A FLIGHT PROGRAMS AND PROJECTS DIRECTORATE QUARTERLY PUBLICATION
A Newsletter Published for Code 400 Employees

INSIDE THIS ISSUE:

Aura Mission – One Year to Launch and Counting Down

The latest spacecraft in the Earth Observing System—Aura-- is slated for launch in January 2004. The countdown to launch has begun with three of the four instruments on the spacecraft and the fourth scheduled for delivery this spring.

The Aura mission, formerly called Chemistry, is designed to synergistically study atmospheric chemistry using four instruments: the Ozone Monitoring Instrument (OMI), the High Resolution Dynamics Limb Sounder (HIRDLS), the Microwave Limb Sounder (MLS) and the Tropospheric Emission Spectrometer (TES).

Aura's suite of instruments is designed to study issues related to air quality, stratospheric ozone, and climate change. For example, Aura will allow scientists to trace air pol-

(AURA Continued on page 4)

TDRS-I Recovery Effort A Success!

TDRS-I was launched on March 8, 2002, from Cape Canaveral on an Atlas IIA launch vehicle. The launch and transfer orbit injection went off without a hitch, and the Centaur did an excellent job of placing the spacecraft in the desired geosynchronous transfer orbit. After separation from the Centaur, controllers in the Mission Control Center (MCC) at Boeing in El Segundo, CA took control of the spacecraft, and began the task of raising the satellite to its final geosynchronous orbit

(TDRS-I Continued on page 8)

TDRS-J Launches Successfully

See Story on page 14

Message from the Director Of

It is with the most profound sadness and sense of loss that I write these notes. I grieve for our astronauts and heroes who flew on STS-107. Everyone in NASA and people around the country and the world mourn our loss. Our thoughts and prayers go out to the families and friends of the astronauts. We will remember them all our lives. We will honor them with everything we do in NASA in the cause of understanding and protecting our home planet, exploring the universe and searching for life, and inspiring the next generation of explorers.

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Since our last edition of the Critical Path, we have launched TDRS-J, ICESat, CHIPSat and SORCE. Congratulations to all of you who have worked on these missions over the years and brought them to orbit. Checkouts on all are proceeding well. Thanks to project managers Bob Jenkens (TDRS), Jim Watzin (ICESat), Dave Pierce (CHIPSat) and Bill Ochs (SORCE) for your leadership in seeing these missions through development and launch.

A recap of 2002 shows that we had eight successful missions: HST Servicing Mission 3B; TDRS-I and TDRS-J; Aqua; NOAA-M; GRACE; RHESSI; and Integral. We also deployed two key elements of IFMP: Travel Manager and Position Description Manager. ICESat, CHIPSat and SORCE have started off 2003 with aplomb. We have many more missions and IFMP modules in various stages of formulation and implementation. Through our technology programs that joined the Directorate this year – the Earth Science Technology Office and the Advanced Technology Office - we also have a hand in a broad array of technology initiatives that NASA is sponsoring. We have a lot to be proud of, and a lot of exciting work to look forward to.

I wish you all the best in 2003.

Dolly

Still More About Thanksgiving

In our last issue, The Critical Path staff, in wishing everyone a Happy Thanksgiving, noted that the U.S. Congress in 1941 stated that Thanksgiving be celebrated on the fourth Thursday of November of every year. We also pointed out that President Abraham Lincoln declared the first national proclamation of Thanksgiving in 1863, albeit the Pilgrims were generally given credit for celebrating the first Thanksgiving in the United States in 1621.

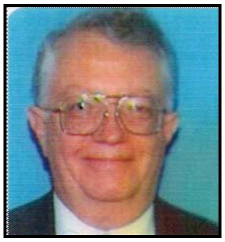
Recently articles have appeared in several newspapers quoting history Professor Michael V. Gannon, University of Florida stating that a group of Spanish explorers were the first to celebrate Thanksgiving in the New World in St. Augustine, FL on September 8, 1565. In so doing, Pedro Menendez de Aviles and 800 Spanish settlers celebrated a Mass of Thanksgiving and invited the native Seloy tribe to join them.

Who knows when the Hubble Space Telescope or a deep space probe might espy some distant lost planet where artifacts might unearth evidence of interplanetary settlers celebrating Thanksgiving for their safe landing on some unknown dot in the universe several billion years ago.

PERSONALITY TINTYPES

Jim Greaves

My best Christmas present ever was to be invited to join Code 400 by Jim Moore in December of 1998. Having to decide between a palatial office at Goddard or returning to a windowless cubicle at Headquarters was difficult, but in the end I decided to stay at Goddard.



BORN: Yes.

EDUCATION: BS in Physics from the University of Pittsburgh, and an MS in Atmospheric Physics from the University of Minnesota.

FAMILY: My wife and I are "empty nesters" living in Bethesda, Maryland. We have three children: Joan, who is a Mechanical Engineer working for the Navy in Philadelphia; Matt, who is a computer specialist working for Resources for the Future near Dupont Circle; and David, who is a CPA working for Aronson & Company.

LIFE IN 400: Serving as Associate Director in 400 has been the job of a lifetime. The Flight Programs & Projects Directorate is where it all comes together. It is difficult to imagine being in any other job where I would be surrounded by more sheer talent and integrity than I see here. I am delighted to be able to play my part in delivering successful missions to the Center and the Agency.

LIFE AT GODDARD (II): In the summer of 1996, I was caught up in the "Downsize Headquarters" and "Move Program Management to the Centers" hysteria at Headquarters. I became part of the Mission to Planet Earth Office at Goddard. It was a wonderful job! Goddard management was suspicious of us because we were viewed as usurping their powers and being an intrusion from Headquarters. Other Centers mistrusted us, believing that we were really part of Goddard and biased toward the Center. And, after we were here about 28 seconds, Headquarters began worrying that we had gone native. It was a noble, and well intended experiment, but one ultimately doomed to fail.

LIFE AT HEADQUARTERS: I enjoyed ten of my 14 years at Headquarters (before April 1992)

(Tintype Continued on page 17)

Otilia I. Rodriguez-Alvarez

Otilia joined the Geostationary Operational Environmental Satellite (GOES) Program in August 2000 as the Advance Baseline Imager (ABI) Instrument Manager. ABI is the next generation of imager instruments for the GOES-R spacecraft series. The new imager instrument will incorporate the best available technologies to meet or exceed the imaging needs foreseen in the next decade and beyond.

