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

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INSIDE THIS ISSUE:

Preparing for One Last Visit to Hubble

When astronauts visit the Hubble Space Telescope later this year, they will perform history-making, on-orbit "surgery" on two important science instruments aboard the telescope. With the Space Telescope Imaging Spectrograph (STIS) and Advanced Camera for Surveys (ACS) still in place in Hubble, spacewalkers will—for the first time ever—attempt to repair an instrument on orbit. In this case, they'll be repairing two, and neither was designed to be fixed in space.

Because neither instrument was designed to be fixed on orbit, neither has astronaut-friendly features. Hubble engineers and the astronauts worked diligently to design special tools, crew aids and procedures to accommodate this situation.

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Things you always wanted to know about the Solar Dynamics Observatory but were afraid to ask!

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Message from the Director Of

Greetings:

Wow, it's sure has been a busy and rewarding 2008 so far. I can't tell you how much I enjoyed serving as the Executive Champion for the Martin Luther King, Jr. celebration in January and how meaningful it was for me. The great outpouring of positive statements following the event was most gratifying. Look for more information on this event elsewhere in this issue. In February, Dorothy Tiffany and her team pulled off the best Project Management Challenge Conference yet in Daytona Beach. The value of the presentations and discussions and their relevance to the whole Agency was astounding. Remember to watch for information on next year's conference which will again be in Daytona Beach in February 2009. This March, the TWINS-B instrument was successfully launched aboard a host agency spacecraft and in early April the CINDI instrument was successfully launched aboard the AFRL C/NOFS spacecraft. Also in early April, the Goddard Safety Awareness campaign provided an abundance of relevant talks, demonstrations, and discussions. Thanks to Gail Regan for leading the Code 400 contributions to Safety Week.

The rest of 2008 will prove to be equally busy and rewarding. GLAST is next in the launch queue. Kevin Grady and the entire Goddard and General Dynamics team have done a tremendous job in overcoming numerous obstacles to maintain a May launch readiness date. Launch vehicle issues currently being worked by KSC may push the launch into June in order to avoid conflict with the next Shuttle launch, but overall the GLAST campaign has shown how the entire NASA team can pull together.

IBEX is scheduled to be next in line after GLAST. IBEX is currently working some fairly serious late breaking launch load issues but I have great confidence that the SWRI, OSC, KSC, Goddard team will overcome these issues and be ready for launch this summer. After IBEX is the very challenging HST Servicing Mission 4 (see lead story). With the installation of the Wide Field Camera 3 and the Cosmic Origins Spectrograph on this last Servicing Mission, HST will be left with more capability than ever before. Watch for information on astronaut crew visits to GSFC and other HST events during the summer. The Sample Analysis at Mars (SAM) instrument suite is also in final integration and test and will be delivered to JPL for the Mars Science Lab (MSL) nuclear rover in the fall. SAM is the primary instrument package on MSL. GOES-O is complete and in storage waiting for a launch opportunity in November. This is the second spacecraft in the GOES-N series and will ensure operational continuity once in orbit. Rounding out the year will be the launches of LRO and SDO (see story this issue). The teams for both of these in-house developed missions are working hard to complete integration and test to maintain their end of the calendar year launch schedules. Goddard's integration and test teams and facilities have never before been so busy. I recommend that each and every one of you take an hour out of one of your days to visit the building 7/10/15/29 complex to see LRO, SDO, and the

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PERSONALITY TINTYPE

Walt Majerowicz

Walt is employed by the Computer Sciences Corporation and supports Goddard and the HQ Office of Chief Engineer through the Program Analysis And Control (PAAC II) contract where his duties include: Deputy Program Manager for the CSC subcontract to SGT, Inc.; PAAC Integrated Program Team Leader for the Code 401 Advanced Concepts & Formulation Office; technical lead for the Planning & Scheduling discipline on PAAC; co-chair of the NASA PM Challenge conference; instructor for the NASA Academy of Program, Project and Engineering Leadership (APPEL); and technical support to the agency's Earned Value Management Working Group (EVMWG). Walt also recently joined the NASA Integrated Program Assessment Office's (IPAO) Standing Review Board (SRB) for the Constellation Program's Extravehicular Activity Systems Project. He is a certified Project Management Professional (PMP) and in recent years received both the NASA Public Service Medal and Project Management Institute's Distinguished Contribution Award.

BORN: Baltimore, Maryland

EDUCATION: MBA University of Baltimore, BS Business Administration Salisbury University, Certificate in Technology Management California Institute of Technology.

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Pam Sullivan

Pam was recently selected as the Deputy Project Manager for the Magnetospheric MultiScale Mission. She is leaving the James Webb Space Telescope Project, where she served as the Integrated Science Instrument Module Manager.

Born: Augusta, GA

Education: Pam has a bachelor's degree in astronautical engineering from the Massachusetts Institute of Technology. She has also taken classes in management and philosophy at the Universities of Maryland, Houston, Colorado, and Indiana/Purdue.

Life before GSFC: Pam was a commissioned officer in the Air Force, serving at the Johnson Space Center in Houston, and at the Air Force Space Command Headquarters in Colorado Springs.

Life at GSFC: Pam started at GSFC in 1991, accepting an offer from then GOES Project Manager Rick Obenschain to be an Instrument Manager. She spent most of her first years on GOES in beautiful Ft Wayne Indiana, overseeing the development of the GOES-I/M Imager and Sounder instruments being built by ITT. She stayed with GOES through 1997, managing the instrument integration and test; participating in the launch and commissioning of the GOES-8 and -9 spacecraft; serving as the COTR for the GOES-N/Q instrument contract; and assisting with the procurement of the GOES-N/Q prime contract.
After GOES, Pam moved to the Hubble Space

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HST Servicing Mission payload first hand.

Management changes at both Goddard and Headquarters have made these challenging times even more interesting. I'll bet that many of you don't realize that there have been critical leadership changes in Codes 100, 300, 400, 500, and 600 all within the last 6 months. In Code 400, Dave Scheve became the Deputy Director after Rick Obenschain moved up to become the Deputy Center Director and I replaced Rick. In Code 600, Nick White became the Director and Peter Hildebrand became the Deputy Director after Laurie Leshin moved up to replace Dolly Perkins as the Deputy Center Director for Science and Technology following Dolly's retirement in December. In Code 300, Chuck Gay vacated the Deputy Director position to move to Headquarters as the Deputy Associate Administrator for the Science Mission Directorate (SMD) in March. There is currently a search underway to find a replacement for Chuck. In Code 500, Tom Magner retired at the end of March and Dennis Andrucyk was selected to replace Tom as Deputy Director. Most recently, our Center Director, Ed Weiler, was asked by Mike Griffin to be the interim Associate Administrator for SMD replacing Alan Stern. Rick Obenschain is now the acting Center Director.

Within Code 400, we have also had some recent management changes. Please see the new code 400 org chart on the adjoining page. Jim Watzin left Goddard in January to take a leadership position in private industry. I asked Nick Chrissotimos to move from Code 450 to replace Jim as the Associate Director and Division Manager in the Heliophysics Projects Division. In turn, I asked Mary Ann Esfandiari to move from her position as Deputy Associate Director in Earth Science to replace Nick as the Associate Director and Division Manager in the Exploration and Space Communications Projects Division. Nick and Mary Ann are in the final stages of transition and will be fully in their new positions by the end of April. The magnitude of these changes is amazing in such a short time and something that I have never experienced in my 25 years at Goddard. Through it all, we have not lost a beat due to the dedication and sense of responsibility of the Code 400 and Goddard workforce.

