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Director's Corner

Happy New Year! I hope everyone took time to rest and enjoy the season. In this issue of the Marshall Star, we get a chance to look back at our 2013 accomplishments and look ahead to the opportunities of 2014.

We continued to make significant contributions to NASA’s three top priorities:

We brought the Space Launch System one year closer to its first launch with engine testing, core stage tooling and manufacturing, advanced development testing, and the kind of vehicle design and systems review that nobody does better than Marshall.

The Payload Operation Integration Center marked its 12th year of continuous 24/7 science operations support to NASA’s “11th field center,” the International Space Station. We’re making it a more productive lab while maintaining its air and water life support equipment.

We finished our work for the James Webb Space

Telescope, meeting all our commitments for testing the observatory's mirrors, composite frames, and calibration equipment.

We continued developing the technologies to make deep space exploration safer and more affordable. We never cease to make discoveries about our planet, our sun, and our universe through our scientific efforts.

Our expertise contributed to two successful commercial cargo launches by SpaceX and Orbital Sciences. The National Institute for Rocket Propulsion Systems delivered a report on the state of our national propulsion industrial base that will strengthen this national strategic capability.

Along the way, we overcame challenges and distractions, including the October furlough. Our ability to stay focused is standard operating procedure for us and explains much about our longevity and achievements

We also marked an anniversary that I think has extra meaning for our current work. It's now been 30 years since the first Spacelab mission aboard the Space Shuttle. We've retired both of those programs, but their legacies live on.

They were the reason NASA looked to us to develop and operate the hardware and the science for the ISS. The people who made Spacelab such a success continue to make Marshall a success, including Deputy Center Director Teresa Vanhooser and Chief Engineer Lisa Watson-Morgan.

So our work today lays the groundwork for the future of space exploration, not just in a year or five years, but in twenty or thirty years. I'm proud of all that we've accomplished.

Our good work is reflected in our rankings in the annual Best Places to Work in the Federal Government Survey. NASA topped the list of favorite large federal employers and Marshall specifically jumped up in rank from 19 to 11.

Thank you for the history you made every day in 2013. I look forward to supporting you as we continue to explore and discover and build the future in 2014.

Patrick

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January

Marshall Center Takes Part in First National Network for Manufacturing Innovation Workshop

NASA's Marshall Space Flight Center cosponsored a public workshop Jan. 16 at the U.S. Space & Rocket Center devoted to reviewing and refining the suggested design for a new National Network for Manufacturing Innovation, an initiative proposed by President Barack Obama. The "Blueprint for Action" is a workshop series providing a forum for the Advanced Manufacturing National Program Office to present the proposed design of the new initiative and its regional components, Institutes for Manufacturing Innovation.

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World's Most Powerful Engine Blazes Path for SLS Advanced Propulsion

To help develop the nation's future heavy-lift rocket, NASA resurrected the world's most powerful rocket engine ever flown -- the mighty F-1 that powered the Saturn V rocket-- and test fired its gas generator Jan. 24 at Marshall. NASA engineers ran the gas generator for 30 seconds at Marshall Test Stand 116. Modern instruments on the test stand measured performance and combustion properties to allow engineers a starting point for creating a new, more affordable, advanced propulsion system for NASA's Space Launch System (SLS), managed at Marshall. "Our young engineers are getting their hands dirty by working with one of NASA's most famous engines," said Tom Williams, director of the Propulsion Systems Department in Marshall's Engineering Directorate.

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February

2013: J-2X Fired Up for Testing

NASA continued its steady progress toward a return to deep-space missions with the hot-fire test of a new J-2X engine at NASA's Stennis Space Center on Feb. 15. The 35-second test signaled the start of a new round of testing on the next-generation J-2X rocket engine that will benefit the SLS.

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Administrator Bolden Tours Marshall Advanced Manufacturing Facility, Highlights Space Program's Contributions to Revitalize U.S. Industry

NASA Administrator Charles Bolden saw some of the

advanced manufacturing techniques like "3-D printing" being used to create parts for the SLS rocket engines during a visit to the Marshall Center on Feb. 22. He toured the National Center for Advanced Manufacturing's Rapid Prototyping Facility in Building 4707, where selective laser melting is creating complex parts like gas generator ducts without the multiple welds required by traditional methods. The technology is expected to provide parts much more efficiently and affordably for the SLS.

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Marshall, U.S. Space & Rocket Center Host 'Robots to Rocket City'

Following the January kickoff of the 2013 FIRST (For Inspiration and Recognition of Science and Technology) Robotics competition, the Marshall Center teamed with the U.S. Space & Rocket Center Feb. 17 to cohost a regional high-school exhibition prior to the main robotics-building challenge in the spring. Each year, Marshall supports the student engineering initiative, providing guidance and inspiration to students across North Alabama, and nearby Tennessee and Mississippi, as well. The robotics event challenges participants to build and field technically complex robots capable of executing intricate tasks -- forcing the students to think like NASA engineers as they design hardware, troubleshoot problems and address the competition's challenges.

Image left: FIRST is a spirited competition using sophisticated robotics technology.

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NASA Offers Glimpse of the Future with SLS at Tennessee Tech

Marshall partnered with the Millard Oakley Science, Technology, Engineering and Math (STEM) Center at Tennessee Tech University (TTU) in Cookeville Feb. 21-23 to introduce area students and the community to SLS. The weeklong series of events reached hundreds of people and included the debut of the new interactive SLS exhibit on display at the STEM center; a “Fab Friday” event attended by community members featuring hands-on activities for children; SLS Strategic Communications Manager Kimberly Robinson speaking to a packed auditorium of students and the public about SLS; distance learning sessions with local schools; and a chat held on Twitter with TTU alumni who work at Marshall.

Image right: Don Krupp, left, SLS Control Systems manager; Mallory Johnston, SLS Flight Systems engineer; and John Rector, SLS Stages Green Run test manager, during a live video teleconference with middle school students at the Millard Oakley STEM Center at Tennessee Tech in Cookeville. The three Tennessee Tech alumni were part of an outreach partnership between SLS and the STEM Center. (NASA/MSFC)

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Materials Science Research Rack Heats Up For Space Station Science

In February, Marshall scientists and researchers worked to design a software upgrade to the Materials Science Research Rack (MSRR) to prevent contamination of the furnace due to overheating of materials. The rack had previously suffered a loss of communications between it and the computer that controls it, causing some of the materials inside the furnace to bond to the furnace itself. The software fix allowed for a much more efficient program to keep the furnace in operation for up to three hours after losing communications, giving researchers enough time to troubleshoot any problems and prevent contamination due to overheating of materials. Getting the MSRR back online was important because applied materials science is essential for the development of new, safer, stronger and more durable materials for use throughout everyday life.

