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MAVEN—Definitive Answers about Mars Climate History

When the Mars Atmosphere and Volatile Evolution (MAVEN) mission launches in November 2013 it will make history. Even though there have been a number of Mars missions before, MAVEN is the first mission to focus its study on the Mars upper atmosphere. MAVEN will study the evolution of the Mars atmosphere and climate, by examining the conduit through which the atmosphere has to pass as it is lost to space (i.e., the upper atmosphere). It is the first mission devoted to understanding the role that loss to space played in the history of the atmosphere and climate. MAVEN will provide a comprehensive picture of the Mars upper atmosphere, ionosphere, solar energetic drivers, and atmospheric losses. It will deliver definitive answers to long-standing questions about the climate history and habitability of Mars.

MAVEN is a Principal Investigator-led mission and the first Mars mission managed by the Goddard Space Flight Center (GSFC).

The MAVEN Team

The MAVEN team consists of multiple partner institutions that include the University of Colorado (CU)/Laboratory for Atmospheric and Space Physics (LASP), GSFC, Jet Propulsion Laboratory (JPL), Lockheed Martin - Denver (LM) and the Space Sciences Laboratory (SSL)/ University of California Berkeley. These organizations have a long history

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Message from the Director Of



As I write this, Thanksgiving is just 2 days away. Where has the year gone? When one is involved in great work with a wonderful organization, time flies!

Congratulations to Rick Fitzgerald and the Radiation Belt Storm Probe (RBSP) team for a successful launch and flawless, on schedule check out on orbit. The two RBSP spacecraft were launched from the Cape in the early morning hours of August 30. RBSP was built by the Applied Physics Lab (APL).

Congratulations also to Karen Halterman and her team that provided instruments for and supported the launch of MetOp-B from Baikonur, Kazakhstan on September 17. All U.S. instruments have completed commissioning and are functioning well. MetOp-B ensures that the mid-morning orbit of the polar weather satellite constellation remains robust.

The Sample Analysis at Mars (SAM) instrument suite on Curiosity continues to perform well, also. Several Mars atmospheric and soil samples have been analyzed by SAM with amazing results that you will hear about soon.

At the time of the last Critical Path edition, the Tracking and Data Relay Satellite – K (TDRS-K) was to be launched in early December from the Cape on an Atlas-V. Because of a performance anomaly experienced in the RL-10 engine on the last Delta-IV, the Atlas launch manifest has been delayed to investigate the anomaly. The RL-10 engine is common to both the Atlas-V and Delta-IV. As of now, TDRS-K will launch no earlier than late January. TDRS-K is in storage and waiting to ship and is managed by Jeff Gramling.

Ken Schwer and his Landsat Data Continuity Mission (LDCM) team have efficiently overcome issues with hardware and ground support equipment to position themselves for the mid-February manifested launch date. The observatory thermal vacuum will be complete before Thanksgiving with shipment to VAFB scheduled for December 18. This has been a tremendous team effort.

With the Holidays fast approaching, I encourage you to take some time off to spend with family and friends. It's "the most wonderful time of the year" and should be enjoyed.

Happy Holidays to all,

George W. Morrow
Director of Flight Projects

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PERSONALITY TINTYPE

Bob Menrad



Bob has served as Associate Director of Flight Projects for Formulation since October 2008, where he represents our Directorate in Center efforts to capture new and exciting missions.

Born: Rockville Centre, NY

Residence: Pasadena, MD

Education: M.S. Computer Science, The Johns Hopkins University; B.S. Physics, minors in Math and Biology Rider University.

Life at Goddard: Bob started his career with CSC in 1985 assigned to the Space Telescope Science Institute working on HST's Science Operations Ground System. He then moved to Stanford Telecommunications (now ITT Corp.) where he was Lead Systems Engineer supporting the old 500/MO&DSD in developing ground systems during the COBE, GRO and UARS era.

In 1990 Bob joined GSFC serving as Data Systems Manager for Wind, SOHO, Polar and Cluster; Ground Systems Manager for Landsat-7; first Deputy and then Project Manager of ESDIS before becoming Chairman of the Center's Mission Operations and Data Systems Review Board.

Bob has served a 1-year detail at NASA/HQ/OCE and 3 years as GSFC's ESMD/Constellation Program representative until he

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Laura Paschal



Laura has worked in Data Management for the James Webb Space Telescope (JWST) Program (Code 443) since 2000. She works for ASRC Research & Technology Solutions (ARTS) on the PAAC III Contract.

Born: Edinburgh, Scotland

Education: B.S. Home Economics, Hood College, Maryland.

Life before Goddard: Laura grew up in Edinburgh, Scotland. She won a scholarship to attend college in the U.S. for her senior year and met her future husband, Michael, while there. They say everyone has their 15 minutes of fame – Laura managed to get that out of the way quite early in life, while attending college in Edinburgh. In 1977, Laura's design class created a gift for Queen Elizabeth II, to celebrate her Silver Jubilee, and Laura was selected to present it to her.



Laura with Queen Elizabeth II at her Silver Jubilee presentation, May 1977.

(Paschal Tintype continued on page 12)

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of success with previous Interplanetary and Earth science missions and bring all of the technical and scientific pieces together to provide a definitive Mars upper atmosphere mission. The MAVEN science team includes many of the world's foremost scientists who have been studying Mars or who have been studying the Earth for many decades, and are now applying that understanding and expertise to Mars in formulating many of today's key questions about Mars, which MAVEN will help answer.

MAVEN's Principal Investigator, Dr. Bruce Jakosky, is based at CU Boulder's LASP. Dr. Jakosky and several of the science team members have been fully engaged in MAVEN since the very beginning. As PI, Dr. Jakosky has ultimate authority and responsibility for the MAVEN mission. Lines of responsibility flow from Dr. Jakosky through Dave Mitchell, the MAVEN Project Manager residing at GSFC, to all development partners. GSFC manages the MAVEN mission and provides the mission systems engineering and Safety and Mission Assurance functions.

All project management components are the responsibility of the MAVEN Project Office. Dave has been involved with MAVEN since the Step 1 proposal in 2006, helping Bruce develop the mission technical, cost and schedule approaches. Bruce and Dave hand-picked many of the team members at the various institutions. Of significance, many on the team have been working on MAVEN ever since selection. The success of MAVEN to date is owed to the wonderful relationships and communication exercised by all the partners. One of the aspects that has made MAVEN so successful has been the stability of the team and its leadership.



MAVEN Team

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In the beginning...

It all started in 2003 when the PI, Dr. Bruce Jakosky, decided to propose a mission to study the Mars upper atmosphere, solar interactions, and the effects of loss of volatiles from the atmosphere to space. The first plan to propose the MAVEN mission was a joint discussion/decision between Dr. Jakosky and two other individuals from the SSL/ University of California Berkeley, Dr. Janet Luhmann and Dr. Bob Lin¹. This three-way discussion cemented the importance of the mission science and the collaboration of LASP and SSL as key members of the science and instrument teams. Dr. Jakosky reached out to GSFC as a partner to lead MAVEN's project management components. Together, Dr. Jakosky and Dave Mitchell hand-picked the rest of the MAVEN partners and Goddard team members that would go on to propose the MAVEN mission.