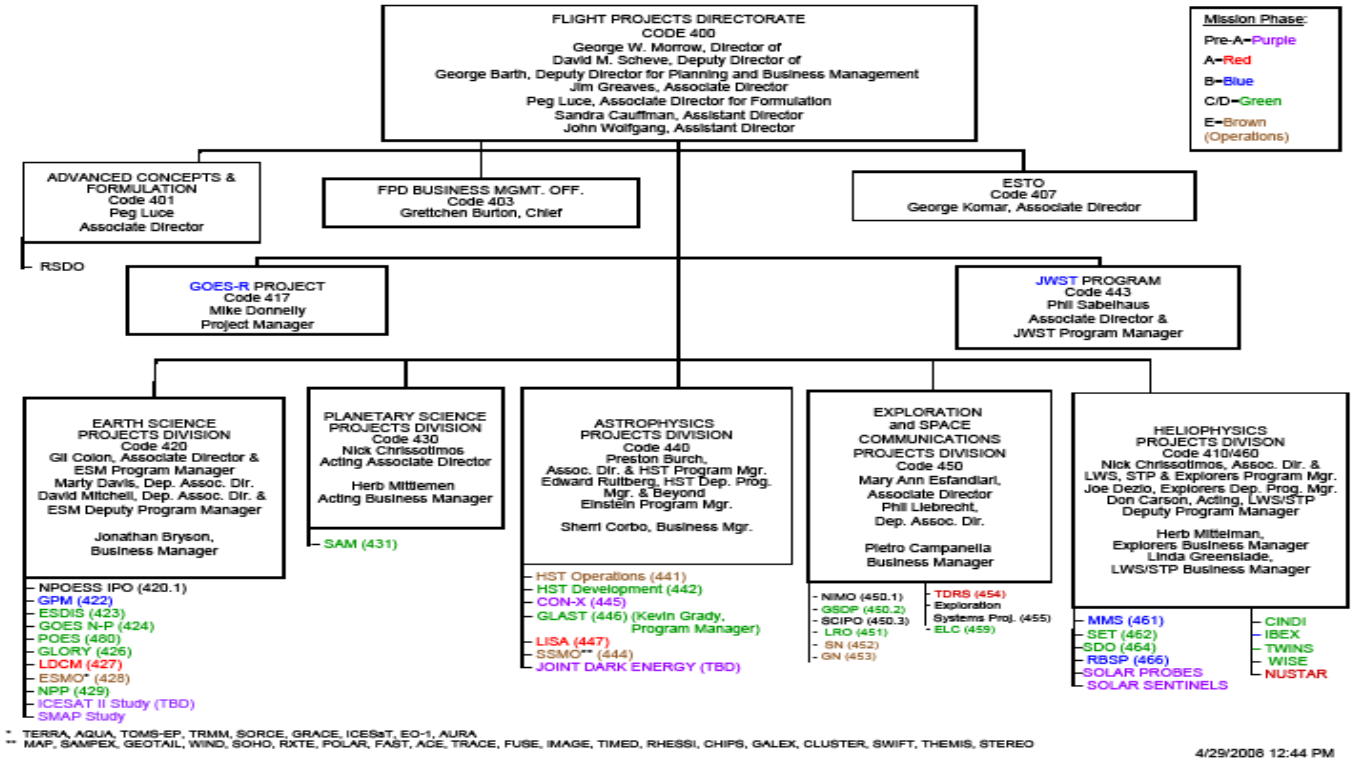
In the coming weeks you will see information on the rollout of the year long Goddard future planning efforts. You will also see information on a series of workshops for supervisors and group leaders on Race, Power & Privilege Workshop. I think you will find both of these activities highly enlightening and worthwhile.

George

Congrats

Dr. Neil Gehrels, Chief of the Astroparticle Physics Laboratory (Code 661) was elected a member of the American Academy of Arts & Sciences. Dr. Gehrels was Principal Investigator for the Swift Gamma-ray Burst Mission.. Other Fellows elected include Nobel laureates, Pulitzer Prize Winners, and a Supreme Court Justice.

Flight Projects Directorate Org Chart
Code 400



Quotes To Think About

"When a distinguished but elderly scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong."
- Arthur C.Clarke (1917-2008)

"When once you have taken the impossible into your calculations, its possibilities become practically limitless."
Saki (H.H. Munro – 1870-1916)

"Where the telescope ends, the microscope begins. Which of the two has the grander view?"
Victor Hugo (1802 – 1885)

"Being 70 is not a sin. It's not a joke either."
Golda Meier (1898 - 1978)

Hubble will be retrieved from its orbit by the Shuttle's robotic arm placed in the payload bay for servicing.

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"The repair of STIS, and of ACS in particular, involves techniques that the astronauts have never done before on Hubble, possibly never before anywhere," explained Dr. Dave Leckrone, Senior Project Scientist for Hubble Space Telescope. "That is, to open up an instrument that was not designed to be opened up and actually pull out electronic printed circuit boards and replace them with new boards."

Work is progressing well as the Hubble Team prepares for this final service call. The 11-day mission, which will leave the telescope more capable than ever before, includes five spacewalks. In addition to the attempted repair of STIS and ACS, spacewalking astronauts will install the powerful new Wide Field Camera 3 (WFC3) and Cosmic Origins Spectrograph (COS), replace a fine guidance sensor, all six batteries, and all six of the telescope's gyroscopes, add new thermal coverings, and install a soft capture mechanism on Hubble's aft bulkhead.

"This is the granddaddy of everything we've learned over 25 years, and we're putting it all together into one great mission," explained Frank Cepollina, Deputy Associate Director of the Hubble Space Telescope Development Project.

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Crew Preparations

During the mission, the Space Shuttle Atlantis and her seven crew members will rendezvous on orbit with the Hubble Space Telescope, capture it with the Shuttle's robot arm, and place it in the Shuttle's payload bay. Here it will be serviced by two teams of spacewalking astronauts during five planned spacewalks.

The SM4 astronaut crew includes Hubble veterans and first time flyers. Commander Scott "Scooter" Altman (Captain, USN) is a veteran of three previous flights, including serving as Commander on STS-109, Hubble Servicing Mission 3B in 2002. Pilot Gregory C. "Ray J." Johnson (Captain, USNRC) will be making his first spaceflight. This is also the first flight for Shuttle Arm Operator Dr. K. Megan McArthur. Payload Commander and Extravehicluar Activity (EVA) Astronaut Dr. John Grunsfeld will be visiting Hubble for the third time on his fifth spaceflight. EVA Astronauts Dr. Andrew Feustel and Michael Good **(**Colonel, USAF) will be making their first flight. This is the second trip to Hubble for EVA Astronaut Dr. Michael Massimino, as well as his second spaceflight.

Training is on schedule for this complex mission. In addition to practicing down at Johnson Space Center (JSC), the astronauts also spend time at Goddard working with the actual flight instruments, tools, and other hardware and the high-fidelity Hubble simulators. As of May 1, 2008, the SM4 crew will have spent their fourth intensive crew familiarization, or "crew fam" at Goddard working closely with the Hubble Team.

