



Marshall Star, January 9, 2013 Edition

MARSHALL STAR



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Director's Corner

Happy New Year! I hope you had an enjoyable holiday and are ready for another busy and exciting year. As we begin 2013, this issue of the Marshall Star provides us a great way to look back and take stock of all that we achieved in the last 12 months. It was a year of change and challenges but also one of great accomplishment.

Marshall experienced several changes of leadership, with Director Robert Lightfoot moving to NASA Headquarters to become Associate Administrator, Acting Director Gene Goldman retiring, and Associate Director Robin Henderson serving as director until I became Marshall's 12th director in September. It's a credit to all those people and the other members of Marshall management that the center's work continued forward successfully.



Patrick Scheuermann (NASA/MSFC)

The Space Launch System marked its first year as a program with successful upper stage engine tests and milestone reviews that move it closer to its important first launch in 2017. We are privileged to play such a key role in the exciting work

of developing NASA's flagship new rocket.

Highlighting our historic role in space propulsion, the National Institute for Rocket Propulsion Systems went from an idea to the real work of developing inputs for a national rocket propulsion strategy, supporting SLS, and collaborating with the Department of Defense on solid propellant purchases.

At the same time, our engineers were supporting NASA's commercial crew and cargo efforts, highlighted by two successful missions by the SpaceX Dragon capsule to the International Space Station and successful design milestones by NASA's other commercial partners.

In our role as a major developer, tester, and operator of systems for living and working in space, we continued to keep both life support systems and scientific research running 24/7 aboard the International Space Station – adding to the knowledge base we'll need to send explorers beyond Earth orbit once more.

Now in its 14th year, Chandra X-ray Observatory continues to capture amazing images. The X-Ray and Cryogenic Facility completed tests on the flight mirrors for the James Webb Space Telescope and related pre-launch test equipment.

Our robotic prototype lander Mighty Eagle soared to more than 150 feet in our Marshall test area, demonstrating the kind of technologies we'll need to explore other worlds and providing our engineers with valuable experience.

We continue making advances in understanding the Sun, our Earth and the mysteries of the universe. Marshall's ISS SERVIR Environmental Research and Visualization System camera system launched from Japan to look out Destiny's Earth-facing window. The High Resolution Coronal Imager, or Hi-C, launched aboard a sounding rocket in July and captured some groundbreaking high-resolution images of the sun's corona.

Marshall did a great job of educating and inspiring the public last year. We teamed with the U.S. Space & Rocket Center for several public events associated with the August 6 landing of NASA's Curiosity rover on Mars. Our 19th Annual Great Moonbuggy Race produced a hometown winner as the University of Alabama in Huntsville brought home the college-division trophy. Our own Jessica Gaskin received an award as part of NASA's Hands-On Project Experience to give young engineers and scientists the chance to gain project and mission experience.

In recognition of that great work and the important role Marshall plays in the state's economy, Alabama Governor Robert Bentley, declared May 3 "NASA Day in Alabama" and signed a proclamation commending the Center for its contributions.

As we move into 2013, you should take pride in what you have accomplished over the last year; you and your accomplishments are responsible for our continuing reputation for excellence. My role is to keep us moving forward on NASA's priorities -- SLS, extension of ISS operations to at least 2020, and completion of JWST -- as well as continuing the other great engineering and scientific exploration at which we excel.

The common thread for all our successes is the knowledge and experience of the Marshall Team. I look forward to a busy and exciting year as I get to know you better, and as I share the great work that's going on at Marshall with our community.

Patrick

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January

High School Students Compete in FIRST Robotics Competition

The For Inspiration and Recognition of Science and Technology, or FIRST, competition kicked off Jan. 7. Twelve high school student teams from across Alabama and Tennessee built and fielded technically complex robots -- some weighing up to 120 pounds -- to tackle competitive challenges on a large game field. Students had six weeks to build and test their robots. NASA awarded a five-year agreement to FIRST to provide support for hands-on robotics competition events to encourage science, technology, engineering and mathematics, or STEM, initiatives. The multi-year cooperative agreement was granted by NASA through 2014.

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Kouveliotou's Year: Marshall Astrophysicist Honored Twice in 2012



Marshall astrophysicist Dr. Chryssa Kouveliotou (NASA/MSFC/David Higginbotham)

Marshall Center astrophysicist [Dr. Chryssa Kouveliotou](#) bookended 2012 with a pair of major honors. She was selected in January as the 2012 recipient of the Dannie Heineman prize in astrophysics, jointly awarded each year by the American Institute of Physics and the American Astronomical Society; and in late fall, she was one of three NASA researchers listed among Time Magazine's 25 "most influential people in space."

The Heineman prize was awarded for Kouveliotou's extensive accomplishments and discoveries in the areas of gamma ray bursts, soft gamma ray repeaters and magnetars. The award, established in 1979, is named for the late Dannie N. Heineman, a Belgian-American engineer and philanthropic sponsor of scientific endeavors. The Time listing, in the magazine's "New Space Discoveries" edition, also cited Kouveliotou's expertise and numerous advances in the study of gamma ray bursts.

Kouveliotou, a NASA astrophysicist since 2004, currently is a co-investigator on the Gamma-ray Burst Monitor, an instrument on the [Fermi Gamma-ray Space Telescope](#); an associated scientist for the [Swift](#) mission; and a member of the [NuSTAR](#) science team.

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Shuttle Engines Moved to Stennis for SLS Testing

NASA started off the year with the arduous task of moving the entire RS-25 space shuttle main engine inventory from the Kennedy Space Center Engine Shop to the Stennis Space Center. The RS-25 will be the propulsion for the Space Launch System's core stage, managed at the Marshall Center and designed to take astronauts beyond low Earth orbit. The engines are in storage at Stennis until testing begins in 2013. Built by Pratt & Whitney Rocketdyne of Canoga Park, Calif., the RS-25 engine powered NASA's Space Shuttle Program with 100 percent mission success.



Image right: Technicians oversee the installation of a Pratt Whitney Rocketdyne RS-25 engine into a transportation canister in the Engine Processing Facility at the Kennedy Space Center. (NASA/KSC)

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February

Orion Capsule and SLS Managers Present at 'Pass the Torch' Lecture



While on a cross-country tour, the Orion crew module stopped in Huntsville and visitors at the U.S. Space & Rocket Center got a close-up view of the test module. The spacecraft was on its way from testing at the White Sands Missile Range to the Kennedy Space Center. At a special "Pass the Torch" lecture Feb. 2, SLS Program Manager Todd May, Orion Deputy Program Manager Mark Kirasich and NASA Deputy Associate Administrator for Exploration Systems Development Division Dan Dumbacher discussed development of the deep-space human spacecraft and heavy-lift launch vehicle and took questions from U.S. Space Camp attendees.

Image left: Speaking with guests at the U.S. Space & Rocket Center Feb. 1, Larry Gagliano, second from left, deputy project manager for the Orion Launch Abort System and Orion lead at Marshall, discusses the Orion spacecraft and how the Launch Abort System will protect future astronauts. More than 2,000 attended the Orion crew module exhibit Feb. 1-5 at the Space & Rocket Center. (NASA/MSFC)

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The SLS program began a year's worth of tests Feb. 15 at the Stennis Space Center on the powerpack assembly for the J-2X engine. The engine will be used for in-space propulsion of the upper stage of the new rocket that will carry humans beyond low Earth orbit. The powerpack is a system of components on the top portion of the J-2X engine. On the complete J-2X engine, the powerpack feeds the thrust chamber, which produces the engine fire and thrust. The advantage of testing the powerpack without the thrust chamber is to operate over a wide range of conditions to understand safe limits. The final test of the power pack took place on Dec. 13, 2012.



Image right: In a brief but dazzling display, a 1.86-second burst of flame emerges from the A-1 test stand at the Stennis Space Center as NASA kicks off the first in a series of J-2X powerpack tests. (NASA/SSC)



A J-2X engine also was installed into a test stand at Stennis in February to begin a second-round of full duration hot fire tests in April. This round gathered data on the performance of a newly installed engine nozzle extension, the test stand "clamshell" design, and new engine start and shutdown sequences. Tests on both continued throughout 2012. The next J-2X engine in the testing timeline, designated 10002, is scheduled for installation into a test stand in January 2013.

Image left: J-2X engine 10001 is installed in the A-2 Test Stand at the Stennis Space Center for its second round of tests. Both the engine and test stand have been

modified to begin simulated altitude testing. (NASA/SSC)

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March

Payload Operations Center Marks 11th Anniversary

Payload Operations Center team members at the Marshall Center marked their 11th anniversary planning, coordinating and executing research for the International Space Station. Since March 8, 2001, the team has worked with researchers around the world and crews aboard the station to perform more than 1,300 investigations. The Payload Operations Center processes hundreds of payload commands per day, transmitting them as fast as eight per second to the station.