Born: Cuba

Education: B.S. degree in Electrical Engineering from the University of Puerto Rico; M.S. degree in Electrical Engineering from George Washington University. Otilia finished Middle School in Cuba but was not allowed (by the government of Cuba) to go to High School for political and religious reasons. After leaving Cuba, she moved to Puerto Rico. In Puerto Rico, she completed High School and went to College

Family: Otilia's parents and her sister Lourdes (also an Electrical Engineer) live in Puerto Rico. Otilia resides in Laurel.

Before GOES: After college, she accepted a position as a Test Engineer with the Space Simulation Test Engineering Section at Goddard Space Flight Center. She was the Test Engineer for the Broad Band X-Ray Telescope (BBXRT), Cosmic Background Explorer (COBE) deployable mechanisms, and spacecraft components in other missions. She transferred to the Guidance, Navigation and Control Branch as a Control Systems Analyst. As an analyst she worked on the Tropical Rainfall Measuring Mission (TRMM) and X-Ray Timing Explorer (XTE) solar array and antenna systems. After completing this assignment, she became the Technical Officer for the Earth Sensor Assembly on the Tropical Rainfall Measuring Mission (TRMM). This sensor had several technical problems and she led the efforts to solve them. Her next assignment was Lead Engineer for the Sensors and Actuators Team on the Microwave Anisotropy Probe (MAP). She was asked to take the job of Technical Officer for the Autonomous Star Tracker

(Tintype Continued on page 17)

FEEDBACK

GSFC Resident Office at KSC

- Preparations are underway for the April 29 – May 1, 2003 Space Congress to be held in Cape Canaveral and Cocoa Beach, Florida. Many Maryland companies and GSFC/ NASA will have displays at the Congress.
- Kris Nighswonger and Mary Halverstadt received dark blue TDRS-J shirts and key chains with a light from Boeing Space Systems. The shirts and chains were given as a "Thank You" for all the diligent work and coordination involved with the teams while they were processing their payload at Kennedy Space Center (KSC).
- Many new facilities are under construction at KSC and several more are planned. The new buildings will be a mix of office and shop space with each providing office space for NASA, United Space Alliance and subcontractor personnel. These new facilities will eliminate boxcars and trailers. "Security Guard Shacks" are among the many nice new facilities being built. Many of these are being placed/moved to completely different locations than previously sited thus placing the new life science building outside the secure area. In the very near future KSC security guards will check badges from these new facilities.
- FREESTAR, a GSFC payload was stowed in the midbody of the orbiter for it's ill-fated flight on STS-107 launched January 16, 2003. FREESTAR contained six experiments: MEIDEX, SOLCON-3, SOLSE-2, CVX-2, LPT, and SEM.
- Ramon Lugo III has been named Deputy Director, Expendable Launch Vehicles (ELV) and Payload Carriers. He will serve as the ELV and Payload Carriers Program strategic interface to the Space Transportation System (STS) and the International Space Station (ISS) programs. He will work with the U. S. Air Force, the National Reconnaissance Office (NRO) and other government agencies to establish beneficial partnerships, and will be a key contact for strategic contract outsourcing and industrial base issues, and for the assessment of business cases.
- Our office supported the payload ICESat (Ice, Cloud and Land Eleva-

(Aura Continued from page 1)

lution events back to local and regional sources and allow for intercontinental tracking of pollution movement.

Aura Spacecraft in Integration at Northrop Grumman Space Technologies

HIRDLS, supplied by the University of Colorado, Oxford University, and Rutherford Appleton Laboratory, will observe global distributions of temperature and several other trace species in the stratosphere and upper troposphere by observing the Earth's limb—meaning the instrument scans the horizon as opposed to looking down on the surface.

MLS, developed by JPL, will observe the limb to measure concentrations of ozone-destroying chemicals throughout the stratosphere and upper troposphere, as well as water vapor, a greenhouse gas, in the upper troposphere.

TES, also developed by JPL, will look downward upon the Earth and will also scan the Earth's limb over a broad range of wavelengths to measure key air pollution constituents.

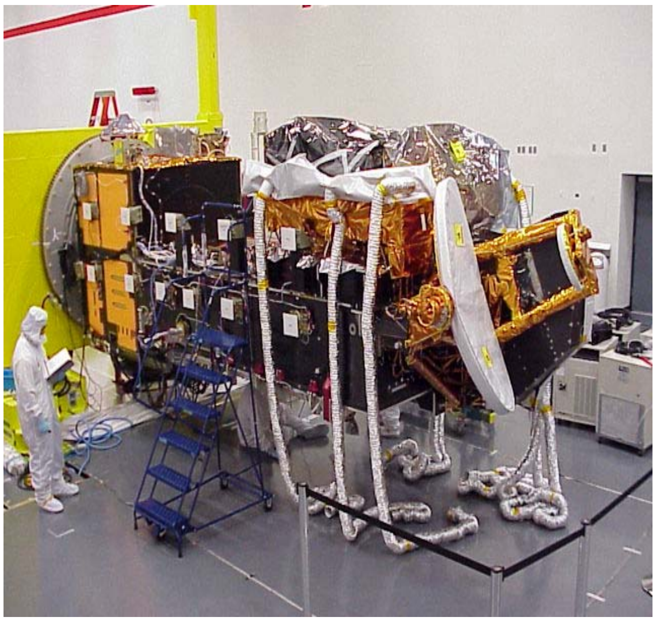
OMI, supplied by the Netherland's Agency for Aerospace Programs (NIVR) and Finnish Meteorological Institute is designed to look down through the atmosphere and measure ozone, aerosols and other pollutants in the atmosphere.

Taken together, data from the instruments on Aura will provide a rich new source of information on the horizontal and vertical distribution of key atmospheric pollutants and greenhouse gases and how these distributions evolve and change over time. Further, combining Aura data with data from other missions will reveal even more information on these and other important issues.

The troposphere is the lowest layer of the atmosphere extending from the ground to about 7 to 10 miles altitude. The stratosphere is above it extending out to about 35 miles.