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March

Space Station Research Features Broadcast Live from Marshall's Payload Operations Integration Center

In March, Marshall began airing weekly live segments from the Payload Operations Integration Center as part of "Space Station Live" on NASA TV. The broadcasts offer viewers a closer look at the latest research news on the station. The Marshall segments include interviews with payload flight controllers, as well as scientists from around the world, to highlight the cutting-edge research performed on the station. Space Station Live airs daily from 10-11 a.m. on NASA TV. The Marshall segments can be viewed on YouTube at http://www.youtube.com/playlist?list=PLBEXDPatoWBngmgCe62SgrfKc6ai-Rg7V

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April

Puerto Rico Teams Take Top Trophies at 20th Annual NASA Great Moonbuggy Race

Rounding out two decades of inventive student engineering, the 20th annual NASA Great Moonbuggy Race brought 89 teams of high school, college and university students to the U.S. Space & Rocket Center April 26-27 to race lightweight, human-powered "moonbuggies" of their own design. Teams representing Teodoro Aguilar Mora Vocational High School in Yabucoa, Puerto Rico, and the University of Puerto Rico at Humacao won first place in the high school and college divisions, respectively. The race is evolving to the NASA Human Exploration Rover Challenge, and in April 2014 student engineers will compete for the first time in this exhilarating challenge, inspired by new missions of discovery across the solar system.

Image right: Team 1 from Teodoro Aguilar Mora Vocational High School in Puerto Rico won first place in the high school division of the 20th annual NASA Great Moonbuggy Race. (NASA/MSFC)

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NASA's Proposed FY2014 Budget Said to Provide Stability for Marshall Workforce

After the president's proposed $17.7 billion NASA budget request for fiscal year 2014 was rolled out April 10, Marshall Center Director Patrick Scheuermann told the workforce and news media that the proposed budget provides the resources needed by the center and agency for the United States to remain the leader in space exploration and scientific discovery. The budget proposal included $2.18 billion for the programs and projects managed by Marshall. That was almost the same as the previous year's request, enabling Marshall to continue development of the "essential" SLS and Orion crew vehicle, maintain International Space Station operations, proceed with testing the James Webb Space Telescope and continue other core programs. "This is a solid budget for us here at Marshall and will provide stability for our workforce," Scheuermann said. "The center has a clear mission, and this budget will give us the resources we need to perform it."

Image left: Marshall Center Director Patrick Scheuermann outlines NASA's fiscal year 2014 budget proposal during an all-hands in Morris Auditorium on April 10. (NASA/MSFC/Emmett Given)

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Marshall Center Honored, Legislature Declares April 18 'NASA Day in Alabama'

Marshall Center Director Patrick Scheuermann met with Alabama Gov. Robert Bentley, Lt. Gov. Kay Ivey and a number of other state leaders and legislators April 18 during events at the state Capitol honoring Marshall for its achievements in space exploration and its significance to the state. The governor signed a proclamation declaring it "NASA Day in Alabama," and Scheuermann accepted resolutions from lawmakers praising Marshall's contributions to Alabama's economy and history.

Image right: Alabama Gov. Robert Bentley signs a proclamation declaring April 18, 2013, "NASA Day in Alabama." Looking on, from left, are Marshall Center Director Patrick Scheuermann, astronauts Kathleen "Kate" Rubins and Jack Fischer, and State Sen. Bill Holtzclaw of Madison, who represents Madison and Limestone counties. (NASA/MSFC/Emmett Given)

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May

Adapter 'Flips' for Progress toward 2014 Exploration Flight Test

In May, engineers at the Marshall Center flipped an adapter -- no easy feat when you're talking about 1,000 pounds of aluminum -- furthering progress toward Exploration Flight Test (EFT)-1 in 2014. The flip was an important step in finishing the machining work on

the adapter, which will attach NASA's Orion spacecraft to a United Launch Alliance (ULA) Delta IV rocket that will send Orion to space during EFT-1. Marshall engineer Jonathon Walden is the lead designer for the adapter.

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Marshall Leads 'NASA Day in Baton Rouge' May 8

The Marshall Center was the talk of Louisiana legislators, industry leaders and visitors to the state Capitol May 8 during "NASA Day in Baton Rouge," celebrating NASA's historic, ongoing partnership with the people and industry of Louisiana. Marshall Center Director Patrick Scheuermann met with Louisiana Gov. Bobby Jindal and key members of the state Legislature. Exhibits and displays in the Capitol also helped demonstrate NASA's work at the Michoud Assembly Facility and elsewhere in Louisiana -- boosting the state's economy and furthering the nation's work in space.

Image right: Students visiting the Louisiana Capitol May 8 line up to pose for a virtual photo of themselves in a NASA space suit. Enjoying the event are Marshall Director Patrick Scheuermann, second from right, and Shannon Raleigh, left, an ASRC Federal/Analytical Services outreach coordinator supporting the SLS Program Office. (NASA/Eric Bordelon)

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Final Winner Named to Conclude 2013 NASA Student Launch Projects

In May, NASA concluded its Student Launch Projects by naming the top college-division winner of the April 21 "launchfest" that wrapped up the annual rocketry challenge for the 2012-13 school year. The Aerospace Club of Vanderbilt University in Nashville, Tenn., took first prize in the annual competition, in which student teams from middle schools, high schools, colleges and universities around the nation design, build and fly small rockets with science payloads to an altitude of 1 mile and return them safely to Earth. Vanderbilt beat 35 other colleges and universities to win the $5,000 top prize, provided by ATK Aerospace Group of Promontory, Utah.

Image left: In 2013, the "Altitude Award," presented annually to the team that comes closest to the 1-mile altitude goal without going over it, went to the team from Alabama A&M University in Huntsville. Their rocket flew to an altitude of 5,269 feet -- just 11 feet short of the goal, a record-setting achievement. (MSFC/Emmett Given)

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Mighty Eagle Gets a New View

The Mighty Eagle, NASA's robotic prototype lander managed at Marshall, completed a test series in May to monitor its systems' functionality after coming out of winter storage. This series included a test flight that was recorded by the Quad-Copter -- a small vehicle also developed at Marshall, equipped with a video camera allowing for never-before-seen footage of the Mighty Eagle. The Quad-Copter is an achievement in itself. It was designed and built by the Aero-M team at Marshall as part of the 2012 Unmanned Aerial Systems competition between various NASA centers. The Marshall team was made up of young engineers from the center tasked with designing a vehicle that could perform an autonomous search-and-rescue mission to locate people after a small plane crash. The Quad-Copter is built with off-the-shelf, hobbyist-grade parts and uses an open-source flight computer. (NASA/MSFC/Todd Freestone)

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Marshall Celebrates Accomplishments, Capabilities, and Partnerships

Elected officials and business and community leaders heard an overview of Marshall's activities, budget and outlook from Center Director Patrick Scheuermann and other key Marshall leaders during an early morning event May 15 that celebrated the vital importance of the center's partnerships with industry, government and academia. Scheuermann said the theme, "We Do the Hard Stuff Together," is particularly appropriate for the "Marshall Team." "Thanks to the management team in place, the people of Marshall and this community, we're ready for the challenges of the future by focusing on partnerships and affordable solutions," he said.