Image right: NASA's Payload Operations Center in Building 4663 at the Marshall Space Flight Center provides the heartbeat for International Space Station research operations. (NASA/MSFC/Fred Deaton)

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Sub-Scale Solid Rocket Motor Tests for SLS



A sub-scale solid rocket motor designed to mimic the SLS booster design was successfully tested March 14 at the Marshall Center. The 20-second firing tested new insulation materials on the 24-inch-diameter, 109-inch-long motor. The motor is a scaled down, low-cost replica of the solid rocket motors that will boost SLS off the launch pad.

Image left: The Marshall Center tested a small solid rocket motor designed to mimic NASA's Space Launch System booster. The March 14 test provided a quick, affordable and effective way to evaluate a new nozzle insulation material for the SLS solid rocket booster. (NASA/MSFC)

The test will help engineers develop and evaluate analytical models and skills to assess future full-scale SLS solid rocket motor tests. Two five-segment solid rocket motors, the world's largest at 154 feet long and 12 feet in diameter, will be used in on the 70-metric-ton configuration of SLS.

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April

Tens of Thousands Watch Live Coverage of 19th Annual Moonbuggy Race

The 19th annual [NASA Great Moonbuggy Race](#), held April 13-14 at the [U.S. Space & Rocket Center](#) in Huntsville, drew more than 70 competing high school, college and university teams and hundreds of spectators. The Marshall media team supporting the event -- which challenges students to solve practical engineering challenges and think like designers of NASA's historic [Lunar Roving Vehicles](#) -- also enjoyed a truly unprecedented success.



Image right: The team from the University of Alabama in Huntsville won first place in the college division of the 19th annual NASA Great Moonbuggy Race in April 2012. (Emmett Given, NASA/MSFC)

In 2012, for the first time, the media team and [Marshall Television](#) provided live, streaming coverage of the entire two-day event. More than 77,000 viewers watched on [NASA TV](#) channels; another 273,000 tuned in via [UStream](#). Marshall's media team also kept nearly 4,500 [Twitter](#) users abreast of real-time race news throughout the weekend, and tracked more than 125,000 page views on Marshall's [race page](#). Race photos posted to [Flickr](#) may have been seen by nearly 250,000 site visitors through the remainder of April.

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Records Broken During NASA Student Launch Projects



More than 500 students from 51 middle schools, high schools, colleges and universities in 28 states took part in the [2011-2012 NASA Student Launch Projects](#) rocketry challenge April 22 -- the most rockets ever to fly in the "launchfest" that concludes each season of rocketeering. Teams launched their creations -- complete with working science or engineering payloads -- high into the sky over North Alabama, vying to see who could come closest to the 1-mile mark.

Image left: Students from the University of Florida in Gainesville carry their rocket to the launch pad during the 2011-12 NASA Student Launch Projects "launchfest," held April 22, 2012, at Bragg Farms in Toney, Ala. (Emmett Given, NASA/MSFC)

A record altitude was set this year as well; the team from Florida A&M University in Tallahassee watched their rocket fly to an altitude of 5,270 feet -- just 10 feet shy of the mark. Meanwhile, Utah State University in Logan [held onto its own record](#) for most wins in the history of the competitive college division. For the fourth time in five years, they won the top prize -- a \$5,000 check from the event's corporate sponsor, ATK Aerospace Group of Salt Lake City, Utah. And for a final record-breaker, the Marshall media team and [Marshall Television](#) achieved their biggest-ever live audience for the launchfest, with

SLS Avionics Test Paves the Way for Full-Scale Booster

NASA successfully tested the solid rocket booster avionics for the first two test flights of SLS. The avionics system includes electrical components for the SLS solid rocket boosters, which provide propulsion to augment the core stage main engines of the rocket. The test, dubbed Flight Control Test 1, FCT-1, included heritage thrust vector control (TVC) actuators -- electro-hydraulic mechanisms previously used on the space shuttle that direct the booster propulsion system -- with a new SLS booster avionics subsystem. ATK of Promontory, Utah, the SLS booster prime contractor for the first two test flights, conducted the test at its Promontory test facility. The test successfully



demonstrated the new avionics subsystem's interface and control of the heritage shuttle Thrust Vector Control system and performed an SLS launch simulation. In addition to the new avionics subsystem, the test included new electronic ground support equipment, which monitored and coordinated activities between the test facilities, avionics subsystem and TVC system. The test is one in a series to reduce risk and demonstrate the avionics subsystem design early in the development life cycle.

Image right: The avionics subsystem and hardware are cleared for Flight Control Test 1, testing the avionics and controls for an SLS booster. (ATK)

NASA Partners With U.S. Air Force to Study Common Rocket Propulsion Challenges



The Marshall Center and the U.S. Air Force Space and Missile Systems Center's Launch Systems Directorate in Los Angeles announced in April their collaboration on the SLS Advanced Development NASA Research Announcement to study an affordable, next-generation rocket engine. NASA and the Air Force are interested in the outcome of a requirements study of the Affordable Upper Stage Engine Program liquid rocket engine for use on upper stages of medium- and heavy-class launch vehicles, including the Evolved Expendable Launch Vehicle family of launch vehicles.

Image left: At the Space Launch System Advanced Development Industry and Academia Day on Feb. 14 at the Marshall Center, then-Marshall Center Director Robert Lightfoot, right, greets Dr. Eun Kim, left, chief engineer for

May

Alabama Legislature Honors Marshall

The Marshall Center hosted "NASA Day in Montgomery" May 3 at the Alabama State Capitol. Gene Goldman, then acting director of the Marshall Center, spoke before a joint session of the Alabama Legislature. He was joined by NASA astronaut T.J. Creamer, now a Payload Operations Director in the Marshall Center's Payload Operations Center, for the reading of a resolution commending Marshall for its achievements in space exploration and for serving as an economic anchor in North Alabama. Gov. Robert Bentley proclaimed the date "NASA Day in Alabama."



Image right: Gene Goldman, then acting director of the Marshall Center, addresses a joint session of the Alabama Legislature. (Emmett Given, NASA/MSFC)

Proven Friction Stir Welding Technology Brings Together Reliability and Affordability for NASA's Space Launch System



NASA's next heavy-lift launch vehicle, the Space Launch System, is moving further in development faster thanks to proven advanced technologies like friction stir welding. Friction stir welding uses frictional heating combined with forging pressure to produce high-strength bonds virtually free of defects. The welding process transforms metals from a solid state into a "plastic-like" state, and uses a rotating pin tool to soften, stir and forge a bond between two metal plates to form a uniform welded joint -- a vital requirement of next-generation space hardware.

Image left: Four aluminum domes, each created using innovative friction stir welding processes, are seen in this overhead view of the Marshall Center's

Advanced Welding and Manufacturing Facility. In this cutting-edge facility, a team of NASA and contractor engineers and technicians develops complex manufacturing processes aimed at achieving high-strength, defect-free, uniformly bonded aluminum structures -- a vital requirement for next-generation launch vehicles and hardware designed for long-term space travel. (NASA/MSFC)

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NASA Begins Development of SLS Flight Software

SLS engineers began work on the rocket's flight software in May with the delivery of software test bed computers from The Boeing Co. of Huntsville. The computers made it possible for NASA to begin fine-tuning the launch vehicle's software. The flight software then will be installed in the Software Integration Test Facility at Marshall and tested with other electrical hardware and software. In this facility, the SLS team can run a variety of simulations to evaluate how the vehicle will perform in space. The final SLS flight computer that will run the flight software will have the highest processing capability available in a flight avionics computer. It is being developed by upgrading existing systems used in Global Positioning System and communication satellites.



Image right: Marshall engineers Dan Mitchell, left, and Walter Robinson check out the SLS flight computer test beds delivered to Marshall by Boeing, the SLS Stages prime contractor. (NASA/MSFC/ Emmett Given)

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Marshall Center Concludes Wind Tunnel Testing to Aid in SpaceX Reusable Launch System Design



The Marshall Center completed wind tunnel testing in May for Space Exploration Technologies, or SpaceX, of Hawthorne, Calif., to provide Falcon 9 first stage re-entry data for the company's advanced reusable launch vehicle system.