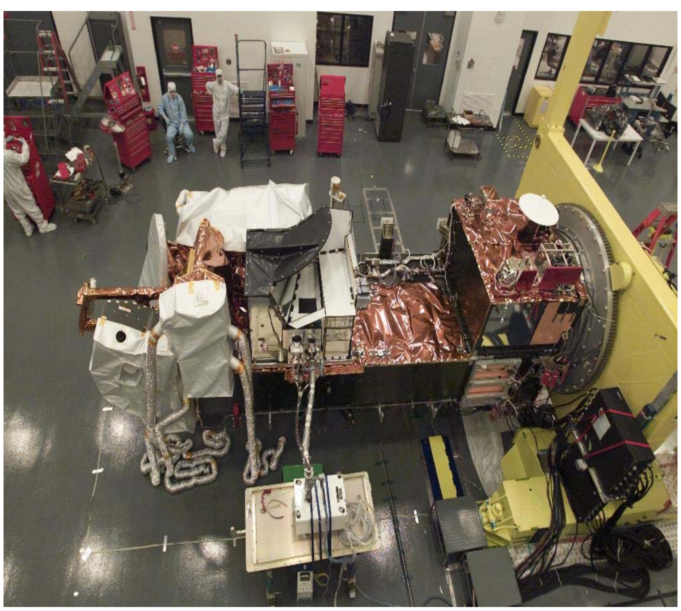
Aura will fly in essentially the same orbit as Aqua, CloudSat, CALIPSO, PARASOL, and a new mission—OCO—creating the A-Train. The Aura orbit is a 705 kilometer, sun synchronous, ascending node, 1:38 PM equatorial crossing time. It will have a 6 year mission life. Aura will be launched from Vandenberg Air Force Base on a Delta II.

The observatory is being integrated by Northrop Grumman Space Technologies (formerly TRW) in Redondo Beach, CA. Integration is going well, with three instruments, MLS, OMI, and HIRDLS



Aura, Resembling A Spider, During Integration

integrated on the spacecraft. TES is slated for delivery later this year.



Anther View Of The Aura Integration Process

"Integration and test is the most exciting, frustrating, and rewarding part of mission development," said Rick Pickering, the Aura Project Manager. "It's exciting because finally the pieces come together and you start to see the goal you've been working for. It's frustrating because there are nagging problems which must be solved and which invariably are not easy to solve, so they represent a time constrained challenge. And it's rewarding because the end goal is in sight and you know you're building something that will provide valuable insights into our world."

The ground system for Aura will be the same one that Terra, Aqua, Landsat-7 and several other satellites use. The ground system, flight operations, and data processing and storage are managed by the ESDIS and ESMO Projects.

The pace of operations readiness is accelerating with the year 2003 to be filled with comprehensive performance, mission, spacecraft interface, and network tests as well as training for the flight operations and flight support teams.

Meanwhile the science team is readying its algorithms and programs needed for science data processing, and planning the validation campaigns which will start after the spacecraft is operational.

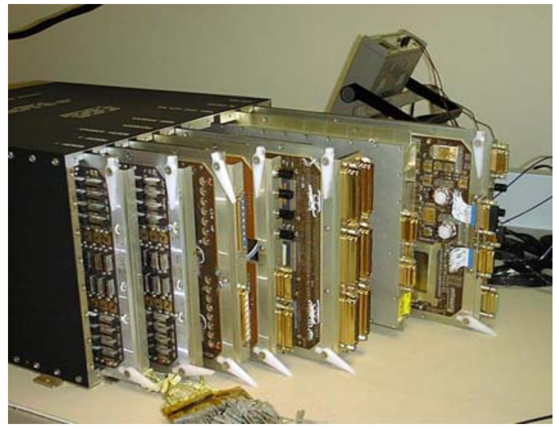
Mark Fontaine/424
Deputy Project Manager/Resources

Technology Corner

EO-1 SOLID STATE RECORDER BREAKING NEW TECHNOLOGY FRONTIERS

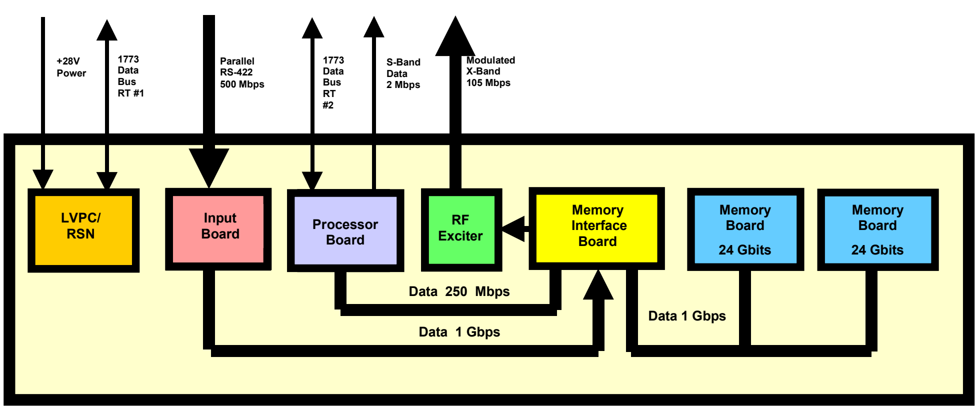
As spacecraft instruments generate data at ever increasing rates, space systems must find ways to handle that data, and transmit it to the ground stations. This challenge is especially evident on earth-imaging spacecraft employing multispectral and hyperspectral detectors. The LANDSAT 7 instrument data rate is 150 Mbps. The EO-1 instrument data rate is over 500 Mbps. The next generation LANDSAT is expected to have even higher instrument data rates.

EO-1 is a stepping-stone to the next generation LANDSAT mission. A key goal of EO-1 is to pioneer and flight-prove technologies that will make that mission feasible. One of those technologies is the Wideband Advanced Recorder and Processor (WARP). The WARP is essentially a very high rate solid-state recorder. It is computer-based and provides science data acquisition, processing, storage, and transmission functions. It has been successfully recording and playing back science data since EO-1's launch in November 2000.



The WARP

One of the capabilities that sets the WARP apart from other solid state recorders is its ability to post-process the data that it has recorded. While the WARP launched with this hardware capability, the software necessary to operate a processing algorithm had to wait until now due to cost and schedule constraints during the WARP's development. Among the processing algorithms that were considered for implementation were data compression, thumbnail imaging, and cloud cover detection. Cloud cover detection was selected and funded in mid-2002. It is expected to be operational by mid-2003. Presently, over 50% of the scenes taken on EO-1 are cloud obscured, and hence unusable. This results in operational inefficiency and increased mission expense. The cloud cover detection effort consists of two steps. The first step is to upload the cloud cover detection software into the WARP, and run it on selected images. The selected images will then be downlinked and the results of the cloud cover detection algorithm will be compared with the actual inspection of the image to determine the viability of the algorithm. If this step is successful, then the mission could save money by not processing cloud-covered scenes on the ground. The second step is to upload software that would give EO-1 the ability to delete cloud covered scenes from the WARP, and then take alternate scenes thus increasing the yield of cloud-free scenes. The goal is to take cloud cover detection to Technology Readiness Level 7 in preparation for the next LANDSAT mission.