Image left: During the breakfast event May 15, Marshall Center Director Patrick Scheuermann, right, talks with former astronaut Owen Garriott beneath the Saturn V rocket suspended in the Davidson Center for Space Exploration at the U.S. Space & Rocket Center. (NASA/MSFC/Emmett Given)

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Budget and SLS Focus of Associate Administrator Lightfoot Visit

NASA Associate Administrator Robert Lightfoot, a former Marshall director, talked with center team members at an all-hands May 21. He discussed the fiscal year 2014 budget and how NASA is managing the budget to continue the work being done within the agency to advance the United States' leadership in space, improve life on Earth and to strengthen the economy. Lightfoot was also on hand when engineers flipped a 1,000-pound aluminum adapter ring which will attach NASA's Orion spacecraft to the United Launch Alliance Delta IV rocket that will launch Exploration Flight Test 1 in 2014.

Image right: NASA Associate Administrator Robert Lightfoot gets a first-hand look at the adapter work underway at Marshall's Building 4705 on May 22. While at the facility, Lightfoot held a press conference to discuss the hardware and answer questions about the status of SLS. (NASA/MSFC/Emmett Given)

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June

NASA's Centennial Challenges Awards $5,000 at Sample Return Robot Challenge

In early June, after two days of extensive competition, NASA awarded Team Survey of Los Angeles a $5,000 prize check after they successfully completed Level 1 of the Sample Return Robot Challenge, a part of NASA's Centennial Challenges prize program. The event, at Worcester Polytechnic Institute in Worcester, Mass., June 5-7, drew 11 robotics teams from the United States, Canada and Estonia to compete for a total of $1.5 million in NASA prize money. Ten of those teams passed inspection and took to the challenge field. After two rounds of Level 1 competition, Team Survey met the level's prize requirements and was declared the winner of this year's competition. The challenge will be re-competed in June 2014. Centennial Challenges is managed at the Marshall Center.

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Marshall's Upgraded Payload Operations Integration Center Enhances Station Work

When International Space Station Program Manager Michael Suffredini visited Marshall in June, he told payload science controllers to prepare to be busy. In 2013, the team helped station crews set records for performing science experiments. Now they have a new control room that will help them break more research records. On June 19, NASA unveiled the payload operations control room with new capabilities to enhance collaboration and enable the ground team to efficiently help the space station crew and researchers around the world perform cutting-edge science in the unique space environment. The Payload Operations Integration Center -- which began around-the-clock operations March 19, 2001 -- plans and coordinates all the research activities on the space station.

Image left: On June 19, NASA unveiled an upgraded Payload Operations Integration Center at Marshall. (NASA/MSFC/Emmett Given)

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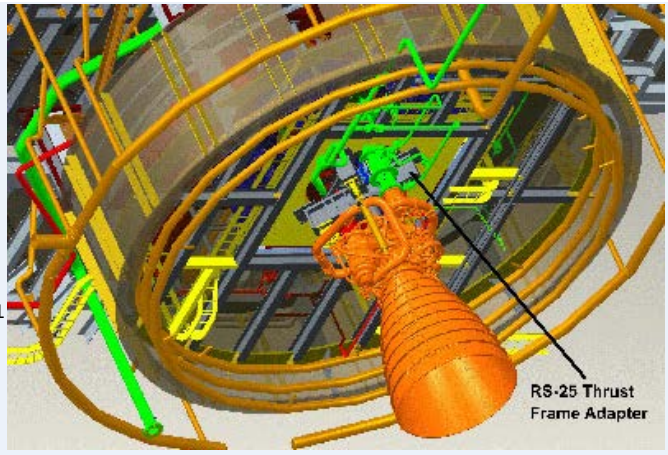
Production of Key Equipment Paves Way for NASA SLS RS-25 Testing

In June, fabrication began at Stennis on a new 7,755-pound thrust frame adapter for the A-1 test stand to enable testing of the RS-25 engines that will provide core-stage power for SLS. "This piece is, literally, a big part of the transition of the test stand to support the core stage engine testing needed for the SLS Program," said Mike Kynard, manager of the SLS Liquid Engines Office at Marshall. "Stennis is making great strides in preparation for RS-25 testing of the A-1 test stand and doing this in an innovative manner. We are excited about getting the data from these tests so that we can ensure the RS-25s are ready to support the SLS missions."



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SLS Work Forges Ahead at Key NASA Facilities

NASA officials unveiled a new Vertical Weld Center on June 21 at the Michoud Assembly Facility -- furthering progress on production of the SLS. The Vertical Weld Center -- standing about three stories tall and weighing 150 tons -- will weld barrel panels together to produce whole barrels for the core stage on the SLS.

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Marshall Family Picnic Helps Beat Summer Heat

On June 8, Marshall workers and their families enjoyed summer fun during the annual Marshall Employee Family Picnic. They played bingo and carnival midway games, bounced on giant inflatable slides, listened to live music from local bands and performers and tried their hand at dousing dunking booth volunteers, including Marshall Center Director Patrick Scheuermann. The picnic was organized and sponsored by the Marshall Exchange, with support from center directorates and clubs.