Heaviest Hubble Servicing Mission

"Servicing Mission 4 will be the heaviest servicing mission to date," explained Preston Burch, Associate Director of the Astrophysics Projects Division and Program Manager for Hubble Space Telescope. "It will be carrying approximately 22,000 pounds of hardware onboard. We'll be using four carriers inside the Shuttle cargo bay to carry all the new science instruments, replacement hardware, tools for the astronauts, and to attach Hubble to the Shuttle while the astronauts are working on it." In previous missions, only three carriers were needed. One of the four SM4 carriers utilizes an advanced design and composite materials to save weight so Atlantis can carry more to orbit.

Servicing Mission 4 is actually the fifth visit to Hubble. The First Servicing Mission took place in December 1993, the Second Servicing Mission in February 1997, Servicing Mission 3A in December 1999, and Servicing Mission 3B in March 2002. (NASA split Servicing Mission 3 due to a critical need to replace gyroscopes in 1999.)

The following sections describe the tasks for SM4, as well as the hardware's status to date:

Wide Field Camera 3 (WFC3)

WFC3 will study early and distant galaxies that are currently beyond Hubble's reach, as well as galaxies in our cosmic neighborhood. This powerful instrument will help astronomers understand

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more about galactic evolution and star formation, unlock secrets about the planets in our solar system, and probe the mysteries of dark energy. WFC3's key feature is its ability to span the electromagnetic spectrum from the near ultraviolet (NUV), through the optical and into the near infrared (NIR). WFC3 is the only Hubble instrument with this panchromatic capability.

This next-generation imaging instrument builds on the capabilities of its predecessors, Wide Field and Planetary Cameras 1 and 2 (WFPC1 and 2), as well as Hubble's Near Infrared Camera and Multi-Object Spectrometer (NICMOS) and Advanced Camera for Surveys (ACS). WFC3 is superior to WFPC2 in resolution and field-of-view. Its "UVIS" detector—sensitive to near ultraviolet and optical light—will provide a 35 times improvement in discovery efficiency (the product of the field of view multiplied by the optical throughput) in near ultraviolet and blue light over ACS. Its near-infrared detector will provide a 15 to 20 times improvement in discovery efficiency over NICMOS.

WFC3, a Goddard in-house instrument, has just completed its third and final full-up thermal vacuum test. Already in flight configuration, it has beaten the specifications in all cases and there are no liens against the instrument. The WFC3 Team is preparing for "Crew Fam 4," and will then deliver the instrument to the Project.

Cosmic Origins Spectrograph (COS)

COS will study the large-scale structure of the universe and how galaxies, stars, and planets formed and evolved. It will also help determine how elements such as carbon and iron, which are needed for life, first formed. One primary science objective is to measure the structure and composition of the ordinary matter that is concentrated in what scientists call the "cosmic web"—long, narrow filaments of galaxies and intergalactic gas separated by huge voids.

The instrument has two channels, the far ultraviolet (FUV) and the near ultraviolet (NUV). A key feature of COS—the one which makes it unique among Hubble spectrographs—is its maximized efficiency, or "throughput." Hubble's other spectrograph, STIS, which was installed in 1997 during Servicing Mission 2, is highly complementary to COS in its capabilities. STIS is a highly versatile, "all purpose" spectrograph. By design, the COS does not duplicate all of STIS's capabilities, but by having more than 30 times the sensitivity of STIS for FUV observations of faint objects such as distant quasars, COS will enable key scientific programs which would not be possible with STIS. If the STIS repair is successful, the two spectrographs working together will provide a full set of spectroscopic tools for astrophysical research.

COS, which is primarily a Ball Aerospace instrument, has completed all of its major tests and is ready to ship to Kennedy Space Center (KSC) in preparation for launch.

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STIS: Repairing a Black Hole Hunter

Astronauts installed STIS on Hubble in 1997 during Servicing Mission 2. Its main function is spectroscopy—the separation of light into its component colors, or wavelengths, to reveal information about the chemical content, temperature and motion of stars and gas. STIS's many accomplishments include confirming the existence of supermassive black holes, surveying and weighing supermassive black holes at the centers of galaxies, and being the first instrument to detect and analyze the atmosphere of a planet orbiting another star. STIS performed brilliantly until a power supply failure in 2004 caused it to stop working. The spacewalkers will replace a low voltage power supply board that contains a failed power converter. They will first remove four screws to install a see-through "capture plate" over the top of a STIS electronics access panel. This plate will hold an additional 107 tiny screws that attach the panel to STIS. By capturing the small screws in the plate, astronauts avoid having to handle them through bulky gloves.

The astronauts will use a specially made, miniature power tool to remove the screws. After detaching the panel (with the attached capture plate holding the screws), they will remove the failed power supply card. They will then insert the new one, much like replacing a computer circuit board. Finally, they will replace the existing panel with a new, simplified version not requiring any screws. Instead, two lever-like latches will lock the new panel into place. Preparations for this repair are going well, and engineers expect it to return STIS to its mission of exploration.

ACS: Restoring Hubble's Workhorse Camera

Installed during Servicing Mission 3B in 2002, the Advanced Camera for Surveys quickly became Hubble's workhorse camera and was responsible for many of the most popular and dramatic images over the last few years. However, the science instrument recently experienced two separate power failures, one on each of its two redundant sides of electronics.

The first failure, in 2006 on Side 1, rendered two of the camera's three channels—the Wide Field Channel and the High Resolution Channel—unusable on that side. Only the circuitry of the Solar Blind Channel, which images ultraviolet light, was unaffected. Ground controllers switched to Side 2, but when a fuse blew on Side 2 in 2007, all three channels on that side failed, and on-orbit repair became necessary.

With less than 18 months to launch, a repair concept was rapidly conceived and developed. The list of tasks for the Hubble Servicing Mission's five spacewalks was already jam-packed, so any new tasks would have to somehow fit into the existing schedule. The team quickly determined that there was no time in the EVA plan to perform the work necessary to access the Side 2 electronics. Instead, they focused on Side 1, analyzing the ways the power supply could have failed and developing a method of bypassing suspect subsystems and components.

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Things you always wanted to know about the Solar Dynamics Observatory but were afraid to ask!

What does SDO stand for?

Solar Dynamics Observatory.

What does it do?

SDO is designed to help us understand Sun's influence on Earth and Near-Earth space by studying the solar atmosphere on small scales of space and time and in many wavelengths simultaneously. Specifically, SDO will enable understanding of: 1) how magnetic fields appear and distribute from their origin in the solar interior; 2) the magnetic topologies that give rise to rapid high-energy release processes; and 3) the dynamic processes which influence space weather phenomena.

Huh?

SDO will monitor the sun almost continuously and will send high-resolution, high-cadence, full-disk images back to Earth. That's lots of data—about 1.5 TB per day. With this data we will be able to advance our understanding of what causes the solar activity that affects the Earth and near-Earth, and we will greatly improve our ability to forecast space weather.

Is that important?

The sun, Earth's closest star, is an immense nuclear furnace spanning 100 Earths. In just one second, it produces enough power to supply the entire United States for nine million years. Although its light powers almost all life on Earth, the sun has a dark side. Storms from the sun can knock our finely tuned technological civilization off balance, disrupting satellites, power grids, and radio communication, including the Global Positioning System. Radiation from solar storms can cause cancer in astronauts on unshielded areas, like the moon's surface.

"Right now, we can make limited space weather predictions, but they are baby steps compared to our ability to forecast weather on Earth," said Dr. Dean Pesnell of NASA's Goddard Space Flight Center, Greenbelt, Md., Project Scientist for SDO. "SDO's instruments are designed to work together to tell us more about how solar storms form, which will improve predictions of when they are about to happen."