Terry Smith, EO-1 WARP Technical Manager, Flight Data Systems and Radiation Effects Branch, Code 561

Integrated Design Capability (IDC)

The NASA Integrated Design Capability (IDC) is a collaborative, concurrent engineering environment that produces design concepts and related analyses for space missions and remote-sensing instrumentation. The IDC success is built on the people, process, tools, and facility paradigm as depicted in Figure 1.

Skilled Goddard engineers work with Investigator Teams (e.g., scientists, proposal/project managers, engineers, etc.) in the IDC's collaborative environment to produce detailed space mission designs, remote sensing instrument designs, and/or technology assessments. The IDC services include end-to-end and focused studies, independent peer reviews, as well as technology and risk assessments. The IDC activities are primarily carried out in one of two closely related rapid design centers, located at the Goddard Space Flight Center (GSFC), and provides mission and remote instrumentation engineering analysis and design products to the science and engineering communities via the Integrated Mission Design Center (IMDC) and/or the Instrument Synthesis & Analysis Laboratory (ISAL). The IDC capabilities include end-to-end and focused studies, independent peer reviews, as well as technology and risk assessments.

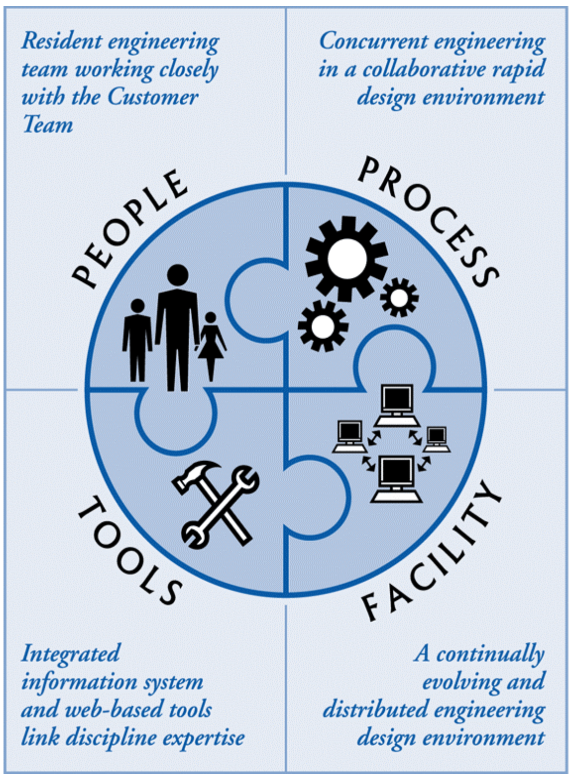


Figure 1. IDC Paradigm

Both design centers tailor a study session to fit an investigator's specific requirements. IDC services are primarily focused on support of teams in pre-formulation or formulation; however, the IDC has also provided valuable services to teams in early implementation.

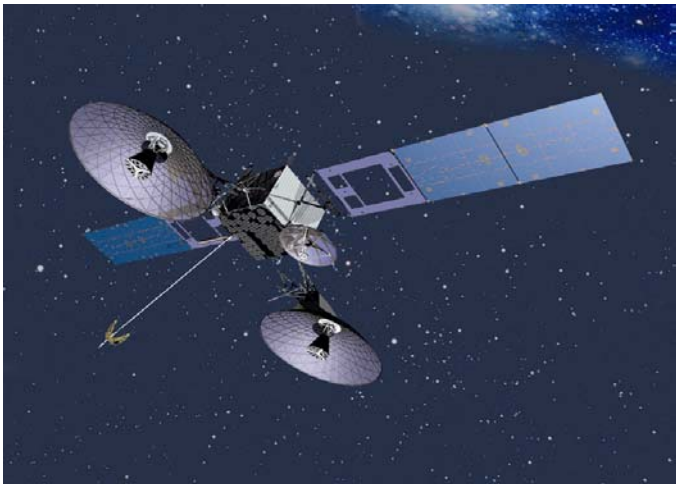
IDC support can range from one day brainstorming sessions to extended design sessions. IMDC end-to-end mission design sessions typically require one week, while ISAL instrument end-to-end design studies are typically two weeks in duration. Design team personnel work with the Investigator Team prior to a design session to understand the mission goals and objectives, the science driving requirements, the instrumentation, mission configuration, architecture, as well as the goals of the design session. During the execution phase of the IDC study, the Investigator is a key member of the IDC collaborative process. This partnership engages the Investigator in the design process and provides him/her the opportunity to influence and refine the study objectives and trade decisions throughout the design process. This process enables the IDC to make the best decisions in real time and has been proven to result in a superior product to meet the Investigator's needs.

IDC products include mission and/or instrument design concepts (e.g., overall baseline architecture(s) with mass/power/data rate/cost rack ups, mechanical drawings, access to space recommendations, data transport

(IDC Continued on page 17)

(TDRS-I Continued from page 1)

using the integral 110 lb. Liquid Apogee Motor (LAM). The first three burns of the planned ten-day transfer orbit were successfully completed on March 10, 11, and 12.



TDRS-I reaches geosynchronous orbit on 9/30/02 following a challenging seven-month planning and recovery effort led by Boeing Satellite Systems. This heroic effort was accomplished by a joint Boeing/NASA TDRS-I mis-

After the third burn, engineers reviewing the fuel tank pressures noticed an unexpected signature on Fuel Tank #2. Dynamics data substantiated the belief that a serious problem existed. A test was devised to evaluate the situation, and it confirmed that Fuel Tank #2 was not being properly pressurized. The problem was isolated to a faulty squib valve controlling Fuel Tank #2 pressurization. Since the bulk of the fuel contained in the two fuel tanks was required to raise the orbit (typically, about 16 percent of the fuel would have remained after final orbit was reached), the success of the mission hinged on being able to use the fuel in the second tank. The oxidizer for the bipropellant propulsion system is contained in two additional tanks, which were operating correctly.