Image right: Children of Marshall team members enjoy activities during the annual Marshall Employee Family Picnic June 8. (MSFC/Fred Deaton)

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Joan A. 'Jody' Singer Named Manager of Flight Programs and Partnerships Office at Marshall

Joan A. "Jody" Singer was named manager of the Flight Programs and Partnerships Office at Marshall in June. She is responsible for overall management and direction of the office, including an annual budget of $108 million and a combined workforce of more than

500 civil servants and contractors. She oversees the work of Marshall in the areas of human exploration projects and tasks; flight mission programs and projects; and ISS hardware integration and operations. The office also is tasked with creating and maintaining value-added partnerships with other government agencies and international and commercial partners that will help achieve NASA's vision. (NASA/MSFC)

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A Good Fit: Adapter, Delta IV Rocket Test Article Successfully Connected for Exploration Flight Test-1

It was a good fit for a spacecraft adapter and a Delta IV test article, as two critical elements of Exploration Flight Test-1 were successfully connected during a fit check June 26 at Marshall. The adapter will join the Orion spacecraft to a United Launch Alliance (ULA) Delta IV rocket, which is being constructed at ULA's facility in Decatur and will launch Orion on the 2014 flight test. "Great work is being done in North Alabama in preparation for EFT-1," said Mark Geyer, Orion program manager from NASA's Johnson Space Center. "The capabilities of the Orion spacecraft and SLS launch vehicle will open exciting deep space destinations, including sending humans to an asteroid and ultimately sending humans to Mars." (NASA/MSFC/Fred Deaton)

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Hot-Fire Tests Show 3-D Printed Rocket Parts Can Stand the Heat

A series of hot-fire tests conducted from June through August at Marshall were the first to test rocket parts

made by the additive manufacturing, or 3-D printing process, at high temperatures and pressures. Early test results of a small injector showed 3-D printed parts rivaled parts made with traditional manufacturing, which requires welding and time-consuming assembly. For the final test in 2013, the largest 3-D printed rocket injector NASA has ever tested blazed to life generating a record 20,000 pounds of thrust. This technology has the potential to reduce the cost of manufacturing rocket engines and thus make it more affordable to build SLS and other space vehicles.

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July

NASA Night with the Stars

Marshall Center Director Patrick Scheuermann helped launch "NASA Night" at Joe Davis Stadium July 12 by throwing out the first pitch of the game between the Huntsville Stars and the Birmingham Barons. More than 3,900 people came out for the game and the fireworks that followed -- and had an opportunity to learn more about the work of Marshall and NASA. (NASA/MSFC/Fred Deaton)

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First Liquid Hydrogen Tank Barrel Segment for the SLS Core Stage Completed at Michoud

The first liquid hydrogen tank barrel segment for the core stage of the SLS was completed in July at Michoud Assembly Facility in New Orleans. The segment is considered a “confidence” barrel segment because it validates the Vertical Weld Center is working the way it should.

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SLS Completes Preliminary Design Review

NASA achieved a major milestone in its effort to build the nation's next heavy-lift launch vehicle by successfully completing the SLS preliminary design review. Senior experts and engineers from across the agency concluded July 31 that the design, associated production and ground support plans for the SLS heavy-lift rocket are technically and programmatically capable of fulfilling the launch vehicle's mission objectives. More than 200 documents, 15 terabytes of data and more than two days of presentations were delivered for PDR. Marshall's Engineering Directorate provided the majority of those documents, which included drawings and data.

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Marshall Wins Small Business Administrator's Cup -- Again!

In July, Marshall was awarded the NASA Small Business Administrator's Cup award, which honors innovative practices that promote small business participation in a variety of NASA initiatives. The award, sponsored annually by NASA's Office of Small Business Programs, also recognizes the winning center's significant contributions to small business programs across the agency as a whole. It was the third time in five years that Marshall received the award. It was presented July 11 by NASA Administrator Charles Bolden and Glenn Delgado, associate administrator of NASA's Office of Small Business Programs in Washington.

Image left: NASA Administrator Charles Bolden, center, and Glenn Delgado, right, associate administrator of NASA's Office of Small Business Programs, present the Small Business Administrator's Cup to Marshall Center Associate Director Robin Henderson. (MSFC/Fred Deaton)

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More Than 200 Marshall Workers Honored During Annual Awards Event

On July 30, Marshall recognized more than 200 individual scientists, engineers and professional and administrative support personnel, plus 73 teams comprised of hundreds more -- all of whom made significant, sustained contributions in 2012-13 to NASA's mission and the work of the center. Marshall Center Director Patrick Scheuermann was joined during the ceremony by keynote speaker Christopher Scolese, director of Goddard Space Flight Center.

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Composite Cryotank Completes Testing At Marshall

In July, Marshall engineers completed a major space technology development milestone by successfully testing a pressurized, large cryogenic propellant tank

made of composite materials. Currently, most propellant tanks are fabricated out of metals. The almost 8-foot-diameter (2.4 meter) composite tank tested at Marshall's Hydrogen Cold Flow Test Facility is considered game-changing because composite tanks may significantly reduce the cost and weight for launch vehicles and other space missions. A potential initial target application for the composite technology is an upgrade to the upper stage of the SLS heavy-lift rocket.

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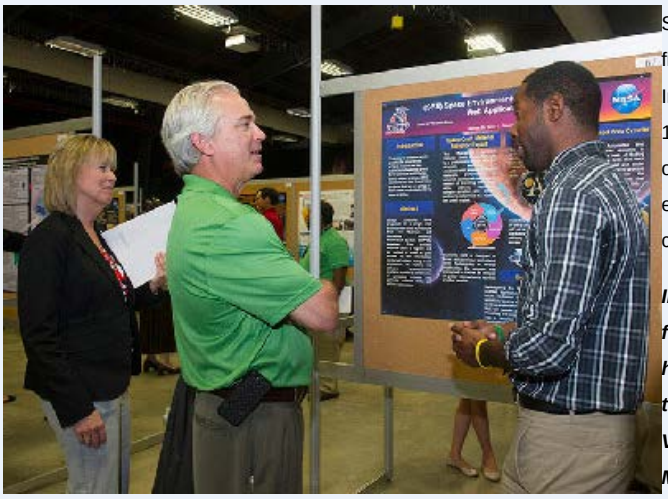
August

Marshall Interns Take 'One Small Step' Toward Aerospace Careers



Students representing colleges from around the country finished their summer internships at Marshall with the Intern Poster Expo on Aug. 7. The event provided the 141 college and four high school students the opportunity to showcase the results of their workplace experience and gain experience for future technical conference presentations.

Image left: Dawid Yhisreal-Rivas, right, a senior from the University of Texas in El Paso, explains his research during his NASA summer internship to Marshall Center Deputy Director Teresa Vanhooser, left, and Chris Singer, director of Marshall's Engineering Directorate.

(NASA/MSFC/Emmett Given)

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Local Teachers Get Behind-the-Scenes Tour of Marshall

Team Redstone -- which includes the Marshall Center

and U.S. Army organizations on Redstone Arsenal -- invited 50 teachers to tour Redstone Arsenal Aug. 15 as part of "Back-2-School Day." The tour focused on sites available for field trips for students studying math, science, technology and engineering. Stops included Marshall's Payload Operations Integration Center and the High Schools United with NASA to Create Hardware lab, or HUNCH, both located in Building 4663. The program gives high school students the chance to work with NASA engineers to design and build hardware for use on the International Space Station.