Image left: The first stage of the SpaceX Falcon 9 rocket is in the foreground, with its second stage in the background. The Falcon 9 rocket is responsible for launching the Dragon spacecraft. (NASA/Jim Grossmann)

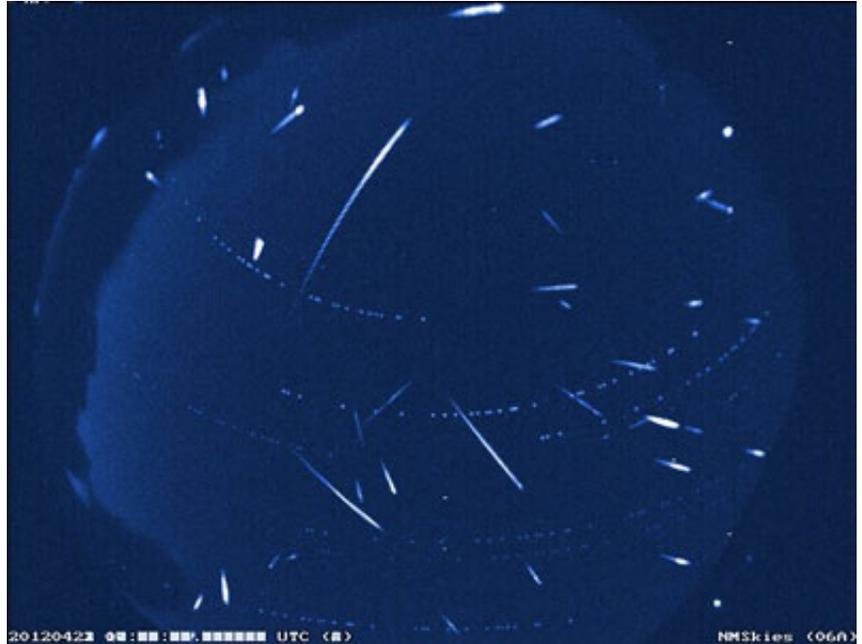
Under a Reimbursable Space Act Agreement, Marshall conducted 176 runs in the wind tunnel test facility on the Falcon 9 first stage to provide SpaceX with test data that

June

Marshall Science Chats Take Audiences Out of This World

The Marshall Center's ongoing series of science webchats continue to serve as a cornerstone of the center's ambitious social media outreach. Hundreds or thousands of participants routinely log in to ask questions of NASA experts, while thousands more stay abreast of upcoming chats via [Facebook](#) and sit in on sessions via [Twitter](#) and [UStream](#) -- often staying up all night with the Marshall science chat team.

Image right: A composite image of Lyrid and non-Lyrid meteors, seen over New Mexico from April 21-23, 2012. (NASA/MSFC)



Marshall hosted six science chats this year, inviting space enthusiasts and inquisitive members of the public to queue up to learn more about [the planets of our solar system](#); the [Lyrids](#), [Perseids](#) and [Orionids](#) meteor showers; and [meteorites falling to Earth](#). In June alone, during the webchat celebrating the [solar transit of Venus](#), a record 4,597 unique participants entered the online chat room to ask questions. In total, nearly 9,000 people joined Marshall chats in 2012. Marshall experts answered more than 2,700 questions -- information seen by more than 450,000 total users on UStream, Twitter and Facebook.

Centennial Challenges Attracts 7,000 for Robotics Competition, Technology Festival



Six teams from the United States and Canada competed in NASA's Sample Return Robot Challenge held June 15-17 at Worcester Polytechnic Institute in Worcester, Mass. The competition was the latest of the Centennial Challenges program, a series of contests that encourages independent inventors, businesses and student groups to create solutions that advance technology for NASA and the nation. The program, based at the Marshall Center, is managed by Sam Ortega. Teams were tasked with building and programming autonomous robots that could maneuver a natural landscape and identify and collect samples within a set period of time, with \$1.5 million in prize money

at stake. No team met all of the requirements for a win, so the challenge will be re-competed in June 2013. The event was paired with the TouchTomorrow Festival, a showcase of science and technology exhibits from NASA and the Worcester Polytechnic Institute. More than 7,000 people attended the weekend events.

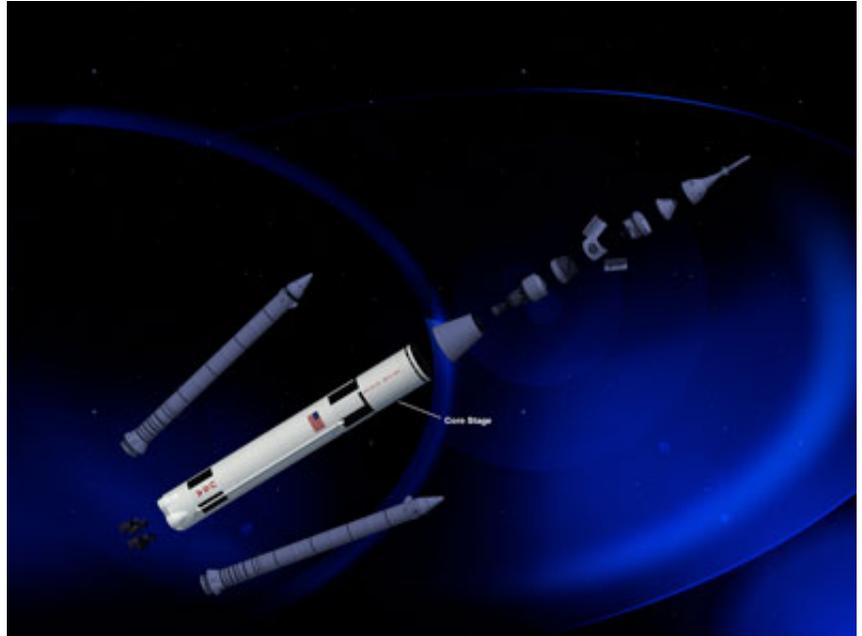
Image left: Students from The University of Waterloo in Canada test their robot on the practice field at the 2012 Sample Return Robot Challenge held in June at Worcester Polytechnic Institute in Worcester, Mass. (NASA/Bill Ingalls)

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SLS Core Stage Moves from Concept to Design

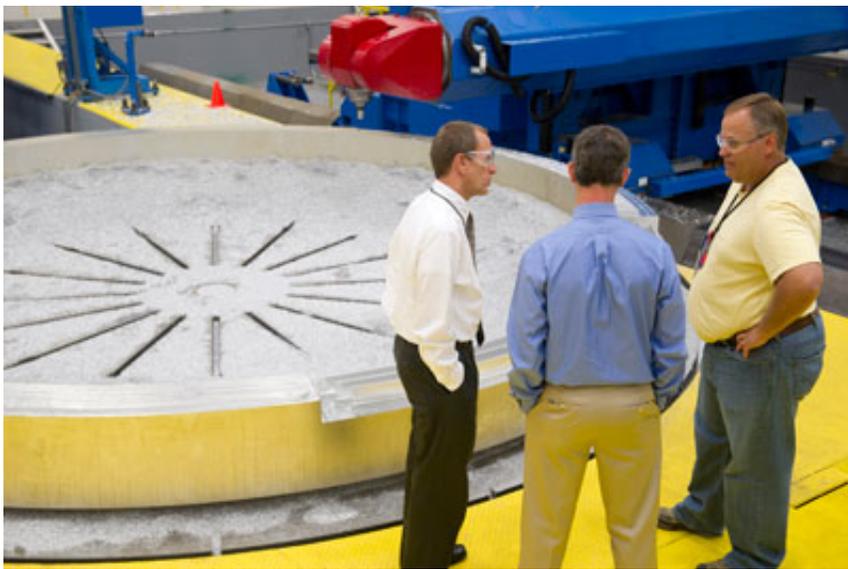
The Marshall Center hosted a major comprehensive review of the SLS core stage design in June. Engineers from NASA and Boeing presented a full set of system requirements, design concepts and production approaches to technical reviewers and the independent review board. The core stage passed this critical early system requirements and definition review to move from concept to design.

Image right: An expanded view of an artist rendering of the 70-metric-ton configuration of SLS, highlighting the core stage. (NASA/MSFC)



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SLS Building Hardware for Orion Test Flight



In June, machinists at the Marshall Center started "cutting metal" for the SLS program using a state-of-the-art milling tool to create the pathfinder version of the adapter hardware design that will eventually connect the Orion spacecraft to the upper stage of the rocket. This design will fly on the first test flight of Orion and connect the capsule not to the SLS rocket, but to a Delta IV. Because the Delta rocket was not originally designed and built to launch Orion, Marshall engineers are building innovative adapter hardware to connect the two. This same hardware design eventually will be used on the various configurations of future SLS flights.

Image left: Discussing the machining of an aluminum adapter ring, similar to the design needed for Exploration Flight Test -1, are, from left, SLS Spacecraft & Payload Integration Manager David Beaman, Adapter Subsystem Manager Brent Gaddes and Multi-Purpose Crew Vehicle to Stage Adapter Lead Myron Tapscott. (NASA/MSFC/Emmett Given)

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Composite Crew Module Encounters Space Vacuum at Marshall Center

In June, engineers at the Marshall Center moved a Composite Crew Module into the Environmental Test Facility vacuum chamber to gauge how well a space structure fabricated with composite materials will react in a simulated space environment. Data gained during this test series will aid in the design and development of future in-space composite habitable structures.

