep (from 505) to 490.1/MOMA-Mass Spectrometer Instrument Project, Instrument Project Manager
* James Pontius (from 505) to 490.2/ Soft X-Ray Spectrometer (SXS) Instrument Project , Instrument Project Manager
* Thomas Johnson (from 505) to 490.3/Near Infra-red Spectrograph (NIRSpec) Instrument Project, Instrument Project Manager
* Todd King (from 505) to 490.4/Neutral Gas and Ion Mass Spectrometer (NGIMS) Instrument Project , Instrument Project Manager
* Cathleen Richardson (from 505) to 491/Advanced Topographic Laser Altimeter System (Atlas) Instrument Project , Instrument Project Manager
* Cindy Simmons (from 505) to 491/Advanced Topographic Laser Altimeter System (Atlas) Instrument Project, Instrument Project Manager
* Aprille Ericsson (from 505) to 491/Advanced Topographic Laser Altimeter System (Atlas) Instrument Project , Deputy Instrument Project Manager

(Comings continued on page 19)

(Comings continued from page 18)

- Arthur Jacques (from 505) to 492/Fast Plasma Instrument (FPI) Instrument Project , Instrument Project Manager
- Glenn Jackson (from 505) to 493/Laser Communications Relay Demonstration (LCRD) Instrument Project , Instrument Project Manager
- Michael Hill (from 505) to 493/Laser Communications Relay Demonstration (LCRD) Instrument Project , Deputy Instrument Project Manager
- Jason Hair (from 505) to 494/ OSIRIS Rex Visible and near – IR Spectrometer (OVIRS) Instrument Project, Instrument Project Manager
- Sridhar Manthripragada (from 505) to 495/Neutron star Interior Composition ExploreR (NICER) Instrument Project, Instrument Project Manager
- Thoniel Cazeau (from 505) to 495/Neutron star Interior Composition ExploreR (NICER) Instrument Project, Deputy Instrument Project Manager
- Vicki Dulski (from 581) to 416/GOES-R Ground Segment Project, Deputy Project Manager
- Susie Jones (from 544) to 408/Satellite Servicing Capabilities Office (SSCO), Secretary
- Liz Citrin to 470/JPSS Program Office, Rehired Annuitant Consultant
- Sam Ramos (from 762) to 400/Flight Projects Directorate, Assistant Director for Operations
- Scott H. Schaire (from WFF/802) to 453/Near Earth Network Project, Station Director

Goings:

- Jackie Fiora retires from 422/GPM Project, Deputy Project Manager-Resources
- Neil Martin detail to 301/Deputy Chief of the Systems Review Office
- Caleb Principe detail to 550/Instrument Systems & Technology Division, Euclid Instrument Manager
- Aprille Ericsson (from 491) detail to 500/AETD Transformation Technologist
- Steve Currier retires from 453/Near Earth Network (NEN) Project, Deputy Project Manager
- Betsy Forsbacka (from 401) detail to NOAA/NESDIS, Office of the Assistant Administrator (OAA)
- Diane Pugel (from 490) detail to HQs/SMD
- Robin Kraus (from 416) detail to NOAA NESDIS
- Sandra Cauffman (from 432) detail to HQs/Office of Chief Technologist
- Monique Collins (from 403) detail to 603/Resources Analyst Support
- Carl Wagenfuehrer retired from 407/Earth Science Technology Office, Financial Manager
- Cheryl Powell retired from 444/Space Science Mission Operations Project, Resources Analyst
- Cheryl Spencer retired from 450/Exploration & Space Communications Projects Division, Program Support Manager
- Mark Ambrose retired from 450.1/Networks Integration Management Office

(Goings continued on page 20)

(Goings continued from page 19)

