A Flight Projects Directorate Quarterly Publication
A Newsletter Published for Code 400 Employees

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Goddard Joins the Exploration "Nationwide" Team

As NASA begins its transition from the era of the Space Shuttle to the Nation's next generation of crew and cargo vehicles, Agency field centers are collaborating in unprecedented ways to meet the challenges of returning humans to the Moon by 2020 as well as future manned missions to Mars. Changes of this magnitude have not been seen for more than 30 years, and Administrator Griffin, as part of his "ten healthy centers" initiative, is seeking contributions from all NASA centers to aid in realizing these goals. Goddard Space Flight Center (GSFC), with its many unique capabilities and core compe-

Exploration SystemsProjects

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Vision for Space Exploration
The Lunar Reconnaissance Orbiter (LRO)

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Message from the Director Of

Greetings:

I can't tell you how thrilled I am to be providing my first Critical Path Director Of message. I was pleasantly surprised in July to be asked to lead the Flight Projects Directorate (FPD), a truly wonderful organization made so by the dedication and expertise of the staff. I thank Rick Obenschain for leaving the Directorate in a strong position for success and wish him the best as Deputy Center Director. I also welcome Dave Scheve as the Deputy Director of Flight Projects. Dave brings a wealth of knowledge and expertise on both space and earth science missions and I am glad to have him here in the Directorate office.

As you are well aware, the mission of the FPD is to enable space and earth science discovery through the formulation, implementation, and operation of space and ground systems. Effective and efficient hardware and software design, development, and operations are the means not the end and we all must remember that. We must also never forget that it takes a diverse team of scientists, engineers, administrative support personnel, and managers to be successful and it is our responsibility to bring these teams together and make them strong. We must encourage and embrace diverse perspectives in order to ensure that we deliver the best systems we can, within the resources allocated to us. As stewards of a very large percentage of the Goddard budget, we must also never lose sight of the fact that we have been and are successful because of the great infrastructure of the Center and, therefore, we must support it as best we can.

Calendar year 2008 will be one of the busiest launch years that the Flight Projects Directorate has ever seen. We will launch 8 missions in 2008 including: TWINS-B, GLAST, CINDI, GOES-O, IBEX, HST SM-4, LRO, and SDO. Each of these has presented challenges that have been overcome and they will continue to challenge us through the coming year. The progress we have made in fulfilling our commitments is testimony to the capabilities of the Goddard workforce (both civil servant and contractor) and the infrastructure and processes of the Center. We can never lose sight of the end goal and I ask each of you to pay attention to and support each of these missions as they finish integration and test and prepare for launch, even if you are not assigned to them as your primary responsibility.

Development of project management expertise and succession planning is extremely important to our continued success in the future. Our Project Management Development Emprise program has now been in existence since 1990 and has graduated 50 people most of whom are now in senior leadership positions at Goddard or around the Agency. We have just completed the selection of the tenth class, 3 administrative and 2 technical. Howard Ottenstein will have more on the selectees in an article in this issue.

In future issues, I plan to talk a little about my view on the need to increase horizontal communications within the Directorate and my thoughts on embracing and increasing the diversity of the workforce.

Please have an enjoyable and safe Holiday season,

George

PERSONALITY TINTYPE

Mark Seidleck

Mark serves as the Deputy Project Manager/ Resources on the Gamma-ray Large Area Space Telescope (GLAST) Project, Code 446. He has served in this capacity since the Project's formulation days back in January, 2000.

Born: Washington, D.C.

Education: BS Business Management, University of Maryland; MGA Information Systems, University of Maryland.

Life at Goddard: Mark began his career at Goddard as a co-op student in 1991, while attending graduate school at the University of Maryland. Beginning as a Resource Analyst in Code 703, he supported the TRMM Project until 1994. Later that year, Mark began a series of 6-month rotations beginning in Code 153 where he worked as a Program Analyst for the POES and International Projects. A second rotation to HQ, Code YM, provided an opportunity to work as a Policy Analyst in the Earth Science Directorate (formally, Mission to Planet Earth).

After returning to GSFC for a rotational assignment on the GOES Project, Mark accepted a permanent position with GOES as a Resources Analyst where he worked for the next 2 years. In 1996, he took a Program Analyst position with the Flight Projects Directorate, Code 403 where,

(Seidleck Tintype Continued on page 20)

Linda Pattison

Linda serves as the Information Technology (IT) Manager for the Astrophysics Projects Division and the Computer Security Official (CSO) for the Hubble Space Telescope, ConX, GLAST (Admin), and LISA projects.

Born: Marquette, Michigan

Education: After graduating from Greenbelt's Eleanor Roosevelt Senior High in the Science and Technology program, Linda earned a Business Travel Certificate from Fleet Business School, her Associate Degree in Computer Science from Prince George's Community College and her Bachelor of Science in Computer Management Information Systems from the University of Maryland University College.

Family: Linda, her husband Jeff, and 2 fur-children Nelson and Hoodwink, live in Odenton, MD. The immediate family live within the Washington DC Metro area, however, most family is scattered around the US and in England.

Life at Goddard: Linda remembers thinking while riding the bus to school and passing Goddard each day – "Wow, it would be great to work there one day." And, through a long road, it happened.

After starting out in college as an Electrical Engineering student and Government Co-op, Linda realized that she spent all of her time in the computer room. So, she changed her major to Computer Science. This meant leaving the Co-op program as there were no slots for a computer person. Then she got a job as the secretary for the Labor Relations Officer at the National Labor Relations Board in Washington, DC. After 8 or 9 months commuting downtown, Linda transferred to Goddard's Flight Data Systems Branch (Code 735 – we're talking Engineering Directorate), in 1986. She was still working on her college degree, and knew that moving around on Center was the best chance to get a job in the computer arena. The Center's Undergraduate Studies Education (USE) program was instrumental in completing her Associate's degree. When Linda took the Center tour for new hires, and went through the building 3 Space Telescope Operations Control Center, she can remember thinking – "That would be a cool place to work."

Linda moved into Code 250's Automated Information Man-

(Pattison Tintype Continued on page 20)

(Exploration Continued from page 1)

tencies, has joined the "nationwide" team by strategically leveraging its activities across robotic and human spaceflight missions to the benefit of both communities.

Within our Flight Projects Directorate, Exploration-related program and project activities reside in the Exploration & Space Communications Projects Division, Code 450. Leaders here have chartered the Constellation Support Office (*soon to be renamed "Exploration Systems Projects"*) with the responsibility to manage these activities. It is through this team that GSFC makes its contributions to "…the Vision."