Image right: The Composite Crew Module being rolled into the vacuum chamber at Marshall's Environmental Test Facility. (NASA/MSFC/Emmett Given)

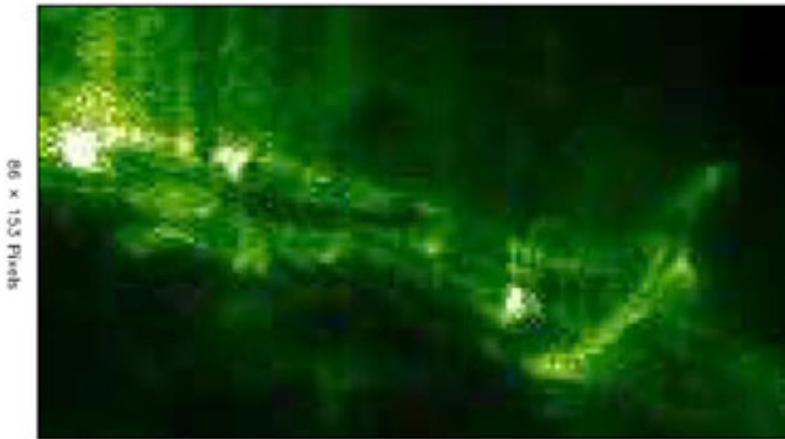


The crew module was designed to test new materials and fabrication techniques that may be used in future space structures, which will be constructed of both metals and composites. Fabricated at Alliant Techsystems in Iuka, Miss., the Composite Crew Module was constructed in two parts. The parts were joined together and then bonded in a unique process developed at the Marshall Center. The Composite Crew Module Project is led by NASA's Engineering and Safety Center at Langley Research Center.

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July

Marshall-led 'Hi-C' Solar Corona Imaging Mission Launches



The Marshall Center, leading an international development team, celebrated the successful launch July 11 of the High Resolution Coronal Imager, or Hi-C, on a sounding rocket from the White Sands Missile Range at White Sands, N.M. Hi-C is a next-generation suborbital space telescope designed to capture the highest-resolution images ever taken of the million-degree solar corona, and can acquire data at a rate of roughly one image every 5 seconds. The mission will aid researchers in better understanding the behavior of the corona and mitigating the occasionally harmful effects of the sun on Earth's environment.

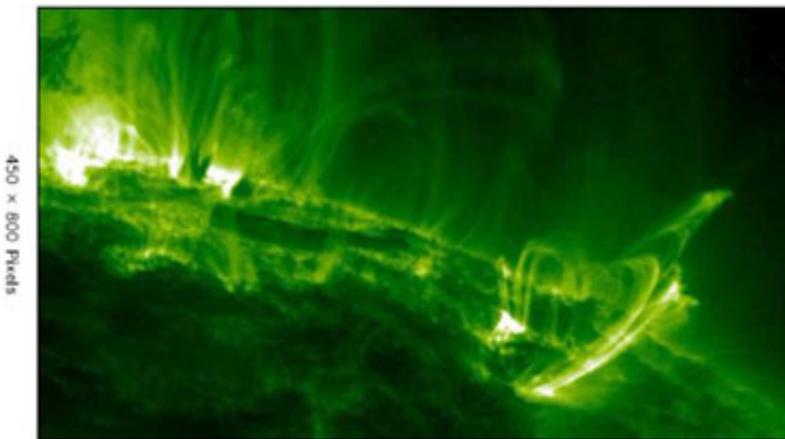


Image left: With high-resolution images such as these, Hi-C has demonstrated the technology necessary to collect 150-kilometer-resolution images of the sun in the extreme ultraviolet spectrum. (NASA)

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Marshall Center Hosts Mentor-Protégé Agreement between Pratt & Whitney Rocketdyne, Alabama A&M

On July 12, the Marshall Center hosted a two-year signing agreement between Pratt & Whitney Rocketdyne and Alabama A&M University in Huntsville. Historically black colleges and universities, such as Alabama A&M, are American schools established before 1964 with the primary purpose of educating African-American students. Pratt & Whitney Rocketdyne has been the prime contractor for the development and testing of the J-2X rocket engine since 2007. The J-2X will power the upper stages of the Space Launch System,



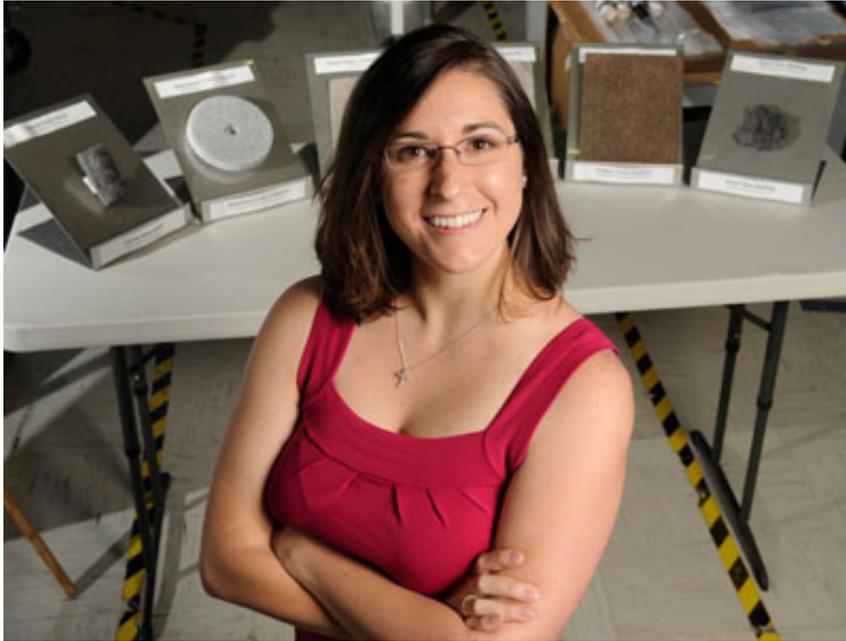
NASA's next heavy-lift launch vehicle. The NASA Mentor-Protégé Program, established in 2008 by NASA's Office of Small Business Programs, pairs large companies with eligible small businesses and institutions to establish long-term relationships, enhance technical capabilities and enable them to successfully compete for larger, more complex prime

contract and subcontract awards.

Image right: Signing the Mentor-Protégé agreement are, seated from left, Kim Spencer, a Marshall contracting officer; Dr. Andrew Hugine Jr., president of Alabama A&M; and Paul Fowler, director of supply management at Pratt & Whitney Rocketdyne. (NASA/MSFC/Emmett Given)

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Marshall's Morgan Abney Receives Presidential Early Career Award



Marshall space systems engineer Dr. Morgan B. Abney was among six NASA researchers named July 23 by President Barack Obama as recipients of the 2011 Presidential Early Career Award for Scientists and Engineers, or PECASE. Abney was recognized for her innovative technical leadership in advancing technologies for recovering oxygen from carbon dioxide for self-sustaining human space exploration. As part of her work in Marshall's Engineering Directorate, she seeks to develop advanced atmosphere-revitalization technologies for future crewed flight missions. The PECASE award is the highest honor bestowed by the U.S. government on scientists and engineers beginning their independent careers.

Image left: Dr. Morgan B. Abney (NASA/MSFC/Emmett Given)

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U.S. Space & Rocket Center Launches New Marshall Bus Tours

The Marshall Center threw open its doors to the public this summer, sharing an inside look at the work of the nation's space program via a new series of bus tours conducted by the [U.S. Space & Rocket Center](#) in Huntsville. The roughly 75-minute tours visit numerous Marshall laboratories and test sites; historic test stands where early American rockets were developed; state-of-the-art facilities where NASA builds and tests powerful new flight vehicles, space systems, science probes and space imagers; and the International Space Station [Payload Operations Center](#), where Marshall personnel orchestrate on-orbit science experiments and maintain communications



between astronauts and researchers around the world. The tours have proved popular with visitors, and remain a regular Space & Rocket Center attraction.

Image right: New Marshall Center bus tours by the U.S. Space & Rocket Center take visitors to unique stops across the Marshall Center. (NASA/MSFC)

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Joint Marshall, Goddard Project Receives NASA 'HOPE' Award



A joint [Marshall Center](#) and [Goddard Space Flight Center](#) team is preparing to test and launch a sophisticated, balloon-borne X-ray telescope that will expand scientific knowledge both in space science and heliophysics -- traditionally separate fields of study at NASA. The "High Energy Replicated Optics to Explore the Sun" project, or HEROES, was selected for the agency's prestigious Hands-On Project Experience ([HOPE](#)) training award, which promotes achievement and accelerates career advancement among scientists and engineers with no previous flight-project experience. The two-day HEROES mission is set to fly in fall 2013, some 25 miles over a Fort Sumner, N.M.,

test site.

Image left: Marshall Center researcher Jessica Gaskin is co-principal investigator for NASA's HEROES project. (NASA/MSFC/Fred Deaton)

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'ISERV' Keeps an Orbital Eye on Earth Below

The International Space Station SERVIR Environmental Research and Visualization System, or ISERV, is an imaging instrument pathfinder project developed and built by the Marshall Center and launched to the space station in July aboard a Japanese rocket. When it goes operational in early 2013 in its new berth in the Destiny window, the sensor-laden Earth observer will turn a fixed eye on the planet below, mapping the globe, studying climate change and tracking natural disasters to help aid preventive planning and relief activities on the ground.