As anyone who has ever been involved in a mission proposal effort knows, it's a long shot getting selected. The competition can be fierce and many proposals never get to be selected. MAVEN was one of 20 missions proposed in response to the 2006 Mars Scout Announcement of Opportunity (AO). Only two missions were selected to proceed to Step 2 and MAVEN was one of them. MAVEN delivered the Phase A Concept Study Report in May 2008. At the end of the second round of competition, the MAVEN mission was selected by the National Aeronautics and Space Administration (NASA) in September 2008 for development as the second Mars Scout mission (the Phoenix Lander was the first Scout Mars mission). The confirmation review, or "Key Decision Point C," was held in 2010 and authorized continuation of the project into the development phase. The successful Critical Design Review (CDR) was conducted in July 2011 and allowed MAVEN to proceed with the assembly of the spacecraft and its instruments. In June 2012 MAVEN conducted a very successful System Integration Review (SIR) and in September 2012 completed Key Decision Point D, which placed MAVEN officially in Phase D. MAVEN will be shipped to the Kennedy Space Flight Center for processing in August 2013. The mission is on schedule for a November 2013 launch from the Cape Canaveral Air Force Base in Florida onboard an Atlas V launch vehicle.

The MAVEN team is doing an exemplary job on this important mission, and so far the team has successfully met every major milestone since the 2008 selection, receiving kudos from stakeholders across NASA and partner institutions. This has not come without many personal sacrifices on everybody's part. All has not been smooth sailing and there have been a few bumps along the road. It must be noted that MAVEN is a cost capped mission. The relatively small MAVEN team has been very committed, technically strong, and stable since the beginning and there has been little need to bring additional individuals on board. In addition, the MAVEN launch period is between November 18 and December 7, 2013. If MAVEN is not ready for launch, the next opportunity is 26 months later. The team is very aware of the consequences of a launch delay and everyone has been working diligently to ensure that MAVEN is launched on time.

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¹ Dr. Bob Lin, the MAVEN Deputy Principal Investigator, passed away on November 17, 2012. Bob was a giant in the space sciences community, and played a major role in MAVEN. Bob was the "conscience" for science on the mission as we made decisions and developed plans, and he oversaw the development of the Particles and Fields instrument suite. Bob will truly be missed.

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The MAVEN Science

The strong evidence for liquid water at the surface of Mars in its early history, but not today, suggests dramatic climate change occurred at some point in the distant past. Evidence increasingly points to atmospheric loss to space as being a major driver behind this change. Understanding the history of climate change on Mars, connecting it to the geological and geochemical evolution of the surface, and determining the nature of planetary habitability and the biological potential of Mars all require understanding the role that escape to space has played.

Determining the impact on climate due to the atmospheric loss to space requires the new, comprehensive, and quantitative measurements that MAVEN will make. MAVEN will measure the structure, composition, and variability of all regions from which escape occurs, and will sample all local solar times and most latitudes. Measurements of escaping species are made simultaneously with measurements of all the solar drivers of escape and the controlling magnetic field, enabling the separation of the roles of different loss mechanisms for both neutrals and ions. These enable us to identify *thoroughly* the role that atmospheric escape to space plays today and to extrapolate to earlier epochs, thus providing an exciting, new understanding of Mars' history.

MAVEN's detailed *in situ* measurements to describe local properties combine with global remote-sensing measurements to enable extrapolation to global conditions. MAVEN will provide definitive answers to the following key science questions:

- What is the current state of the upper atmosphere and ionosphere, and what processes control it?
- What are the rates of escape of atmospheric gases to space today and how do they relate to the underlying processes that control the upper atmosphere?
- What has been the total loss to space through time?

The MAVEN Payloads

The MAVEN science instruments are grouped into three packages—the Particles and Fields Package (PFP), the Remote Sensing Package (RSP) and the Neutral Gas and Ions Mass Spectrometer (NGIMS) instrument. This allows the instruments to be integrated into their packages first, followed by package integration onto the spacecraft.

MAVEN also carries the Electra Ultra High Frequency (UHF) communications package to assist other Mars assets in transmitting their data back to Earth and may support UHF relay operations during both the science mission phase and any extended mission period. MAVEN is the official relay backup to the Mars Reconnaissance Orbiter (MRO) and Mars Odyssey (ODY) orbiters and will not get called on to perform relay service if they are operational.

Particles and Fields Package (PFP)

The PFP is an integrated package of six instruments that will provide comprehensive *in situ* measurements of electrons (LPW, SWEA, SEP); ions, including composition and charge state (SWIA, STATIC, SEP); magnetic fields (MAG); and wave electric fields (LPW). It has a common data processing unit (PFDPU) interfacing to the spacecraft.

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- Supra-Thermal And Thermal Ion Composition (STATIC) instrument, provided by SSL, measures ion composition and energy from thermal to pick-up-ion energies
- Solar Energetic Particle (SEP) instrument, provided by SSL, measures solar energetic particle inputs to the atmosphere
- Solar Wind Ion Analyzer instrument (SWIA), provided by SSL, measures solar wind and magnetosheath ion density and velocity
- Solar Wind Electron Analyzer (SWEA), provided by SSL and sensor provided by the Centre d'Etude Spatiale des Rayonnements (CESR), measures solar wind and ionospheric electrons
- Langmuir Probe and Waves (LPW) instrument measures ionospheric electron and electric wave properties and solar EUV input to the atmosphere. LPW is provided by collaboration between LASP and SSL; LASP is providing the electronics, and SSL is providing the detector, the booms, and the component of the electronics that mount on the boom.
- Magnetometer (MAG), provided by GSFC, measures interplanetary, solar wind and ionospheric magnetic fields

Neutral Gas and Ion Mass Spectrometer (NGIMS)

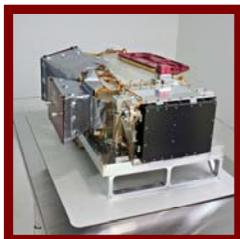
The NGIMS instrument, provided by GSFC, will measure the composition and isotopes of thermal ions and neutrals in the Martian upper atmosphere.

Remote Sensing Package (RSP)

The RSP consists of Imaging UltraViolet Spectrograph (IUVS), which is being provided by LASP, and measures global characteristics of the upper atmosphere and ionosphere. The Remote Sensing Data Processing Unit (RSDPU) provides a single power and data interface between the spacecraft and the IUVS.



Neutral Gas and Ion Mass Spectrometer - GSFC



Remote-Sensing Package Imaging Ultraviolet Spectrometer - LASP



Electra UHF Transceiver - JPL

Particles and Fields Package



Solar Energetic Particles - SSL



SupraThermal and Thermal Ion Composition - SSL



Solar Wind Electron Analyzer - SSL



Solar Wind Ion Analyzer - SSL



Langmuir Probe and Waves - LASP & SSL



Magnetometer - GSFC

MAVEN Payloads

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The MAVEN Spacecraft

The spacecraft is being designed, fabricated and tested by Lockheed Martin (LM) in Denver, Colorado. LM has an extraordinary amount of experience working on interplanetary missions and MAVEN has benefitted greatly from the lessons learned.

Some of the MAVEN success is due to the requirements driven design beginning with the operations concept and leveraging use of existing hardware/software in the right application. MAVEN did not force-fit a standard product or an Earth-orbiting spacecraft bus to a deep space MAVEN application. Lessons were applied from the beginning and allowed the team to select a spacecraft design that consists of the “best of the best” from previous Mars missions.



MAVEN Spacecraft being integrated at Lockheed Martin - Denver

Going to Mars is not an easy task

If everything continues to go to plan, MAVEN will launch aboard an ATLAS V in a 20-day launch period from November 18 – December 7, 2013. Every day during the launch period MAVEN will have a 2-hour window. If we are not ready, we will have to wait 26 months for another opportunity to arrive. The trip of MAVEN to Mars is approximately 10 months with MAVEN arriving into Mars orbit on September 22, 2014. MAVEN will be in essence on a ballistic cruise to Mars. During cruise, MAVEN will utilize the Deep Space Network antennas which will help navigators know where MAVEN is in relation to Mars as it approaches the Red Planet.

