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Two Boosters Complete for Orion Spacecraft's First Flight Test

By Shannon Ridinger and Megan Davidson

Two of the boosters that will help send NASA's Orion spacecraft into space for the first time are on their way to Florida.

Orion will launch on top of a Delta IV rocket this fall, and two of the rocket's three boosters were rolled out of the United Launch Alliance (ULA) facility in Decatur, Ala., and loaded onto a Mariner cargo barge Feb 21.

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A Delta IV booster is moved out of the United Launch Alliance (ULA) facility in Decatur. From ULA, two completed boosters were shipped and expected to arrive at Cape Canaveral, Fla., in early March for final processing prior to Orion's first flight test later this fall. (NASA/MSFC)

Marshall's Nadra Hatchett 'Followed the Lighted Path' to a Career at NASA

By Bill Hubscher

Nadra Hatchett has a Zen-like view of the course her life has taken.

"Even when it leads me in a direction I did not expect to go, I've trusted my faith and followed the lighted path," she says with a smile. "Thankfully, I have not been steered wrong yet."

Hatchett, an aerospace engineer and a technical assistant in the Marshall Space

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Nadra Hatchett, left, an aerospace engineer and technical assistant in the Marshall Center's Office of the Center Director, enjoys a visit to the Kennedy Space Center in 2010 as a Space Flight Awareness honoree. With her are her husband Ollie, right, and NASA astronaut Cady Coleman.

Orion Boosters *Continued from page 1*

ULA is constructing the Delta IV for the flight test of Orion, called Exploration Flight Test-1, or EFT-1. From ULA, the boosters will arrive at Cape Canaveral, Fla., in early March for final processing prior to the launch. A third booster is still in fabrication at the Decatur facility.

“We all know Orion’s first flight is coming soon, but seeing these boosters and knowing they are headed to the Cape makes it that more real,” said Larry Gagliano, NASA Orion project manager at NASA’s Marshall Space Flight Center. “EFT-1 is such a big milestone for NASA, and we are all so excited to see Orion fly and get the data from the flight that will enable us to continue NASA’s space exploration goals.”

During the test, Orion will travel 3,600 miles into space -- farther than a spacecraft built for humans has been in more than 40 years -- and orbit the Earth twice. The capsule will re-enter Earth’s atmosphere at speeds approaching 20,000 mph, generating temperatures as high as 4,000 degrees Fahrenheit, before splashing down in the Pacific Ocean.

The uncrewed flight on the Delta IV will provide engineers with important data about Orion’s heat shield and other elements, including the spacecraft adapter’s performance. The adapter was completed earlier this month at the Marshall Center and will be delivered to ULA in mid-March. The spacecraft adapter will connect Orion to the Delta IV and also will connect Orion to the Space Launch System (SLS). SLS, NASA’s new rocket, will be capable of taking humans to deep space missions, including Mars. Orion’s first flight on the Delta IV will help finalize the design of the spacecraft to increase efficiencies and reduce risks as preparations are made for the first Orion SLS mission set for 2017.

The Marshall Center has been an integral part of the EFT-1 mission. In addition to designing and building the spacecraft adapter, engineers and specialists have provided design and oversight support to NASA’s Langley Research Center for the Launch Abort System (LAS) that will sit on top of the Orion. The LAS is designed to get astronauts safely and quickly away from the spacecraft in the event of an emergency and is one of the components that will be tested during Orion’s first flight. The



Looking on as the United Launch Alliance (ULA) boosters are loaded onto the Mariner cargo barge at ULA’s facility in Decatur, are from left, Greg Jenkins, ULA representative; Corey Brooker, Lockheed Martin Orion systems and launch vehicle integration; Bill Hill, NASA assistant deputy associate administrator for exploration systems; Paul Marshall, NASA Orion program assistant manager for strategy integration; and Larry Gagliano, NASA Orion project manager at the Marshall Center. (NASA/MSFC)

center also has been able to provide access to its unique facilities to help maintain the EFT-1 manufacturing schedule. To date, more than 300 EFT-1 flight and test parts have been produced at Marshall.

For more information on Orion, click [here](#).