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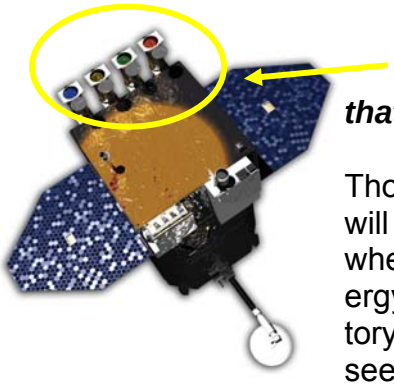
Well, if I cared, how could I get the 10-day forecast for Space?

NOAA's Space Weather Prediction Center in Boulder, CO, is the Nation's official source of space weather alerts and warnings. They continually monitor and forecast Earth's space environment; provides accurate, reliable, and useful solar-terrestrial information; conducts and leads research and development programs to understand the environment and to improve services; advises policy makers and planners; plays a leadership role in the space weather community; and fosters a space weather services industry. The Space Weather Prediction Center is eagerly awaiting SDO's data, and has negotiated to obtain quick-look data 15 minutes after receipt on Earth.



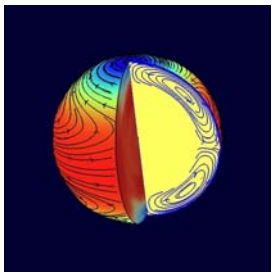
What are those four tubes on SDO? Are they laser canons that will be used to shoot down enemy satellites?

Those are the 4 Atmospheric Imaging Assembly (AIA) telescopes that will take pictures of the sun's atmosphere relatively close to the surface where solar magnetic fields suddenly change shape and release energy. AIA was built by Lockheed Martin Solar Astrophysics Laboratory, who also developed the TRACE instrument (SMEX). You may see the similarity in the telescopes, although TRACE only had one.

Are there other instruments on SDO?

Yes, the Helioseismic and Magnetic Imager (HMI) provided by Stanford Univerity and the Extreme Ultraviolet Variability Experiment (EVE) from University of Colorado, LASP.

HMI can look inside the sun to map out the flows of plasma that generate solar magnetic fields. Helioseismology traces sound waves reverberating inside the sun to build up a picture of the interior, similar to the way an ultrasound scan is used to create a picture of an unborn baby. HMI will also be able to measure the strength and direction of the magnetic fields emerging on the sun's surface.



EVE will measure the sun's ultraviolet brightness. The sun's extreme ultraviolet output constantly changes. The small solar flares that happen almost every day can double the output while the large flares that happen about once a month can increase the ultraviolet a thousand times in minutes. This harmful ultraviolet radiation is completely absorbed in the atmosphere, which means we can only observe it from satellites.

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Earlier you said that SDO will send down high definition video images of the sun. Will that be like DirectTV?

Sort of, but instead of the 18-inch dish in your back yard, SDO uses two 18-meter antennas located at the White Sands facility in New Mexico. Ka-band science data from the observatory is continuously down-linked to both antennas, and then piped directly to the Science Operations Centers at Stanford University in Palo Alto and LASP at the University of Colorado in Boulder.

How many people does it take to build a space flight mission?

Hundreds!

At GSFC, during our peak design/build time, there were 300 people working on SDO (not all full-time, of course). We have our excellent engineers and brilliant scientists, indispensable technicians, project support elves, financial whizzes, contracting and procurement specialists, and yes, even a few managers.

You're kidding!

No, and that doesn't even take into account our Instrument partners, and the vendors who supplied dozens of SDO components. We each have contributed to the mission, and we all have reason to feel proud!

Which part was built here on Center?

The spacecraft bus was designed and built in-house at GSFC. Although it's hard to tell from this tiny picture, SDO is a really big Observatory! It's about 15 feet tall, and will weigh over 3 tons when fueled. The three instruments were delivered to GSFC and integrated here, and all testing will completed here in our Center's premier environmental test facilities before shipment to the launch site.

And, the SDO Ground System and Mission Operations are the responsibility of GSFC. The Ground System scope is larger than the typical science mission because it includes the Ground Station at White Sands. The Mission will be operated for 5 years (10 year goal) from the SDO Control Center in Building 14.

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Can you explain why a recent issue of Goddard View showed a picture of SDO on the cover but had an LRO caption?

The explanation is that, although the picture is of SDO, the LRO caption refers to an article inside the View. It was suggested that to most people all spacecraft look alike. Judging by the number of phone calls that I have received, I would say that at GSFC most people can tell the difference between spacecrafts.

Is SDO ready to launch?

Not quite yet! Although SDO is fully integrated, the hardware must successfully complete a rigorous environmental test program that simulates the violence of a launch event and life in the harsh extremes of space. SDO is undergoing this test program right now!

Are these real questions or did you just make them up so that you could sound smart?

Really? I sound smart? Thanks.

Liz Citrin/SDO Project Manger/Code 464

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The team agreed that while the failure was likely confined to the low-voltage power supply, a direct repair of that subsystem would require too much of the astronauts' spacewalking time. It would also run the risk of not fixing everything that was damaged. Instead, the team devised an ingenious "bypass" solution: Astronauts will remove the four boards that drive the Wide Field Channel detectors by going into a small panel outside of the instrument. They will then replace these boards with a new device that performs the same function but takes power from an externally mounted box attached to ACS's existing main power supply.

The only way to supply external power to the boards is by removing and replacing them entirely. The team realized that replacing the boards individually is too time consuming, so they devised a cartridge that holds all four boards, allowing them to be mated with a single action.

While formulating the bypass solution, engineers realized that the wires that power the old Wide Field Channel electronics are also connected to the High Resolution Channel electronics. By applying power to these wires, the High Resolution Channel electronics could be powered without direct astronaut manipulation. The Wide Field and High Resolution channels, along with the still-operable Solar Blind Channel, will provide a full functioning Side 1.

As in the STIS task, astronauts will use the "capture plate" to hold screws—in this case, 32—that come from the access panel. And again, astronauts will replace the old panel with one that has two lever-like latches to hold it in place. One side benefit of the ACS repair is lower power usage. Whereas the WFC detector electronics previously consumed 21 Watts, the newly repaired WFC will use approximately 9 Watts. If the repair goes as planned, the noise level of the detectors could also be reduced.

Preparations for this task continue. The development program went very well and all technical issues have been resolved. High fidelity engineering units are now running and meeting all the requirements and goals established for that hardware. Fabrication of the flight hardware has begun, as has assembly of the cards for Flight Units 1 and 2. The replacement Low Voltage Power Supply (LVPS-R) has completed final qualification testing and is now at Goddard.

"There are only three words that can best describe the efforts of the ACS Repair Team," explained Cepollina. "Blood, sweat, and tears. To do what they've done—and they're almost there now, they're almost home, ready for the final flight acceptance test program—but in order to do it they've had to overcome heartache after heartache after heartache in terms of failures, problems, issues, schedule challenges, only to be invigorated after each of those kinds of things by successes."

Batteries

Spacewalking astronauts will replace all six of Hubble's original 125-pound nickel hydrogen batteries, which provide electrical power to Hubble during its nighttime to support the telescope's functions. Now 18 years into the mission, Hubble's nickel hydrogen batteries have lasted more than 13 years longer than their design orbital life—longer than those in any other low Earth orbit spacecraft. This was possible partly because the batteries are built to very exacting standards using an

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extremely robust design.