What is this "Exploration Initiative" I keep hearing about?

With the impending retirement of the Space Shuttle by 2010, the Exploration Systems Mission Directorate (ESMD) at NASA Headquarters has been charged with the responsibility of designing the Nation's architecture that will fly to the International Space Station (ISS), return humans to the Moon, and then reach to Mars. ESMD exercises its charter through the execution of several programs; however, the Constellation Program (CxP), managed by the Johnson Space Center, has been assigned responsibility for developing the new human spaceflight architecture.

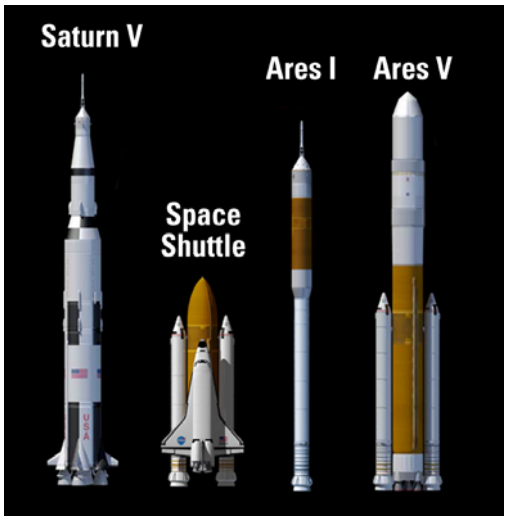

Figure 1 – Comparing Launch Vehicle Sizes. On the left is an artist's rendering of the relative sizes of past launch vehicles to the Ares vehicles.

In an effort to reduce the overall cost of the program while improving safety and reliability, CxP has returned to Apollo-style crew and launch vehicles. The Crew Exploration Vehicle (CEV) named Orion, at 5 meters (16.5 feet) in diameter and two-and-a-half times the volume of the Apollo capsule, will provide a significantly increased capacity for both astronauts and cargo. The Orion will support expanded crew sizes of up to six astronauts for low-Earth orbit (LEO) missions to the ISS and four astronauts for lunar surface missions. The Ares I launch vehicle will be used to send Orion into orbit. In a departure from the Apollo concept, the Lunar Surface Access Module (LSAM) will use a separate heavy-lift launch vehicle, Ares V, and will rendezvous with Orion in low-Earth orbit. While the concept bares some similarities to the Apollo program, Constellation faces many new challenges which will require the leveraged experience of all NASA centers to achieve success.

What kind of Constellation work is our Center engaged in?

The CxP is following a "system-of-systems" organizational approach where efforts are horizontally and vertically divided using the program and project distinction; the program level is known

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as Level 2 and the project level is referred to as Level 3.

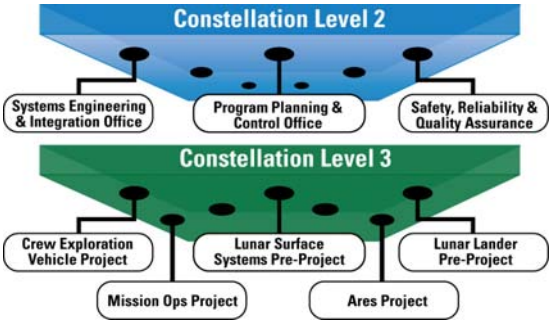

Figure 2 – The Constellation Program two-level structure. Requirements, policy and high-level engineering trades are made at Level-2 while Level-3 teams focus on the development of specific parts of the agency's new architecture.

Level 2 - program activities are broad in scope and encompass the development of program-wide policy and definition of high-level requirements across the end-to-end architecture. Efforts at this level involve a wide range of technical disciplines most notably in the areas of safety, reliability and quality assurance (SR&QA) and systems engineering and integration (SE&I), including verification and validation (V&V). By contrast, Level-3 - project activities have limited scope but delve to the lowest level of detail for the specific elements of the architecture. Examples of Level-3 projects include the Orion Crew Exploration Vehicle, Ares expendable launch vehicles, Lunar Surface Access Module, and Lunar Surface Systems. Exploration Systems Projects' (ESP) work portfolio spans both Level 2 and Level 3 activities with over 50 people from GSFC conducting analyses and trade studies, as well as, supporting system/subsystem design activities.

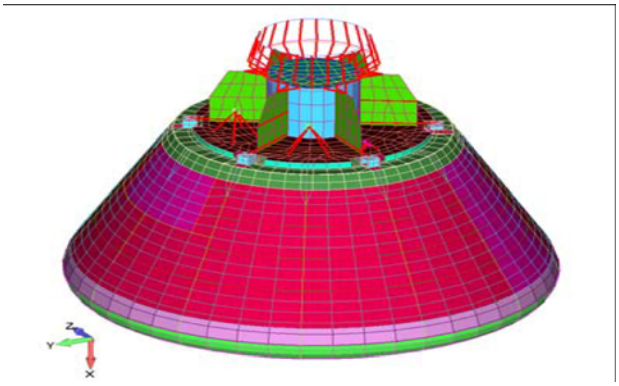

Figure 3 – Finite element model of the Orion Command Module. Image from the vibro-acoustic assessment performed at GSFC by the ISLM SIG.

What are we contributing in the areas of Systems Engineering & Integration (SE&I)?

SE&I is a Level 2 activity and is the area within CxP where GSFC is most involved. Our efforts include participation on several System Integration Groups (SIGs) examining technical areas such as Computer Systems Interoperability (CSI); Integrated Loads, Structures and Mechanisms (ILSM); and Flight Performance (FP). The CSI team is focusing on next-generation methods for communication and data sharing amongst all the flight and ground systems. The ISLM team recently concluded a vibro-acoustic assessment of the Orion Command Module. The FP SIG has been involved with defining requirements involving aerodynamics and aerothermodynamics, aborts, trajectory design, mass properties, propulsion, and integrated guidance navigation and control (GN&C). While the majority of the necessary engineering trades are taking place within CxP, not all are. In fact, GSFC engineers are supporting ESMD-sponsored studies as well, including activities in lunar navigation and the assessment of high solar activity on radiometric tracking.

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As part of the SE&I effort, GSFC also has a team focused on Verification & Validation. This team has been supporting CxP through the System Requirements Review (SRR) in November 2006, as well as, participating in Interface Requirements Document (IRD) development and Constellation Architecture Requirements Document (CARD) updates. Additionally, this team has the lead in defining the end-to-end system testing strategy for the "nationwide" team. A second team at Goddard has been assigned the responsibility for developing the network-based infrastructure that will be used to link all of the avionics labs distributed throughout the country; all of this is being led by our Center!