Boeing quickly assembled a team of senior attitude control system and propulsion system engineers, and challenged them to come up with a solution that could salvage the mission. This crash effort was Boeing's highest priority, and for several weeks the conference rooms in the MCC and the propulsion department were packed with Boeing's most experienced engineers.

As with any design exercise, several potential solutions were devised and analyzed in detail, with the approach promising the highest probability of success selected for implementation. The chosen course consisted of a never-before-attempted scheme of performing LAM burns from Fuel Tank #1 until it was emptied, and then transferring Helium gas (pressurant) through the emptied tank and into the fuel outlet of the Propellant Management Device (PMD) in Fuel Tank #2. From there, the gas had to be coaxed into the bulk space of the tank in order to provide gas-free fuel at the outlet during LAM burns and Attitude Control System (ACS) firings.

Sounds simple. Far from it! From a fluid dynamics standpoint, the PMD was designed to effectively gather the fuel in the bulk space of the tank during both the spinning transfer orbit phase and also during the three-axis (on-station/Zero-G) phase, and to deliver it to the outlet to meet the demand of the firing thrusters. In fact, the PMDs were designed to prevent gas from passing through and reaching the thrusters. For the old-timers on the Project, this challenge was reminiscent of the one faced in recovery of TDRS-1, when it had been put in an off-nominal transfer orbit with failed thrusters. That recovered mission is now approaching 20 years of successful Space Network service.

To move from concept to the detailed design necessary to effect the recovery, the team conducted numerous sessions over many weeks to hammer out a precise series of burns to first deplete the fuel in Fuel Tank #1, and then to begin the tedious process of transferring the gas to Fuel Tank #2. As described earlier, it was not as easy as simply throwing a switch to open a line and "filling'er up." Once the team thought they had a workable propulsion system solution, other dynamics problems had to be tackled. For instance, engineers had to deal with the offset to the spacecraft center of mass that was created by having one tank completely empty and the second nearly full of fuel. Dynamics experts had to perform simulations to ensure the spacecraft could be controlled during the orbit raising burns. The answer was to fire the LAM in a pulsed mode instead of a normal continuous burn, while simultaneously firing a 5-pounds-force axial thruster to counteract the overturning torque caused by the shift in the center of gravity.

The actual transfer of the gas to the second tank involved a complex series of burns, repressurizations from the Fuel Tank #1, vents, and fuel line priming. One phase involved changing the spacecraft from the nominal 5 rpm spinning transfer orbit configuration, to a near 3-axis stabilized mode. All of these cycles and phases were necessary to nudge the gas from the PMD into the bulk space of Fuel Tank #2 in order to have gas pressure to push the fuel out to the thrusters. Later in the process, the spacecraft had to be changed back to a spinning phase. Each phase required its own analyses, simulations, design reviews, and mission operations team rehearsals prior to the actual execution of the special procedures developed.

The team's efforts were rewarded when the spacecraft was successfully placed in a geosysnchronous orbit with the final LAM burn on September 30, 2002. Additional gas and liquid transfers were necessary to get the propulsion system in the proper configuration for its fifteen-year service life. The spacecraft was then de-spun for deployment of the Single-Access antenna booms, the Space-Ground Link Antenna that points at the White Sands Complex, and the Forward Omni antenna. After these deployments were completed, the spacecraft was switched from inertial mode, to sun hold mode, and then to normal mode pointing at Earth. Handover from the MCC, which had been using Ground Network and Deep Space Network stations, to the White Sands Complex was accomplished on October 15. This began the approximately two-month on-orbit test program to demonstrate spacecraft health and performance prior to government acceptance and integration into the operational Space Network as TDRS-9. This test program was completed on January 3rd, 2003.

While Boeing engineers and operations personnel were responsible for the recovery (including the necessary analysis, design work, procedure generation, and operations during the recovery mission), the TDRS Project and other Goddard organizations played a significant part in the effort. The NASA team—consisting of TDRS Project members, Applied Engineering and Technology Directorate staff, Aerospace Corporation employees, and project support contractors from Swales—provided technical advice and independent review of the Boeing designs. They also were present in the MCC for all of the many recovery mission maneuvers over the course of the seven-month effort. Space Network personnel also were part of the operations team, and worked side-by-side with Boeing to schedule the Ground Network and Deep Space Network assets in the very dynamic environment that was required to support the mission. In addition, the Flight Dynamics Facility supported the recovery by providing backup orbit determination products.

The TDRS-I recovery required a phenomenal effort and great commitment from everyone involved, resulting in an incredible engineering success story.

By Jeff Gramling/GSFC Code 454

For additional information about the TDRS-I recovery effort, please contact the author via email (Jeffrey.J.Gramling.1@gsfc.nasa.gov).

Awards

The 2001-2002 NASA Honor Awards Ceremony was held on December 4, 2002. Noted below are awards to Code 400.

PUBLIC SERVICE GROUP ACHIEVEMENT AWARD

Tropical Rainfall Measuring Mission (TRMM) Boost Team from Japan

In recognition of your outstanding leadership and technical contributions toward the successful boost of the Tropical Rainfall Measuring Mission (TRMM) Satellite.

GROUP ACHIEVEMENT AWARD

Earth Observer-1 (EO-1) Formation Flying Team

In recognition of your outstanding dedication and engineering innovation in the demonstration of autonomous spacecraft formation flying for the EO-1.

Earth Science Data and Information System (ESDIS) Project

In recognition of your commitment, skill, and dedication in overcoming many difficult obstacles while producing a world-class system that will play a key role in improving our understanding of planet Earth.

Earth Science Data and Information System (ESDIS) Project – Project Information Management System Development Team

In recognition of your contributions to the implementation and continuous improvement of the Earth Science Data and Information System (ESDIS) Project Information Management System.

Geostationary Operational Environmental Satellite (GOES) Project

In recognition of your contribution to the Geostationary Operational Environmental Satellites (GOES) I-M series of new and improved geostationary weather satellites.

Hubble Space Telescope (HST) Flight Operations Relocation Planning and Implementation Team

In recognition of your sustained excellence in planning and implementation, leading to the successful relocation of the Hubble Space Telescope (HST) Flight Operations from GSFC to the Space Telescope Science Institute

Hubble Space Telescope (HST) Reaction Wheel Assembly 1 (RWA1) Recovery Team

In recognition of your outstanding teamwork, dedication, and personal sacrifice in determining the cause of the Hubble Space Telescope (HST) Reaction Wheel Assembly 1 (RWA1) anomaly and replacing RWA1 on Hubble Space Telescope (HST) Servicing Mission 3B (SM3B).