Image right: Once installed on the International Space Station, the ISERV camera will study the globe. Upon command, it will acquire image data of specific areas on Earth as the station passes overhead. (NASA/MSFC/Fred Deaton)



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Centennial Challenges Launches 'After the Challenge' Spotlight Program

Many of the teams that competed in past Centennial Challenge competitions have gone on to form NASA partnerships, start their own businesses, expand their staffing or all of the above, and not just the ones who took home prize money. "After the Challenge" was launched in July on the official Centennial Challenges website as a place to spotlight the accomplishments of these individuals and companies once the competitions have ended. Under the heading "And THEN What Happened?" teams have their own space that features current interviews, statistics and submitted photos. The features aim to provide a benefit to competitors by exposing their successes and current endeavors to a wider audience. They also seek to encourage future teams to take part in competitions. The features can be found at <http://www.nasa.gov/challenges>.

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A Record Summer of Testing



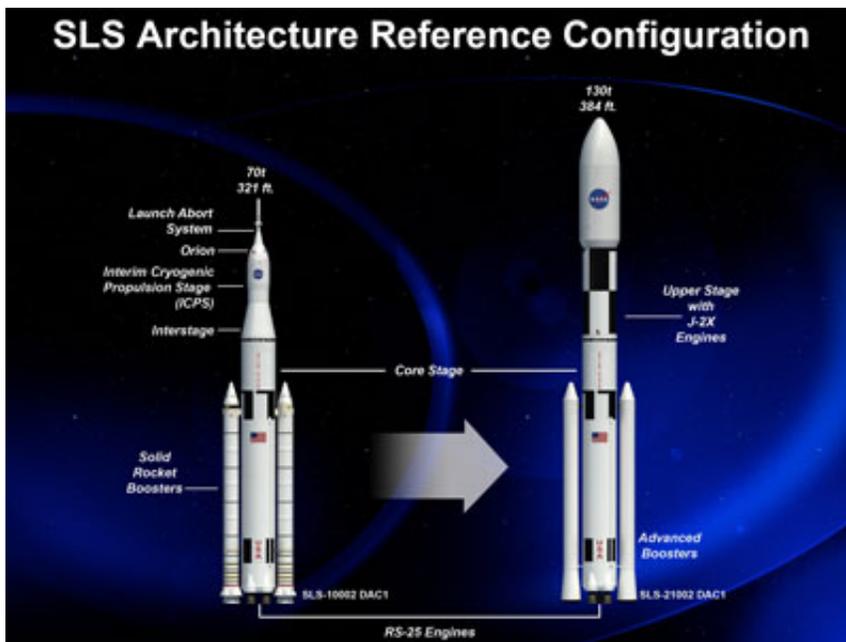
NASA set a record while testing the J-2X powerpack at the Stennis Space Center in July. Engineers ran a 1,350-second test of the engine component on the A-1 Test Stand, below, the longest duration test ever completed on that particular test stand. The test data provides critical information for continued development of the turbopump for use on the J-2X engine, the first human-rated liquid oxygen and liquid hydrogen rocket engine to be developed in four decades. (NASA/SSC)

A week earlier, the J-2X engine had been pushed to a 550-second test on the A-2 Test Stand, below, continuing a series of firings to gather critical data for engine development. This was the first flight-duration test of the engine's nozzle extension, a bell-shaped device to increase engine performance. (NASA/SSC)



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SLS Passes Major Agency Review



The SLS Program reached a critical milestone in July with agency-level approval of the System Requirements and System Definition Review. Guiding the course of the program, this key step was a pivotal moment, allowing SLS to move from concept to design and target preliminary design review next year. As part of the process, an independent review board comprised of technical experts from across NASA evaluated SLS Program documents describing vehicle specifications, budget and schedule. The board confirmed SLS is ready to move from concept development to preliminary design. SLS reached this major milestone less than 10 months after the program's inception.

Image left: An artist rendering of the various configurations of the SLS. (NASA/MSFC)

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10 Years of Accomplishments by Microgravity Science Glovebox Heralded

A Marshall workhorse, the Microgravity Science Glovebox, marked a 10-year milestone of scientific accomplishments aboard the International Space Station. The glovebox, also known as MSG, is a facility sealed and at negative pressure, so astronauts can manipulate experiment hardware and samples without the risk of small parts, particulates, fluids or gasses escaping into the open. It offers a 9-cubic-foot work area accessible to the space station crew through glove ports, and to ground-based scientists through real-time data links and video. The glovebox was developed by the European Space Agency and is managed by the Marshall Center.



Image right: Expedition 30 Commander Dan Burbank works with hardware inside the Microgravity Science Glovebox aboard the International Space Station. (NASA)

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Goldman Retires from Marshall Center



Arthur E. "Gene" Goldman retired from the agency Aug. 3 to accept a management position at Aerojet in Huntsville. His departure ended a 22-year career with NASA that began in 1990 as a project engineer in Marshall's Space Shuttle Project Integration Office. Goldman had been Marshall's acting center director since March 5 when Robert Lightfoot began his assignment as NASA acting associate administrator at NASA Headquarters. Beginning in March 2010, Goldman was Marshall's deputy director. "Working for NASA and supporting the Space Shuttle Program was a dream come true for me," said Goldman. "It has been an honor and a privilege to work on

NASA's human spaceflight programs, both at Marshall and across the agency for more than two decades."

Image left: Gene Goldman announces his retirement from NASA during an all-hands meeting July 9. (NASA/MSFC/Fred Deaton)

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Community Counts Down to 'Curiosity' at Space & Rocket Center

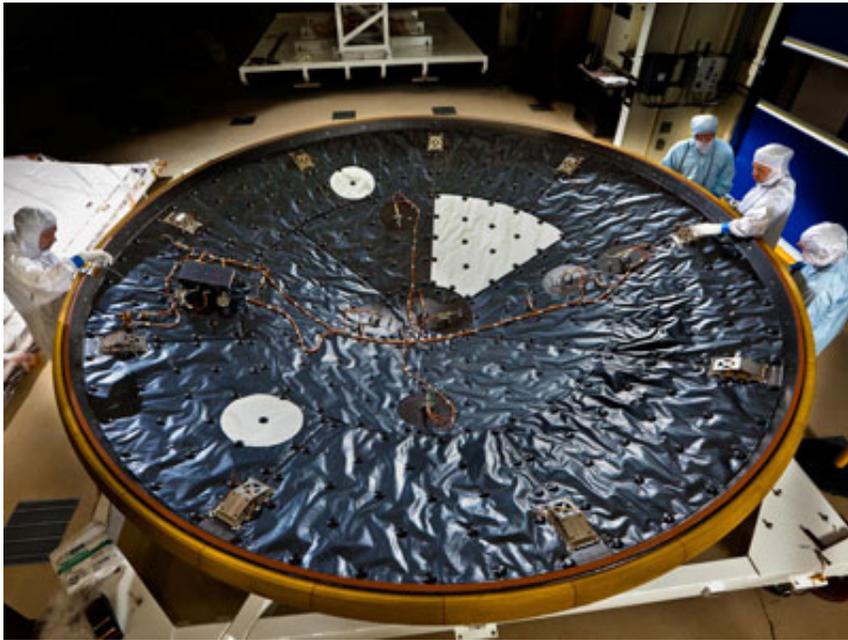
The Marshall Center and the [U.S. Space & Rocket Center](#) teamed to raise excitement for the countdown to the successful Aug. 6 landing of NASA's [Curiosity rover](#) on the planet Mars. On Aug. 2, Marshall planetary scientist [Dr. Barbara Cohen](#) gave a [presentation about past and future Mars exploration](#) to more than 200 people as part of the Space & Rocket Center's "Pass the Torch" lecture series. On Aug. 5, more than 100 kids and parents participated in an all-night "snoozeum" under the Saturn V rocket at the Davidson Center for Space Exploration.



Image right: Dr. Bill Cooke, left, lead of Marshall's Meteoroid Environments Office, takes "snoozeum" participants on a twinkling tour of the United States via an inflatable planetarium. (NASA/MSFC)

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Mission Success for Mars Science Laboratory Entry, Descent, & Landing Instrument



Mission success for the Mars Science Laboratory Entry, Descent, & Landing Instrument, or [MEDLI](#), Suite was achieved when the [Curiosity](#) rover touched down on the red planet Aug. 6 at 12:32 p.m. CDT. The instrumentation payload, carried in the entry vehicle's heat shield, included an intricate array of sophisticated engineering sensors designed to measure heat, pressure and other conditions impacting the heat shield during atmospheric entry and descent. The shield is jettisoned prior to landing.