What are we contributing in the area of Safety, Reliability, and Quality Assurance (SR&QA)?

SR&QA is another very strong activity for GSFC and one in which the Goddard team has been asked to lead many key areas. One of these is Software Assurance; focusing the processes and procedures that will ensure software - the backbone of the Constellation architecture - functions properly, reliably, and safely. The Center's team is influencing designs, acquisition approaches, and fabrication plans to name just a few activities. The GSFC SR&QA team continues to work closely with engineering early in the development process, chair program-level boards and panels, convene symposia focusing on key issues (e.g., "Ultra-reliability"), and participate in the risk management process.

What Level 3 Constellation efforts are underway at Goddard?

In addition to the Level 2 activities, ESP also has four groups supporting CxP Level 3 activities. The four groups include Orion Engineering, Mission Operations, Low Impact Docking System (LIDS) Manufacturing, and Exploration Navigation.

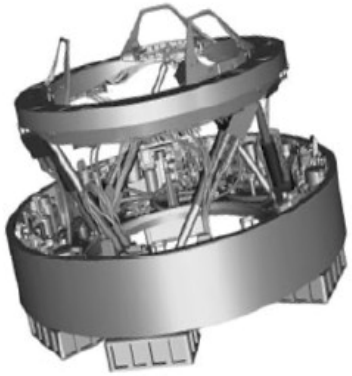

Figure 4 – Low Impact Docking System (LIDS). The Constellation flight elements are significantly lighter in weight than the Space Shuttle. This means that they have small levels of inertia; the force that keeps an object moving in its original direction. Hence, a new means of docking these lighter machines is required. LIDS is designed to meet this need.

- The Orion Engineering group contributes to several key areas of the Orion acquisition effort spanning development of the Radio Frequency (RF) subsystem, radiation analysis and parts testing, and modeling of the Attitude Control System.

- The Mission Operations group supports the Constellation ground system development activity. This team focuses on the development of operations plans, evaluations of decision systems, and lunar surface operations scenarios.

- The LIDS Manufacturing group is based at Wallops Flight Facility (WFF). This team supports the fabrication of high-precision piece parts needed to make an early version of this

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next-generation docking adaptor for Constellation.

- The Exploration Navigation group participates in the definition of tracking and navigation systems necessary to conduct mission operations to the Space Station, the Moon, and Mars. This relationship extends the long-standing role of GSFC as a member of the human spaceflight tracking and navigation team.

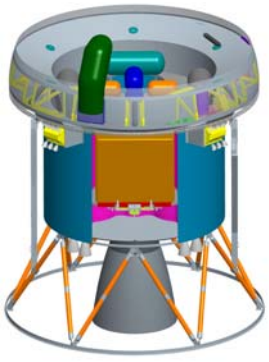

Figure 5 – Carrier cargo loaded into the Orion Service Module. GSFC has been assigned the role of providing rapid access to space for secondary payload users. This leadership responsibility spans the entire Constellation architecture.

Will the Center's participation in the Constellation Program grow in the future?

Yes! Our growth with the "nationwide" team is one of the most exciting trends to share with our colleagues. This past summer alone, the Center has extended its activities into three key areas: Unpressurized Cargo (a.k.a. "Carriers"), the Lunar Surface Access Module, and Lunar Surface Systems. Each of these areas represent exciting opportunities to extend the legacy of Hitchhiker, return humans and cargo to the surface of the Moon, and participate in the definition of the many systems – such as rovers, habitats, and lunar surface power systems.

GSFC has emerged as an integral member of the "nationwide" team chartered to replace the Space Shuttle, return humans to the Moon, and extend the human presence to Mars. The Center is engaged in a wide range of technical engineering disciplines, mission assurance disciplines, and project management activities.

The ESP Team is committed to its mission; to identify, communicate, and implement Goddard's contribution to NASA's Exploration and Constellation initiatives. By leveraging Goddard's expertise in the development and management of spaceflight missions, our Center is furthering the Nation's vision for space exploration. For more information on any of these activities please do not hesitate to contact Bob Menrad at <Bob.Menrad@nasa.gov>.

Bob Menrad/Chief/Constellation Support Office(450.3) & Tom Peiffer

Editor's Note: The Constellation Support Office provides the leadership and resources for the coordination of all work related to the Constellation Program that is being performed at GSFC. The Constellation Program is managed by JSC.

Heritage Technologies Will Help Power Constellation

The Constellation Program (CxP) as been directed to leverage "heritage technologies", wherever possible, in an effort to develop a cost-effective architecture where crew safety is paramount. The most visible example of this approach is seen in the Agency's decision to return to an Apollo-style launch configuration, but beneath the surface, many other innovative uses of "tried and true" technologies are being leveraged to develop the new architecture.

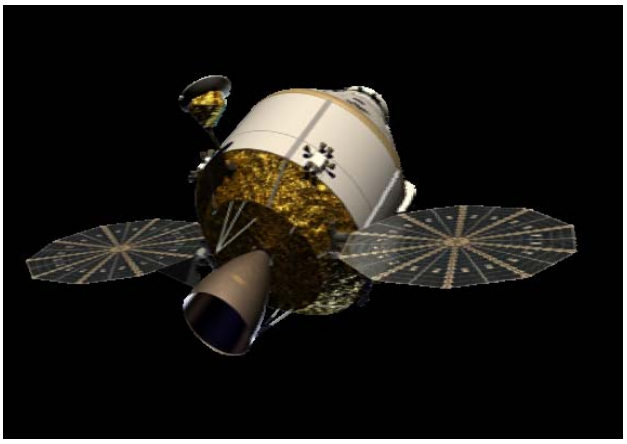

Figure 1 – A rendering of the Orion Spacecraft. Orion, the new Crew Exploration Vehicle, will fly into space atop of the Ares I launch vehicle.

Like Apollo, Orion will launch atop the multi-stage booster rocket named "Ares I". Returning to a "stacked" launch configuration is intended to eliminate any possibilities of debris or ice damaging the spacecraft during ascent, as has been the case with the Shuttle configuration. In addition, a launch abort system mounted atop Orion, similar to the ones used in the earlier programs through Apollo, will be capable of propelling the crew to safety in the event of an emergency on the launch pad or during ascent; something not possible with the Shuttle concept.