Microwave Anisotropy Probe (MAP) Guidance, Navigation, and Control (GN&C) Team

In recognition of your innovative design, process, and tool advances that resulted in the flawless performance of the Microwave Anisotropy Probe (MAP) Mission.

Awards

Microwave Anisotropy Probe (MAP) Team
In recognition of your outstanding teamwork, dedication, and technical skill exhibited in the development and launch of the Microwave Anisotropy Probe (MAP) mission.

PUBLIC SERVICE MEDAL

Peter M. Bay/Jackson & Tull/560/410.5
In recognition of your outstanding leadership in systems engineering advancement of NASA's Antarctica long duration balloon program.

Clay A. Deyarmin/General Dynamics/424
In recognition of your 20 years of outstanding and innovative leadership in spacecraft operations.

EXCEPTIONAL SERVICE MEDAL

Vanessa L. Griffin/423
In recognition of your sustained commitment and continuous initiative to assure availability of Earth science data to NASA researchers and the American public.

Paul J. Heffernan/533/454
In recognition of your exceptional contributions and service to the field of satellite telecommunication systems implementation and advancements.

Chris Wilkinson/441
In recognition of your outstanding contributions and leadership in managing Hubble Space Telescope (HST) mission operations.

Gary T. Davis/480
In recognition of your outstanding technical contributions and engineering management of the "in-house" build of the MAP propulsion system.

Parminder S. Ghuman/407
In recognition of your exceptional achievement in the development of high-data-rate digital processing technology for space and ground applications.

OUTSTANDING LEADERSHIP MEDAL

Elizabeth A. Citrin/492
In recognition of your outstanding leadership of the Microwave Anisotropy Probe (MAP) Project culminating in the successful MAP launch and flawless on orbit performance.

IFMP, a Perfect Match for Code 400

The Integrated Financial Management Program (IFMP) continues to grow at Goddard through Code 400's own IFM Projects Office, Code 405. Already IFMP has successfully implemented two modules under Code 405's management (Resume Management and Position Description Management), provides support to a third module (Travel Manager), and is preparing to implement two more – Core Financial and Budget Formulation – which promise to be the most challenging and rewarding yet. Like its Code 400 colleagues, the IFM Program is charged with a bold mission – to improve the financial, physical, and human resources management processes throughout NASA. To do so, it is tasked with reengineering NASA's business infrastructure and implementing enabling technologies to provide better management information for decision-making. With such a large and aggressive assignment to tackle, how is IFMP ensuring its continued success?

IFMP will continue to accomplish its critical mission for NASA by applying Code 400 best practices in program and project management to this initiative. Of the nine modules to be implemented as a part of IFMP, program and project management best practices have already been leveraged to bring in NASA STARS and Position Description Management on time and under budget. For the remaining modules, which are at varying stages of formulation and implementation on the project life cycle, the IFMP Projects Office, Code 405, will continue to set high standards for program and project success. It will be up to the Core Financial and Budget Formulation modules, the next two projects on the implementation schedule whose "go-live" dates are June and August respectively, to prove that they can meet those expectations.

According to Mark Walther, Chief of the IFM Projects Office, he is confident that they will. "We have all the right pieces in place – leadership support, pathfinder success, a proven product with SAP, strong implementation methodologies from Accenture and IBM, and seasoned management techniques and experience under Code 400." Similarly, David Baden, the Associate IFM Projects Office Chief, feels that "since the Program has the ability to dramatically benefit both the work of our Center and so many of our employees, we have the responsibility to manage it with all the best practices of the 400 Flight Programs and Projects Directorate." Clearly, Code 400 leadership believes in not only the strength of NASA's mission and charge, but in the people, processes and tools partnering to make this initiative a success.

Resume Management, commonly known as NASA STARS, changed the way Human Resources offices fulfill their recruiting and staffing responsibilities, most notably by allowing the general public to apply for NASA jobs using an online resume builder and application process.

Position Description Management has improved our Human Resources processes by allowing managers to create and/or customize position descriptions online from drop-down menus, content pick-lists, and position description libraries.

Travel Management allows for electronic approval of travel documents and online access to accounting codes and expense items for document completion.

A little more about Core Financial and Budget Formulation…

The Core Financial module alone will benefit over 1,700 Goddard employees by:

- Providing an accounting and budgeting structure to enable Full Cost Management;
- Laying the technical foundation to lead NASA and its Centers into the world of e-government;
- Facilitating the sharing of information across functions (i.e., accounting and procurement);
- Improving the timeliness of acquiring the goods and services needed to perform the mission of the Agency; and
- Enabling the 'One NASA' concept by providing an integrated and consolidated information source to facilitate data sharing across the Agency.

Additionally, Code 400, especially those involved in managing projects or developing Program Operating Plans

(IFMP Continued on page 16)

“Cultural Tidbits”

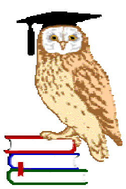
Did you know…

How does the word familia connote more to a Latin American than the U.S. sense of the word family? In Latin America, in addition to meaning people who share a biological bond, the word familia is commonly used for relationships where there is comraderie such as within work teams or amongst artists. Salsa singers often use familia in their songs when referring to their fans and other salsa singers.

Do you have a cultural tidbit to share? Send it to the Code 400 Diversity Council c/o Andrea Razzaghi @ andrea.i.razzaghi@nasa.gov and we'll publish it in a future issue.

Andrea Razzaghi, Code 424

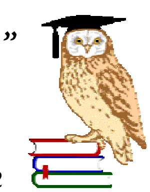
Quotes of the Quarter



“`Let chaos storm! Let cloud shapes swarm!”
— Robert Frost —

“Old trees are like old people. They have character.”
— David Stahle —

“It is time for us all to stand and cheer for the doer, the achiever, the one who recognizes the challenge and does something about it.”
— Vince Lombardi —



“A strong workforce comes from having the right people with the right skills in the right place at the right time. Only then will government operate in an effective, efficient, and economic manner.”
— Senator Daniel K. Akaka —

TDRS-J Launches Successfully

NASA's Tracking and Data Relay Satellite-J (TDRS-J) was successfully launched on December 4th, 2002. The TDRS-J satellite lifted off on schedule at 9:42 p.m. EST from Cape Canaveral Air Force Station, Fla. aboard an Atlas IIA Expendable Launch Vehicle. A half-hour after launch, TDRS-J separated from the Centaur upper stage to begin its geosynchronous transfer orbit.