Ridinger is a public affairs officer and Davidson is an ASRC Federal/Analytical Services employee, both in the Office of Strategic Analysis & Communications.

Marshall Small Business Alliance to Meet Feb. 27

On Feb. 27, NASA's Marshall Space Flight Center will host its first Small Business Alliance meeting of 2014 -- and members of the Marshall team are invited to attend.

They'll be joined by representatives of large and small business prime contractors, subcontractors and NASA organizations. The event will be held in the Davidson Center at the U.S. Space & Rocket Center in Huntsville. Onsite registration will open at 7 a.m.

The meeting will begin at 8 a.m. with welcoming remarks by Marshall Center Director Patrick Scheuermann, Huntsville Mayor Tommy Battle and Madison Mayor Troy Trulock. Marshall speakers will include John Honeycutt, deputy manager of the Space Launch System Program; Dr. Daniel Schumacher, manager of

the Science & Technology Office; David Iosco, deputy director of the Office of Procurement; Stacy Counts, manager of the Partnerships Office within the Flight Programs & Partnerships Office; Terry Taylor, manager of the Technology Transfer Office; Johnny Stephenson, deputy director of the Office of Strategic Analysis & Communications; and Marshall small business specialist David Brock.

The meeting will adjourn at 12:30 p.m.

The Small Business Alliance is sponsored by Marshall's Small Business Office, which is part of the center's Office of Procurement. Established in 2007, the alliance helps small businesses pursue NASA procurement and subcontracting opportunities.

Nadra Hatchett *Continued from page 1*

Flight Center's Office of the Center Director, became the first member of her immediate family to attend college, but NASA was not her final goal.

"I wanted to be an architect," Hatchett says. "I knew the first step was to get into college so I could eventually be an urban planner, but I didn't want to travel far from my parents' home in Madison. I started taking graphic arts and drafting design classes at Calhoun Community College in Decatur."

It was while attending Calhoun in the 1980s that her "path" took one of those unexpected turns. A professor asked if she was interested in a college internship at NASA.

"I'd been to the U.S. Space & Rocket Center as a kid and heard the rocket engine tests from my house," Hatchett says. "I even knew some engineers, so I thought I would apply for the internship just for the experience."

Her time as a college intern at NASA guided her future academic choices as well, soon graduating from Athens State College with a degree in mathematics and a minor in physics.

More than 20 years later, she has worked on the test stands where those roaring engines made an impact on her life, helping design structures in the center's test area and eventually managing one of the world's largest seven-axis machining tools in Building 4705.

Today, Hatchett is on a yearlong assignment in the center director's office, supporting the director, deputy director and associate director by accompanying them to various meetings and special events, providing on demand support, assisting with management projects and observing the center's governing bodies -- witnessing firsthand how Marshall coordinates with NASA Headquarters and other centers. She is grateful for yet another learning opportunity.

"I now have a new understanding of our managers and the monumental task they have in running a NASA center," she says. "A newfound respect for what the director, deputy director and associate director do to support the rest of us every day. They juggle and guide the complex aspects of Marshall's mission and our place in the agency -- things that many people don't know about. I think seeing this from behind-the-scenes will help me as a manager when I go back 'into the trenches.'"

Nadra Hatchett recently discussed her NASA experiences for Marshall Television as part of Black History Month. She shared what motivates her, the path she took to get here and her thoughts about her parents' struggle during the civil rights era. Her video profile is posted at the [Marshall Center's YouTube channel](#).

Hubscher, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.

Marshall Center's Black History Month Program Features Journalist Clarence Page and His Experiences During the Civil Rights Era



Clarence Page, a Pulitzer Prize-winning syndicated columnist, speaks to the Marshall Space Flight Center workforce in Morris Auditorium during the Black History Month Program on Feb. 25. He talked about his nearly 40-year career as a journalist during the civil rights era, as well as his observations on the space program. "The space race was launched at the height of the civil rights era and so many people here in Huntsville wanted to collaborate with others and work together to look toward a future in the stars. I salute you for that," Page said. He also took questions from the audience during the event and signed autographs afterward. (NASA/MSFC/Emmett Given)