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The MAVEN orbit insertion (MOI) maneuver will be performed autonomously by the spacecraft. It is impossible to command the satellite real-time as we do with our Earth-Orbiting satellites due to the latency in the communications. It takes approximately 15 minutes for a command to reach Mars and a similar duration for the confirmation that the command was properly executed. As it nears the planet, the MAVEN spacecraft will capture directly into a highly elliptical 35-hour orbit. Following a 5-week transition phase, MAVEN will execute its science mission from a Sun-pointed attitude in a 4.5-hour orbit that precesses in attitude and local solar time with a periapsis altitude between 140 and 170 km. MAVEN will execute five “deep dip” campaigns, which will lower the periapsis altitude to approximately 125 km for a period of 5 days each.

Why has MAVEN been so successful so far?

MAVEN has not launched yet. We have about one year to go. However many on the team will say that MAVEN has been the best mission that they have ever worked on. MAVEN has had its share of technical issues, as is expected, but we have had many technical triumphs. The team works well together and tackles all the issues together as a cohesive group. As described before, the MAVEN mission involves diverse partnering institutions, which have learned to communicate effectively, to acknowledge and respect each other’s talents, and to focus on the ultimate prize – the success of the mission.

There are many additional reasons we could point to why MAVEN has been successful so far, but the following reasons rise to the top of the list.

Number 1 and already mentioned above, the MAVEN leadership has been stable since the beginning, but more importantly the team developed a proposal with all the partner institutions in place that allowed for early team building. When selected in 2008, the team already knew what to expect from each other and how things were going to operate since they’d been working together at that point for almost three years. In addition, there was a big push from the beginning to get front line managers in the Project Office who had a lot of good hardware development experience (e.g., Observatory Manager, Instrument System Manager, Chief Safety and Mission Assurance Office, Mission System Engineer). The same approach has been followed at all the partner institutions where it was clear that the Project had “A Team” personnel. There is no substitute for having good people on board, it can make or break a mission.

Number 2 has been getting sufficient cost reserves at the outset of the mission. The mission was proposed at reserve levels that were more than sufficient to address many of the unknowns that we have and will experience in the life cycle of the project. In addition, the MAVEN team took time to plan out the full development cycle schedule that was executable with margin.

Number 3 has been resisting requirements creep, both in the science and engineering areas. PI mode missions help in that regard. When the PI makes a final decision, we haven’t seen second guessing and/or lobbying by external groups to others to change a decision. The requirements have remained stable since proposal time.

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Number 4 is the tight planetary launch period which forces the tough decisions to be made promptly and to stick with the decisions. The sense of urgency is always present with planetary missions and people appear to operate more crisply and efficiently.

Number 5 is that MAVEN has scheduled lessons learned sessions at phase transitions during the whole development cycle. The purpose is to capture lessons from the past phase as well as to discuss how the team could/should operate differently in the phase going forward.

Last but not least, we will never claim MAVEN success until we are safely in orbit around Mars and taking good science for the science community. Yes! Things have gone well thus far but we have a lot ahead of us that can trip us up. So we must all remain diligent in seeing this mission through to a successful completion.

**Sandra Cauffman, Code 432
MAVEN Deputy Project Manager**



**Comings & Goings
July 1 thru September 30, 2012**

Comings:

- * Gregory Boegner [from 567] to 454 / TDRS Project, Deputy Telecommunications Systems Manager
- * Andrew S. Carson [from HQs/SMD] detailed [extended] to 401 / Advanced Concepts & Formulation, TESS Mission, Deputy Project Manager
- * Rick Howard to 443 / JWST Project, Consultant
- * Joe Stevens [from 702] to 474 / JPSS Ground Project, COTR Manager
- * Chikia Barnes [from 603] to 423 / ESDIS Project, Financial Manager

Goings:

- * Jane Dailey [from 474] to 603/Resources Analyst
- * Andrea Razzaghi [from 460] to NASA Headquarters, Science Mission Directorate

**Lisa Hoffman, Administrative Officer
Code 400**



NASA's LADEE Spacecraft Gets Final Science Instrument Installed

Engineers at NASA's Ames Research Center, Moffett Field, California, have installed the third and final science instrument that will fly onboard NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE). One of the three science instruments, the Neutral Mass Spectrometer (NMS) is from GSFC.

LADEE is a robotic mission that will orbit the moon to gather detailed information about the lunar atmosphere, conditions near the surface, and environmental influences on lunar dust.

"The installation of the final science instrument to LADEE's flight structure in the clean room at Ames is an important step toward completing the spacecraft build and testing," said Butler Hine, LADEE project manager at Ames. "Now that the three science instruments are fully integrated onto the spacecraft, it has become a full-fledged, high-precision space observatory."

In addition to LADEE's science instruments, a technology demonstration also will fly onboard. The Lunar Laser Communication Demonstration (LLCD) is led by GSFC and was built by MIT Lincoln Labs. The science instruments include the Ultraviolet and Visible Light Spectrometer (UVS), which will examine the composition of the lunar atmosphere by analyzing light signatures of materials it finds; the Neutral Mass Spectrometer (NMS), set to measure variations in the lunar atmosphere over multiple lunar orbits with the moon in different space environments, and the Lunar Dust Experiment (LDEX), which will collect and analyze samples of any lunar dust particles in the tenuous atmosphere. The technology demonstration payload is called the Lunar Laser Communications Demonstration and will enable the LADEE spacecraft to use lasers instead of radio waves to achieve broadband speeds to communicate with Earth.

"We now have our full science suite, and LADEE has the tools it needs to address mysteries and questions that have lingered since Apollo," said Rick Elphic, LADEE project scientist. "Was electrostatically lofted lunar dust responsible for the horizon glow that the astronauts observed? LDEX and UVS will settle that question once and for all. What makes the exotic, tenuous atmosphere of the moon breathe and change? NMS and UVS will tell us where the different species come from, how they move and how they are lost. A mission like LADEE has been needed since Apollo, which left us with tantalizing hints about the dust and an exotic, tenuous atmosphere."

LADEE now begins its environmental test phase and will undergo tests simulating the conditions it will face during launch and operations in space. These tests include acoustic (the loud roar of the rocket), vibration (the shaking of the rocket), shock (the jolt when stages separate), and thermal-vacuum (the hot and cold vacuum conditions of deep space).

LADEE's launch in August 2013 will mark several firsts. It will be the first payload to launch on a U.S. Air Force Minotaur V rocket integrated by Orbital Sciences Corporation, and the first deep space mission to launch from Goddard's Wallops Flight Facility in Virginia.

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NASA's Science Mission Directorate in Washington funds the LADEE mission, a cooperative effort led by NASA's Ames Research Center, Moffett Field, California. Ames is responsible for managing the mission, building the spacecraft and performing mission operations. Goddard is responsible for managing the science instruments and technology demonstration payload, and the science operations center. Wallops Flight Facility will be responsible for launch vehicle integration, launch services, and launch range operations. Marshall Space Flight Center, Huntsville, Alabama, manages LADEE within the Lunar Quest Program Office.