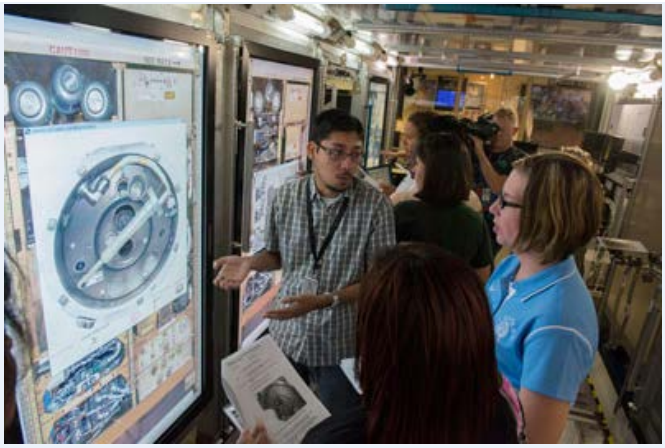

Image right: Vincent Vidaurri, center, a technical specialist with Teledyne Brown Engineering supporting Mission Operations at Marshall, provides details about a mock-up of the ISS science lab to a group of area teachers as part of "Back-2-School Day." Teachers learned about the resources available to them and their students. (NASA/MSFC/Fred Deaton)

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Scale Model of SLS B-2 Test Stand Successfully Completes Wind Tunnel Testing

A 1:100 (31-inch) scale model of the SLS core stage B-2 test stand successfully completed wind tunnel testing Aug. 8 at the Fort Collins, Colo. facility of NASA subcontractor CPP Wind Engineering & Air Quality Consultants. The actual B-2 test stand, located at Stennis, was originally built to test Saturn rocket stages that propelled humans to the moon. It is being renovated to test the core stage of the SLS in late 2016 and early 2017.

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James Webb Space Telescope Backplane Arrives for Cryotesting

The James Webb Space Telescope's primary backplane support arrived at Marshall Aug. 22 for testing in the X-ray and Cryogenic Test Facility. The backplane is the backbone of the telescope, supporting its 18 beryllium mirrors, instruments and other elements while the telescope is looking into deep space. With all cryogenic testing of the backplane, sunshield and mirror complete, the Webb Telescope moves closer to its planned 2018 launch. One-hundred-times more powerful than the Hubble Space Telescope, the Webb Telescope will observe the most distant objects in the universe, provide images of the first galaxies formed and capture detailed data about unexplored planets around distant stars.

Image right: The Webb Telescope's backplane element arrives at Marshall. (NASA/MSFC/Fred Deaton)

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Sensor Testing Complete on Cryogenic Composite Tank

A team of engineers at Marshall conducted advanced structure sensor testing on a carbon composite cryogenic tank. Composite cryogenic tanks are fuel storage tanks made of a carbon composite, which is lighter than the metal from which traditional tanks are built. These new tanks could reduce cost and weight significantly for future spacecraft. Composite cryogenic tanks could be used to carry fuel for future vehicles like the SLS. The testing was part of a structural health monitoring study funded by NASA's Advanced Exploration Systems program and led by NASA's Kennedy Space Center.

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September

NASA Docks in the Port City for Mobile Business Forum

Marshall co-hosted a business forum with the Mobile, Ala., area Chamber of Commerce on Sept. 4 in Mobile. NASA managers from Marshall, Michoud and Stennis, as well as representatives of 25 prime contractors, presented a behind-the-scenes look at working with NASA and how Mobile Bay-area businesses can get involved.

Image left: Robert Champion, deputy director of Michoud, details various aspects of working with the nation's space agency as he addresses participants at the NASA Mobile Business-to-Business Forum. (NASA/MAF/Samuel Senter)

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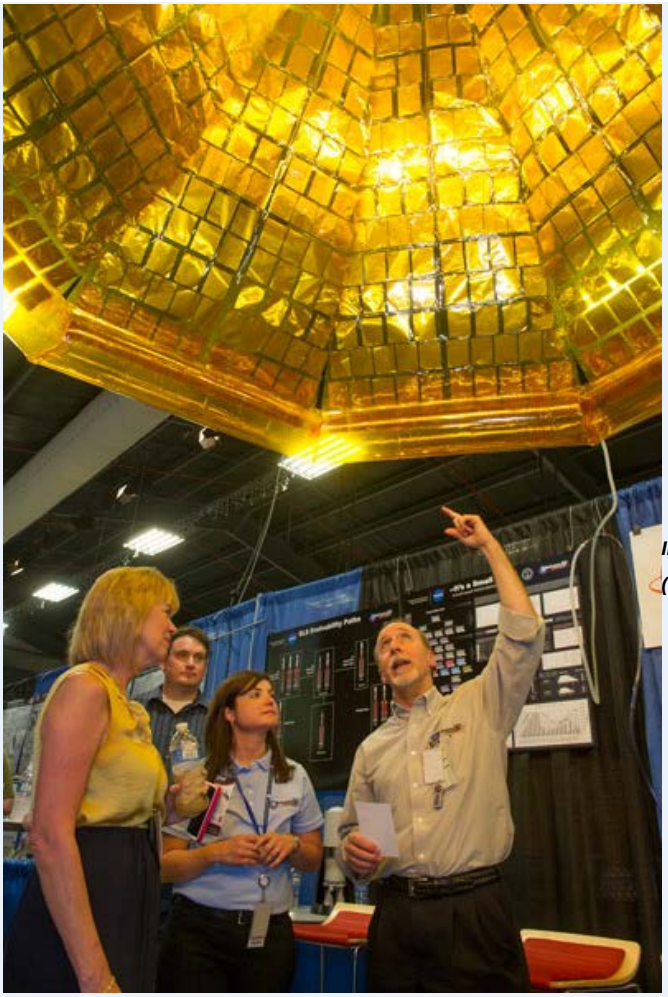
Marshall Hosts Annual Innovation & Technology Day

More than 80 different Marshall organizations exhibited their latest advances at the annual Innovation & Technology Day event Sept. 12 at the Activities Building. These organizations shared their progress and project innovations with the hundreds who attended throughout the day.