Ares I will also use proven "heritage technologies" in its solid-fuel first stage, derived from the Shuttle solid rocket boosters and its second stage which will employ a liquid fuel engine known as the J-2X, an updated version of the upper stage engine which reliably powered the Saturn series of launch vehicles for nearly a decade during the Apollo and Skylab eras.

Figure 2 – Ares I Launch Vehicle. The Ares I will incorporate technologies from the Space Shuttle solid rocket boosters and external tank in its first and second stages.

NASA plans to use these two vehicles – Orion and Ares I – for missions to the ISS by 2015.

A New Way to the Moon

For missions to the Moon, NASA will use a new, dual launch concept. First, a newly developed massive "Ares V Cargo Launch Vehicle" will autonomously deliver the Lunar Surface Access Module (LSAM) into a low-Earth parking orbit. Only after this is successfully done will the Ares I deliver the astronauts into orbit for an Earth-Orbit-Rendezvous (EOR) with the LSAM and Earth Departure Stage.

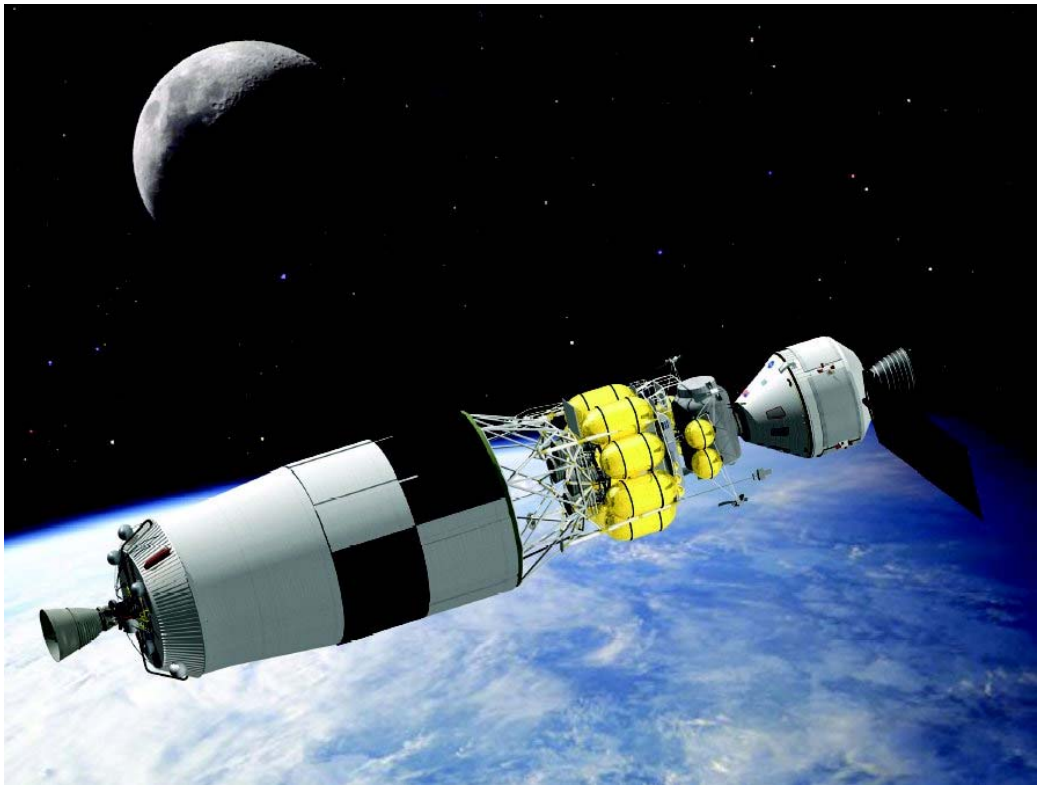

Figure 1 - An artist's rendering of the LSAM and Orion after rendezvous in Earth orbit. Prior to the journey to the moon the astronauts will rendezvous with the LSAM and Earth Departure Stage (EDS) in low-Earth orbit.

EOR was one of the mission modes considered during the 1960s before NASA opted to integrate both the lunar module and the command module onto a single Saturn V vehicle.

In another departure from the Apollo concept, the two spacecraft, having rendezvoused in low-Earth orbit, will begin the journey to the Moon under the power of the Earth Departure Stage (EDS) booster. During the Apollo program, the service module provided the propulsion required to make the transfer to Lunar orbit.

Corrections

The TCP regrets the misspelling of Barbara Blom (shown as Barbara Blum) in the most recent issue of The Critical Path.

In another instance, the Melwood contractor was shown as Millwood. The TCP regrets that error as well.

(LRO Continued from page 1)

LRO – The Beginnings

On January 14, 2004, President George W. Bush issued a new space exploration policy, "A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration". Its fundamental goal: to advance U.S. scientific, security, and economic interests through a robust space exploration program. In support of this goal, the United States would:

- Implement a sustained and affordable human and robotic program to explore the solar system and beyond;
- Extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations;
- Develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about the destinations for human exploration; and
- Promote international and commercial participation in exploration to further U.S. scientific, security, and economic interests.

A month later, NASA released, "The Vision For Space Exploration". "Under this new Vision, the first robotic missions will be sent to the Moon as early as 2008 and the first human missions as early as 2015 to test new approaches, systems and operations for sustainable human and robotic missions to Mars and beyond."

And thus, the Lunar Reconnaissance Orbiter (LRO) was born. LRO is the first mission in NASA's Vision for Space Exploration. It will launch in late 2008 with the objectives of finding safe landing sites, locating potential resources, characterizing the radiation environment, and demonstrating new technology.

The mission startup was not easy. First, the Robotic Lunar Exploration Program (RLEP) was created within the Science Mission Directorate at NASA Headquarters. The Program was based at Goddard Space Flight Center (GSFC) to carry out the LRO project as well as future missions. However, funding was an issue. During FY04, the Program had a plan to execute and the workforce to start it, but no money was available. To get things moving, a loan was provided from the Center Director. Instrument selection was made in December 2004. Funding was received from Headquarters in early 2005.