For more information about the LADEE Mission, visit: <http://www.nasa.gov/ladee>

Abstracted from NASA News

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Life at Goddard: Laura has been working at Goddard since 1980, a fact that hit home when the signs for the 50th anniversary went up a couple of years ago and she realized she had been here for longer than half the life of the Center. She began working as a Documentation Specialist on the Solar Maximum Mission (SMM) and was a little worried that she may have jinxed it when the spacecraft stopped working a month after she started. However that led to the first in-orbit repair mission and she enjoyed being a part of the team that helped publicize that ground-breaking event in 1984. She transitioned to the Satellite Servicing Project, working until 1985, when she left to stay home with her first child.

Laura kept in touch with her former colleagues, however, and returned in 1993 to help out with the photographic documentation effort for the first Hubble Repair mission. Originally slated to work for a couple of months, she ended up coming back permanently and worked three more Hubble missions (SM2 in 1997, HOST in 1998, and SM3A in late 1999). It was a great experience as it involved working with the astronaut crews during their training and working on-console performing live video captures during the missions. In 2000, she moved to the Data Management Office of the James Webb Space Telescope Program. She also provides editing services for various projects on an as-needed basis and enjoys assembling *The Critical Path* three times a year.

Family: Laura and husband Michael have been married for 32 years and live in Lanham, Maryland. They have two daughters – Catherine, an independent graphic designer who is married to Zac Dolch (Code 432) and Elizabeth, who teaches 2nd Grade in Montgomery County and was just married this past September.

Life Outside of Goddard: Laura is an avid reader and also loves to travel, especially to Scotland, of course. She enjoys gardening and is the on-call seamstress for many of her friends. Since the past year has been occupied with a lot of wedding planning, she is looking forward to taking time to smell the roses.

NASA's GPM Observatory Completes First Dry Run

NASA's Global Precipitation Measurement (GPM) Core Observatory satellite went through its first complete comprehensive performance test (CPT), beginning on October 4, 2012 at Goddard Space Flight Center (GSFC). The testing ran 24 hours, seven days a week and lasted ten days as the entire spacecraft was put through its paces.

The GPM mission is an international satellite mission that will set a new standard for precipitation measurements from space. The observatory will collect advanced measurements of rain and snow that will be combined into a global data set every three hours. The GPM observatory is scheduled to launch in early 2014. GPM is a joint mission between NASA and the Japanese Space Agency, JAXA.

"This is the first time we've gotten to see the observatory all put together, running the way it's supposed to be running in flight," said CPT Test Lead Peter Gonzales (Code 422). "The CPT is the test that verifies that the observatory can do everything we designed it to do," he said. He spent months talking with each team that engineered the spacecraft's subsystems and two instruments, the GPM Microwave Imager (GMI) and the Dual-frequency Precipitation Radar (DPR), to design the tests that would evaluate how the GPM spacecraft functions as a whole.

"When the observatory's flying on-orbit, all of the subsystems are operating together. We're not running a single subsystem in isolation," said Gonzales. "We want to see all the subsystems work together. We want to see if we're running a test on the RF [radio frequency communications] system, if it's being affected by the power system and vice versa."

In the Goddard clean room where the GPM Core Observatory was assembled, the spacecraft was oriented the way it would be if it were flying in space. It's about the size of a small fire truck but twice as heavy. During the test, the scanning antenna of the GMI, built by Ball Aerospace Corporation in Boulder, Colorado, rotated in place as it would in orbit to collect data, the High Gain Antenna for communications inched around to orient toward a simulated receiver, and the mechanisms for the solar arrays, which were not attached, turned as if tracking the Sun.

In the control room next door, more than 20 engineers occupied every workstation where telemetry data from the tests streamed by lightning fast on their screens. Each subsystem and instrument was



Engineers check on the GPM spacecraft after successful completion of its first comprehensive performance test. The silver disc and drum (center) is the GPM Microwave Imager, and the large block on the base is the Dual-frequency Precipitation Radar. The tall golden antenna is the High Gain Antenna for communications.

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represented by the engineers that built it to make sure everything was going as expected, including a team from NASA's partner the Japan Aerospace Exploration Agency (JAXA) that built the DPR and will launch the GPM Core Observatory on a Japanese H-IIA rocket from an island in southern Japan.

"There are some 30-odd units being tested," said Candace Carlisle (Code 422), Deputy Project Manager for GPM at Goddard. Every subsystem on the observatory, from propulsion to the two instruments, went through the process of being turned on and/or deployed after launch and then run through every function, she said.

Each test was run more than once since almost all of GPM's systems and instruments are redundant in case of failure in orbit. The electronics have an A-side and a B-side with two identical computers, though only one is active at a time. If the A-side fails, or in some cases if even a single A-side subsystem fails, the B-side can take over.

The comprehensive test went well, said Gonzales. They found the expected small hiccups that are normal when an observatory is first brought online as a unit, but no hardware problems or anything that would prevent them from moving forward, he said.

As the test progressed, the engineering teams were learning the nuances of how the spacecraft runs, said Gonzales, which is essential to know before going into the thorough environmental testing scheduled to begin in November 2012. In environmental testing, the GPM Core Observatory will be pushed to its limits as it goes through the rigors of the extreme temperature changes and electro-magnetic interference it might experience in space, and the vibration and noise levels it will encounter during launch. The results of the comprehensive testing will serve as a baseline to compare to the results of the environmental tests.

To learn more about the GPM mission, visit:

<http://www.nasa.gov/gpm>

<http://gpm.nasa.gov>

Ellen Gray, Code 612
Outreach Science Coordinator/Writer

Three Former GSFC Leaders Pass On

During the year 2012, three GSFC space pioneers passed away: John Boeckel; George Pieper, and Frank McDonald. All played lead/key roles in the development of the nation's space program and leading Goddard from its inception to near the end of the 20th century.

John Boeckel, as all who knew him agree, was a gentleman, engineer, leader and manager, widely liked and admired by Goddard employees. As Director of first Systems Reliability and then of Engineering (1976-1988), he put his stamp of excellence on dozens of Goddard space projects. As stated by many: "a true Goddard Pioneer." He will be remembered for his positive attitude on life and his work.

George Pieper was Director of Sciences from 1965-1986. Throughout that time period and beyond he was elected to several scientific organizations (e.g., AAAS, AGU). Yet he still found time to be Class Secretary for 26 years (Williams College), and after retirement serve as Naval Academy Visiting Professor, and for many years as President of Goddard Retirement Alumni Association (GRAA).

Frank McDonald was selected as Head of the Energetic Particles Branch in the Space Sciences Division in 1959. He served as PI on a myriad of satellite programs, culminating his lengthy career at Goddard as Chief Scientist, before retiring in 1989 to go on to continue his work at the University of Maryland. To quote Center Director Chris Scolese: "His vision and leadership were integral to the scientific success of the Center."

Note from the Editor:

When Frank McDonald left the Center in 1989, as a former employee of his for several years, I attended his farewell dinner at the Rec Center. I had with me the poem shown on the next page. For whatever reason, perhaps mostly because there was a long series of plaudits, I never got around to reading it. I later showed it to Frank and he berated me for not reading it to all those in attendance. In going through mounds of documents recently, I came across it, and have decided to publish it now. Those who may remember him might enjoy it.

An Ode to McDonald

There was a day in June of 1964,
Hardly anyone is still around anymore,
When I first knocked on Frank McDonald's door,
And started a job that was never a bore.

I've seen his star rise since that day in June,
And soar like Voyager toward a majestic Neptune,
And now just as Voyager passes Neptune's last moon,
So Frank McDonald, another career begins to fine tune.

He transferred me in as a resource type,
Supporting Heppner, Trainor, Fichtel and the like,
Les Meredith's Code 610 also boasted Kupperian, Brandt, and Norman Ness,
Sparks might have flown but there never was stress.

