National Aeronautics and Space Administration
NASA Marshall Star: March 27, 2008: Vol. 48/No. 26

MARSHALL STAR

Serving the Marshall Space Flight Center Community

March 27, 2008

Space shuttle Endeavour undocks from station March 24

Framed by components of the International Space Station, a full moon is visible in this view above Earth's horizon and airglow. The image was taken during the STS-123 mission while the space shuttle Endeavour was docked with the space station.

From combined reports

Space shuttle Endeavour undocked from the International Space Station on March 24, and at the Marshall Star press deadline was scheduled to land at Kennedy Space Center, Fla., the evening of March 26. The crew of Endeavour successfully delivered the first segment of the Japan Aerospace Exploration Agency's Kibo laboratory and the Canadian Space Agency's two-armed robotic system, known as Dextre, to the International Space Station. The flight also brought a new crew member to the station and is returning an astronaut who has spent nearly seven weeks on board the complex.

The STS-123 mission began with a March 11 launch from the Kennedy Center, Fla.

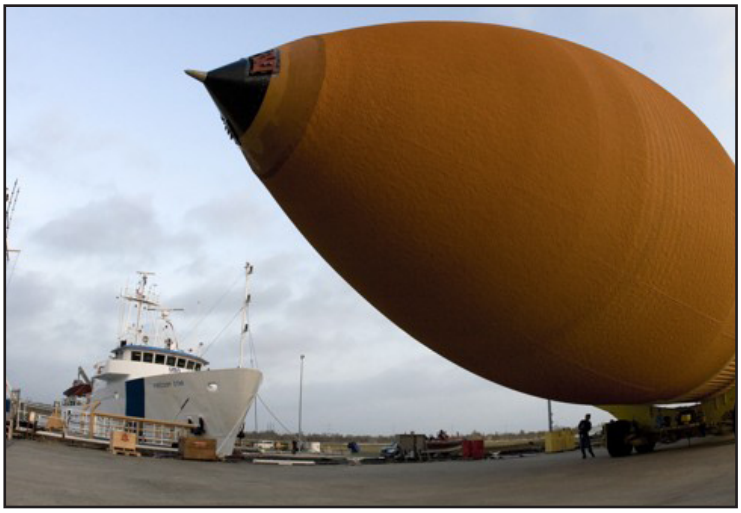
Endeavour's mission to the space station included a record five spacewalks. The shuttle's seven astronauts worked with the three-member space station crew and ground teams around the world to install the first section of the Kibo laboratory and Dextre.

The mission continued the space station's assembly. The Japanese Experiment Logistics Module-Pressurized Section held experiment

See Landing on page 8

'New' external tank will fly on Space Shuttle Discovery's STS-124 mission

Space shuttle external tank ET-128 – the first tank to fly with improvements made while building the tank rather than modified after production – shipped by covered barge from NASA's Michoud Assembly Facility in New Orleans on March 20 to NASA's Kennedy Space Center, Fla. It was expected to arrive March 26. It will fly with Discovery on the STS-124 mission, scheduled to launch in May. Since Return-to-Flight, NASA has continued to evaluate and improve the external tank's performance for each shuttle mission.



Lockheed Martin

Celebrating NASA's 50 years of accomplishments

Saturn rocket work began 50 years ago in Huntsville

By Mike Wright

As NASA approaches its 50th anniversary, attention will return once again to the important role the Marshall Center had in the Saturn V program that launched Americans to the lunar surface in 1969.

The size and power of the three-stage Saturn V alone has been the subject of countless stories from the 1960s and the Apollo era. Standing more than 360 feet tall, the first stage alone provided 7.5 million pounds of thrust at liftoff.

With so much attention focused on the Saturn V, it is sometimes easy to forget that the Saturn V was not the only Saturn rocket. It was one of a family of three Saturns.

In fact, the initial work on the Saturn family of rockets began in 1958, the same year NASA was created.

Ten months after they provided the Jupiter-C rocket to launch Explorer I on Jan. 31, 1958, an Army team in Huntsville began developing a high-performance rocket for advanced space missions. Tentatively called Juno V and finally designated Saturn, the rocket work was turned over to NASA in late 1959 and eventually to the Marshall Center, which was created in 1960.