It didn't take long for NASA to change things. The RLE Program was moved from the Science Mission Directorate to the Exploration Systems Mission Directorate in April 2005. Just four months later, in August 2005, the Program Office was moved from GSFC to Ames Research Center (ARC). Goddard maintained responsibility for LRO, but all future mission planning was to be done by Ames. Around this time, NASA decided to add the Lunar Crater Observation and Sensing Satellite (LCROSS) managed by Ames, as a secondary payload to fly with LRO. Another major administrative change affected LRO in May 2006. The Program Office was moved from ARC to Marshall Space Flight Center (MSFC). Also at this time, the Program name was also changed, from Robotic Lunar Exploration Program to Lunar Precursor Robotic Program (LPRP). In March 2007, the MSFC Program Office was abolished and responsibility

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for LPRP was transferred to Headquarters. After Congress got involved, the Program moved back to MSFC in the summer of 2007.

The technical side of the house had its growing pains, too. Decisions had to be made on the type of material and propulsion system to use to build the spacecraft, where to place the instruments on the spacecraft, how to accommodate additional "instruments", which launch vehicle to use, creation of a ground system, development of a command and data handling architecture, etc. Due to the hard work of the entire team, all these technical challenges, as well as the administrative ones, were overcome. LRO is now only several months away from launch and moving quickly to meet this objective.

LRO Spacecraft and Instruments

The LRO bus is being built at GSFC by the Engineering Directorate. Integration of the science instruments to the Orbiter housekeeping systems as well as Orbiter environmental testing will also be performed at GSFC. In October 2008 the LRO will be launched from the Kennedy Space Center onboard an Atlas V Evolved Expendable Launch Vehicle (EELV) into a direct lunar injection trajectory. Using its own propulsion subsystem, the Orbiter will perform a Mid-Course Correction and will maneuver towards the Moon. After a trans-lunar trajectory phase of approximately 100 hours the Orbiter will be inserted into a lunar orbit using the onboard propulsion subsystem. The Orbiter will perform several additional maneuvers to circularize the orbit and ultimately place LRO into its final polar circular orbit with an altitude of 50 km (a little over 30 miles), closer than any other lunar mission. Prior to and upon reaching the mission orbit, a series of spacecraft and instrument checkout activities will be performed.

LRO is a three-axis stabilized spacecraft, nadir pointing for instrument observation of the Moon. In its final mission configuration with appendages deployed, the Orbiter will measure approximately 2.4 meters (m) in length, 1.4 m in width and 3.7 m in height, with a mass of approximately 1800 kg. The primary structural modules are the Avionics Module, Propulsion Module and the Instrument Module.

LRO's primary goal is to prepare for future human exploration of the Moon. Specific objectives of the mission are:

a. Characterization of the global lunar radiation environment and its biological impacts and potential mitigation, as well as investigation of shielding capabilities and validation of other deep space radiation mitigation strategies involving materials.

b. Assessment of the resources in the Moon's Polar Regions (and associated landing site safety evaluation), including characterization of permanently shadowed regions and evaluation of any water ice deposits.

c. High spatial resolution global resources assessment including elemental composition, mineralogy, and regolith characteristics.

d. Acquisition of a high spatial resolution, 3-dimensional, global geodetic grid of the Moon suitable for analysis at landing site scales.

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e. Landing site imaging at landform, as well as landing hazard relevant scales.
f. Characterization of lunar regolith for resource assessment.
g. Identification of possible water ice resources on/within the lunar surface through orbital and in-situ ground truth measurements.
h. Global geodetic knowledge by means of spatially resolved topography.

Due to lighting constraints, the launch window is constrained to 2-to 3-day periods every two weeks, with one launch opportunity on each of those days. LRO is following a direct, minimum energy transfer to the Moon, culminating in a critical lunar orbit insertion burn about 4-5 days after launch. It is carrying 6 primary instruments and 1 technology demonstration. Its on-board data storage and communication systems, as well as its ground station network and systems, are sized to handle the unprecedented amount of data that will be generated by these instruments.

The LRO science instruments are:

CRaTER - Cosmic Ray Telescope for the Effects of Radiation, built by MIT for Boston University. The CRaTER instrument will characterize the global lunar radiation environment and its biological impacts. CRaTER utilizes a stack of silicon detectors to determine the effects of long term exposure to charged particles by humans — mainly protons and electrons — using a material that replicates human tissue. The goal is to establish the linear energy transfer (LET) of cosmic radiation relevant for human and electronic parts considerations.

Diviner (DLRE) - Diviner Lunar Radiometer Experiment, built by JPL for UCLA. DLRE is a multi-channel solar reflectance and infrared filter radiometer. The primary goal for DLRE is to map the surface temperature of the moon over a range of 40 - 400 Kelvin. These measurements will help characterize the lunar thermal environment for habitability. In addition, the instrument will attempt to determine rock abundances at potential landing sites, identify potential lunar cold traps, map silicate mineralogy, and identify potential polar ice reservoirs.

LAMP - Lyman Alpha Mapping Project, built by Southwest Research Institute. The LAMP instrument is a spectrograph that will observe the shadowed lunar surface in the far ultraviolet spectrum. The primary measurement goals include: observing the entire lunar surface in the far ultraviolet, polar mapping and searching for water frost in permanently shadowed regions, demonstrating the feasibility of using starlight and sky-glow for future surface mission applications, and detecting/constraining the abundances of several atmospheric species.

LEND - Lunar Exploration Neutron Detector, built by the Russian Institute for Space Research, with support from GSFC and several American universities. LEND will provide high spatial resolution maps of neutron emission at the lunar surface in order to characterize the deep space radiation environment. LEND's ^{3}He detectors and scintillator sensors will lead to the detection of the lunar neutron albedo, which is produced by the bombardment of galactic cosmic rays. LEND measurements will be used to create hydrogen distribution maps, characterize sur-

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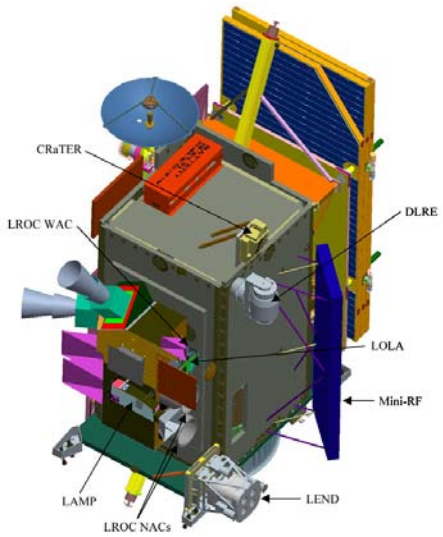
face distribution and column density of possible near-surface water ice deposits, and create a global model of the neutron component of space radiation.