For 25 years I've criss-crossed his trail,
His scientific career a well known success tale,
But more than that he's one fine fellow,
A gentleman who has always remained mellow.

He never fails to greet you warmly,
And if you had a good point to support you strongly,
A person known by scientists worldwide,
But also a person you can count on to stand by your side.

I for one will miss him dearly,
And so will the Center, just as clearly,
But for everyone a time comes to leave,
Either to retire or for new goals to achieve.

We all wish you well at your new post,
Certainly U of M will benefit the most,
Both the faculty and students can now partake,
From Frank McDonald's wit, good humor, and scientific plate.

Good Luck
Howard Ottenstein
September 7, 1989

New Business News

- An Update on FPD “New Business” Activities -

Looking at the recent past...

Discovery AO – In my last report I shared with all of you that congratulations were in order for the Comet Hopper (CHopper) Step-2 Capture Team’s completion of the competitive process and that a selection was imminent. Well, the decision was announced...and unfortunately I can share with you that CHopper was not selected. Members of the CHopper Capture Team joined the PI in attending a meeting at NASA/HQ to be briefed on the evaluation results for the proposal and it was not a surprise to hear that many positive things were said; yet, it was not meant to be. Given the fact that this was the first time CHopper was proposed, the team is to be commended on the quality of their work and how far they went through the process!

Office of the Chief Technologist (OCT)/Technology Demonstration Mission (TDM)

Proposals – “Green Propulsion” is the latest thing in propulsion systems. Unlike standard hydrazine systems “green” refers to new propellants that are minimally hazardous, have equal or better performance, are easier to ship and can be cost-effective. Goddard Space Flight Center (GSFC) is a leader in the new era of our country’s utilization of these new propellants. An example of this leadership is our central role on the High Performance Green Propulsion (HPGP) Project that includes a diverse project team spanning GSFC, Marshall Space Flight Center (MSFC), private industry and the Swedish Space Agency. Here too the Center’s proposal was edged out...but it must have been a difficult decision. Thanks and appreciation to the HPGP Team for all their efforts on behalf of GSFC!

Jupiter Icy Moon Explorer (JUICE) – The JUICE mission is a planned European Space Agency (ESA) spacecraft to visit Jupiter and will focus on three moons: Ganymede, Callisto, and Europa. There are two opportunities for the GSFC science community to participate on this mission: as a selected NASA instrument or as a member of an ESA selected instrument team. Normally the Flight Projects Directorate (FPD) would not be involved in instrument proposals but for JUICE this is different as the Advanced Concepts and Formulation Office (ACFO) has been asked to join forces on several efforts to propose in response to this AO. As of this report the work has been completed, the proposals (or inputs to ESA proposals) have been submitted and now we wait for the results. Keep your fingers crossed.

(New Business continued on page 18)

(New Business continued from page 17)

Looking at the present...

Explorers AO – The finish line is getting closer for the Center’s two Explorers/Step-2 capture teams where the FPD new business community is actively participating in efforts to propose both the Atmosphere-Space Transition Region Explorer (ASTRE) and Transiting Exo-planet Survey Satellite (TESS) missions. Last September, the first of two major milestones was completed when each team submitted their mission’s Concept Study Report. After a brief respite and completion of “Pause & Learns” both teams are now actively engaged in preparations for the second and final major event in this competition...the Site Visit. These site visits are expected to occur on or about January 2013 with selection to occur in March. Good luck to the ASTRE and TESS Teams as they come down the home-stretch, as well as to the Center’s Explorers/Mission of Opportunity proposal NICER!



A small portion of the ASTRE Team rejoices outside the drop-off location after submission of the mission's Concept Study Report.



Keith Walyus, TESS Project Manager, and Dr. Keith Gendreau, NICER Principle Investigator, show receipts proving submission of their respective mission Concept Study Reports on behalf of GSFC.

Looking to the future...

The Opportunity Forecast – The senior members of the Center’s new business community, along with the members of each Line of Business, are actively reviewing the next series of competitive opportunities to be released. It is expected that several science concept teams (i.e., nascent capture teams) will be started soon and FPD will be right there in the middle of these activities. More information will be coming in future editions of *The Critical Path*.

(New Business continued on page 19)

(New Business continued from page 18)

Defining Excellence – Members of the ACFO are hard at work assembling information that references current best practices and the minimum standards expected by the FPD when it comes to executing studies or capture activities. It is important to note that these references are not rote recipes for executing this kind of work; but, more importantly, resources that answer questions, establish basic principles and clarify expectations so any practitioner has the best understanding possible of what it means to create a “good” study or capture product. This work is being done in coordination with the New Opportunities Office and will be shared for anyone involved in these types of activities.

For studies this reference has been entitled, “The Studies Compendium,” and the effort to harness the knowledge from across the FPD of what makes a good study is being led by Kate Hartman (401), ACFO Study Group Lead. On the capture side, the reference intended to support the Directorate’s focused efforts to increase the executability of the missions the Center proposes is known as, “The Guide to Capture,” and is being led by Tim Van Sant (401) and Steve Benner (401), ACFO Deputy Chief and ACFO Capture Group Lead, respectively. Each time a new Study Manager, Capture Manager or Project Manager comes into the ACFO to work on a new business activity they attend the ACFO’s Orientation and Workshop...and copies of the appropriate reference are provided. Thanks to the many people from across the FPD who have contributed their knowledge and experience to the development of these important guides to this point.

Bob Menrad / Code 401
Associate Director for Formulation

(Menrad Tiintype continued from page 3)

started in his current position. He also serves as the Standing Review Board Chair for JPL’s Jason-3 mission.

Life Outside of Goddard: Bob lives in Pasadena, MD, with his wife, Amy. Now that their five children are out of the house Bob spends his free time: making sure the kids do not find the spare key and move back in; spending as much time as possible with their three grandchildren; taking impromptu trips with his beloved Amy just because “they can;” cheering for the Redskins so he never loses the skill of rooting for a team in rebuilding mode, and enjoying the many hobbies that he never had time for, such as his Lionel O-27 model train Christmas display.

Knowledge Management Corner

Improving the Lessons Learned Process: The GEMS Experience

In June of 2009, Goddard learned that the Gravity and Extreme Magnetism Small Explorers (GEMS) mission had been selected as one of two Small Explorer Program missions. The GEMS project team moved on to the development phase, with a plan to launch in July 2014. In May 2012, the project failed to pass its Confirmation Review and was eventually cancelled in early June.

A project cancellation is a very painful experience for everyone involved. Some would even characterize it as a traumatic experience (ref. 1). Given the emotional toll of a project cancellation on the project team and other project stakeholders, ensuring that the experience is adequately captured, in terms of lessons and ensuring that mistakes are not repeated, is both essential and challenging.

The following questions frame the challenge:

- Who is responsible for capturing lessons? Who is doing the learning?
- How does learning really happen? When is a lesson truly “learned”?

Headquarters (HQ) gave the project/program office an action to provide a “lessons learned” report. A traditional approach would have had the project manager sitting down, perhaps with other members of the project management team, to come up with a report essentially listing what went wrong and why, and possibly coming up with a list of things that could have been done differently. Upon multiple reviews of the document by management, nuances would have been added to ensure a balanced view, and the final “lessons learned” document might have been submitted to the Lessons Learned Information System.

While this would not be a bad outcome, it is not sufficient. Certainly, it is not good enough if we want to make sure the root causes of the project’s cancellation are addressed.