Saturn V S-IC stage at Dynamic Test Stand at Marshall

This Saturn I vehicle and its follow-on, the Saturn IB, served as test-bed rockets for the larger and more powerful Saturn V that would eventually carry the first humans to the moon. Along the way toward developing the Saturn V, the Marshall Center also used the Saturn I for two early scientific efforts. One was called "Project Highwater." The second was called "Pegasus."

The initial firing of two Saturn I first stage engines occurred March 28, 1960, only a few days after President Dwight D. Eisenhower officially directed that the NASA facilities in Huntsville would be known as the George C. Marshall Space Flight Center. After the center's activation July 1, the Marshall Center assumed responsibility for Saturn. On Oct. 27, 1961, the first Saturn vehicle flew a flawless 215-mile ballistic trajectory from Cape Canaveral, Fla. The 162-foot-tall rocket weighed 925,000 pounds and employed a dummy second stage.

The primary objective of the second Saturn flight April 25, 1962, was to gather engineering data for future Saturn flights. However, the mission also included "Project Highwater." This experiment released nearly 30,000 gallons of ballast water in the upper atmosphere. Release of this vast quantity of water in a near-space environment marked the first purely scientific large-scale experiment concerned with the space environment. The water was released at an altitude of 65 miles where, within only 5 seconds, it expanded into a massive ice cloud 4.6 miles in diameter that continued to climb to a height of 90 miles.

Eight more Saturn I vehicles were scheduled to fly. Following another Saturn I launch Sept. 18, 1964, the Marshall Center declared the Saturn I operational, noting that the vehicle had placed 39,000 pounds of payload into orbit.

The eighth Saturn I flight Feb. 16, 1965, placed a Pegasus I satellite into orbit. "The Pegasus satellite will 'sweep' space, detecting and reporting collisions with meteoroids," wrote one observer. "The information will give scientists a better indication of the distribution, size and velocity of such particles near Earth."

A ninth flight of the Saturn I on May 25, 1965, successfully relied on both stages built by private industry and managed by the Marshall Center. That mission also marked the first night launch of a Saturn and the launch of a Pegasus II satellite. The final flight of the Saturn I on July 30, 1965, climaxed what Marshall officials described as "a program that started the U.S. on the road to the moon with 10 straight successes." The Saturn I launch vehicle provided NASA with significant new payload lifting capabilities.

However, the Saturn IB vehicle, the second member of the Saturn family, had even more power, enough for orbital missions with Apollo spacecraft. The Saturn IB vehicle was a two-stage rocket. The first stage was called the "S-IB" and was based on a redesigned first stage for the Saturn I. The second stage was called the "S-IVB." It was based on the third stage of the mightiest Saturn vehicle of all, the Saturn V. The first Saturn IB vehicle was launched Feb. 26, 1966. The next four were launched July 5 and Aug. 25, 1966, and Jan. 22, and Oct. 11, 1968.

Work on the Saturn V at Marshall occurred concurrently with much of the work on the Saturn I and Saturn IB. Dr. Wernher von Braun, the first director of the Marshall Center, and other Marshall leaders referred to the development of Saturn as "a building block approach."

Wright is the Marshall Center historian.

Saturn, the giant

Editors Note:

Only a few years before his death in 1977, Dr. von Braun provided his own description of Marshall's involvement in the Saturn program. The following accounts of Saturn were among those he published in 1975 in a NASA history book entitled "Apollo Expeditions to the Moon."

By Wernher von Braun

With the beep-beep-beep of Sputnik on Oct. 4, 1957, the Soviet Union had inaugurated the Space Age. It had also presented American planners with the painful realization that there was no launch vehicle in the U.S. stable capable of orbiting anything approaching Sputnik's weight.

Responding to a proposal submitted by the Army Ballistic Missile Agency, the Department of Defense was in just the right mood to authorize ABMA to develop a 1,500,000-pound-thrust booster. That unprecedented thrust was to be generated by clustering eight S-3D Rocketdyne engines used in the Jupiter and Thor missiles. The tankage for the kerosene and liquid oxygen was also to be clustered to make best use of tools and fixtures available from the Redstone and Jupiter programs. The program was named "Saturn" simply because Saturn was the next outer planet after Jupiter in the solar system.