Image left: Lockheed Martin installed the Langley-built MEDLI on the backside of the Mars Science Laboratory's aeroshell/heat shield. At almost 15 feet in diameter, the aeroshell is the biggest ever built for a

planetary mission. MEDLI is made up of two kinds of instruments, with seven sensors of each kind, that are installed in 14 places on the heat shield. It will gather engineering data on aeroheating by using sensor plugs and pressure ports embedded into holes drilled in the spacecraft's aeroshell. (Lockheed Martin)

The MEDLI suite powered up successfully Aug. 5 during the Mars Science Laboratory's approach to the red planet. Real-time streaming data from the shield sensors was acquired through much of the vehicle's entry and descent. The rover touched down smoothly in [Gale Crater](#) to begin its two-year primary mission.

MEDLI is one of NASA's [Technology Demonstration Missions](#) -- a program managed for the agency by Marshall.

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Marshall Center Presents Annual Honor Awards

On Aug. 16, NASA and the Marshall Center honored more than 300 team members whose contributions helped achieve the center's goals and further NASA's science, engineering and spaceflight endeavors. Robert Lightfoot, associate administrator at NASA Headquarters and Marshall Center director from 2009-2012, delivered the keynote address and helped present awards. Complete lists of [NASA-level awards](#) and [Marshall honors](#) are available online.

Image right: Members of the Marshall Center workforce fill Morris Auditorium Aug. 16 to help celebrate the achievements of hundreds of their fellow team members. (NASA/MSFC/ Ray Downward)



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Chandra Captures Images of 'Supermom Galaxies,' Other Wonders



In 2012, NASA's [Chandra X-ray Observatory](#) continued to capture extraordinary images of all kinds of celestial phenomena, helping us better grasp the secret workings of the cosmos and our place in it. Launched to space in 1999, the orbiting imager spent the past year partnering with other space- and ground-based telescopes and observatories to shed new light on subjects as varied as [the Phoenix cluster](#), a group of "supermom" galaxies 5.7 billion light years from Earth, in which stars form at the highest rate ever observed in such a configuration; [Abell 383](#), a galaxy cluster 2.3 billion light years away, which researchers are studying to learn how the invisible cosmic material known as "dark matter" is distributed in space; and [IGR J11014](#), a spinning, super-dense star known as a pulsar, which may be the fastest-moving pulsar ever documented -- hurtling through space between 5.4 and 6.5 million mph, about 30,000 light years from Earth.

Image left: The hot gas of the Phoenix cluster, seen in this artist's rendering, gives off copious amounts of X-rays and cools quickly over time, especially near the cluster's center. This causes gas to flow inward, forming a previously unrecorded number of stars. (NASA/CXC/M. Weiss)

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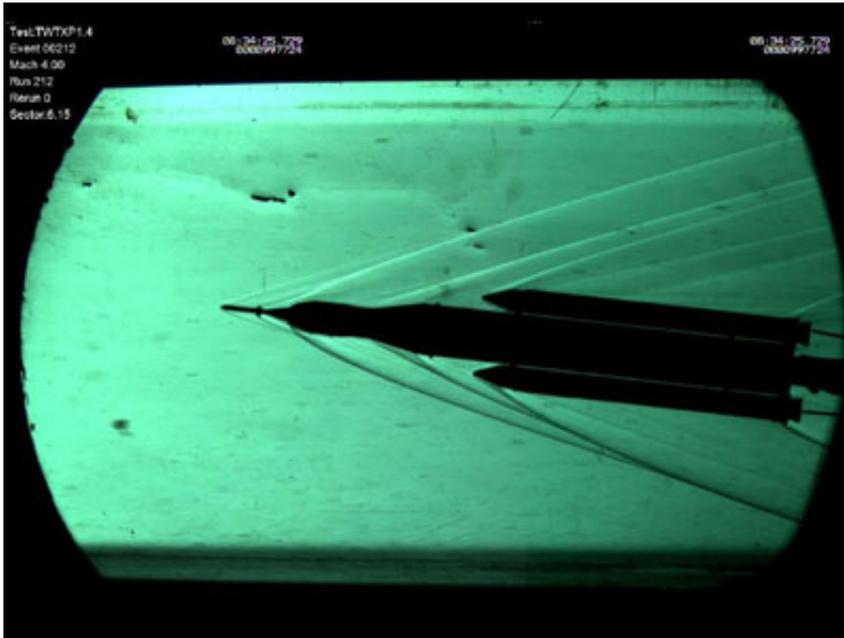
Reaching Mars, Losing Heroes Swells Marshall Facebook Audience

In August, the Marshall Center's [official Facebook presence](#) saw an unprecedented spike in activity -- 2,600 new fans, nearly 2,500 direct shares of Marshall posts and more than 16,000 "Like This" approvals -- as users celebrated NASA's [Mars Science Laboratory](#) reaching the Red Planet and successfully delivering the [Curiosity rover](#) to the surface Aug. 5-6. At the close of 2012, the Marshall Center's Facebook page had nearly 22,000 fans around the world.



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Smooth Sailing for SLS Wind Tunnel Testing



Engineers at Marshall's Trisonic Wind Tunnel wrapped up four months of testing on SLS in August, putting early scale models through more than 900 tests of various crew and cargo configurations. The Trisonic Wind Tunnel is testing the flight stability of SLS, providing the initial configuration testing and the basis to assess flight stability.

Image left: The 70-metric-ton configuration of the SLS rocket, designed to carry the Orion spacecraft, is tested in Marshall's Trisonic Wind Tunnel. This view uses special cameras and a deflection of light directed through the windows in the tunnel to show the shadows of airflow as it changes angles at high speeds, helping visualize the various intense pressures of atmosphere on the model. (NASA/MSFC)

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September

Space Launch System: A Year of Powering Forward

SLS marked a year of progress since the formation of the program on Sept. 14, 2011. NASA began work immediately after the announcement, finding new methods of creating designs, conducting reviews and improving scheduling and budget planning. The program has made swift progress improving on existing hardware, testing and developing new components, and paving the way for a new launch vehicle. NASA created [a video highlighting the first year of SLS achievements](#).

Image right: Artist concept of the SLS launching from the Kennedy Space Center. (NASA/MSFC)



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Marshall Hosts Third Annual 'International Observe the Moon Night'

"International Observe the Moon Night," sponsored by Marshall's Lunar Quest program, was held Sept. 22 at the Education Training Facility at the U.S. Space & Rocket Center. More than 600 people attended the event designed to encourage educators and moon enthusiasts from around the globe to gather together to learn more about the celestial body humans first set foot on more than 43 years ago. Special speakers from Marshall were on hand to discuss moon exploration and

science, including Dr. Barbara Cohen, a planetary scientist; Dr. Rob Suggs, head of Marshall's Space Environments Team; Dr. Renee Weber, a planetary scientist; Dr. Bill Cooke, lead of Marshall's Meteoroid Environments Office; and Rhiannon Blaauw, a meteor physicist.

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Patrick Scheuermann Named Marshall Center Director



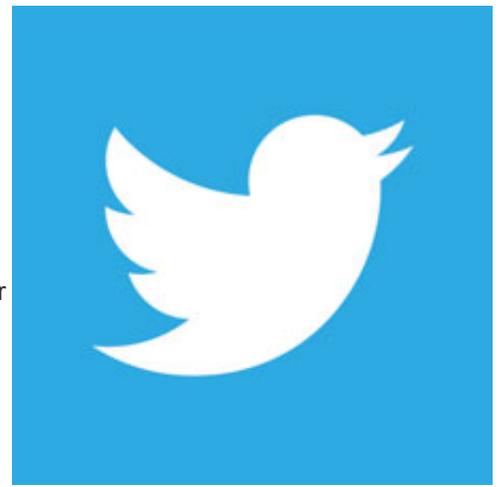
On Sept. 25, NASA announced the appointment of [Patrick Scheuermann](#) as the 12th director of the Marshall Center. Scheuermann, formerly director of the [Stennis Space Center](#) from 2010-2012, replaced Robert Lightfoot, who was director of Marshall from 2009-2012 before assuming the role of NASA acting associate administrator at NASA Headquarters last May. Scheuermann also served as chief operating officer of NASA's [Michoud Assembly Facility](#) from 2005-2007. He joined NASA in 1988 as a propulsion test engineer.

Image left: Marshall Center Director Patrick Scheuermann addresses the workforce Sept. 26 in Morris Auditorium. (NASA/MSFC/Emmett Given)

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Marshall Tweets Gain Over 30,000 Followers

September was a big month for the Marshall Center's [Twitter feed](#). A tweet about Dr. Bill Cooke's harvest moon blog entry was retweeted nearly 200 times by Marshall Twitter followers, and "favorited" 56 times -- a record-breaking number for a single tweet on Marshall's social media site. Cooke is lead of Marshall's Meteoroid Environment Office. More than 10,000 new users also joined Marshall's Twitter feed in 2012, boosting the total to more than 30,000 by year's end. The 140-character Web communication tool enables Marshall communicators to share daily updates and real-time breaking news about center team members, milestones and events.