Another reason for the batteries' longevity is the careful, daily, on-orbit management by Electrical Power System engineers at Goddard to ensure long-term on-orbit performance. However, due to aging and cycling, the batteries are showing a slow loss in capacity**.** If not replaced, they will eventually be unable to support Hubble's science mission during the orbit night.
The replacement batteries are also nickel hydrogen, but they are superior to the old ones in several ways. The new batteries are made using a process called wet slurry, which makes them physically stronger and better performing than the dry sinter batteries they replace. Each new battery also has the added safety feature of a battery isolation switch that electrically dead faces each connector. "Dead face" means no electrical power is present at the connectors while the switch is in the "off" position. This creates a safer environment for astronauts installing the battery modules.

The flight batteries are at Goddard and have already undergone performance testing, as well as pre-launch testing and verification. The batteries meet specifications and are in great shape.

Gyroscopes

Hubble's six gyroscopes are packaged in pairs within three Rate Sensor Units (RSUs). They are part of the system that allows it to point at stars, planets, and other celestial targets. All of the current gyros were installed in December 1999, and all are approaching the end of their limited lifetimes. The telescope was originally designed to use three at a time, with the other three held as spares.

After thorough analysis and testing, engineers determined that Hubble could conduct science on two gyros. With new control modes added to Hubble's main computer, and major changes made to Hubble's planning and scheduling system, two-gyro operations began in 2005. Currently, three gyros are still operational. Two gyros are in use, and the third is turned off and is being held in reserve. Astronauts will install a fresh set of six new gyros during Servicing Mission 4 to keep the telescope in peak condition through 2013.

The team has completed all testing on the three flight RSUs and one flight spare, and all are ready to fly. One interesting tidbit is that RSU 1004 has always been considered the "hangar queen"—it has flown as a spare on SM1, SM3A and SM4, but it has never been installed. Now, because the team has rebuilt it and it has new flex leads in it, we will install the hangar queen.

Fine Guidance Sensor (FGS)

Along with the gyroscopes, the FGSs are part of Hubble's pointing control system. The FGSs and gyroscopes together produce extraordinary stability—0.007 arcseconds of "jitter"—which is like holding a laser beam on a dime 350 miles away. The FGSs also provide capability for astrometry, the detailed study of stellar dynamics and motions, enabling the detection of close binary stars and star-planet systems.

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(HST Continued from page 15)

Over the past servicing missions, astronauts have been replacing Hubble's three FGSs with refurbished units one at a time in "round robin" fashion. A refurbished unit returned from the 1999 mission will replace FGS 2 on SM4. Only two units are needed to point Hubble; the third FGS provides additional target pointing efficiency and redundancy.

The Hubble Team has completed all testing, and the FGS is ready to fly.

Soft Capture Rendezvous System

To prepare for the end of Hubble's life, engineers developed the Soft Capture and Rendezvous System, which will enable the future rendezvous, capture, and safe disposal of the telescope. The Soft Capture and Rendezvous System is comprised of the Soft Capture Mechanism (SCM) system and the Relative Navigation Sensor (RNS) system.

The SCM is a ring-like device that attaches to Hubble's aft bulkhead. It provides a Low Impact Docking System (LIDS) interface and associated relative navigation targets for future rendezvous, capture, and docking operations. The SCM will launch attached to the turntable-like Flight Support System (FSS), which serves as the berthing platform for Hubble and provides all electrical interfaces between the Shuttle and the telescope while Hubble is docked. About 72 inches in diameter and 2 feet high, the SCM will sit inside the FSS berthing and positioning ring without affecting the normal FSS-to-Hubble interfaces. It will be fitted onto the telescope by three sets of jaws, which will be controlled by the astronauts.

The RNS system consists of optical and navigation sensors, as well as supporting avionics and processors. It will collect data on Hubble during capture and deployment. This information will be used for developing the navigation systems of the spacecraft that will de-orbit Hubble when the telescope reaches the end of its useful life.

All of the preliminary tests for the SCM engineering unit hardware went well. The flight unit has been delivered and has been integrated onto the FSS.

IMAX Camera

The IMAX community approached NASA with a desire to fly a camera on SM4. IMAX cameras have been used on previous Hubble missions. Now, the IMAX people are making a new movie about Hubble servicing and currently targeting 2010 for release. It will use the footage from the previous missions along with new footage shot during this mission. The IMAX folks are also working with the Space Telescope Science Institute to make certain Hubble images are three dimensional, to give the effect of flying through the Universe. They're planning to do specific observations with Hubble for the purpose of creating images to be used in the IMAX movie.
The IMAX camera is going to fly on the ORUC carrier and look up at Hubble. This unique perspective has never been shot before. This time, there will be no IMAX hand-held camera inside the crew cabin, as in previous missions. The only IMAX camera will be the one on ORUC, and it will carry three lenses for versatility. "Our crew will be the producers on orbit when it comes time

(HST Continued on page 17)

(HST Continued from page 16)

to take the pictures," explained Michael Kienlen, Deputy Project Manager for the Hubble Space Telescope Development Project.

Carriers

The **Flight Support System (FSS)** completed its system level thermal vacuum test and carrier-level EMI test, and will soon undergo acoustics testing. Although the FSS has flown on every Hubble mission, Kienlen explained, "FSS is a new carrier for SM4. A lot of effort went into to getting the FSS ready for this flight. We have new or rebuilt motors, a completely recertified electrical system, and all the mechanisms have been taken apart and rebuilt."

The **Orbital Replacement Unit Carrier (ORUC**) will hold COS and an IMAX camera, which will document the mission for a future film on Hubble. The ORUC is in the process of electrical integration, and the majority of its components mechanically integrated. Because of the late addition of the IMAX camera, some significant structural changes had to be made to the carrier, and that engineering is complete. The hardware to hold the IMAX camera is at Goddard and testing is complete. No major tests are left except for supporting the acoustics test for COS, and possibly a stand-alone acoustics test for ORUC.

The **Super Lightweight Interchangeable Carrier** (**SLIC**) will contain the WFC3 and Hubble's new batteries. SLIC is the first all-composite carrier ever to fly in the Manned Space Flight Program. All structural testing is complete, and electromagnetic interference (EMI) and acoustics tests will be conducted soon.

The **Multi-Use Logistic Equipment Carrier** (**MULE**), which will hold contingency hardware, is undergoing thermal vacuum testing in May to validate the carrier and the RNS hardware. Afterwards, the team will conduct EMI testing on this carrier.

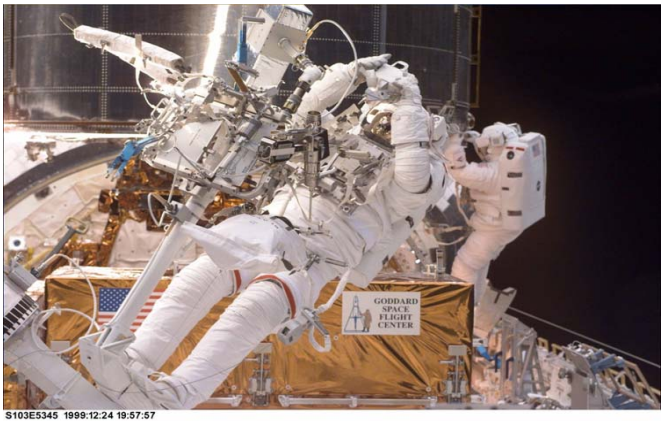
Crew Aids and Tools

The Hubble Team is flying significantly more crew aids and tools for this mission than ever before. More than 60 Hubble engineers are working on tool development right now. Every servicing mission continues to advance the technology, developing more complex tools that enable the astronauts to accomplish increasingly more difficult tasks. The ACS and STIS repairs are prime examples.