Gen. John B. Medaris, commander of ABMA and my boss, felt that for a good design job on the booster it was necessary for us also to study suitable upper stages for the Saturn. On Nov. 18, 1959, Saturn was transferred to the new National Aeronautics and Space Administration. NASA promptly appointed a committee to settle the upper-stage selection for Saturn. It was chaired by Dr. Abe Silverstein who, as associate director of NASA's Lewis Center in Cleveland, had spent years exploring liquid hydrogen as a rocket fuel. As a result of this work the Air Force had let a contract with Pratt & Whitney for the development of a small 15,000-pound-thrust liquid hydrogen/liquid oxygen engine, two of which were to power a new "Centaur" top stage for the Air Force's Atlas. Abe was on solid ground when he succeeded in persuading his committee to swallow its scruples about the risks of the new fuel and go to high-power liquid hydrogen for the upper stage of Saturn.

In the wake of Yuri Gagarin's — the first Soviet cosmonaut — first orbital flight on April 12, 1961, Saturn gained increased importance. Nevertheless, when the first static test of the booster with all eight engines was about to begin, at least one skeptical witness predicted a tragic ending of "Cluster's last stand." Doubts about the feasibility of clustering eight highly complex engines had indeed motivated funding for two new engine developments. One was in essence an uprating and simplification effort on the S-3D, and it led to the 188,000-pound-thrust H-1 engine. The other aimed at a very powerful new engine called F-1, which was to produce a full 1.5-million-pound thrust in a single barrel. Both contracts went to Rocketdyne.

Wernher von Braun with the Apollo 11 Saturn V launch vehicle

Following up on the recommendation of the Silverstein committee, NASA awarded a contract to the Douglas Aircraft Company for the development of a second stage for Saturn that became known as S-IV. It was to be powered by six Centaur engines. On Sept. 8, 1960, President Eisenhower came to Huntsville to dedicate the new Center, named after Gen. George C. Marshall. It was to become the focal point for NASA's new large launch vehicles, and I was appointed as its first director.

Choosing the Saturn builders

By Wernher von Braun

How many prime contractors, we wondered, should NASA bring in for the development of the Saturn V? Just one, or one per stage? How about the Instrument Unit that was to house the rocket's inertial-guidance system, its digital computer, and an assortment of radio command and telemetry functions? Who would do the overall systems engineering and monitor the intricate interface between the huge rocket and the complex propellant-loading and launching facilities at Cape Canaveral? Where would the various stages be static-tested?

Understandably, the entire aerospace industry was attracted by both the financial value and the technological challenge of Saturn V. To give the entire plum to a single contractor would have left all others unhappy. More important, Saturn V needed the very best engineering and management talent the industry could muster. By

See 50th anniversary on page 4

Continued from page 3

breaking up the parcel into several pieces, more top people could be brought to bear on the program.

The Boeing Company was the successful bidder on the first stage; North American Aviation won the second stage; and Douglas Aircraft fell heir to the Saturn V's third stage. Systems engineering, and overall responsibility for the Saturn V development was assigned to the Marshall Space Flight Center. The inertial-guidance system had emerged from a Marshall in-house development, and as it had to be located close to other elements of the big rocket's central nervous system, it was only logical to develop the Instrument Unit to house this electronic gear as a Marshall in-house project. IU flight units were subsequently produced by IBM, which had developed the launch-vehicle computer.

Uniquely tight procurement procedures introduced by NASA Administrator Jim Webb made it possible to acquire billions of dollars' worth of exotic hardware and facilities without overrunning initial cost estimates and without the slightest hint of procurement irregularity. Before it could issue a request for bids, the contracting NASA Center had to prepare a detailed procurement plan that required the Administrator's personal approval, and that could not be changed thereafter. It had to include a point-scoring system in which evaluation criteria — technical merits, cost, skill availability, prior experience, etc. — were given specific weighting factors. Business and technical criteria were evaluated by separate teams not permitted to know the other's rankings. The total matrix was then assembled by a Source Evaluation Board that gave a complete presentation of all bids and their scoring results to the three top men in the agency, who themselves chose the winner. There was simply no room for arbitrariness or irregularity in such a system.