"We're very pleased with this evenings' launch," said Bob Jenkens, TDRS Project Manager. "Controllers have made contact with TDRS-J as the satellite passed over NASA's ground station in Canberra, Australia and all seems well. My congratulations to everyone who helped make this launch a success."

Lift-off of the Tracking and Data Relay Satellite-J from Cape Canaveral Air Force Station

Preliminary evaluation of the telemetry showed that all primary systems were operating properly. Approximately three hours after launch, the unfurling of the spacecraft's 15-foot diameter antenna reflectors occurred as planned.

Over a two-week period following the launch, Boeing controllers completed a series of orbit raising maneuvers with the satellite's Liquid Apogee Motor. This boosted TDRS-J into a geosynchronous orbit, 22,300 miles above the Earth's equator. After the completion of orbit-raising maneuvers, all appendages of the spacecraft were successfully deployed and TDRS-J was moved into an on-station Earth-pointing configuration at its testing location of 150° West longitude.

Hand-over of control and operations of the spacecraft from the Boeing Mission Control Center to NASA's White Sands Complex occurred on December 18, 2002, which marked the beginning of the on-orbit testing of the spacecraft. Bus on-orbit testing was completed as planned. The payload activation and calibration phase of the on-orbit testing began in January 2003.

The launch of the TDRS-J satellite not only marked the launch of the last satellite of the TDRS H, I, J series, but it also was the final launch of the Atlas IIA series of rockets built by Lockheed Martin. Thus ended the Atlas IIA's 10-year history of flawless launches.

TDRS –J is the third in a series of enhanced satellites built by Boeing Satellite Systems of El Segundo, California that will provide researchers with data and images from several NASA missions.

"This state-of-the art communications system will support NASA's overall mission by helping us better understand and protect our home planet, explore the universe, search for life, and inspire the

The Atlas II A rocket with TDRS-J aboard awaits launch on its last flight.

next generation of explorers," said Bob Jenkens.

The enormous amount of scientific data, flowing through the TDRS fleet, benefits people everywhere. TDRS supports several NASA Earth and space science missions, such as the Hubble Space Telescope, which helps scientists explore the birth and death of stars, Landsat-7, which helps farmers and urban planners wisely use the Earth's valuable natural resources, and the Tropical Rainfall Measuring Mission, which provides scientists with accurate rainfall measurement maps.

The TDRS system consists of in-orbit telecommunications satellites stationed at geosynchronous altitude and associated ground stations located at White Sands New Mexico. The TDRS satellites receives voice, television and data transmissions from orbiting Space Shuttles, the International Space Station and other satellites and relays the information to Earth. The satellites also allow ground teams to send signals to their spacecraft via TDRS.

Lyle E. Tiffany, Code 454
Deputy Project Manager for Resources

(IFMP Continued from page 12)

(POPs), will reap significant benefits through the upcoming implementation of the IFM Budget Formulation system. Enhancing the way Goddard does business, this system will:

- Establish standard and efficient processes to provide budget data for management analysis and reporting;
- Support the formulation of components of a full cost budget; and
- Provide an integrated and consolidated budget information source to facilitate the sharing of data.

To learn more about how NASA is revolutionizing the way it does business, visit Goddard's website at http://ifmpinfo.gsfc.nasa.gov/.

NASA has identified the following core business drivers for IFMP:

1. **Provide timely, consistent, and reliable information for management decisions** -- This involves getting the right information to the right people, at the right level - enabling them to make timely, informed decisions, and eliminating reconciliation to ensure that the financial and program decision data are the same.
2. **Improve NASA's accountability and enable full cost management**--By providing the ability to understand cost drivers, to relate cost to value by using full cost management and by enhancing the Agency's ability to manage institutional capabilities, the IFM System will enhance NASA's ability to provide business support to the mission.
3. **Achieve efficiencies and operate effectively**—Through the improved efficiencies of NASA's business processes, the Agency's accomplishments and products will be safer, less costly, and greatly improved.
4. **Exchange information with customers and stakeholders**—By enabling the free flow of consistent, complete, and reliable information both internally and externally, NASA will be able to communicate the cost effectiveness of its actions and achieve the highest level of data integrity and information.
5. **Attract and retain a world class workforce**—Through state of the art systems, NASA will improve its ability to compete in commercial markets for a highly motivated and skilled workforce. Simultaneously, it will minimize employee frustration by allowing us to focus on value-added functions and work in cross-functional teams.

Critical to the success of IFM, implementation teams are reaching out to NASA employees as various business modules are developed and implemented across the Centers. Attendance at Goddard's recent IFM Expo, pictured above, indicates strong employee interest in NASA's business transformation.

IFMP Change Management Team/405

(TinTypes Jim Greaves Continued from page 3)

serving in various capacities including Program Manager for the POES & GOES weather satellites, Program Manger for the Advanced Communications Technology Satellite (ACTS) at Glenn Research Center, and as Branch Head for the Earth Observing System (EOS) missions. All in all, Headquarters was a good experience in that it provided a better perspective on the Agency as a whole, as well as insight into the workings (and "personalities") of other NASA Centers. I would highly recommend a tour of duty at Headquarters as a learning experience.

LIFE AT GODDARD (I): My first tour of duty at Goddard from 1971 to 1982, was spent mostly on the science side of the house beginning with overseeing the early marine resources Landsat investigations, becoming Project Manager for NASA's role in the Global Atmospheric Research Program, and finally being used as a "problem solver" to pull out of the fire activities perceived to be in trouble by Goddard management.

BEFORE THAT, EVEN: Before Goddard, I worked at a small private company called Allied Research Associates which developed some of the photogrammetric and mathematical attitude determination models for the early weather satellites. I also had the opportunity to work on some of the first attempts to measure sea surface temperature and cloud climatology from operational and research (Nimbus) satellites. I would have to say that one of my neatest jobs was at Woods Hole Oceanographic Institute in the very early days of satellite meteorology and oceanography. Neat, primarily because my desk was up against an open-able window facing out toward Martha's Vineyard where I could watch the ferry boats and research vessels come and go. I've never quite topped that office-wise.