Two specialized tools developed for this mission are the Mini Power Tool and the Fastener Capture Plates. The Mini Power Tool is a small, high speed, low torque power driver that astronauts will use on all of the fasteners described in the ACS and STIS repair tasks. The tool's low torque is an advantage, because higher torque risks breaking a fastener. The high speed is also essential. "Speed is very crucial for getting the STIS task in the box in the time frame that we're allocated, explains EVA Tool Engineer Justin Cassidy. "So, in this case faster is better."

(HST Continued on page 18)

(HST Continued from page 17)



Astronauts will perform the fifth and final visit to Hubble

The Fastener Capture Plates, which will also be used for the STIS and ACS repair tasks, are transparent plates that capture the many, tiny fasteners as they are removed from the instruments' covers. These ingenious plates will prevent the fasteners from floating away, and they will also preclude the need for astronauts to handle very small fasteners with bulky EVA gloves.

At the Apex

The improvements of SM4 will add about five extra years of science to Hubble's mission. They will also provide a full toolkit of cutting edge research tools to astronomers around the world. "Personally, I think that's where the more exciting results will come from after the servicing mission," explained Leckrone. "What will 'blow us all away', I predict, will be the unexpected discoveries that come from the completely new ideas that astronomers will have about how to use this wonderful set of cutting-edge tools. After SM4 our instrument "toolbox" will be complete for the first time since 1993."

"That just demonstrates the role and the value of having astronaut servicing of a spacecraft like this, that we can keep it fresh and up-to-date and basically it becomes a new observatory each time it's serviced," Leckrone added. "At the end of Servicing Mission 4, when the astronauts leave Hubble for the last time, we have a very good prospect that Hubble will be at the apex of its capabilities. It will be better than it's ever been before, which is quite awesome when you realize that it will be over eighteen years old as an observatory," Leckrone said.

"Servicing Mission 4 marks the apex of not only the scientific capabilities of Hubble, but the apex of the capabilities of NASA," added Burch. "In addition to making enormous gains in our understanding of the universe we live in, we have learned a lot in the areas of technology development, engineering, and management. The long duration of the Hubble mission, and its symbiotic relationship to the human spaceflight program, has taught us much about how to build better spaceflight systems and components, how to best utilize human capabilities in space, and how to work together with multiple NASA Centers and with industry and academia."

"Today, those of us who have been privileged to work on this great mission are standing on the shoulders of the giants who preceded us, who envisioned the Hubble mission and built this program over several decades," concluded Burch. If you would like to read more on HST click on the link. http://www.nasa.gov/mission_pages/hubble/servicing/SM4/main/index.html

Ann Jenkins/SGT 442
Hubble Space Telescope Development Project

Astronauts Make Virtual Connection With Students

Astronauts flying on a space shuttle mission to service the Hubble Space Telescope for a final time spoke to middle school students across America simultaneously at 1:15 p.m. EDT, April 30, from NASA's Goddard Space Flight Center in Greenbelt, Md.

Through NASA's Digital Learning Network (DLN), students at five middle schools and an invited student audience at Goddard talked to the shuttle crew. Topics of discussion included details about the upcoming STS-125 mission to service Hubble. Astronauts also discussed career diversity among the crew. Each has a doctorate degree in a science, technology, engineering and mathematics discipline.

The goal of the DLN is to enhance NASA's capability to deliver unique content by linking students and educators with NASA experts. The DLN offers videoconferencing or Webcasting at no charge, providing interactive educational experiences to students and teachers from kindergarten to college across the country and around the world.

Schools selected to participate were Junior High School 145 Arturo Toscanini, Bronx, New York; Brenham Junior High School, Brenham, Texas; and South Puget Intertribal Planning Agency, Shelton, Washington. Two NASA Explorer Schools, Greencastle-Antrim Middle School, Greencastle, Pennsylvania, and Middle School at Parkside, Jackson, Michigan, also participated.

For more information about the Hubble Space Telescope, visit: http://www.nasa.gov/hubble.

Goddard Drivers

As a recent survivor of a driver paying little attention to me while crossing a Goddard street within the appropriate walk lane, it might be prudent to address another issue pertaining to driving on the Center.

NASA Procedural Requirements (NPR) 8715.3C, effective March 12, 2008 speaks to mandatory operational safety at Goddard Space Flight Center (GSFC). Under the section titled Motor Vehicle Safety, it states that operators of motor vehicles on NASA property or operating a NASA vehicle both on and off NASA property shall:

Not use hand-held communication devices while the vehicle is in motion except for emergency, security, and fire vehicles during official operations.

Note: This includes cell phones, UHF radios, or other hand-held wireless communication devices. When there are two individuals traveling in an emergency, security, or fire vehicle during official operations, the passenger should be the person to use the hand-held communication device.

For more information you can contact your Directorate Records Manager. In code 400 call Linny Dyson on 6-7003.

(MLK Continued from page 21)

Centennial High School Choir

tional ballad that shows that the struggle to be free exists in the hearts of all humankind.

Later, as George Morrow was interviewed for this article, he said that as the planning for the event progressed throughout the summer, he would talk about it at the dinner table at home with his children. Son, Matthew, age 14 is in the 9th grade and daughter, Ashley (then 16) is in the 11th grade at Centennial High School in Howard County. They asked to come in that day to see the activity. They were impressed with the efforts taken by so many Goddard employees to make such a day so memorable and surprised to see that we can plan events that seem far reaching from space science and flight project activities. All were impressed afterward as the Equal Opportunity Program Office staffers hosted tables of various ethnic foods for all to sample and enjoy. Afterward, George Morrow received many kind e-mails from employees all over the Center saying what a wonderful day it was and how Goddard employees—from every job category were able to relate to the program and become inspired by Dr. King's legacy.

Gail Regan/403

Did you Know.....

...that Iranians ring in their New Year at the precise moment of the astronomical vernal equinox (start of spring in northern hemisphere), which was on March 20th this year at ~1:48 AM EDT. On the Iranian calendar, this began the year 1387. The Persian New Year is called Norooz, which roughly translates to "New Day". Norooz has been celebrated for at least 3000 years and is deeply rooted in the rituals and traditions of the Zoroastrian religion. On New Year's Day, family members don new clothes and start twelve-days of celebrations by visiting their family elders, then the rest of their family and finally their friends.
In anticipation of the exact moment of the vernal equinox, family members gather around a table decorated with seven items starting with the letter S, or seen ((س in the Persian alphabet. This is called the Haft Seen and each item carries special meaning. Among the items are sabzeh, which is grass grown from wheat, barley or lentils, that symbolizes rebirth; decorated eggs, which symbolize fertility; a bowl of water with goldfish, symbolizing life within life, as well as the sign of Pisces which the sun is leaving; a bowl of water with an orange in it, symbolizing the earth floating in space; and a holy book (e.g., the Qur'an, Avesta, Bible, Torah, or Kitáb-i-Aqdas,) and/or a poetry book (almost always the Shahnameh or the Divan of Hafez). After the countdown to the New Year, family member exchange kisses and gifts.