The tremendous increase in contracts needed for the Saturn V program required a reorganization of the Marshall Space Flight Center. Most of our resources had been spent in-house, and our contracts had either been let to support contractors or to producers of our developed products. Now 90 percent of our budget was spent in industry, much of it on complicated assignments, which included design, manufacture, and testing. So on Sept. 1, 1963, I announced that Marshall would henceforth consist of two major elements, one to be called Research and Development Operations, the other Industrial Operations. Most of my old R&D associates then became a sort of architect's staff keeping an eye on the integrity of the structure called Saturn V, and the other group funded and supervised the industrial contractors.

That same year Dr. George Mueller had taken over as NASA's Associate Administrator for Manned Space Flight. He brought with him Air Force Maj. Gen. Samuel Phillips, who had served as program manager for Minuteman, and now became Apollo Program Director at NASA Headquarters. Both men successfully shaped the three NASA Centers involved in the lunar-landing program into a team. I was particularly fortunate in that Sam Phillips persuaded his old friend and associate Col. (later Maj. Gen.) Edwin O'Connor to assume the directorship of Marshall's Industrial Operations.

On Sept. 7, 1961, NASA had taken over the Michoud Ordnance plant at New Orleans. The cavernous plant — 46 acres under one roof — was assigned to Chrysler and Boeing to set up production for the first stages of Saturn I and Saturn V. In Oct. 1961, an area of 13,350 acres in Hancock County, Miss., was acquired. Huge test stands were erected there for the static testing of Saturn V's first and second stages.

Shipment of the oversize stages between Huntsville, Michoud, the Mississippi Test Facility, the two California contractors, and the Kennedy Space Center in Florida required barges and seagoing ships. Soon Marshall found itself running a small fleet that included the barges Palaemon, Orion, and Promise. For shipments through the Panama Canal we used the USNS Point Barrow and the SS Steel Executive. For rapid transport we had two converted Stratocruisers at our disposal with the descriptive names "Pregnant Guppy" and "Super Guppy." Their bulbous bodies could accommodate cargo up to the size of an S-IVB stage.

A completed Saturn I launch vehicle

A little extra luggage on board the space station

During the fifth spacewalk of STS-123, astronauts Bob Behnken and Mike Foreman stowed some luggage on the outside of the International Space Station. However, these were not ordinary suitcases. The Materials on International Space Station Experiment 6, or MISSE-6 is the latest in a series of experiments that have tested hundreds of different materials in the harsh space environment.

Photo courtesy

Astronaut Robert Behnken tows one of the MISSE-6 suitcases to its attach point on the Columbus module.

Data gathered from the five previous MISSE experiments has already contributed to the International Space Station Program, the Constellation Program and several defense programs. MISSE-6 builds on that previous experience, with newer materials but re-using the same suitcase-like containers.

"With the one-year exposure of MISSE-3 and -4 and the four-year exposure of MISSE-1 and -2, we have much more confidence in the thermal control materials used on the space station and also more confidence in our ground simulations," said Miria Finckenor, a Marshall Center engineer, and one of the MISSE investigators. "For MISSE-6, we focused more on future needs, like the heatshield and radiation shielding materials and the aluminum-lithium alloy that will be used in the Orion spacecraft. We also are continuing to monitor the space environment as the sun's activity for this solar cycle increases."

MISSE-6 is a combination of active and passive experiments, drawing power from the station and sending data to the ground. The MISSE program is managed by NASA's Langley Research Center in Hampton, Va., with investigators from Marshall and other government agencies and corporations.

MISSE-6 will remain attached to the outside of the International Space Station for about one year before returning to Earth.

Hang up wireless waste through April

Marshall asked to take part in cell phone recycle campaign

The "Wipe Out Wireless Waste" campaign is under way at Redstone Arsenal, and Marshall employees are encouraged to recycle their old cell phones through April for a good cause.

The project was started by Keep America Beautiful, a national, volunteer-based community action and education organization working to improve the environment. The goal of the campaign is to keep wireless phones out of landfills and generate proceeds for community improvement and revitalization projects.