* John Jackson retired from 453/Near Earth Network (NEN) Project, Ground Systems Mission Manager
* Linda Layton retired from 453/NEN Project, Resources Analyst
* Gifford Moak retired from 454/TDRS Project, Deputy Project Manager-Resources
* Cathy Fleshman retired from 472/JPSS Flight Project, Project Support Manager
* Liz Citrin retired from 470/Deputy Associate Director for the JPSS Program
* Angela Davis-Naylor resigned from 400/FPD, Administrative Officer Assistant
* Mary Ann Esfandiari retired from 450/Exploration & Space Communications Projects Division, Associate Director
* Ann Travis retired from 403/FPD Business Management Office, Directorate Workforce Administrator
* Paul Hwang retired from 422/Global Precipitation Measurement (GPM) Project, Operations Manager
* Mark Dombrowski retired from 417/GOES-R Resident Manager
* Marsha Gosselin (from 461) to 153.1/Program Analyst
* Ken Mobeck retired from 417/GOES-R Flight Project, Resident Manager
* Hongwoo Park retired from 472/JPSS Flight Project, Instrument Systems Manager

Reassignments/Realignments/Details within Code 400:

* Cathy Barclay to 450/Exploration & Space Communications Projects Division, Supervisory-Deputy Division Manager
* Bob Menrad (from 401) to 450/Exploration & Space Communications Projects Division, Supervisory-Deputy Division Manager
* Jeanine Murphy-Morris to 472/JPSS Flight, Observatory Manager
* David Long to 407/ESTO, Senior Resources Analyst
* Vanessa Hernandez-Martinez to 461/MMS Sr. Resources Analyst
* Chris Greco (from 460) to 461/MMS Project, Sr. Resources Analyst
* Donna Burfoot to 425/ICESat-2 Project, Sr. Resources Analyst
* Ken Lee (from 432) to 460/Explorers Program Office, Sr. Resources Analyst
* Shama Khan (from 454) to 460/TESS Project, Sr. Resources Analyst
* Eileen Groves (from 153) to 403/FPD Business Management Office, Financial Manager
* Mindy Deyarmin to 470/JPSS Program Office, Program Specialist
* Sherill Platt to 420/Earth Science Projects Division, Deputy Project Manager-Resources for Decadal
* Vanessa Soto Mejias to 433/OSIRIS-REx Project, Sr. Resources Analyst

(Reassignments continued on page 21)

(Reassignments continued from page 20)

- Melissa F. Rice (from 452) detail to 450/Exploration & Space Communications Projects Division, Sr. Resources Analyst
- Tim Van Sant to 401/Advanced Concepts & Formulation Office, Associate Director for Formulation
- Lorrie Eakin (from 427) to 454/TDRS Project, Deputy Project Manager-Resources
- Ken Schwer (from 400) to 490/Instrument Projects Division (IPD), Associate Director
- Rob Lilly (from 400) to 490/IPD, Deputy Division Manager
- Laura Milam-Hannin (from 400) to 490/IPD, Deputy Division Manager
- Rob White (from 400) to 490/IPD, Division Business Manager
- Jahi Wartts (from 400) to 490/IPD, Deputy Project Manager-Resources for ATLAS
- Arthur Jacques (from 492) to 401/ACFO, Deputy Program Manager
- Jaya Bajpayee to 401/ACFO, Instrument Capture Project Manager
- Del Jenstrom (from 401) detail to 420/Division, Sustainable Land Imaging Architecture Study Manager
- Matt Mazur detail to 490/IPD, Deputy Division Business Manager
- Nick Jedrich (from 432) to 460/TESS, Deputy Project Manager
- Valerie Lunz to 400/Special Assistant to the Flight Projects Directorate
- Justin King (from 476) detail to 490/Instrument Projects Division
- Jonathan White (from 421) detail to 403/FPD Business Management Office, Financial Manager

Reorganizations within Code 400:

- Inactivated the Joint Polar Satellite System (JPSS) Free Flyer Project, Code 476
- Re-established Code 424 and modified the title to the Polar Free Flyer (PFF) Project

  Employees reassigned as a result of the re-org:

  Kevin Carmack, PFF Project Manager
  Steve Pszcolka, PFF Deputy Project Manager
  John Van Blarcom, PFF Instrument Manager
  Deb Dodson, PFF Deputy Project Manager-Resources
  Barbara Haskell, PFF Financial Manager
  Justin King to 490/Instrument Projects Division, Resources Analyst

Please refer to the article in the previous issue regarding the reorganization of Code 490.