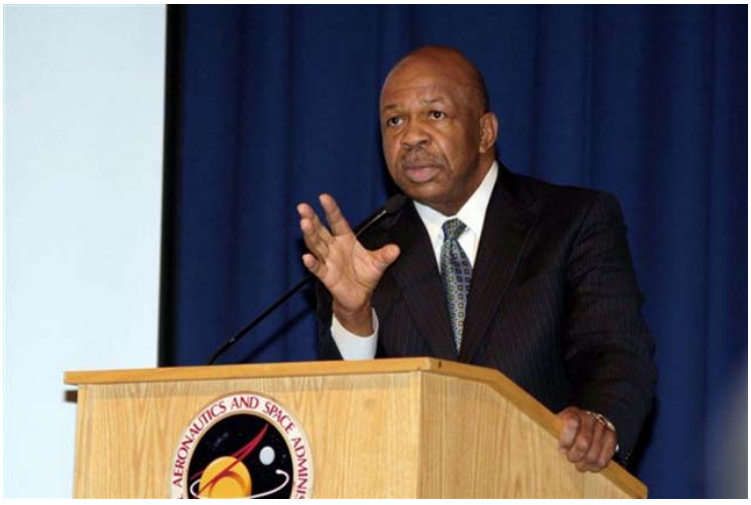
MLK Jr. Celebration a "Home Run" at Goddard

In April 2007, George Morrow, Director of Flight Projects, was asked to be the first Senior Champion for the 2008 Dr. Martin Luther King, Jr. celebration at Goddard Space Flight Center.

George Morrow - Director Of Code 400

A Planning Committee was formed consisting of: George Morrow, Senior Champion, Tonjua Hines-Watts/586, Chairperson, Merle Robbins/120, Recording Secretary, Theresa Stevens/210, Dennis Small/583, Anetra,Tucker/130, Monica Price/210, Sharon Wong/100, Dee Kerr/140, Julia Knight/403, Lori Moore/115, Aprille Ericsson/556, Antionette Wells/130 and Deanna Trask/100.

Maryland Congressman Elijah E. Cummings (D-MD) was available to come to Goddard and gave a very moving keynote address. The Kenmoor Middle School Concert Choir, the Parkdale High School Color Guard and our own Ms. Angela Conley, Code 410 (ServiSource) were also a part of the program. Ms. Theresa Stevens was the Mistress of Ceremonies. George Morrow introduced the "Reflections on Martin Luther King, Jr." video that contained video clips and remembrances from various Goddard employees. Morrow said "Dr. King was indeed a great American, whose work and sacrifice contributed so much to improve the social direction of our country and, in fact, to the enlightenment of the entire world." "Each time I revisit Dr. King's thoughts, dreams, and overall legacy, I find myself reinvigorated with the energy to push forward to accomplish the work left before us," Morrow said to the full house and overflow crowd outside the Building 8 auditorum.



Congressman Elijah Cummings

The message imparted by Rep. Cummings was one of diversity and that our children are our living messages that we send to a future we will never see. He is committed to ensuring that our next generation has access to quality healthcare and education, clean air and water, and a strong economy. Rep. Cummings closed the speech with the theme of country music star, Garth Brooks "We Shall Be Free," a touching and inspira-

(Continued on page 20)

NASA PM CHALLENGE 2008

NASA PM Challenge 2008, the agency's 5th project management conference, was held February 26-27th in Daytona Beach, Florida, near the Kennedy Space Center. "Reach Higher" was this year's conference theme.

Nearly 1,200 NASA stakeholders participated in PM Challenge 2008. Goddard Space Flight Center was well represented with speakers, panelists, and attendees including Rick Obenschain, Acting Center Director; George Morrow, Director, Code 400 Flight Projects; Phil Sabelhaus, Associate Director and JWST Program Manager; and Nick Chrissotimos, Associate Director Heliophysics Projects and LWS, STP & Explorers Program Manager. Many Goddard employees also assisted as Session Coordinators and Track Managers.

Plan ahead for PM Challenge 2009!

February 24-25, 2009
Daytona Beach, Florida

For more information visit website at http://pmchallenge.gsfc.nasa.gov

Comings & Goings

Comings:

Warren Connley detailed to 464/SDO Project Office

Joe Burt to 460/Heliophysics Projects Division, Deputy Program Manager-Technical

Lisa Callahan to 401/Advanced Concepts & Formulation Office, Study Manager

Darlene Fennell to 461/MMS Project Office, Sr. Resource Analyst

Goings:

Dave Baden to 703/Business Management Officer

Tim Gehringer to 101/Proposal Development Manager

Felicia Harrison to 153.1/Program Analyst

Ron Mahmot transferred to NOAA

Sharla Rice-Moore to 130/Public Affairs, Sr. Resource Analyst

Rosalie Avant to 200/Directorate Secretary

John Baniszewski Retires from 458/ECANS Project, Deputy Project Manager-Resources

Doug Campbell Resigns from 401/Advanced Concepts & Formulation Office, Instrument Manager

John Gainsborough Retires from 428/ESMO Project Manager

Jim Mentall Retires from 480/POES Project

Teresa Rishell to 201/Sr. Resource Analyst

Deanna Adamczyk to 603/Resource Analyst

The Goddard Honor Awards Ceremony was held on December 11, 2007. Noted below are awards to Code 400

EXCEPTIONAL ACHIEVEMENT AWARD (INDIVIDUAL)

Greg Waldo/Code 441/LMTO
For your outstanding contribution to the development, testing, and on-orbit implementation of software taper charge as a battery life extension initiative for the Hubble Space Telescope.

EXCEPTIONAL ACHIEVEMENT AWARD (TEAM)

Goddard Robotic Explorers for Avionics Testing (GREAT) Project Team/Code 400
For your outstanding engineering of a remotely-controlled, Autonomous Robotic Vehicle for Testing Flight Avionics, by a team of College and Goddard engineers.

THEMIS Mission Team/Code 410
In recognition of your significant contribution to the THEMIS mission success in producing a world-class science multi-probe mission that exemplifies your commitment and professionalism.

Earth Science Mission Operations Instrument Support Toolkit Re-engineering Team/Code 428
For your exceptional achievement with designing, testing, and implementing a more secure remote user interface for Terra, Aqua, and Aura.

JWST Next Generation Integrated Network Development Team/Code 443
In recognition of the development of James Webb Space Telescope Next Generation Integrated Network.

Constellation Lunar Lander Cryogen Study Team/Code 450
In recognition of your professionalism and dedication in studying the complexities associated with the National's next generation Constellation Lunar Lander.

Low Impact Docking System (LIDS) Fabrication Team/Code 450
In recognition of your professionalism and dedication to the Exploration Initiative by rapidly fabricating critical parts for the LIDS Risk Reduction Unit.

Orion-ISS Common Communications Adapter (CCA) Proposal and Red Teams/Code 450
In recognition of your outstanding contribution to develop a complete technical proposal for building Criticality-1 flight hardware for the Constellation Orion Project in less than 30 days.

Near-Earth Networks Services Mission Integration and Operation Team/Code 452
In recognition of your outstanding efforts preparing, coordinating, and executing Network Integration for a Ground-to-Space Station Communications Link during Queen Elizabeth II's visit.

(Awards Continued on page 25)

(Awards Continued from page 24)

MetOpA Launch Team/Code 480
In recognition of your exceptional dedication, perseverance, and team effort in support of a very challenging mission.

SECRETARIAL/CLERICAL EXCELLENCE

Paula Wood/Code 450
In recognition of your professionalism and personal dedication in support of the STEREO Flight Project, Exploration and Space Communications Division, and Constellation Support Office.