The City of Huntsville Operation Green Team, a city-funded organization that promotes environmental consciousness, is sponsoring the event at Redstone. All campaign proceeds will go to the American Cancer Society's "Relay for Life," an overnight event designed to celebrate cancer survivors and raise money for cancer research and programs.

Employees can drop off their old cell phones at the following locations:

- Gates 1 and 7 on Martin Road
- Gate 3 on Redstone Road
- Gate 8 on Goss Road
- Gate 9 on Rideout Road
- Gate 10 on Patton Road

For more information, contact Bennie Jacks at 544-7848.

Obituaries

Glenn P. Barr Sr., 84, of Huntsville died March 9. He retired from the Marshall Center in 1979 as an engineer. He is survived by his wife, Mabry Miller Barr.

Orville E. Driver, 87, of Huntsville died March 8. He retired from the Marshall Center in 1987 as an engineer. He is survived by his wife, Mary Driver.

THE FACE OF MISSION SUCCESS IS:

Chris Shepherd

Team lead for the Vehicle Systems Test Assurance Team in the Quality Assurance Branch

Members of the Marshall Center team are very familiar with the saying "safety comes first." Chris Shepherd, who leads Marshall's Vehicle Systems Test Assurance Team in the Safety & Mission Assurance Directorate, is devoted to that credo, with the approach that safety often starts with quality, and strives to make sure that quality is planned into the process.

What is your education background?

I graduated from the University of Illinois at Urbana-Champaign in 1974 with a bachelor's degree in German and minor in Russian. I then attended Department of Defense Ammunition School in Savanna, Ill., and graduated in 1978 as a certified quality assurance specialist. In 2005, I graduated from the University of Phoenix with a master's degree in organizational management.

I've also obtained a certification from the American Society for Quality as a manager of Quality and Organizational Excellence in 2007.

David Higginbotham/MSFC

Chris Shepherd

What are the key responsibilities of your position?

There are two quality assurance teams that provide support to in-house manufacturing and test activities at Marshall. Together we manage and implement the center's in-house quality assurance program, and provide tailored quality assurance surveillance for the projects and other customers such as the Shuttle Propulsion Office, Ares Projects and Engineering Directorate.

We have a mix of civil service employees and contractor specialists who have subject-matter expertise and certifications in a variety of products and processes. My team provides quality assurance coverage to the East and West Test Areas; testing of components and flight hardware in Building 4619; nondestructive evaluation and welding inspection services; and Reinforced Carbon-Carbon Crack Repair mix and delivery to Kennedy Space Center, Fla., for each launch. The repair mix is used for on-orbit repair of the space shuttle's nose cone and wing leading edges. We also monitor Marshall contracts supporting test operations, and propellants, pressurants and calibration contracts here at the center.

Our responsibilities cover the center's test facilities and to varying degrees, the test articles. The test facilities have to meet codes and standards that require quality assurance inspections, so our work often involves hazard mitigation. In the case of hazardous operations, quality workmanship, proper configuration control and compliance with all procedures provides a safe and successful outcome. We work with our customers to determine their needs for development, qualification and acceptance tests. We look at hazards and risks, and work to assist the customer in mitigating risk through planning and verifying critical processes and parameters. We also use three state-of-the-art videoscopes to collect data pertaining to the internal condition of components, such as engine valves or injectors, which saves disassembly time between tests.

As a team lead, I assign personnel to various activities based on their skills, certification and experience, and I help team members plan for their training and development. As a technical lead, I work with our customer to resolve problems, or work out the best course of action in a new or unusual situation.

What services does your job provide in support of the center's mission and NASA's goal of exploration?

My team and I have been heavily involved in providing quality assurance for testing of the space shuttle external tank. We have supported numerous other shuttle development, qualification and acceptance test activities. We are also heavily involved in planning activities for the Ares rocket testing, in particular integrated vehicle ground vibration testing, main propulsion test article testing and cryostructural testing planned for the upper stage. My team also supports the methane research and development testing for possible lunar access engine applications and in-space propellant storage.

What do you hope to accomplish in your role this year?