Fast forward to early November 2012 to a meeting at Headquarters gathering Goddard’s Center Director, GEMS’ Project Manager, the Goddard Explorers Program Manager, as well as HQ program office executives. Imagine that instead of everyone sitting around the table to witness the delivery of a “lessons learned” document, and perhaps even arguing over some wording and recommendations, everyone is sitting around the table to review a set of lessons that have been distilled through a comprehensive process stretched over several months. Imagine that instead of finger-pointing and assigning blame, ALL the stakeholders are willingly taking ownership of the pieces of the lessons they are accountable for. Can this really happen? Yes, and it did happen.

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When a mission fails during or after launch, a major investigation is initiated. Cancelled missions tend to not receive the same level of scrutiny and therefore opportunities to learn are missed (ref. 2). The rest of this article will describe the process that was implemented to go from a request for a lessons learned report in June 2012, to a fruitful discussion of distilled lessons in early November and further corrective actions into the future.

Pause and Learn sessions

The Pause and Learn (PaL) is a foundational knowledge management practice at Goddard. Developed by the Office of the Chief Knowledge Officer as an adaptation from the Army's After-Action-Review (see *The Critical Path*, December 2011, ref. 3), it is flexible enough to be adapted to different circumstances. Since the PaL is meant to be a group reflection activity, the question of who should attend is key. GEMS posed a number of challenges:

- The team of a cancelled project does not necessarily welcome discussion of what happened and why and may fear how such a session could turn into a bad case of finger pointing; How would the session need to be presented to the team to encourage participation? How would the session need to be managed?
- Given that the PaL session would cover the entire history of the project (post proposal stage), who should be invited? Should everyone who had ever worked on the project attend or should it be the team as it stood at the time of cancellation?
- Perhaps even more importantly, who, beyond the project team, needed to learn and have a PaL of their own?

The implementation was as follows:

- Three PaL sessions were organized, starting with the project, moving on to Center Management, and finally to Headquarters. It was important to recognize that a cancellation is not just a project failure; it is the result of a set of failures at different levels (project, program, center, HQ). It was important for three key groups of stakeholders to initially discuss and articulate their respective perspectives independently of what the other groups might have to say. A common PaL bringing together everyone would not have yielded the type of open conversation required for learning, at least not at that early stage in the process.

"The initial PaL conversation with the project team allowed many significant observations and insights to be expressed by the team members. Over time, and with additional facilitated conversations, we were able to distill our lessons."

*Greg Frazier, GEMS Project Manager
(at the time)*

(KM continued on page 22)

(KM continued from page 21)

- The Project PaL was restricted to the project team as it stood at the time of cancellation; however, some of the key personnel were not in attendance, so individual interviews were scheduled to ensure a very inclusive process and to cover all perspectives. This individual interview process included previous team members and managers as well as the spacecraft contractor, Orbital.

Knowledge Maps

Each PaL session conversation was turned into a set of knowledge maps. The maps highlight, in a graphical fashion, key insights expressed by participants and connections across issues. Maps were reviewed with their respective stakeholders, to ensure accuracy, generating additional discussions in the process. In addition, key stakeholders became eager to see what the other groups' maps said. The project team wanted to know what Center management had to say. Headquarters wanted to hear more about the project's perspective. The maps became critical intermediate products.

Integration and Sharing

Over a period of several weeks and additional meetings, perspectives were shared, using the maps as a conduit of information and understanding between the key stakeholders. As a result, the early November meeting did not bring surprise to anyone. By then, all parties had reached a reasonably good understanding of what the key lessons were, and more importantly, they had reached an understanding of how each group had contributed in various ways, to the cancellation — an undesirable outcome for everyone involved.

Moving Forward & Challenges Ahead

The early November meeting at headquarters was not the end of the process. While a key milestone was met, stakeholders have now taken ownership of specific lessons and their respective follow-up actions.

From a knowledge management perspective, the key objective of ensuring that all involved have truly learned something of value from the experience has been achieved. Lessons haven't just been identified and filed in a report. Lessons have been learned. Still, one challenge remains. How do we ensure that the lessons are shared beyond the key stakeholders who were involved in this process? Several avenues should be explored:

1) integrate GEMS lessons in the FPD Knowledge Exchange, so that they are aggregated with other lessons from a wide range of projects; 2) develop one or more case studies to share GEMS' story through workshops and other venues (see the Vegetation Canopy Lidar case study highlighted below for an example of a story based on a cancelled project (ref. 4).

This approach to learning, which goes well beyond traditional gathering of lessons learned, is not something that can happen overnight. It takes time. It requires significant guidance and facilitation (in this case a substantial involvement on the part of Goddard's Chief Knowledge

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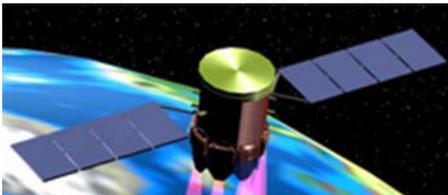
Officer, Dr. Ed. Rogers), but it is much more likely to result in valuable changes. It encourages true ownership of change and corrective actions.

Generally speaking, however, the PaL process is simple and easily implementable within the project's lifecycle, and projects do not need to wait for something as dramatic as a cancellation to reap the benefits of a group reflection activity to articulate and consolidate project learning.

References:

1. Robert K. Hurley and Joseph T. Jimmerson, "Managing the Trauma of a Terminated Project," ASK Magazine, 2009.
http://askmagazine.nasa.gov/issues/35/35s_managing_trauma_terminated_project.html
2. Steve Newman & Dave Lengyel, "Program Cancellation Failure Modes and Lessons Learned" – PM Challenge 2012, <http://www.slideshare.net/NASAPMC/d-l-engyel>
3. "Improved Learning in Projects," *The Critical Path*, December 2011.
4. Vegetation Canopy Lidar (VCL) Case Study,
<http://www.nasa.gov/offices/oce/appel/knowledge/publications/VCL.html>

Case Study Highlight: Vegetation Canopy Lidar (VCL) Case Study



The Vegetation Canopy Lidar (VCL) was selected in March 1997 as the First Earth System Science Pathfinder (ESSP) spaceflight mission. It was scheduled for launch in January 2000. Technology challenges (specifically with the Multi-Beam Laser Altimeter or MBLA) and project management challenges under the "PI-Mode" of mission management led to the mission being postponed indefinitely. To learn more about VCL's background and ultimate cancellation, read the case study overview (one page), the full case study (12 pages) and/or knowledge maps (links below).

- Vegetation Canopy Lidar (VCL) overview of case study
<http://www.nasa.gov/offices/oce/appel/knowledge/publications/VCL.html>
- Vegetation Canopy Lidar (VCL) Case Story & Lessons Learned
http://www.nasa.gov/pdf/384157main_VCL_case_study.pdf

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- Vegetation Canopy Lidar Knowledge Maps, the Flight Projects Directorate Knowledge (GSFC access only)
<https://fpdspi.gsfc.nasa.gov/sites/400KE/SitePages/FPD%20Insights.aspx>

Coming up soon: Guided Conversations around Knowledge Maps

The Flight Projects Directorate's Knowledge Exchange (now open to all within Goddard) includes a rich web of more than 100 knowledge maps. Just as a collection of case studies or lessons learned has little value if it is not utilized, such a collection of maps has little value until it comes to life around a conversation. The plan, therefore, is to make use of them in the context of small group discussions.

For those of you familiar with the case study workshop format implemented by Ed Rogers in the Office of the Chief Knowledge Officer, this will be an attempt at using a similar face-to-face conversation format using a different 'primer.' In the case study workshop, the case study document is the primer. In a knowledge map conversation, the primer will be a specific topic map. Topics covered will include major areas of project management, the same areas covered in the FPD Knowledge Exchange (see previous article about the Knowledge Exchange in the Summer 2012 issue of *The Critical Path*).