The Voices of Marshall performed during the Black History Month event, singing "Lift Every Voice and Sing" and "Sevenfold Amen." The Voices of Marshall is a choir made up of Marshall Center team members. Marshall's Office of Diversity & Equal Opportunity sponsors the annual Black History Month event. (NASA/MSFC/Emmett Given)

Tools Building SLS Progress at Michoud



The second Space Launch System (SLS) core stage forward liquid oxygen (LO2) tank dome recently was completed on the *Circumferential Dome Weld Tool* at NASA's Michoud Assembly Facility. SLS, NASA's new rocket, will have the greatest capacity of any launch system ever built, minimizing cost and risk of deep space journeys. The dome was welded as a "confidence" article to ensure that the weld tool can produce the qualification and flight domes. The SLS *core stage* liquid hydrogen and liquid oxygen tanks will each have two domes similar to the confidence article. The dome will be used to develop inspection techniques for the flight articles. It also will be used for future confidence welding on the Vertical Assembly Center -- one of the world's largest welding tools scheduled to be completed in 2014. (NASA/Michoud)



At left, the foundation has been completed, and tooling structure built, on the Vertical Assembly Center. The tool will be used to join domes, rings and barrels together to complete the tanks or dry structure assemblies for the SLS. The tool also will perform nondestructive evaluation on the completed welds. When finished, as depicted in the artist concept, right, the Vertical Assembly Center will measure 170 feet tall and 78 feet wide. (NASA/Michoud)

Marshall Inventors Engage the Public In Google+ Hangout to Discover New Uses for Out-of-this World Technologies

By Janet Anderson

NASA's Marshall Space Flight Center hosted its first Google+ Hangout Feb. 19. The Hangout focused on using a crowdsourcing platform to help discover ways that the technologies developed for the agency's missions can be repurposed for use here on Earth.

NASA has joined forces with the product development startup [Marblar](#) for a pilot program allowing the public to crowdsource product ideas for 38 of NASA's patents. Marblar is a platform that curates patented science from the world's top research labs, and allows anyone to submit new product ideas based upon these technologies. This initiative allows Marblar's online community to use a portion of NASA's diverse portfolio of patented technologies as the basis of new product ideas. The technologies NASA is making available to the platform range from advanced satellite optics, to micro-sensors, to materials, devices and manufacturing techniques developed for the shuttle program, plus much more.

"Our world-class researchers are continually developing new innovations to benefit the space program," said Terry Taylor, manager of Marshall's Technology Transfer Office. "The role of the Technology Transfer office is to help industry benefit from these inventions by widely disseminating the technologies for scientific, academic, industrial and commercial use."

The Google+ Hangout featured two Marshall inventors discussing their patented technologies.

Mike Tinker, Marshall deputy chief technologist and a patent inventor, discussed his patent on "[Foam-Rigidized Inflatable Structural Assemblies](#)." Tinker's patented technology uses foam to achieve an inflatable structure for use as a habitat or load-bearing structure.

Fred Schramm, a retired Marshall employee, talked about his patent "[2-Component Tagging](#)." This patented technology applies the use of both optical and chemical identification to determine authenticity of an object.



Mike Tinker, Marshall deputy chief technologist and a patent inventor, discussed his patent "[Foam-Rigidized Inflatable Structural Assemblies](#)" during a Google+ Hangout held Feb. 19. Tinker's patented technology uses foam to achieve an inflatable structure for use as a habitat or load bearing structure. (NASA/MSFC/Janet Sudnik)

"I thoroughly enjoyed the experience of communicating the technology to the public," said Tinker. "My favorite questions came from a 6th grade class and a high school calculus class -- it was rewarding to see their interest."

Other panelists for the Google+ Hangout were Dr. Daniel Lockney, Technology Transfer Executive, NASA HQ Office of Chief Technologist; and Daniel Perez, CEO of Marblar.

Miss the Hangout? Watch the YouTube video [here](#).

For more information about Marshall's Technology Transfer Office, visit [here](#).

Anderson is a public affairs officer in the Office of Strategic Analysis & Communications.