With more than 30 years of experience in quality assurance as it applies to rocket propulsion, hazardous testing and launch operations, I hope to continue to provide guidance to my team, to other quality assurance professionals at Marshall and to our many customers. I have supported the Student Launch Initiative for several years, and I hope to continue providing guidance and inspiration to future scientists and engineers.

Away from work, how do you like to spend your personal time?

I am active in the American Society for Quality, a global non-profit organization of professionals dedicated to seeking quality technology and tools to better their work performance. As a member, I learn new ways to improve my work, and share ideas with industry peers.

I also have an application pending with the Daughters of the American Revolution, a women's organization for descendants of people who helped achieve America's independence. The members fund local scholarships, help with historic restorations and head volunteer projects in their communities.

Jessica Wallace, an ASRI employee and Marshall Star editor in the Office of Strategic Analysis & Communications, contributed to this article.

Order up!

Building 4708 cafeteria is now open for business

Emmett Given/MSFC

The cafeteria in Building 4708 on Apollo Road is now open for Marshall employees. At left, employees take a break from a busy workday to refuel their bodies with a bite to eat. Located at the west end on the first floor, the cafeteria serves a variety of entrees, salads, vegetables, desserts and beverages. The service is provided by Southern Foodservice Management Inc., based out of Birmingham, Ala.

Classified Ads

To submit a classified ad to the Marshall Star, go to Inside Marshall, to "Employee Resources," and click on "Employee Ads — Submit Ad." Ads are limited to 15 words, including contact numbers. No sales pitches. Deadline for the next issue, April 3, is 4:30 p.m. Thursday, March 27.

Miscellaneous

Four-piece oak entertainment/bookcase wall unit, $600; Two Queen Anne chairs, cherry table, $300. 931-425-0205

Weslo Cadence 78E treadmill, mat, $250. 852-9177

King semi-waveless waterbed, mirrored headboard, pedestal, dresser, mirror, two chests, nightstand, sheets, $650. 683-9232

Ten prom dresses, formals, sizes 3-6, 14, $20-$100. 722-9989

Three tires, off a Toyota, 175/70r13, $75. 878-4524

Ten-in-One game table, new in box, $45. 505-3363

Dog cage, folding metal crate, tray, $40; Little Tykes table, chairs, talking vanity, $10 each. 777-1810

KitchenAid 36-inch gas cook top, stainless steel, model KGCS166GSS, $400. 837-7732

1/2-carat diamond band, yellow gold, $225. 426-7862

Huntsville Memory Garden, Garden of Devotion, six adult spaces, $2,195 each, negotiable. 859-4002

Designer sunglasses $100 gift certificate, Eyecare Associates, $75. 698-4533

Contemporary dining room set, 72-inch glass table, six chairs, two China cabinets, $500 obo. 603-1273

Sofa, three seats, formal, curved back, cream with sage, large pillows, $150 firm. 859-9165

10-inch Jet Contractor table saw, manuals, mobile base, other items included. 828-4448

Hot tub, six-person luxury model, ozone treatment, 1 year old, half of new price. 489-8031

New Dell Inspiron 530s desktop, 17-inch flat panel monitor, wireless card, speakers, $500 firm. 656-3657

Vehicles

2006 Starcraft 20-foot pontoon boat, loaded, $15,500. 503-8000

2006 Honda CRF 230 dirt bike, four stroke, electric start, red and white, $2,600. 797-0342

2004 Jeep Liberty Columbia Edition, 4x4, khaki/slate, tow package, 95k miles, $9,000. 606-5039

2004 F-150 Supercrew Lariat, leather, heated seats, sunroof, tow package, 48k miles, $18,000. 426-1822

2003 Honda Pilot EX, black, gray cloth interior, 94k miles, $13,700. 468-3749

2004 Monte Carlo, white, $6,500; 2007 Chrysler 300, $15,995; 2003 Galant, 77k miles, $5,200. 520-2802

2002 Dodge Ram 1500 pickup truck, V8, auto transmission, 89k miles, $8,000. 244-0682

2000 BMW 528i, beige, leather, automatic, multi-CD changer, 104k miles, $13,500 obo. 922-1424

1999 Toyota 4-Runner Limited Edition, white, brown interior, sunroof, CD, A/C, $7,000. 694-1260

1999 Honda Magna motorcycle, red, many options, 9k miles, $3,900. 489-8031

1996 34-foot Rexhall Aerbus Class A wide-body motorhome, new tires, $18,000. 325-2919