LOLA - Lunar Orbiter Laser Altimeter, built by GSFC. The LOLA instrument is designed to measure the distance between the LRO spacecraft and the lunar surface using a laser spot pattern, which along with the spacecraft position will allow precise measurements of the lunar shape (range to the surface). LOLA will produce global geodetic lunar topography, characterize polar region illumination, image permanently shadowed regions, assess meter scale features for landing site selection, and identify near-surface water ice.

LROC - Lunar Reconnaissance Orbiter Camera, built by Malin Space Science Systems for Arizona State University. The LROC instrument is designed to address two of LRO's primary measurement objectives: landing site certification and monitoring of polar illumination. LROC consists of two narrow angle cameras (NACs) to provide 0.5 m and 1 m-scale panchromatic visible-light images over a 5 km swath, and a wide angle camera (WAC) to provide 100 m-scale images over a 100 km swath. The wide angle system utilizes seven visible/UV wavelengths (310 - 680 nm) to characterize polar illumination and the distribution of lunar resources.

Mini-RF - Mini-Radio Frequency Technology Demonstration, provided by the Naval Air Warfare Command for NASA's Science Operations Mission Directorate (SOMD). The Mini-RF technology demonstrator is a Synthetic Aperture Radar (SAR), and is the second instrument in a spiral technology development effort. The purpose of Mini-RF is to demonstrate new radar technology for future use in planetary resource mapping, and to use both S- and X-Bands to image surface areas that were imaged by a previous radar instrument, Forerunner. (The Forerunner instrument is a current payload on the Chandrayaan-1 mission to the Moon.)



LRO Spacecraft with Instruments

It is remarkable to see what has been accomplished in less than three short years and to realize that less than one year from now Goddard, NASA and the United States will be heading back to the Moon. Success so far has not been easy. It has come with participation from EVERY directorate at Goddard – Code 100 management, legal, human resources and finance support; Code 200 procurement, security, facilities and logistics support; Code 300 safety, reliability and parts support; Code 400 project management; Codes 500 and 800 multi-discipline engineering; Code 600 science; and Code 700 information technology support. It is through continued cooperation and the drive for completion of this important undertaking that will enable LRO to make it off the launch pad in 2008 and carry out a successful mission.

Bill Sluder, DPM/R/Code 451

Code 400 Peer Award Winners for 2007

Steady Helm

Ed Cheng, Code 442
"For successfully shepherding the HST ACS Instrument Repair effort from concept to reality."

Jeff Gramling, Code 454
"For providing outstanding leadership and focus to the Tracking and Data Relay Satellite (TDRS) K Program requirements development and procurement activities, while working to further establish the TDRS Project Office and build a strong foundation for program success."

Keith Opperhauser, Code 451
"For your dedication to the Lunar Reconnaissance Orbiter (LRO) project, being a team player and working behind the scenes to keep things moving."

Kathy Nieman, Code 440
"In recognition of your long-term commitment and dedicated service to the Hubble Space Telescope Program as the Configuration Management Officer."

Art Azarbarzin, Code 422
"In recognition of your outstanding leadership as the GPM Project Manager in a time of project transition and re-direction. With your leadership the GPM Project is on a steady course going forward with Phase B and beyond."

Boundless Energy

Karen Michael, Code 586/423
"In recognition of the Boundless Energy you have displayed in leading the system integration of the EOSDIS Evolution as well as always volunteering to take on additional duties and support your fellow team members."

Jean Plants, Codes 441 & 444
"For your tireless dedication and support to the HST Operations and SSMO Projects in the area of Resources Management - you are truly a role model for all employees in the resources field."

Leslie Cusick, Code 422
"In recognition of your excellent support to all aspects of the GPM Project, your leadership, enthusiasm, and ability to help others inside and outside the Project has clearly enabled these organizations to maintain strong commitment to Project, Center and Headquarters Management."

Mary Walker, Code 480
"Mary's boundless energy, dedication, and whole hearted commitment to taking on responsi-

(Peer Awards Continued on page 15)

(Peer Awards Continued from page 14)

bilities beyond assigned duties have carried the POES Project to excel to its highest."

Pamela Sullivan, Code 443
"For your unending commitment to ISIM and the JWST Project, your many hours of work, technical expertise, and inspirational management, are evident in the excellent work the ISIM Team has produced."

Mentor

John Baniszewski, Code 458
"John's mentoring support of the Federal Career Intern Program provided guidance for two years. He successfully inspired college fresh-outs to pursue careers in the Flight Projects Directorate. His mentoring endowed a foundation for new employees."

Mission Impossible

Angelita Kelly, Code 428
"Angie Kelly performs the impossible with overseeing and coordinating all the Terra, Aqua, and AURA instrument teams as well as Afternoon Constellation satellite teams and their interaction with the ESMO flight operations and software development teams."

Brian Rehm, Code 443
"For overcoming myriad obstacles to successfully deploy the eight Science Instrument Test Sets at JWST Instrument Facilities across North America and Europe."

Rosemary Thorpe, Code 429
"In recognition of your tireless dedication to the success of the NPP Mission as demonstrated by your commitment to the integrity of the thermal systems."

Steve Metcalf, Code 423
"For completing "Mission Impossible" as the ESDIS and ESMO resource, budget, contracts and financial issue guru. Steve worked tirelessly to ensure resources and funding flowed flawlessly to NASA's Earth Science Data and Mission Operations."

Rookie of the Year

Andrew E. Mitchell, Code 423
"In recognition of your outstanding performance, agility, and commitment in your first year as ECHO Operations Lead."

Unsung Hero

Claudia Krogel, Code 443
"To Claudia Krogel, for your dedication, commitment, and tireless efforts for JWST Configuration Management. Your attention to detail, willingness to work hard and to assist others has made you an unsung hero of JWST."

(Peer Awards Continued on page 16)

(Peer Awards Continued from page 15)

Carolyn Ellenes, Code 427
"Carolyn Ellenes, you are an unsung hero of LDCM. This award is for your dedication, teamwork and exemplary attitude which directly contributes to continuing the 33+ year legacy of the Landsat Mission."

Karen Latham, Code 429
"In recognition of your outstanding, behind the scenes support to the NPOESS Preparatory Project (NPP). Your ability to facilitate the day-to-day activities of three agencies enables mission success."

Carl Clause, Code 464
"For your dedication to the team, the goals, the mission, and the vision of NASA's Solar Dynamics Observatory."

Debbie Cusick, Code 442
"For unending dedication and exceptional commitment to the Hubble Space Telescope Program."