Keep an eye on announcements for Knowledge Maps Workshops!

Beyond these workshops, which will be open to all within Goddard, maps can be used to trigger useful brainstorming sessions within projects. Do you have a major review coming up? Would you like to know what other projects have learned about reviews? How about scheduling a two-hour brainstorming session, using the "reviews" knowledge map as a starting point for conversation and leveraging everything your team members already know from their own experiences? Need help setting it up such a session and navigating the maps? Call Barbara Fillip (301) 286-4666, your Code 400 Knowledge Management point of contact.

If you are a Goddard employee, you already have access to the FPD Knowledge Exchange using your NDC login when prompted for a username and password.

<https://fpdspi.gsfc.nasa.gov/sites/400KE>

**Barbara Fillip, Code 400
Knowledge Management Project Manager**

2012 Agency Honor Awards Selections Code 400 Awardees*

The Agency Honor Awards Ceremony was held on August 28, 2012. Noted below are awards to Code 400.

DISTINGUISHED SERVICE MEDAL

Philip Sabelhaus/427

For more than 30 years of distinguished service and steadfast leadership to advance NASA's ultimate mission to improve life on Earth through spectacular science and technology.

DISTINGUISHED PUBLIC SERVICE MEDAL

Peter Phillips/Aerospace Corporation/427

For outstanding leadership of the joint mission system integration and mission operation readiness team for the Suomi National Polar-orbiting Partnership (NPP) mission.

OUTSTANDING LEADERSHIP MEDAL

Paul Brandinger/420

For decisive programmatic contributions, knowledge sharing expertise and valuable insight used to guide the Earth Systematic Missions Program Office.

Richard Burley/441

For outstanding leadership in making an automated Hubble Space Telescope (HST) operations concept a reality.

Sergey Krimchansky/422

For outstanding expertise and dedication leading National Polar-orbiting Partnership's (NPP) development of Advanced Technology Microwave Sounder (ATMS) total power radiometer for weather soundings.

David Littman/454

For outstanding leadership and dedication in the development of the Tracking and Data Relay Satellite System (TDRSS).

Kenneth Schwer/429

For exceptional diligence in pursuit of programmatic excellence.

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OUTSTANDING PUBLIC LEADERSHIP MEDAL

William Sullivan/Raytheon IIS/474

For sustained and superior leadership during a highly intense period of contract transition while maintaining the Common Ground System (CGS) focus on the path to the on-schedule launch of National Polar-orbiting Partnership (NPP).

David Wampler/ITT Information Systems/450

For outstanding achievements in radio frequency coverage to over 100 missions.

EXCEPTIONAL ACHIEVEMENT MEDAL

Garry Gaukler/474

For innovative adjustment for earned value reporting in a constrained funding environment and for creative recommendations for cost formatting of change proposals.

Robert Lilly/427

For outstanding leadership, expertise and exemplary performance throughout the National Polar-orbiting Partnership (NPP) Satellite environmental test program and launch flow campaign.

Margaret Pavlik/470

For unwavering commitment to the Joint Polar Satellite System (JPSS) Program and efforts to continually improve JPSS business and reimbursable processes.

Lisa Shears/429

For exceptional leadership and dedication to the successful and on-time completion of the National Polar-orbiting Partnership (NPP).

Janice Smith/474

For exceptional achievement in establishing the Joint Polar Satellite System (JPSS) Ground System Contract within six months to support an on-time launch of Suomi National Polar-orbiting Partnership (NPP).

EXCEPTIONAL SERVICE MEDAL

Robert Buchanan/454

For outstanding contributions and dedication in the development of the Tracking and Data Relay Satellite (TDRS) K/L Program.

Carolyn Ellenes/420

For exceptional, sustained performance contributing to the success of the Landsat Data Continuity Mission (LDCM) Project.

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(Agency Awards continued from page 26)

Susan Sparacino/432

For service and extraordinary dedication to the Mars Atmosphere and Volatile Evolution Mission (MAVEN) Project, the Planetary Science Projects Division and for many years of exemplary service to the NASA Mission.

Lyle Tiffany/429

For 39 years of sustained and superior ability to develop GSFC financial systems and successfully execute all financial aspects of the Tracking Data Relay Satellite (TDRS) and National Polar-orbiting Partnership (NPP) missions.

EXCEPTIONAL PUBLIC ACHIEVEMENT MEDAL

Sonja Harding/ITT Corporation/450.S

For exceptional achievement expertise and dedication on 60 successful launches over the last 5 years.

Colleen Higgins/Raytheon IIS/474

For leadership, organizational skills and engineering expertise in the successful development and installation of the Joint Polar Satellite System (JPSS) McMurdo receptors.

EXCEPTIONAL PUBLIC SERVICE MEDAL

Clay Deyarmin/Qwaltec, Inc./429

For significant contributions to the success of NASA and the National Polar-orbiting Partnership mission.

Larissa Graziani/Sgt. Inc./429

For outstanding engineering accomplishments in support of the National Polar-orbiting Partnership Visible-Infrared Imaging Radiometer Suite (VIIRS) Anomaly Review Investigation.

Dan Linebarger/Raytheon IIS/474

For 20 years of outstanding operational leadership.

David Venzor/ASRC Aerospace Corporation/450.S

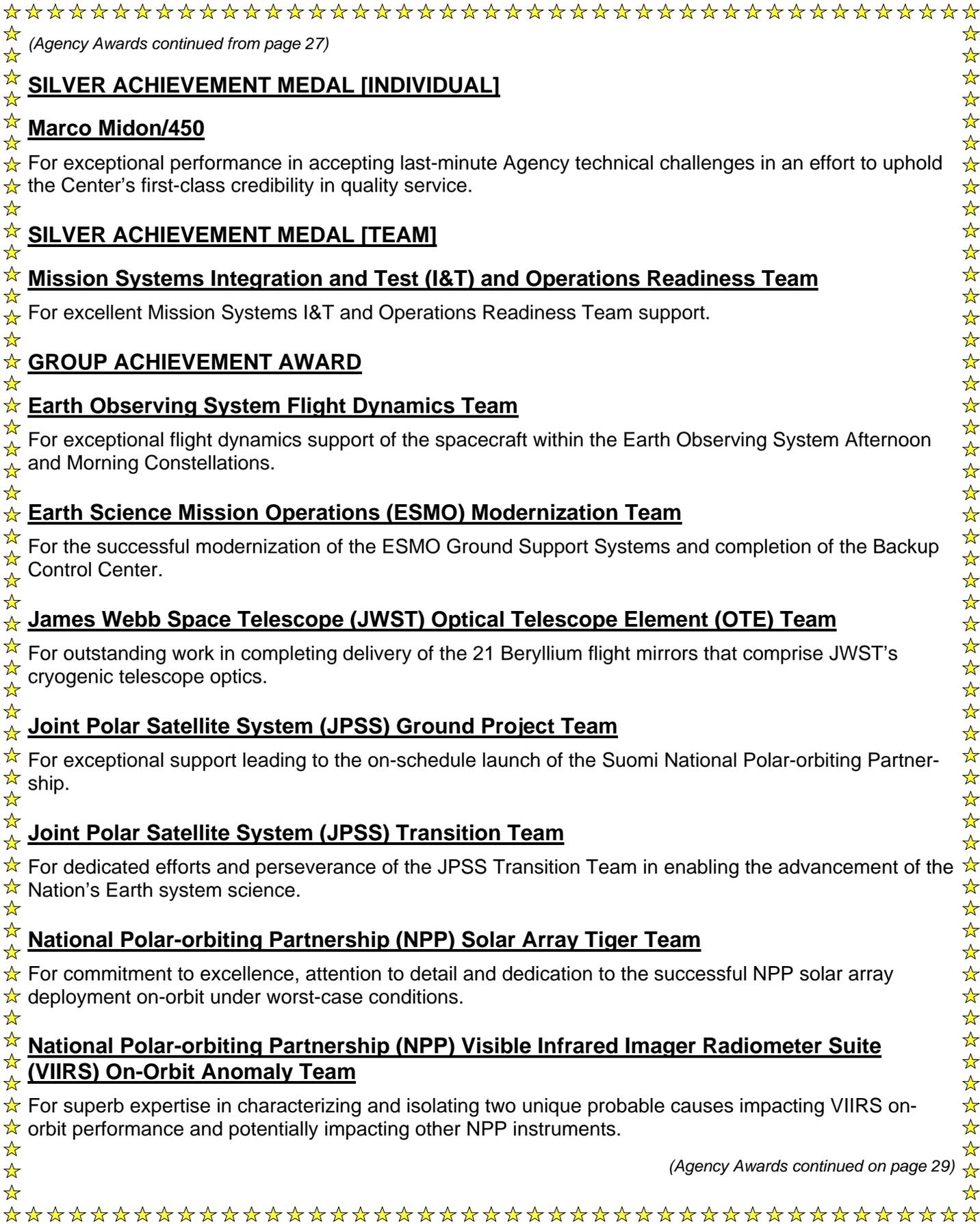
For outstanding contributions to the near Earth Network Project and enhancing NASA's capability to conduct science missions.