OTHER INTERESTS: My wife and I enjoy traveling, checking out new restaurants, going to "high tea" on a winter afternoon, good books, and musical concerts in general.

(TinTypes Otillia Rodrigues-Alvarez Continued from page 3)

for MAP when this project was having serious technical and schedule problems. She also served as the GSFC lead for the Autonomous Star Tracker projects for EO-1, IMAGE and TIMED.

<u>FPPD:</u> She joined Code 415 after STACC was dissolved and some of the Instrument Managers were transferred to Code 400. She is currently in Code 400's Project Management Development Emprise (PMDE) Program.

<u>Hobbies:</u> Otilia's hobbies include reading, sewing and world traveling. Her next vacation is planned for the spring of 2003, to Australia. Other interesting places visited include Egypt, Turkey, several Mayan ruins in Mexico, Honduras and Guatemala, and riding a mule to the bottom of the Grand Canyon.

(IDC Continued from page 7)

options, mission operations approach, engineering analysis, documented trades, technology needs, issues and risks, etc.) as well as the supporting analysis, engineering models, CAD files, grass roots and parametric cost estimations.

The IDC paradigm has resulted in the successful execution of over 150 IMDC studies since 1997 and over 40 ISAL studies since 1999. Approximately 40% of IDC studies have been in support of Goddard's directed missions, 40% in support of competed proposals, and the remaining 20% in various other support areas. While primarily supporting a Goddard customer base, more or less equally apportioned across Earth and Space Sciences, the IDC also provides services to the other NASA Centers, JPL, other federal agencies, and academia.

IDC facilities are in continuous evolution as new capabilities, tools, technologies, processes, and products are evaluated for infusion into the labs and existing ones are refined to maintain and improve the level and quality of IDC services.

To obtain additional information on the IDC or to discuss the scheduling of an IDC study, please contact Ms. Ellen Herring, the IDC Operations Manager, at 301-286-7393, via email at Ellen.L.Herring@nasa.gov, or visit the IDC web page at http://idc.gsfc.nasa.gov/.

Kind Words

Modesty prevents us from printing some of the accolades received by the The Critical Path recently from Goddard retirees.. But not too modest to mention the names of those saying the very nice words. The list includes: Margie Townsend, Art Fuchs, Tom Ryan, Herb Fivehouse (who just

ICESAT/CHIPS SATELLITES UP AND AWAY

NASA's Ice, Cloud and Land Elevation satellite (ICESat) and Cosmic Hot Interstellar Spectrometer (CHIPS) satellite lifted off from Vandenberg Air Force Base, Calif at 7:45 p.m. EST aboard Boeing's Delta II rocket. Separation of the ICESat spacecraft occurred 64 minutes after launch at 8:49 p.m. EST. Initial contact with ICESat was made 75 minutes after launch at 9 p.m. EST as the spacecraft passed over the Svalbard Ground Station in Norway. The CHIPS spacecraft separated from the launch vehicle 83 minutes after launch at 9:08 p.m. EST.

Photo of ICESAT/Chips rocket launch

"The Delta vehicle gave us a great ride! The ICESat spacecraft was right where we expected and is performing great. The whole team is thrilled to be having such a wonderful start to our mission" said Jim Watzin, the ICESat Project Manager at Goddard.

ICESat is the latest in a series of Earth Observing System spacecraft, following the Terra satellite launched in December 1999, and the Aqua satellite launched in May of last year. The primary role of ICESat is to quantify ice sheet growth or retreat and to thereby answer questions concerning many related aspects of the Earth's climate system, including global climate change and changes in sea level.

Goddard manages the Earth Observing System Program for NASA's Earth Science Enterprise in Washington, D.C. More information about the ICESat mission is available at: http://ICESat.nasa.gov

CHIPS will study the gas and dust in space, which are believed to be the basic building blocks of stars and planets. The CHIPS satellite, the first NASA University-Class Explorer (UNEX) mission, weighs 131 pounds (60 kilograms) and is the size of a large suitcase. It will orbit above the Earth at about 350 miles (590 kilometers) altitude and is expected to operate for one year.

CHIPS is sponsored by the Office of Space Science, NASA Headquarters, Washington, D.C. The project is managed at the Wallops Flight Facility and Goddard through the NASA Explorers Program. The CHIPS instrument was built at the Space Science Laboratory of the University of California, Berkeley, and SpaceDev, Inc. of Poway, Calif., built the spacecraft bus.

For detailed information about CHIPS and its mission, go to: http://chips.ssl.berkeley.edu http://www.gsfc.nasa.gov/topstory/2002/1217chips.html

Launch Update

The Solar Radiation and Climate Experiment (SORCE) was successfully launched from a Pegasus rocket at 1:14 pm on January 25 and is now in its planned orbit. SORCE will provide state-of-the-art measurements of incoming x-ray, ultraviolet, visible, near-infared, and total solar radiation. The measurements provided by SORCE specifically address long-term climate change, natural variability and enhanced climate prediction, and atmospheric ozone and UV-B radiation. These measurements are critical to studies of the Sun, it's effect on our Earth system, and its influence on mankind. More on SORCE in the next issue of The Critical Path.

Best Looking Pet In The Universe Contest

The judges have met and made their decision in selecting first, second, and third place winners from the eleven applications submitted for their review. Winning pet owners will receive gift certificates in the amount of $10, $7, and $5 for their pets.

First Place Winner

Curt Schroeder's (423) young Jax with his first frisbee.

Second Place Winner

Bill Anselm (425) - a double handful of puppy love.

Third Place Winner

This is Honey Regan. My Yankee Doodle Poodle. Owned and loved by Gail Regan and family Code 403

Congratulations to the winners and to all those and their pets who submitted pictures. Those who were not winners this year are encouraged to try again during our next contest some time in 2004.

FUTURE LAUNCHES CALENDAR YEAR 2003	
GALEX	MAR
CINDI	OCT
SWIFT	DEC
TWINS A	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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Howard K. Ottenstein,
Editor

Nancy L. White,
Production Assistant

Paula L. Wood,
Editorial Assistant

If you have a story idea, news item, or letter for The Critical Path, please let us know about it. Send your note to Howard Ottenstein via Email: hottenst@pop400.nasa.gov, Mail: Code 403, or Phone: 6-8583. Don't forget to include your name and telephone number. Deadline for the next issue is April 30, 2003.