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NASA Seeks SLS Advanced Development Solutions

NASA announced selection of 26 proposals from academia and industry for advanced development activities for the SLS. Proposals selected under the NASA Research Announcement seek innovative and affordable solutions to evolve the launch vehicle from its initial configuration to a much larger lift capacity capable of sending humans farther into deep space. This included a variety of areas including concept development, propulsion, structure, materials, manufacturing, avionics and software. A complete list of the accepted proposals can be found [here](#).

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October

Michoud Ramps Up to Build New SLS Rocket

Marshall and Stennis were not the only NASA centers buzzing with activity over SLS. The Michoud Assembly Facility hosted an industry day in October to update the progress of the rocket program to business representatives from 90 companies across 19 states. With 43 acres under one roof, the Michoud facility -- managed by the Marshall Center -- has a rich history in spaceflight manufacturing, from the Saturn V to the external tanks of the Space Shuttle Program. The workforce at Michoud is already hard at work installing new state-of-the-art manufacturing equipment and building the Orion composites and the core stage of the Space Launch System.

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NASA Awards Space Launch System Advanced Booster Contracts

NASA awarded three contracts totaling \$137.3 million to improve the affordability, reliability and performance of an advanced booster for the SLS. The awardees -- which included ATK Launch Systems of Promontory, Utah; Dynetics of Huntsville; and Northrop Grumman Inc., of Redondo Beach, Calif. -- will develop engineering demonstrations and risk reduction concepts for a future version of the SLS. There will be a future competition for design, development, testing and evaluation for the SLS advanced booster. This future competition is planned for 2015, will be acquired through a separate solicitation and will not be limited to the awardees of these research contracts.

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SLS Engine 'Brain' Gets an Upgrade



SLS engineers upgrade an engine control unit for the RS-25. While a major update to an engine "brain" used during the Space Shuttle Program, this also is a cost-saving measure as engineers develop the new unit to be used on many different engines, not just the RS-25. The role of an engine controller unit is to allow communication between the vehicle and the engine, sending commands down to the engine and transmitting data back to the vehicle. The controller also provides closed loop management of the engine by regulating thrust and fuel mixture ratio while monitoring the

engine's health and status.

Image left: During a recent tour for Space Launch System Program managers, Mike Kynard, left, manager of the program's Engines element office, explains how test personnel use working parts from an RS-25 engine to test the new engine control unit at the Marshall Center test facilities. (NASA/MSFC)

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'Mighty Eagle' Scores Longest, Highest Flight Yet

The "Mighty Eagle," a NASA robotic prototype lander, reached its highest altitude and velocity -- and longest duration -- on Oct. 25 when it soared to a height of more than 150 feet during its 45-second flight. "Mighty Eagle's" highest flight had been 100 feet, with a flight duration of about 35 seconds. The increased height and flight duration means the vehicle could be used for different applications including testing sensors and other equipment that require higher altitudes and longer durations in the air. The "Mighty Eagle" is a three-legged prototype vehicle that resembled an actual flight lander design. It is 4 feet tall and 8 feet in diameter, and weighs about 700 pounds when fueled. It is

a green vehicle, fueled by 90 percent pure hydrogen peroxide, and is guided by an onboard computer that activates the thrusters to power the craft's movements. NASA will use the "Mighty Eagle" to mature the technology needed to develop a new generation of small, smart, versatile robotic landers capable of achieving scientific and exploration goals on the surface of the moon, asteroids or other airless bodies.



Image right: The "Mighty Eagle" soared to an altitude of more than 150 feet during a 45-second flight Oct. 25. (NASA/MSFC/Dennis Olive)

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Marshall Center Lighting the Match to Learn More about Fires in Space



Engineers at the Marshall Center are conducting a series of tests and studies to learn more about fires in space. Marshall teamed up on the collaborative, three-year project with four other NASA facilities -- Glenn Research Center, the lead center for the project; Johnson Space Center; the Jet Propulsion Laboratory; and the White Sands Test Facility. The combined test data will be used to help design a future large-scale fire experiment in space. Marshall's role is to recommend the best material to set aflame for the large-scale test. Testing is being done at Marshall's Materials and Processes Laboratory. The project is part of NASA's Advanced Exploration Systems, or AES, program --

pioneering new approaches for rapidly developing prototype systems, demonstrating key capabilities and validating operational concepts for future human missions beyond low Earth orbit.

Image left: During a combustion demonstration test, a sample material is set on fire for 30 seconds in a large chamber, filled with varying pressure levels of nitrogen and oxygen. Data, including the maximum oxygen concentration at which a propagating flame will go out, is collected while the samples are kindled for 30 seconds. (NASA/MSFC/Emmett Given)

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Coalition of NASA, Army, Academic Researchers Wins Contract to Develop Innovative Flight Navigation Technology

In October, NASA tapped a team of aerospace, military and academic researchers for a three-year project that could dramatically improve in-flight navigation capabilities for space vehicles, military air and sea assets and commercial vehicles. The project, "Fast Light Optical Gyroscopes for Precision Inertial Navigation," includes researchers from the Marshall Center; the U.S. Army Aviation and Missile Research, Development and Engineering Center at Redstone Arsenal; and Northwestern University in Evanston, Ill.

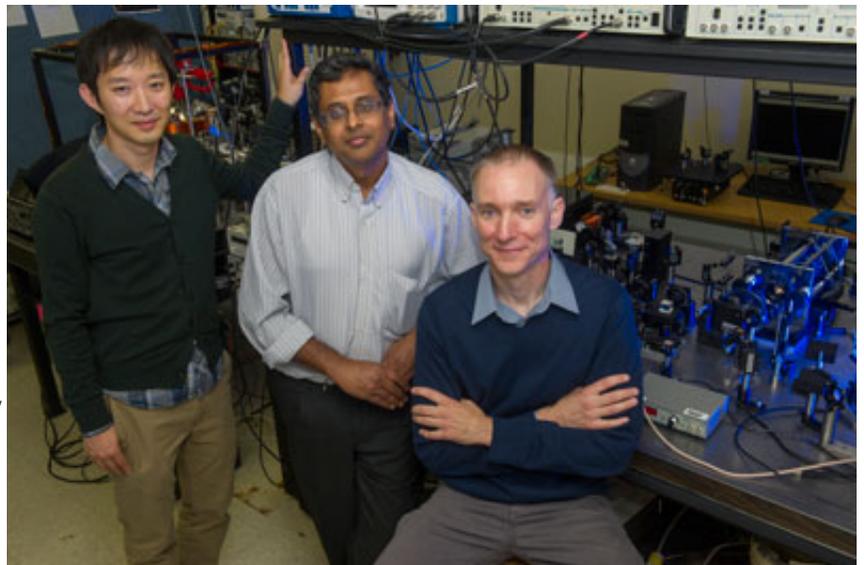


Image left: Tackling an innovative flight navigation technology development effort for NASA are, from right, Dr. David Smith, of Marshall; Krishna Myneni, of the Army Aviation and Missile Research, Development and Engineering Center (AMRDEC); and Hongrok Chang, an Army contractor. Smith, the co-principal investigator for the project, says his team seeks to deliver gyroscopes at least 1,000 times more sensitive than those used in today's vehicles. (NASA/MSFC/Emmett Given)

The project team at Marshall includes co-principal investigators Dr. David Smith, an optical physicist in the Marshall Center's Engineering Directorate; and Dr. Selim Shahriar, a professor of electrical engineering and computer science as well as physics and astronomy, and director of the Laboratory of Atomic and Photonic Technology at Northwestern University; and AMRDEC research physicist Krishna Myneni. Their work is intended to enhance the performance of a vehicle's inertial guidance system by refining the optical gyroscopes that drive it.

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November

FASTSAT Minisatellite Mission Ends



After two years of successful on-orbit operations, NASA's [Fast, Affordable, Science and Technology Satellite](#), or FASTSAT, mission came to an end in late November. Designed, assembled and tested at the Marshall Center over a period of 14 months, NASA's first minisatellite was launched to space Nov. 20, 2010, from the [Kodiak Launch Complex](#) in Kodiak, Alaska. It weighed slightly less than 400 pounds and was outfitted with [six technology and atmospheric science experiments](#). The most high-profile of these was the [NanoSail-D](#), a nanosatellite that successfully deployed NASA's first-ever solar sail in low Earth orbit. The FASTSAT mission demonstrated Marshall's critical ability to build, test and deliver low-cost nanosatellites capable of conducting innovative research and maturing new technologies for future missions.