Image left: Teresa Vanhooser, left, Marshall deputy director, listens as Advanced Planning analyst Steve Lambing, right, provides details about a proposed inflatable solar array with, from left, Andrew Schnell with the Advanced Concepts Office and Stefanie Justice, a project engineer with Jacobs Engineering Group. The display was part of the Advanced Concepts booth at the annual



Innovation & Technology Day. (NASA/MSFC/Emmett Given)

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Marshall Team Captures Gold and Valuable Experience at Aerial Vehicle Competition

A small team of young engineers from Marshall won a competition internal to NASA to create autonomous and remote controlled vehicles. Marshall's "Aero-M" team was challenged with applying NASA's system engineering practices and system review processes to a small technical project. The competition, which included teams from Johnson and Kennedy, tested the engineering practices of the various teams and the performance of their vehicles as they conducted a simulated search-and-rescue mission Sept. 11 at Kennedy. The vehicle was tasked with scanning a mock airplane crash site, identifying the airplane, a replica "black box" and several crash dummies, using sensors and software developed and installed in the aircraft.

Image right: A small hexcopter -- a helicopter with six sets of rotating blades, built by Marshall engineers -- whirls through the clear skies over the Kennedy Space Center on Sept. 11. The flight was part of an internal NASA competition creating aerial vehicles. (NASA/Adam Kimberlin)

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Centennial Challenges Joins Asteroid Challenge at New York Maker Faire

NASA’s Centennial Challenges Program exhibited alongside NASA’s Asteroid Grand Challenge at the MAKE Magazine Maker

Faire held in Queens, N.Y., Sept. 21-22. The program was one of 650 exhibitors at the event, which had an attendance of 70,000. The bi-annual event showcases the work and projects of makers, hackers, do-it-yourselfers and artists in the areas of science and technology. Centennial Challenges, managed at Marshall, also displayed a spacesuit and a pressurized space glovebox created by previous challenge winners. Other NASA exhibits, including 3D-printed asteroid models, were included in the shared space staffed by Headquarters personnel. Centennial Challenges Program Manager Sam Ortega and NASA Chief Technologist Mason Peck were featured speakers at the event. The Centennial Challenges Program is NASA's prize competition program for citizen inventors, awarding monetary prizes for technology innovations that benefit NASA and the nation.

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93 Beat the Station as it Completes One Earth Orbit During Racin' the Station Duathlon!

The 2nd annual Racin' the Station Duathlon was held Sept. 28. A total of 188 duathlon participants tied their shoes and pumped air into bike tires in their effort to beat the space station as it orbited the Earth in 91 minutes, 12 seconds. By the time the orbiting laboratory completed a full circle, 93 racers crossed the finish line after running for 1.95 miles, biking for 14.3 miles and running again for 1.95 miles. The event was sponsored by the Team Rocket Tri Club, along with the Marshall Association to support the Marshall Association Scholarship Fund.

Image left: Ready, set, go! And these runners are off to "beat the station" before it completes one Earth orbit. (NASA/MSFC/Emmett Given)

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SLS Program Manager Todd May Talks 'NASA's Next Great Ship' on USS Alabama in Mobile and at Alma Mater

SLS Program Manager Todd May talked to the public about the SLS, NASA's "Next Great Ship," Sept. 4 at the USS Alabama in Mobile. NASA astronaut Tony Antonelli also was on deck to sign autographs. May -- who grew up in nearby Fairhope – also spoke about the SLS Program to students at his alma mater, Fairhope High School, on Sept. 5.

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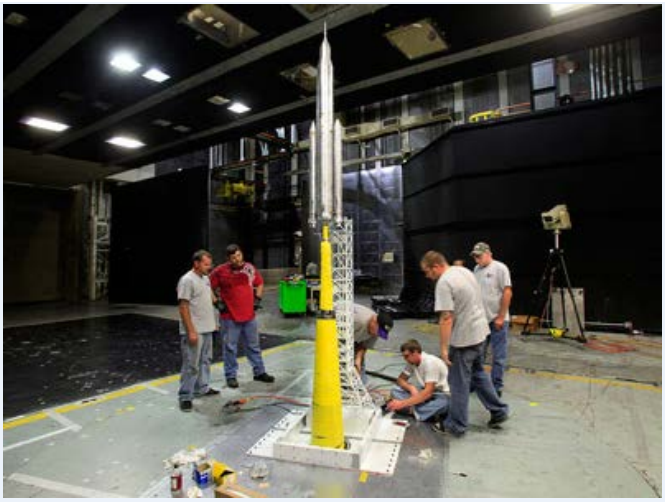
Wind Tunnel Testing Used to Ensure SLS will 'Breeze' through Liftoff

In September, NASA engineers and contractors completed liftoff transition testing of a 67.5-inch model of the SLS in a 14-by-22-foot subsonic wind tunnel at NASA's Langley Research Center. Data acquired from the test will help prepare SLS for its first mission in 2017, Exploration Mission-1, which will deliver an unmanned Orion spacecraft to a stable lunar orbit to check out the vehicle's fully integrated systems.



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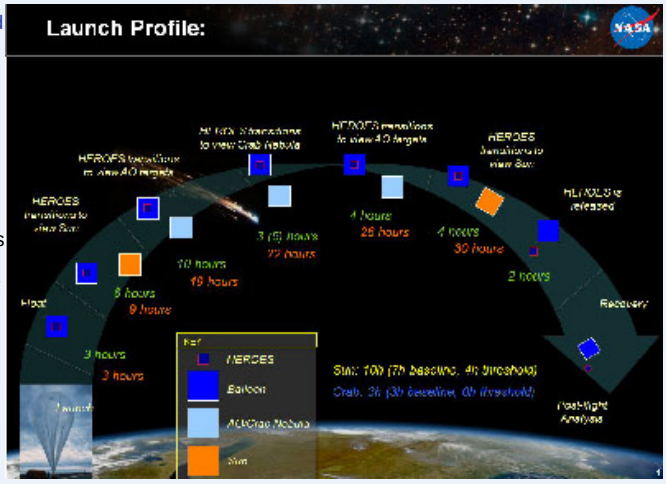
Marshall, Goddard Scientists Team for Dual-Purpose Science Balloon Mission



On Sept. 21-22, Marshall and Goddard centers teamed to conduct a unique flight mission: the "High Energy Replicated Optics to Explore the Sun" project, or HEROES, launched by balloon over Fort Sumner, N.M. This joint effort to fly a powerful X-ray telescope high into Earth's atmosphere had two goals. During the day, it studied solar flares, seeking new insight into the sun's magnetic energy. At night, it observed the Crab Nebula and other astrophysical targets. Planned and developed over 15 months by team members at both centers, HEROES was a recipient of the HOPE award, presented annually by the NASA Academy of Program/Project & Engineering Leadership, or APPEL, in partnership with NASA's Science Mission Directorate, Office of the Chief Engineer and Office of the Chief Technologist. The awards are designed to help NASA engineers and scientists with little or no previous flight-project experience take a mission from concept to launch to post-flight analysis over the course of a year. Analysis of HEROES' solar and astrophysical data is ongoing.