OUTSTANDING LEADERSHIP

Laurie Kleppin/Code 480
In recognition of your outstanding leadership performance in managing the POES/NOAA-N spacecraft team and prime contractor.

OUTSTANDING MANAGEMENT

Al Vernacchio/Code 446
In recognition of your outstanding management and leadership support of the Gamma-ray Large Area Space Telescope.

GSFC ENGINEERING ACHIEVEMENT

Dr. Gunther Haller/Code 446/SLAC
In recognition of your outstanding leadership and engineering of the Gamma-ray Large Area Space Telescope's LAT Instrument.

Martin Nordby/Code 446/SLAC
In recognition of your outstanding leadership and engineering support in the development of the Large Area Space Telescope.

Congratulations To All The Winners

(Majerowicz Tintype Continued from page 3)

LIFE AT GODDARD: In nearly 17 years at Goddard, Walt has provided schedule management support to numerous programs and projects including the Tropical Rainfall Measuring Mission (TRMM) Project and the Polar Operational Environmental Satellites (POES) Program. He also assists other programs, projects, proposals and studies by providing scheduling and earned value management advice and support. Over the past several years, Walt has been assisting in the development and delivery of project management training courses at Goddard and throughout the agency, and helps to organize the NASA PM Challenge conference. All of these initiatives have been very rewarding experiences that have provided ways to contribute to the success of NASA's missions. When asked about his most memorable experience at Goddard, Walt remarked that it "has really been the collaborative energy of working with such a diverse group of people from different disciplines over the years. I have been fortunate to have been involved with some truly high performing teams, and our current team in Code 401 is no exception."

LIFE OUTSIDE GODDARD: Walt resides in Pasadena. He enjoys outdoor activities such as hiking, camping, and visiting places with a connection to history. A self-proclaimed "do-it-yourselfer," Walt can often be found working on home improvement projects around the house.

(Sullivan Continued from page 3)

Telescope Project, serving as Instrument Manager for the Advanced Camera for Surveys (ACS). There she worked with Ball Aerospace and the science team at Johns Hopkins on the development of ACS, and had her first opportunity to do in-house work when ACS was delivered to GSFC for environmental test. Pam supported Servicing Mission 3B where astronauts installed ACS into HST in February 2002. Since 2001, Pam has supported the James Webb Space Telescope. She has been its NIRCam Instrument Proposal Manager, NIRSpec Instrument Manager, Spacecraft Manager, and finally Integrated Science Instrument Module (ISIM) manager. She found ISIM to be a great challenge, and also great fun, due to the incredible variety of work: there is in-house development of major subsystems; one instrument being built by Lockheed and the University of Arizona; one instrument from the Canadian Space Agency; one from the European Space Agency; and one being developed by a collaboration of JPL and a consortium of European space agencies. Pam enjoyed working with, and learning from, this diverse group of organizations. She also enjoyed doing public outreach and had the opportunity to introduce hundreds of people to JWST by giving "tours" of the full-scale model when it was on display in Seattle, Dublin, and on the National Mall in DC.

Pam has recently started on the Magnetospheric MultiScale (MMS) Mission as the Deputy Project Manager. MMS is currently in Phase B and is gearing up for PDRs within the next year.

Life outside GSFC: Aside from her job, Pam's other great passion is travel. She has been to all 50 states, all 7 continents, and 58 countries. She loves learning about history through her travels and particularly enjoys visiting sites of historical significance.

Federal Interagency Holocaust Remembrance

The 15th annual Federal Holocaust Remembrance program was held on Wednesday, May 7 at the Lincoln Theatre in Washington DC. The theme for 2008 was: Rescuers.

The purpose of the program is to educate Federal employees, students, and the general public about the Holocaust, which began in 1933 when Adolph Hitler became chancellor of Nazi Germany. The Nazi regime killed approximately 11 million people, including 6 million Jews, 3.5 million Soviet prisoners, as well as Jehovah's Witnesses, Gypsies, unionists, clergymen, homosexuals, Freemasons, political opponents, non-Jewish Poles, disabled and mentally ill people. In the past, other areas of mass murder have been a major focus of the program including genocide in Rwanda and Sudan.

When the program began 15 years ago it was sponsored by five Federal agencies, today there are 23.

This years' program speakers included Joseph Ichiuji, a Japanese-American war veteran interned in Arizona, but later a part of the 100/442nd Regimental Combat Team, an army unit of Japanese Americans, the most decorated unit in U.S. military history. He was among the first of allied forces to liberate Jews from Dachau concentration camp in April, 1945.

Majlinda Muyrton an Albanian-American Muslim spoke about her father secretly taking in Jewish friends, protecting them from the Nazis for the entire war. He later was one of a group of Righteous Albanians honored by Israel many years later.

A representative from the Polish Embassy to the U.S. read a letter from Irena Sendler. Ms. Sendler, a Polish christian social worker smuggled approximately 2,500 Jewish children out of the Warsaw ghetto and placed them with Polish families, in convents, or in orphanages. Because her goal was to unite the children with their families if possible after the war, she put information about each one into glass jars which were buried in her garden. Moderator of the program was Derek McGinty, the weekday co-anchor for News Now on WUSA-TV Channel 9.

Social News

Congratulations:

Steve Horowitz (Code 422) became engaged to Michelle Adato last October. They will be married outside Frederick, Maryland on May 30, 2008. After honeymooning in Bali, Steve and Michelle will be living in Takoma Park.

Births

Mark Hubbard (Code 442) is a grandfather again (number 3)! Hampton Wilcox Hubbard was born on Monday morning, March 17, in Providence, RI, to Mark's son, Billy, and Billy's wife, Becca. He weighed in at 8 lbs - 5 oz. Hampton's sister, Bella, was excited to get a little brother! Billy and family reside in Wakefield, RI.

Congratulations to Amy DeLisa & David Hughes (Code 442), who are proud parents of Giuseppe Tobias DeLisa Hughes, born on April 2, 2008, at 9:38 am. He measured 21.75 inches long, weighed 8 pounds,10 ounces.

Best wishes to Jill (Code 442) and Guy McGuire, proud parents of their first child, Wyatt Andrew McGuire. He was born on February 5, 2008, at 5:01 pm, weighed in at 8 lbs., 5 oz., and 20.2 inches long.

NASA: Explore. Discover. Understand.
www.nasa.gov

Public Service Recognition Week

Public Service Recognition Week (PSRW) is getting ready to kick off on May 5 with more than 100 civilian and military agencies exhibiting on the National Mall in Washington D.C. The event showcases the many ways in which the Federal government makes life better for all of us.

Running through May 11,the event will feature the ability of kids of all ages to meet an astronaut, climb aboard an F-16, and take home free buttons, coloring posters, maps and puzzles. Adults can take advantage of the celebration by exploring space technology among scores of other educational opportunities. Federal employees will be on hand to answer questions about what they do and why they have chosen public service careers.

FUTURE LAUNCHES CALENDAR YEAR 2008	
TWINS-B	Launched
CINDI	Launched
GLAST	MAY/JUN
IBEX (SMEX-10)	JUL
HST SM4	OCT
LRO	OCT
GOES-O	NOV
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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If you have a story idea, news item, or letter for The Critical Path, please let us know about it. Send your note to Howard Ottenstein via Email: Howard.K.Ottenstein@nasa.gov, Mail: Code 403, or Phone: 6-8583. Don't forget to include your name and telephone number. Deadline for the next issue is July 31, 2008.