Charles K. Scharmann, Code 442
"For your unending dedication and support in the development and fabrication of the Neutral Buoyancy Laboratory unique hardware mockups used for EVA crew training for the Hubble Space Telescope Servicing Missions."

Anita Wellen, Code 480
"Ms. Anita Wellen has provided outstanding support to the Polar Operational Environmental Satellite Project Mission Operations Support Task with the pre-launch, launch and early on-orbit checkout activities of the NOAA-15 (K), -16 (L), -17 (M), and -18 (N) spacecraft."

Andy Eaker, Code 451
"The Code 400 Unsung Hero Award is for all your hard work behind the scenes and your dedication to the LRO project. Your ability to integrate multiple schedules and provide management with the insight required is truly appreciated."

Wild Card

Bob Hesenperger, Code 451
"For all your hard work in helping to develop and maintain the Lunar Reconnaissance Orbiter (LRO) earned value management system -- a first for a NASA in-house project."

Congratulations To All The Winners

Comings & Goings

Comings:

Jonathan Bryson to 420/Earth Science Projects Division, Program Business Manager

Nick Jedrich to 459/ELC Project, Deputy Project Manager/Technical

Dan Hein to 452/Space Network Project, White Sands Deputy Station Director

George Komar to 407/Earth Science Technology Office, Associate Director

Dave Littmann to 454/TDRS Project, Deputy Project Manager/Technical

Charles Sanders to 420/Earth Science Projects Division, Information Technology Manager

Mark Voyton detailed to 430/MAVEN Mission Observatory Manager

Goings:

Harold Brockelsby from 452/Space Network Project, White Sands Station Director

Rebecca Knoble to 700/Information Technology and Communications Directorate, Mission Business Manager

Joe LeBlanc resigned from 424/GOES Project, Boeing Resident Manager

Claire MaCaulay to 603/Administration and Resources Management Office

Rick Obenschain to 100/Office of the Director, Deputy Director

Donna Sadof retired from 452/Space Network Project

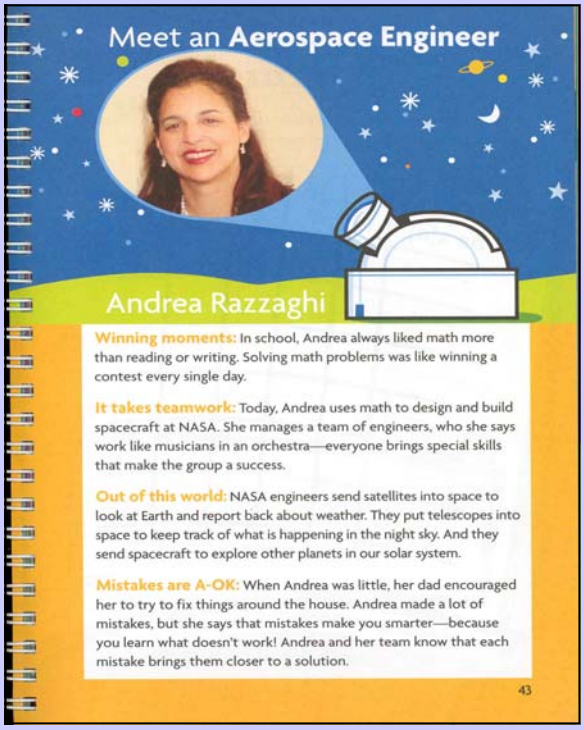
Harley Thronson to 660/Astrophysics Science Division, Associate Director for Advanced Concepts and Planning

Priti Vasudeva to 501/AETD Business Management Office, Program Analyst

Kimberly Wiggins to 200/Management Operations Directorate, IT Specialist

See What You Can Be

"American Girl celebrates a girl's inner star - that little whisper inside that encourages her to stand tall, reach high, and dream big."



'See What You Can Be' is a publication of American Girl Publishing Company. It provides a rainbow of opportunities for young girls to think of to start careers as they grow up. The book also lets you meet a few real grownup women as in 'Meet an Aerospace Engineer.' And who do we see here, smiling at us, no one else but Goddard's (and code 400's) own Andrea Razzaghi.

Dr. John McElroy

Former Center Director Dr. John McElroy passed away in Texas at age 71. Dr. McElroy came to Goddard in 1966 and later served as Center Deputy Director from 1980 to 1982.

You're Invited To The

Flight Projects Directorate

Holiday Celebration

Open House

Date: Tuesday, December 18, 2007

Time: 1:00 P.M.

Location: Bldg. 8, Rm. 240 Suite/Conference Room

NASA turns 50 on October 1, 1958. A 50th birthday logo was recently made public by NASA and appears to the left.

To commemorate NASA's 50th Anniversary, GEWA is offering a NASA Team Member exclusive t-shirt to start the year-long celebration. Our 50th Anniversary t-shirt is 100%, pre-shrunk cotton, for only $5, and will only be sold to NASA civil servants and contractors. T-shirts may be ordered online by December 31 at: http://www.tcbspecialties.com/nasa50th.html. Delivery will be made approximately during the last week of February 2008. T-shirts should be picked up at the GEWA Store in Bldg. 1.

(Seidleck Tintype Continued from page 3)

among other duties, he served as the COTR for the PAAC contract. In 1998, Mark moved back to the "Projects" accepting a position with the Earth Systems Science Pathfinders (ESSP) Program Office. Mark served as the Mission Business Manager for the Calipso (formally Picasso-Cena) and CloudSat projects until 2000.

From ESSP, Mark began his life as the DPM/R for the GLAST project where he continues to work today. GLAST is scheduled to launch in the Spring of 2008, so you can look for Mark in the "*available for new work*" pool later next year!

Family: Mark and his wife, Christina, live in Davidsonville and have a 12 year old daughter, Lauren. Christina is a software engineer for Muniz Engineering Services in Code 561. Lauren is a middle school student at Central Middle School in Edgewater, MD.

Life Outside Goddard: Outside of work, Mark enjoys coaching soccer and playing lacrosse with his daughter. The family loves to ski in the Rockies and has a trip planned early next year to Sun Valley, ID. Mark's parents and three brothers live in the area and enjoy frequent family get-togethers.

(Pattison Continued from page 3)

agement Office (later the Automation and Planning Branch, Code 251) as a Computer Assistant in 1988. She remained in Code 251 for 10 years. During this time, she completed her Bachelor's degree; became a network administrator; then a computer security point of contact; supported the COTR for computer mass buys and repair/maintenance contracts; was the COTR for the Center Software requirements contract and provided computer and network support for the Source Evaluation Board facility. After ten years time, she was ready to move to another area of the Center for more challenges, and took a position as Project Support Specialist on the Hubble Space Telescope (HST) Project.