Image right: A diagram of HEROES' unusual flight profile, splitting its time between heliophysics and space science. (NASA/MSFC)

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Marshall's Mighty Eagle Improves Autonomous Landing Software with Successful Flight

The Mighty Eagle, a NASA robotic prototype lander managed at Marshall, successfully completed a test flight in September as part of a series to help validate software from Moon Express Inc. The test flight helped validate the company's Guidance, Navigation and Control flight software that tells the vehicle where to go and how to get there. The series was under the terms of a Reimbursable Space Act Agreement signed with the company. The flight also evaluated a new hazard avoidance system designed and developed at Marshall that can search for obstacles or hazards like rocks or boulders.

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LADEE Launch Lights Up East Coast

NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE) spacecraft lit up the Eastern Seaboard when it was successfully launched onboard a Minotaur V rocket, developed by Orbital Sciences Inc. The launch became a sensation across the United States, inspiring enthusiasts from all over the East Coast to take pictures of the vehicle on its way to the moon. The LADEE spacecraft was designed, developed and built at Ames Research Center and is managed by the Lunar Quest Program at Marshall.

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October

Annual Combined Federal Campaign Gets Underway

The annual Combined Federal Campaign, or CFC, started in October and CFC organizers spread the word about the charity drive using bus tours and Community Service Days to help expand awareness about the many different organizations in need. The Marshall workforce registered for scheduled visits to local charities and volunteer opportunities to help non-profits that receive donations as part of CFC's annual philanthropy campaign. The campaign's goal is to raise $700,000 by mid-January 2014. The CFC mission is to support and promote philanthropy, giving all employees an opportunity to improve the quality of life for all.

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Chandra Data Archive Honors 'American Archives Month'

October is designated as American Archives Month by the Society of American Archivists. Researchers working on NASA's Chandra X-ray Observatory, seeking to honor the nation's long legacy of data acquisition and archival, made public in October a series of images from NASA's own Chandra Data Archive. The Chandra archive plays a central role in the observatory's mission, giving the astronomical community -- and the public -- access to a wealth of data collected by the orbiting space imager. The imagery chosen to honor American Archives Month represents the observations of thousands of objects made permanently available to the world thanks to Chandra and the Chandra Data Archive.

Image right: A collage of never-before-released images drawn by NASA's Chandra X-ray Observatory researchers from the Chandra Data Archive. See more imagery here. (NASA/CXC/SAO)

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November

"Thanks-for-Giving": CFC Charity Fair and Lunch Nov. 12

Nearly 30 non-profit groups visited Marshall Nov. 12 as part of the CFC "Thanks-for-Giving" charity fair in the Activities Building. Organizations from Madison County and nearby areas spoke to the Marshall team about the many ways they can help those in need – both financially and by volunteering. By the end of year, donations totaled more than $614,000 reaching 88 percent of the $700,000 goal.

Image left: Renee Higgins, right, manager of the Training and Incentives Office in Marshall's Office of Human Capital, and executive chairperson of the center's CFC drive, greets Anne Sentell and Weezy from Therapy Partners in Huntsville at the CFC "Thanks-for-Giving" charity fair. The non-profit Therapy Partners provides professionally trained handlers and animals as therapeutic tools in hospitals, schools and long-term care facilities. (NASA/MSFC/Emmett Given)

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Marshall Celebrates International Space Station 15th Anniversary

In November, NASA celebrated the 15th anniversary of the International Space Station and the valuable

science results the orbiting laboratory continues to reveal. Marshall played a pivotal role in station design and construction and continues to support thriving science operations. On Nov. 20, 1998, the Russians launched the Zarya control module. A few weeks later on Dec. 4, the space shuttle STS-88 mission delivered the first U.S. element of the space station, the Unity module, built in an advanced manufacturing area at Marshall by The Boeing Company, the station's prime contractor.

Image right: The Unity node, the first U.S. element of the ISS, was built in advanced manufacturing areas at Marshall. (NASA/MSFC)

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Marshall-Managed Spacelab Paved Critical Path to Space Station

Nov. 28 marked the 30th anniversary of the first launch of Spacelab 1, a reusable laboratory managed by Marshall with a legacy that still lives on through the International Space Station. "For the Marshall Center, Spacelab helped gain skills needed to work on the International Space Station," said Marshall Deputy Director Teresa Vanhooser who was manager of the Microgravity Science Laboratory (MSL-1) mission, in which 29 experiments were performed in a Spacelab module. Vanhooser began her NASA career at the center in 1980 as an engineer in the Ground Systems Analysis Branch, where she led development and documentation of requirements for integration and testing of payloads for the Spacelab carrier. "We learned about payload integration as well as building and managing complex hardware like Spacelab modules and pallets. We proved we had the skillset to support critical roles on the space station. I think it was really just a tie from Skylab to Spacelab then on to the station. It was that continued effort down what I call our 'swim lane.' Our Spacelab operations experience helped Marshall add value to the space station program and communicate the rationale for the center's Payload Operations Integration Center."

Image left: Aboard Spacelab 1 during STS-9 in 1983 are, from left, Mission Specialist Robert Parker, Payload Specialist Byron Lichtenberg, Mission Specialist Owen Garriott and Payload Specialist Ulf Merbold. (NASA)

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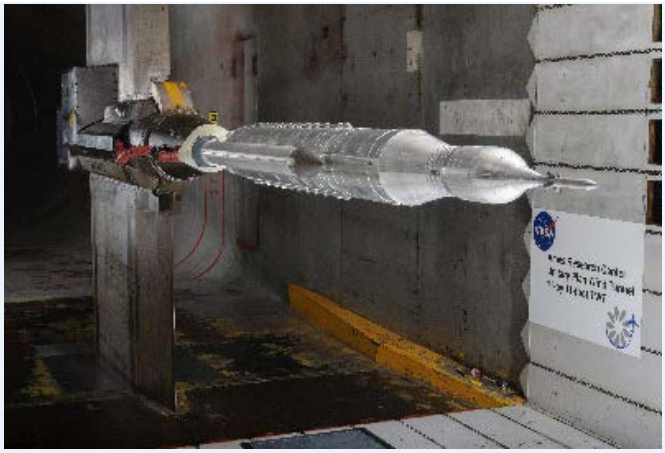
Wind Tunnel Testing Used to Understand the Unsteady Side of Aerodynamics

Wind tunnel tests conducted at Ames Research Center in November will be used to enhance the design and stability of the SLS. Four models of three different crew and cargo variations of the SLS, including the 70-metric-ton (77 ton) configuration, were tested in a series of wind tunnels at Ames. "The aeroacoustic tests we completed at Ames are all about unsteady aerodynamics," said John Blevins, lead engineer for aerodynamics and acoustics in the Spacecraft & Vehicle Systems Department at Marshall. "Local

vibrations can have a major impact on the rocket and critical hardware."