Lisa Hoffman, Code 400
Administrative Officer

Flight 370 and the Work of Professor Earl L. Wiener

Dr. Earl Wiener was a University of Miami professor of management science, aviation human factors expert and collaborator on many NASA research projects over the course of more than two decades. Dr. Wiener, who passed away last year is known as a pioneer in the field of aviation cockpit safety. He will be remembered especially for his aviation expertise as well as for his wit.

Some time ago he addressed a gathering of the Airline Pilots Association to discuss 21st century aircraft. A memorable comment he made that day follows: "The crew will consist of one pilot and a dog. The dog will be there to bite the pilot if he touches anything."

Dr. Wiener left a legacy known as Wiener's (15) laws which appear below:

Wiener's Laws

(Note: Numbers 1-16 intentionally left blank - no one knows why)

17. Every device creates its own opportunity for human error.
18. Exotic devices create exotic problems.
19. Digital devices tune out small errors while creating opportunities for large errors.
20. Complacency? Don't worry about it.
21. In aviation, there is no problem so great or so complex that it cannot be blamed on the pilot.
22. There is no simple solution out there waiting to be discovered, so don't waste your time searching for it.
23. Invention is the mother of necessity.
24. If at first you don't succeed … try a new system or a different approach.
25. Some problems have no solution. If you encounter one of these, you can always convene a committee to revise some checklist.
26. In God we trust. Everything else must be brought into your scan.
27. It takes an airplane to bring out the worst in a pilot.
28. Any pilot who can be replaced by a computer should be.
29. Whenever you solve a problem you usually create one. You can only hope that the one you created is less critical than the one you eliminated.
30. You can never be too rich or too thin (Duchess of Windsor) or too careful what you put into a digital flight guidance system (Wiener).
31. Today's nifty, voluntary system is tomorrow's F.A.R.

In a paper co-written more than 30 years ago entitled "Flight-deck automation: promises and problems", Dr. Wiener wrote "It is highly questionable whether total system safety is always enhanced by allocating functions to automatic devices rather than human operations, and there is some reason to believe that flight-deck automation may have already passed its optimum point."

The Editor (who learned about Dr. Wiener from Dr. Mitchell Hobish)

*** NOTICE—THE CRITICAL PATH ***

Like so many other communications and newsletters, The Critical Path (TCP) will move to an electronic distribution with the next issue. Each edition will be sent as an attachment in individual e-mails to all our current recipients. We encourage our readers to contact Paula Wood, TCP Production Assistant with their updated e mail addresses. Paula's e-mail address is: Paula.L.Wood@nasa.gov, or she can be reached by phone at: (301) 286-9125.

Subsequent changes to e-mail addresses should be sent to Paula as well to receive future copies of the TCP.

The Editor

If you are not a current GSFC employee and you wish to continue to receive The Critical Path, it's important that you send us your e-mail information. Please contact Paula Wood (301-286-9125) or at:

Paula.L.Wood@nasa.gov

or complete the form below, tear off the back cover, fold in half, attach a stamp, and return to Paula.

(Paula's address is printed on the back cover):

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FUTURE LAUNCHES CY 2014 / 2015	
Soil Moisture Active & Passive (SMAP)	November 2014
Deep Space Climate Observatory (DSCOVER)	January 2015
Magnetospheric Multiscale Mission (MMS)	March 2015
Geostationary Operational Environmental Satellite GOES)-R	October 2015
Astro-H	November 2015
Tracking and Data Relay Satellite (TDRS)-M	December 2015

We're on the WEB

http://fpd.gsfc.nasa.gov/news.html

or via the Code 400 Homepage

http://fpd.gsfc.nasa.gov

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If you have a story idea, news item, or letter for The Critical Path, please let us know about it. Send your note to Howard Ottenstein via email: Howard.K.Ottenstein@nasa.gov, Mail: Code 403, or Phone: 6-8583. Don't forget to include your name and telephone number. Deadline for the next issue is July 14, 2014.

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