1996 Chrysler van, new tires and paint, 107k miles, $3,300. 890-0799

1992 Camry LE, white, sunroof, power windows/locks, automatic, multi-disk player, 196k miles, $2,000. 651-7991

1988 Yamaha Terrapro 4-wheeler, runs, needs tune up, $600. 461-9404

Wanted

CD-R, black, for older Dell Dimension desktop computer running Windows XP. 883-2757

Houses/offices to clean, available evenings and weekends. 777-8595.

RV to rent for weekend of July 25. 539-7140

Wooden swing set, at least two swings, slide, must be in excellent condition. 288-0906

Found

Eyeglasses, Building 4200 south parking lot, March 14, contact security desk, lobby of Building 4200.

Free

Assorted ceramic molds, you move. 505-3363

Local students get sneak peek of what it's like to be a Marshall engineer

Doug Stoffer/MSFC

From left, Brent Cobb, an engineer in the Structural & Dynamics Analysis Branch of Marshall's Engineering Directorate, reviews components of an Ares I model with Jeffrey Stapler, a junior at New Hope High School in New Hope, Ala., during the Junior Achievement Job Shadow Day at the Marshall Center on Feb. 28. The event is part of a national effort to provide high school students a new perspective on their studies through hands-on learning and a one-day mentoring experience. Approximately 23 juniors and seniors from high schools in the city of Madison, Huntsville, Madison County and southern Tennessee were paired with employees from Marshall's Engineering Directorate to observe what it's like to be an engineer. Marshall's Academic Affairs Office in the Office of Human Capital and the External Relations' Speakers Bureau in the Office of Strategic Analysis & Communications coordinated the event for the center. Job Shadow Day aims to attract and inspire America's next generation of scientists, engineers and explorers.

Landing

Continued from page 1

samples, maintenance tools and other spare items. Dextre can be attached to the station's robotic arm to handle smaller components typically requiring a spacewalking astronaut. At the tip of each arm is a "hand" that consists of retractable jaws used to grip objects.

Dominic Gorie commanded the flight and was joined by Pilot Gregory H. Johnson, mission specialists Robert L. Behnken, Mike Foreman, Rick Linnehan, Garrett Reisman and Japan Aerospace Exploration Agency astronaut Takao Doi. Reisman remained aboard the space station, replacing Expedition 16 Flight Engineer Léopold Eyharts, who returned to Earth on Endeavour after living on the outpost since early February. Reisman will return on shuttle Discovery's STS-124 mission, currently targeted for launch on May 25.

STS-123 was the 122nd space shuttle flight, the 21st flight for shuttle Endeavour and the 25th flight to the station.

The STS-124 mission will be the second of three flights that will launch components to complete the Japanese Kibo laboratory. Space shuttle Discovery will deliver Kibo's large pressurized module and robotics system to the station.

For the latest information about the STS-123 mission, visit http://www.nasa.gov/shuttle.

For more on the International Space Station, visit http://www.nasa.gov/station.

MARSHALL STAR
Vol. 48/No. 26

Marshall Space Flight Center, Alabama 35812
(256) 544–0030
http://www.nasa.gov/centers/marshall

The Marshall Star is published every Thursday by the Public and Employee Communications Office at the George C. Marshall Space Flight Center, National Aeronautics and Space Administration. Classified ads must be submitted by 4:30 p.m. Thursday, and other submissions no later than 5 p.m. Friday to the Marshall Public and Employee Communications Office (CS20), Building 4200, Room 102. Submissions should be written legibly and include the originator's name. Send e-mail submissions to: intercom@msfc.nasa.gov. The Star does not publish commercial advertising of any kind.

Manager of Public and Employee Communications — Dom Amatore
Editor — Jessica Wallace

U.S. Government Printing Office 2008-723-022-20142

PRSRT STD
US POSTAGE PAID
HUNTSVILLE, AL
PERMIT NO. 298