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NASA Tests Space Launch System Autopilot Technology on F/A-18 Jet

NASA completed the first tests with an F/A-18 research jet to evaluate the autonomous flight control system for the SLS. The tests were flown Nov. 14-15 from Dryden Flight Research Center. The system, called the Adaptive Augmenting Controller, will allow SLS to respond to vehicle and environmental variations, such as winds or vehicle flexibility, after it blasts off the launch pad and heads toward space. This is the first time a flight control system for a NASA rocket is being designed to adjust autonomously to unexpected conditions during actual flight rather than pre-flight predictions. This ability to make real-time adjustments to the autopilot provides enhanced performance and increased safety for the crew.

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Orion Flight Test Hardware Thrives Under Pressure

The adapter diaphragm was joined to an adapter prototype Nov. 14 for pressurized testing at Marshall. For the test, the adapter was sealed, and a vacuum pump was connected to the diaphragm. The vacuum pressure simulates atmospheric conditions the hardware may experience during the mission. To see a video of the test, click *here*.

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Marshall Researcher Helps Document Russian Chelyabinsk Meteor Event

Detailed findings about the size, power and impact of the Chelyabinsk meteor, which streaked across Russian skies the morning of Feb. 15, 2013, were published Nov. 6 in a pair of acclaimed science

journals by an international coalition of space scientists -- including Marshall astronomer Bill Cooke. The atmospheric entry and airburst of the meteoroid over the Russian city of Chelyabinsk injured approximately 1,600 people on the ground, and shattered windows and caused structural damage to an estimated 7,200 buildings, say city officials. Cooke said the unprecedented modern event provided a valuable opportunity to study a rare but natural hazard that often preoccupies workers at Marshall's Meteoroid Environments Office: helping them better understand the behavior and effects of "meteoric impactors." Said Cooke: "That's invaluable to our study of near-Earth objects and for the development of strategies to protect our planet from stray asteroids and other hazards from space."

Image left: This image of the small meteoroid streaking through the sky above Chelyabinsk, Russia, Feb. 15, 2013, was taken by photographer M. Ahmetvaleev. (M. Ahmetvaleev)

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NASA Human Exploration Rover Challenge Announced

The NASA Human Exploration Rover Challenge was unveiled in November, revealing the evolution of the NASA Great Moonbuggy Race into a new engineering design challenge focused on NASA's mission of discovery -- exploring planets, moons, asteroids and comets across the solar system. Registration for high school and college and university competitors is open through early 2014. The event will culminate in a race at the U.S. Space & Rocket Center April 10-12, 2014.

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'Brown Bag, Red Planet' Event Encourages Huntsville to Gather and View Maven Launch

On Nov. 18, Marshall partnered with the U.S. Space & Rocket Center to host a community-wide viewing of the Mars-bound launch of the Mars Atmosphere and Volatile EvolutioN (MAVEN) spacecraft. Activities included a panel discussion, educational activities for kids and a question-and-answer session about deep space exploration. The event culminated with a live launch viewing. The public and children attending Space Camp participated in the activities. Speakers included David Smitherman, Advanced Concepts Office study lead; Bill Cooke, Meteoroid Environments Office lead; Paul Bookout, deep space habitat concept demonstrator project manager; and Sharon Cobb, SLS assistant program manager. The panel discussion was broadcast live on Marshall's Ustream channel and questions were taken through the center's Twitter account for the panel. Employees also had the opportunity to participate by attending an event at the Activities Building where they could purchase lunch and watch the launch live. To see a video of the MAVEN launch, click here.

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Marshall's Mighty Eagle Successfully Concludes Test Series

The Mighty Eagle, a NASA robotic prototype lander managed at Marshall, successfully completed its fall test series with an autonomous, free flight test to help validate software from Moon Express Inc. This last test flight allowed the company's Guidance, Navigation and Control software to be integrated into the existing software on-board the Mighty Eagle to control the flight, telling the vehicle where to go and how to get there.

"We are really excited to conclude this test series with such a great flight," said Jason Adam, flight manager for the Mighty Eagle at Marshall. "Working with Moon Express to help test their new software is a great example of the types of partnerships NASA is looking to build. By utilizing agency resources and expertise, we can gather data that can also help advance the commercial sector." (NASA/MSFC/Todd Freestone)

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December

Engineers Crush Giant Fuel Tank to Improve Rocket Designs

During a series of tests at Marshall from Dec. 9-13, engineers applied nearly a million pounds of force to the top of an empty but pressurized rocket fuel tank while instruments and cameras recorded everything. It was the second full-scale test conducted at Marshall by engineers from Langley and NASA's Engineering and Safety Center, as part of the Shell Buckling and Knockdown Factor Project. Marshall engineers conducting the test -- dubbed Can Crusher II -- have a keen interest in the results because the data will enhance the design of the SLS, which is being built by Marshall. "What we learn will make it possible for NASA to design safe but still thinner and lighter structures for the SLS and other spacecraft," said Dr. Mark Hilburger, senior research engineer in the Structural Mechanics and Concepts Branch at Langley.

Image right: In December, engineers took a tank similar in size to the SLS fuel tanks and crushed it for science. The goal was to see just how much force the 27.5-foot-diameter, 20-foot-tall tank can withstand by pressing down on it with amost 1 million pounds of force and causing it to buckle. Engineers are compiling the data to determine shell-buckling design factors that will enable light-weight, safe and sturdy designs for SLS and future launch vehicles.

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Marshall Social Media Sites See Great Growth in 2013

Marshall's social media sites saw significant growth in 2013, with accounts adding new users and followers at a fast pace. Marshall Facebook accounts added almost 30,000 fans from January to December 2013, Twitter added almost 32,000 followers, and Flickr had 5.2 million views. Web chats continued to be an effective way to communicate key events and subjects, such as meteor showers, and scored big numbers with over 267,000 Ustream views, 2,500 questions asked and over 325,000 views of the chat promos. YouTube also saw major increases in 2013, with over 1 million total views, and also added 3,000 subscribers during the year. New accounts were also added including a relaunch of Google+ in the spring, and Instagram in December. "We have an amazing team of people that do a terrific job of managing these accounts that keep the public informed on all the great work going on at Marshall, and NASA agency-wide," said Shannon Ridinger, social media team lead and public affairs officer in the Office of Strategic Analysis & Communications. "We've had a great year, and I can't wait to see what the team accomplishes in 2014."

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