Image left: The FASTSAT minisatellite, fresh from a comprehensive final review at Marshall in 2010, awaits delivery to the launch site in Kodiak, Alaska. (NASA/MSFC)

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Teresa Vanhooser Named Marshall Center Deputy Director

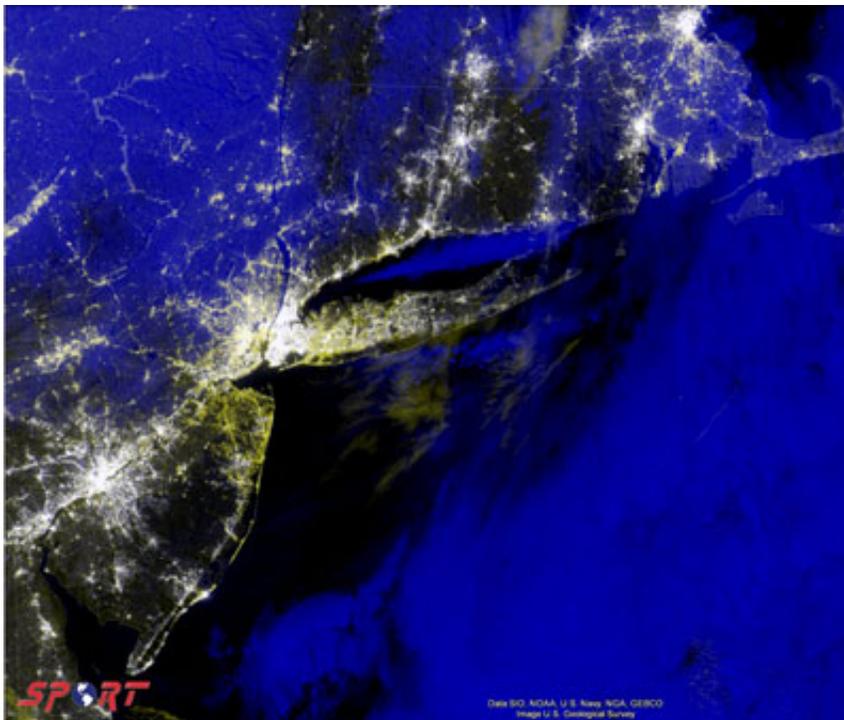
On Nov. 29, NASA announced the appointment of Teresa Vanhooser as deputy director of the Marshall Center. Vanhooser previously was director of the Flight Programs & Partnerships Office from 2011 to 2012. From 2007 to 2011, she served as deputy manager, acting manager and manager of Ares Projects -- the launch vehicle development effort at Marshall which laid the foundation for development of NASA's [Space Launch System](#), the heavy-lift launch vehicle set to carry human explorers to new destinations beyond Earth orbit. Vanhooser joined NASA in 1980 as an engineer in the Marshall Center's Ground Systems Analysis Branch.



Marshall Center Deputy Director Teresa Vanhooser (NASA/MSFC)

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SPoRT Helps Identify Scope of Sandy Power Outages



When the hurricane dubbed "Superstorm Sandy" wreaked havoc in the Caribbean and along the entire U.S. Eastern Seaboard in late October, NASA's Short-term Prediction Research and Transition Center, or SPoRT, Center team at Marshall applied enhanced image-analysis techniques to NASA satellite data to help assess the storm's impact and assist in disaster assessment and relief efforts.

Image left: Composite data gathered Nov. 1 depicts urban regions of New York and New Jersey, hard-hit by Hurricane Sandy. Yellow regions indicate high-population centers which had electric power before the hurricane hit but not in its wake; blue regions represent cloud cover. (NASA/SPoRT)

Using space-based assets and real-time data provided by the University of Wisconsin, the SPoRT team helped identify regions without power, enabling the Federal Emergency Management Agency, the U.S. Army's Joint Force Land Component Command Coordination Element and the U.S. Army Corp of Engineers to better coordinate their disaster response activities.

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First SLS 'Pathfinder' Hardware Completed

Engineers, using a state-of-the-art vertical and circumferential welding tools at the Marshall Center, put the finishing touches on a pathfinder version of the adapter design that will be used on test flights of the Orion spacecraft and the Space Launch System. The adapter will eventually connect the Orion spacecraft to the SLS. It will be flight tested on Exploration Flight Test-1 in 2014, when it will be used to mate Orion to a Delta IV heavy-lift rocket. The term "pathfinder" refers to an early version of the hardware that is not intended to fly, but to prove the concept and feasibility of manufacturing the design. This pathfinder is 18 feet across and 5 feet tall.



Image right: Engineers at the Marshall Center conduct their first circumferential weld of the pathfinder version of the adapter design that will be used on test flights of the Orion spacecraft and SLS. The adapter eventually will connect the Orion spacecraft to the propulsion elements of the rocket. (NASA/MSFC/Emmett Given)

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Expedition 31/32 Astronaut Joe Acaba Shares Mission Highlights; Visits Payload Operations Center Team



Astronaut Joe Acaba, center, who lived and worked nearly four months as a flight engineer aboard the International Space Station, talked with current station astronauts from a console in the Payload Operations Center on Nov. 7. During his visit to Marshall, Acaba thanked the Payload Operations team and shared highlights of his 123-day mission in space -- from May 15 through Sept. 17, 2012. Acaba supported the arrival of the first commercial resupply spacecraft -- SpaceX's Dragon, and he and his fellow crew members performed more than a hundred scientific investigations from 24 countries as part of the Expedition 31/32 crews. (NASA/MSFC/Emmett Given)

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Supersonic Decelerator Project 'On Track' for Success

The [Low-Density Supersonic Decelerator project](#) -- which is developing technologies to use atmospheric drag to dramatically slow a vehicle as it penetrates the skies over worlds beyond our own -- completed three successful rocket sled tests of the "SIAD-R," a Supersonic Inflatable Aerodynamic Decelerator in November, the first of three innovative deceleration systems now in development. The project is a NASA [Technology Demonstration Mission](#) led by NASA's [Jet Propulsion Laboratory](#). The program is sponsored by NASA's [Office of the Chief Technologist](#) and the [Space Technology Program](#), managed for the agency by the [Marshall Center](#) and supported by NASA field centers and partner facilities around the nation.



Image right: NASA's Low-Density Supersonic Decelerator team gathers around the "SIAD-R" -- a Supersonic Inflatable Aerodynamic Decelerator they're developing to assist future planetary exploration missions -- during rocket-sled testing at China Lake, Calif. (NASA/JPL)

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December

Marshall raises \$710,458 for 2012 Combined Federal Campaign



The Marshall Center exceeded its 2012 fundraising goal for the Combined Federal Campaign, raising a total of \$710,458 during the goodwill drive, which ran from Oct. 1 to Dec. 15. Hundreds of Marshall team members also participated in CFC Community Service Days -- when volunteers lend their time to support charities and special events. Some 200 team members also took part in CFC bus tours, visiting participating charitable organizations in the community. Marshall's CFC effort is part of the Tennessee Valley Combined Federal Campaign -- a joint effort that also includes the Army's Aviation and Missile Command and other federal agencies at Redstone Arsenal

and in surrounding Alabama and Tennessee counties. To learn more about CFC, visit <http://cfc.msfc.nasa.gov>.

Image left: Miss Alabama, Anna Laura Bryan, sings the hymn, "How Great Thou Art" at the CFC kickoff rally Oct. 3. Bryan, a keynote speaker, emphasized the importance of giving, and autism awareness -- her pageant platform. (NASA/MSFC/Emmett Given)

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SLS Core Stage Passes Major Milestone, Ready to Start Construction

The team designing the SLS delivered a holiday gift for NASA by completing a major technical review of the vehicle's core stage on Dec. 21, ahead of schedule. The preliminary design review, or PDR, of the core stage, held at the Marshall Center, included representatives from the agency and The Boeing Co. of Huntsville. Boeing is the prime contractor for the core stage. The purpose of the PDR was to ensure the design met system requirements within acceptable risk and fell within schedule and budget constraints. An important part of the PDR was to prove the core stage could integrate safely with other elements of the rocket's main engines and solid rocket boosters, the crew capsule and the launch facilities at Kennedy Space Center.



Image right: Tim Livengood, a welding engineer with The Boeing Co., confirms the setup on a friction stir weld test fixture at Michoud Assembly Facility in support of SLS. The workforce at Michoud will build the core stage for SLS. (Boeing)

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SLS Core Stage Passes Second Major Milestone Review in 2012

The central component of the SLS rocket -- the core stage -- completed a Preliminary Design Review in late December. This means the early design meets all system requirements with acceptable risk and within the cost and schedule constraints and allows for proceeding with a detailed design.

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Just in Time for the Holidays: SLS Receives the Gift of Flight Hardware



In December, Marshall Center engineers received materials to begin manufacturing the adapter that will connect the Orion capsule to a Delta IV heavy-lift rocket for Exploration Flight Test-1, or EFT-1. Two forward and two aft rings, being delivered in the box shown in the photo above, will be welded to barrel panels, shown in the photo below, to form two adapters. This adapter design will be tested during EFT-1 for use during the first launch of NASA's SLS in 2017. Data from the adapter on the flight test will provide Marshall engineers with invaluable experience developing hardware early in the design process.

Designing the adapter once for multiple flights

also provides a cost savings. Of the two adapters welded at Marshall, one will attach Orion to the Delta IV heavy-lift rocket used for EFT-1. The other adapter will be a structural test article to gain knowledge about the design. (NASA/MSFC/Ray Downward)

Find this article at:



<http://www.nasa.gov/centers/marshall/about/star/index.html>