NASA's Chandra Sees Runaway Pulsar Firing an Extraordinary Jet

From news release

NASA's Chandra X-ray Observatory has seen a fast-moving pulsar escaping from a supernova remnant while spewing out a record-breaking jet -- the longest of any object in the Milky Way galaxy -- of high-energy particles.

The pulsar, a type of neutron star, is known as IGR J11014-6103. IGR J11014-6103's peculiar behavior can likely be traced back to its birth in the collapse and subsequent explosion of a massive star.

Originally discovered with the European Space Agency satellite INTEGRAL, the pulsar is located about 60 light-years away from the center of the supernova remnant SNR MSH 11-61A in the constellation of Carina. Its implied speed is between 2.5 million and 5 million mph, making it one of the fastest pulsars ever observed.

"We've never seen an object that moves this fast and also produces a jet," said Lucia Pavan of the University of Geneva in Switzerland and lead author of a paper published Feb. 18 in the journal *Astronomy and Astrophysics*. "By comparison, this jet is almost 10 times longer than the distance between the sun and our nearest star."

The X-ray jet in IGR J11014-6103 is the longest known in the Milky Way galaxy. In addition to its impressive span, it has a distinct corkscrew pattern that suggests the pulsar is wobbling like a spinning top.

IGR J11014-6103 also is producing a cocoon of high-energy particles that enshrouds and trails behind it in a comet-like tail. This structure, called a pulsar wind nebula, has been observed before, but the Chandra data shows the long jet and the pulsar wind nebula are almost perpendicular to one another.

"We can see this pulsar is moving directly away from the center of the supernova remnant based on the shape and direction of the pulsar wind nebula," said co-author Pol Bordas of the University of Tuebingen in Germany. "The question is, why is the jet pointing off in this other direction?"

Usually, the spin axis and jets of a pulsar point in the same direction as they are moving, but IGR J11014-



Composite image of pulsar IGR J11014-6103. (X-ray: NASA/CXC/ISDC/L.Pavan et al, Radio: CSIRO/ATNF/ATCA O)

6103's spin axis and direction of motion are almost at right angles.

"With the pulsar moving one way and the jet going another, this gives us clues that exotic physics can occur when some stars collapse," said co-author Gerd Puehlhofer also of the University of Tuebingen.

One possibility requires an extremely fast rotation speed for the iron core of the star that exploded. A problem with this scenario is that such fast speeds are not commonly expected to be achievable.

The supernova remnant that gave birth to IGR J11014-6103 is elongated from top-right to bottom-left in the image roughly in line with the jet's direction. These features and the high speed of the pulsar are hints that jets could have been an important feature of the supernova explosion that formed it.

NASA's Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory in Cambridge, Mass., controls Chandra's science and flight operations.

For an additional interactive image, podcast, and video on the finding, visit [here](#).

For Chandra images, multimedia and related materials, visit [here](#).

NASA 'House Teams' Ready for FIRST Robotics Competitions

Students on the Mad Rockers FIRST Robotics team -- made up of students from Bob Jones and James Clemens High Schools of Madison -- catch a ball as it's thrown through the target barrier by a robot they built for the 2014 FIRST Robotics Competition. FIRST, which stands for "For Inspiration and Recognition of Science and Technology," is a national organization founded in 1989 by inventor Dean Kamen in Manchester, N.H., to inspire young people to pursue careers in science and technical fields. Teams had six weeks to build their robots, and will program and remotely control their entries to perform a number of tasks during regional and district competitions in March and April that lead to the FIRST Championship, to be held April 24-26 in St. Louis, Mo. The Mad Rockers team was among 10 demonstrating their skills during Robots to Rocket City on Feb. 23 at the U.S. Space & Rocket Center, co-hosted by NASA's Marshall Space Flight Center. The Mad Rockers and Morgan County Mech Tech, made up of Morgan County schools including A.P. Brewer High School in Somerville, are NASA-sponsored "house teams." NASA, through its Robotics Alliance Project, provides grants for high school teams and support for FIRST Robotics competitions around the country to address the critical national shortage in science, technology, engineering, and mathematics or STEM fields. (NASA/MSFC/Emmett Given)