Carrie White/Honeywell/452

For outstanding leadership and dedication in the development of the Tracking and Data Relay Satellite System.

(Agency Awards continued on page 28)





(Agency Awards continued from page 27)

SILVER ACHIEVEMENT MEDAL [INDIVIDUAL]

Marco Midon/450

For exceptional performance in accepting last-minute Agency technical challenges in an effort to uphold the Center's first-class credibility in quality service.

SILVER ACHIEVEMENT MEDAL [TEAM]

Mission Systems Integration and Test (I&T) and Operations Readiness Team

For excellent Mission Systems I&T and Operations Readiness Team support.

GROUP ACHIEVEMENT AWARD

Earth Observing System Flight Dynamics Team

For exceptional flight dynamics support of the spacecraft within the Earth Observing System Afternoon and Morning Constellations.

Earth Science Mission Operations (ESMO) Modernization Team

For the successful modernization of the ESMO Ground Support Systems and completion of the Backup Control Center.

James Webb Space Telescope (JWST) Optical Telescope Element (OTE) Team

For outstanding work in completing delivery of the 21 Beryllium flight mirrors that comprise JWST's cryogenic telescope optics.

Joint Polar Satellite System (JPSS) Ground Project Team

For exceptional support leading to the on-schedule launch of the Suomi National Polar-orbiting Partnership.

Joint Polar Satellite System (JPSS) Transition Team

For dedicated efforts and perseverance of the JPSS Transition Team in enabling the advancement of the Nation's Earth system science.

National Polar-orbiting Partnership (NPP) Solar Array Tiger Team

For commitment to excellence, attention to detail and dedication to the successful NPP solar array deployment on-orbit under worst-case conditions.

National Polar-orbiting Partnership (NPP) Visible Infrared Imager Radiometer Suite (VIIRS) On-Orbit Anomaly Team

For superb expertise in characterizing and isolating two unique probable causes impacting VIIRS on-orbit performance and potentially impacting other NPP instruments.

(Agency Awards continued on page 29)

News From the PAAC III Contractor Team

KUDOS to Kevin Schwartz (Code 417) who received the Outstanding Process Improvement / Innovation Award for 1Q FY12 for his work integrating the desk-top VTC system for the GOES-R Program Office into NESDIS Headquarters. His persistent work made it possible for the system to work at both NASA and NOAA.



Calvin, on right, with Red Cross team

Calvin Williams (Code 417) has been a Red Cross volunteer since 2003. Calvin was recently called to actively support the Hurricane Isaac stricken areas of New Orleans, LA from September 4 through 18. His Red Cross team set up numerous temporary shelters for the families left homeless from the hurricane. Calvin's team also provided over 7,000 meals to those in need during that time. Calvin used his annual leave hours in order to assist those in need. As the saying goes ... "The people that make a difference in your life are the ones that care". Calvin is one of the many volunteers who demonstrate how much they care when disasters occur.



From *Pieces of PAAC*,
November 2012

Social News

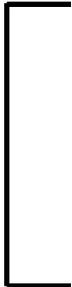
- Congratulations to Tricia Gregory (452) and Dick Aldridge who were married on August 3, 2012.
- Best wishes to Steve Dobrosielski's (417) daughter, Martina, who was married on November 10, 2012.
- Congratulations to Shannon (Hall) King (460) who wed Anthony King on July 14, 2012 in Ocean City, MD
- Congratulations to Laura Paschal's (443) daughter, Elizabeth, who was married on September 29, 2012.
- In September, Mary Reph/408 and her husband, Tom Gutnick, welcomed Sophie Chang to their family as an exchange student from Taiwan. She will be attending Yorktown High School, in Arlington, for the entire school year.
- Kristina Safdie (432), requirements specialist, had a son on October 1. Gavin Elijah Pevear joins his sister Miranda, another MAVENite born in July 2011. Kristina reports that Gavin is doing very well, although he's always hungry and doesn't want to sleep at night. This is a problem, since Kristina has been continuing to support MAVEN even while adjusting to the demands of her growing family. Kristina is grateful to have a helpful family supporting her early return to work.
- Chris Derkacz (432), scheduler, welcomed grandson Lucas Joshua Ford on September 1. Lucas' brother Caleb, another MAVENite, was born in February 2011.
- Susan Sparacino (432), DPM/R, became a first-time grandmother on November 11, 2012. Susan's daughter Rita Sparacino Ray, an alumna of the Goddard Child Development Center, delivered Hannah Marie Ray.
- Oswin Findlay (ASRC/460) and wife Gemma are proud to welcome Abigail, their second grandchild. She was born in the City of Nagoya, Japan on November 13, 2012. The proud grandparents received a picture from the hospital a few minutes after her birth, at 4:03 a.m. Abigail, her parents, and big sister, Akera are all doing fine.
- Janet Wood (460) welcomed the arrival of her second granddaughter, Kelsey Lynn Wood on St. Patrick's Day this year. She arrived early and was 8 lbs, 7oz, 22.5 inches long. Stacy Wood (Code 615) also became an Aunt for the first time.



The staff of The Critical Path wishes everyone a very happy and safe holiday season.

FUTURE LAUNCHES CY 2013	
Tracking and Data Relay Satellite-K (TDRS-K)	JANUARY
Landsat Data Continuity Mission (LDCM)	FEBRUARY
Interface Region Imaging Spectrograph (IRIS)	FEBRUARY
Lunar Atmosphere and Dust Environment Explorer (LADEE)	AUGUST
Mars Atmospheric and Volatile Evolution (MAVEN)	NOVEMBER

ATTENTION INTERNET BROWSERS:



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 — In April, August, and December —

Howard K. Ottenstein,
Editor

Laura Paschal,
Production Assistant

Paula L. Wood,
Editorial Assistant

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 April 1, 2013.