When Linda first went to HST, they looked at her skills and said "Great, we'll put her in the Library." She remembers thinking, "The LIBRARY???" Turns out, this was the electronic library of all the drawings and documents for HST. And it was UNIX! Truly, a new challenge!! Linda also supported the Scheduling group created and maintained project schedules for engineers and became the Computer Security Official for HST.

Life in the Projects has been wonderful, if not totally different from Code 250, Linda said. And over the years, she has moved from Project Support to Information Technology Specialist.

Now on HST for 9 years, Linda has worked 4 missions to date -- Servicing Mission (SM) 2, HOST (which was a test bed that flew on the John Glenn shuttle mission), SM3A and SM3B. During SM3B, she was in the Mission Operations Room manning an actual console – wish granted from her early tour as a new hire! And it was cool.

While working servicing missions is great, Linda's most challenging job has been in IT Security. Managing multiple security plans; supporting system owners and administrators who are from all walks of life; and keeping up with changing requirements has been a challenge to Linda – to say the least. But she see's her job as being the one who makes sure that everyone knows what is required of them. Her role as an IT Manager and CSO keeps Linda on her toes.

She finds herself looking forward to the next 10-20 years with anticipation. What will be next? Who knows.....but it will be interesting, Linda said. Over the years, she has taken many personality profile tests. One, which looks at what motivates you or what you value, showed that her strongest motivation/value was ... Change. So she figures she is in the right field.

Hobbies: Computers, Music, Crafts and Astronomy.

Goddard Clubs: Goddard Astronomy Club; Music and Drama Club

Welcome

Code 400 welcomes David Scheve as its new Deputy Director. Dave comes to this position from his role as Associate Director of Flight Projects for the Earth Science Projects Division. Prior to that, Dave has held a variety of senior management positions in Code 420 and several areas within the Hubble Space Telescope program including Acting Associate Director of Flight Projects for HST.

Social News

Congratulations:

Kudos to Linda Nash (450.3), who placed 9th in her category of about 50 competitors in the 2007 Kina Elyassi NPC Natural East Coast Tournament of Champions Body-building and Figure Championships. The event, presented by Yohnnex Sports, Inc., was held at The University of the District of Columbia, is recognized as one of the most popular natural (drug-free) bodybuilding and figure contests in the country. Many of the competitors have gone on to compete in both national and international champi-onships. The competition was held June 9, 2007, and was Linda's very first competi-tion. Go Linda!

Vanessa Hernandez (451), was engaged to Freddy Pesante on August 30. An August 2008 wedding is planned.

Births

John and Kelly Loiacono, along with Johnny and Joey, welcomed baby daughter Eden Ireland (Edy) on June 23.

Congratulations and best wishes to Pietro (450) and Marianne Campan-ella as they welcome their daughter Keira. She was born on September 7, 2007, weighing 6 lbs., 1 oz., and became a member of their family through adoption on November 1.

2007 Presidential Rank Award Winners Announced

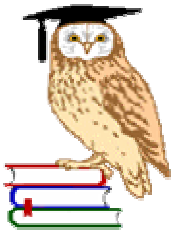
The Office of Personnel Management (OPM) recently released the names of 333 federal executives, out of 7,800 career members of Senior Executive Service, Senior Level and Scientific and Professional corps who were recognized by President Bush. Those selected exemplified outstanding leadership, accomplishment, and service over an extended period of time in some of the nation's most critical positions in the federal government.

Congratulations to George Morrow (Director of Flight Projects) and David Leckrone (HST Program Office Scientist) for their receipt of 2007 Presidential Rank Awards. David Leckrone in the category of Meritorious Senior Professional and George Morrow for Meritorious Executive.

Congratulations are also extended to former Center Deputy Director and now NASA Chief Engineer Mike Ryschkewitsch for his Presidential Rank award as Distinguished Senior Professional.

Tom Magner, Deputy Director of Code 500 was in receipt of a Meritorious SES Award.

PMDE Class of 2007



The PMDE Advisory Board, chaired by Code 400 Director Of George Morrow, has just selected the Class of 2007. The five individuals brought into the program include three professional administrative and two technical from a broad spectrum of Goddard directorates.

Congratulations to (technical): Kevin McCarthy (450) and Jim Morrissey (599). Administrative applicants accepted are: Lorrie Eakin (210S); Valerie Mackritis (603), and Priti Vasudeva (501).

It is anticipated that the next class formed will be in 2009.

NASA Project Management (PM) Challenge 2008!

Registration is now open for PM Expo 2008 February 26-27 2008 at the Hilton Oceanfront Hotel, Daytona Beach, FL. The $375 registration fee includes continental breakfast, lunch and Tuesday evening reception.

PM Challenge is sponsored by the NASA Office of the Chief Engineer, the NASA Academy of Program/Project & Engineering Leadership (APPEL), and the NASA Office of Safety & Mission Assurance.

Theme for the Fifth Annual PM Conference is "Reach Higher."

Conference Co-Chairs, both from Goddard, are Dorothy.J.Tiffany@nasa.gov and Walter.Majerowicz.1@gsfc.nasa.gov.

Quotes To Think About

"Never discourage anyone who continually makes progress, no matter how slow."
- Plato (427 BC - 347 BC)-

"I was always taught to respect my elders, and I've now reached the age when I don't have anybody to respect."
- George Burns (1896 - 1996) -

"What a splendid head, yet no brain."
- Aesop (620 BC - 560 BC) -

"Wisdom outweighs any wealth."
- Sophocles (496 BC - 406 BC) -

"Nobody goes there anymore. It's too crowded."
- Yogi Berra (1925 -)

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Happy Holidays From The TCP Staff

FUTURE LAUNCHES CALENDAR YEAR 2008	
TWINS-B	First Quarter
CINDI	APR
GLAST	MAY
GOES-O	JUN
IBEX (SMEX-10)	JUN
HST SM4	AUG
LRO	OCT
SDO (LWS)	DEC

ATTENTION INTERNET BROWSERS:

We're on the WEB
http://fpd.gsfc.nasa.gov/news.html
Or via the New "Code 400" Homepage
http://fpd.gsfc.nasa.gov

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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: hottenst@pop400.gsfc.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 March 28, 2008.