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Marshall Space Flight Center, Alabama 35812
256-544-0030
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Manager of Public and Employee Communications: June E. Malone
Editor: Jenalane Rowe

Orion, Marshall-Developed Adapter Lifted onto Delta IV

The Orion spacecraft and adapter were lifted on top of a United Launch Alliance Delta IV Heavy rocket Nov. 12 at Cape Canaveral Air Force Station Space Launch Complex 37. The adapter -- designed, built and tested at NASA's Marshall Space Flight Center -- will connect Orion to the Delta IV for Orion's first test flight Dec. 4. The spacecraft will be fully connected to the rocket and powered on for final testing and preparations in the weeks leading up to launch. The same adapter technology will connect the Orion to NASA's Space Launch System -- the most powerful rocket ever built for deep space missions, including Mars. The Marshall Center manages the SLS Program for the agency. (NASA/KSC)



Marshall Engineers Help 3-D Printer Power Up on the International Space Station

By Bill Hubscher

NASA took a big step toward changing the way we plan for long-duration space voyages Nov. 17, when astronaut [Barry "Butch" Wilmore](#) successfully installed and prepared the first 3-D printer for upcoming manufacturing operations on the [International Space Station](#). Engineers at NASA's Marshall Space Flight Center manage the printer project and put the printer through extensive testing in

See 3-D Printer on ISS on [page 2](#)



Darian Bryant, left, and Melissa Hopper, stowage engineers with the Payload Operations Integration Center at NASA's Marshall Space Flight Center work with NASA astronaut Barry "Butch" Wilmore to calibrate the first 3-D Printer flown on the International Space Station. (NASA/MSFC/Emmett Given)

3-D Printer on ISS *Continued from page 1*

Marshall engineering laboratories to prove its flight readiness before launch. Controllers in Marshall's Payload Operations Integration Center worked with Wilmore as he installed and checked out the printer in space.

"This technology is critical for human space exploration missions," said Quincy Bean, principal investigator for the In-Space Manufacturing Project at the Marshall Center. "Additive manufacturing will allow space travelers to create needed parts or tools on demand with raw material and the right programmed design. We would not have to send duplicates of every part or tool to space because astronauts could easily create a new one from scratch and, after they are finished with the tool, they could even recycle it and create something new."

Wilmore installed the printer in the station's [Microgravity Science Glovebox](#) and started the printer, which extruded plastic filament to form the first in a series of calibration test prints about the size of a postage stamp, verifying the printer is operational. Now, the printer is poised to make the first NASA-designed 3-D printed object in space. The goal of the [3-D Printing in Zero-G Technology Demonstration](#) on the space station is to show that additive manufacturing can make a variety of parts and tools in space. The [3-D printer](#) heats a relatively low-temperature plastic filament to build parts layer on top of layer in designs supplied to the machine.

Before the printer left Earth in September on [SpaceX's fourth commercial cargo resupply mission](#), engineers loaded the first files to be printed. These initial parts -- primarily test designs -- will be returned to Earth for detailed analysis and comparison to identical ground control samples made earlier this year in the Marshall Center's additive manufacturing area.

"The goal of the first phase of printing is to verify that the 3-D printing process works the same in microgravity as it does on the ground," said Niki Werkheiser, NASA's 3-D printer project manager at Marshall. "Once we confirm that the process works, we will move to the second phase of printing which focuses more on the design and utilization of the parts we print, which will ultimately lead to establishing [an on-demand machine shop in space](#)."

To develop the printer, NASA worked with [Made In Space Inc.](#), at NASA's Ames Research Center. Going forward, Made In Space engineers will use NASA-provided software and work with controllers at the Payload Operations Integration Center at Marshall to send commands directly to the printer from the ground. As the first objects are printed, NASA and Made In Space engineers will monitor printing via downlinked images and videos. The majority of the printing process is controlled from the ground to limit crew time required for operations.

"This printer is a critical first step for in-space manufacturing," said Jason Crusan, director of NASA's Advanced Exploration Systems Division at NASA Headquarters. "Additive manufacturing with 3-D printers will allow space crews to be less reliant on supply missions from Earth and lead to sustainable, self-reliant exploration missions where resupply is difficult and costly. The space station provides the optimal place to perfect this technology in microgravity."

NASA invited students to propose what they would print in space as part of a [Future Engineers](#) competition. Students can create and submit a digital 3-D model of a tool they think astronauts need in space. The winning student will watch from the POIC alongside the operations control team as their design is printed in space. The deadline for entry is Dec. 15.

Learn more about additive manufacturing at [NASA's 3-D printing website](#) or follow updates [on Twitter at the @NASA3DPrinter account](#).

[Watch this video](#) of Niki Werkheiser, project manager for NASA's 3-D Printing investigation at the Marshall Space Flight Center, explain the calibration and check-out process during a recent episode of Space Station Live on NASA-TV.

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

Crunch Time for 2014 Combined Federal Campaign

By Molly Porter

Time is running out for team members at NASA's Marshall Space Flight Center to participate in the 2014 Combined Federal Campaign.

As of Nov. 13, the Marshall Center had raised \$332,683 toward its \$675,000 goal during the 2014 CFC, which benefits charitable organizations from the local to international level. Of Marshall's civil service workforce, 24 percent have contributed an average gift of about \$560 each. Federal employees can contribute by logging in to [Employee Express](#).

NASA Administrator Charles Bolden [recorded a video](#) encouraging everyone at NASA to keep "Making It Possible" in space and right here on Earth by contributing to charities that are meaningful to them during this year's CFC.

To make it easy for people to contribute and help the center achieve its goal, CFC organizers have scheduled a variety of activities open to all employees and contractors.

Upcoming CFC Nonprofit Fair

A charity fair is scheduled for Nov. 20 to help team members learn about and give to different nonprofit organizations. Representatives from three local charities will be onsite to share information with team members from Marshall and Redstone and give them a chance to volunteer "on the spot." The fair will run from 11-1 p.m. near Building 4610, where the Marshall Exchange holds its daily Food Truck Corral.

"The goal is to make giving easy and fun," said Adam Kimberlin, who has spearheaded planning for the event. Kimberland explained that the three nonprofit organizations selected to participate all work to solve challenges related to education, hunger and health.

Free2Teach runs a store stocked with free teaching tools and school supplies donated by the Huntsville community to support public education in Madison County. Manna House distributes food to people in need, feeding thousands in the Huntsville community every week. HEALS, Inc. provides school-based health and dental care for eligible children enrolled in the Huntsville City and Madison County schools.



Marshall Center Director Patrick Scheuermann, second from right, Deputy Director Teresa Vanhooser, right, and other team members toured Happy Trails Therapeutic Riding Center, Inc. on Nov. 13 to see how interacting with horses can improve the lives of people with physical, emotional and mental disabilities. (NASA/MSFC/Emmett Given)

"These organizations are working hard to help very important members of our community," said Markeeva Morgan, chair of Marshall's 2014 CFC executive committee. "I hope everyone chooses to participate. Then, I hope those who choose to participate leave inspired to give of themselves to help someone else."

Bus tour and service days

As weekly bus tours to local nonprofit organizations that benefit from CFC come to an end, several Community Service Day activities still need volunteers:

The Downtown Rescue Mission requests help on Nov. 23-25 to support the Thanksgiving Box Giveaway, and on Nov. 26 for its annual Thanksgiving banquet. Christmas Charities seeks volunteers to sort clothing and general household items Nov. 20-Dec. 2, and to pack canned goods for its annual Can-a-thon Dec. 1-3. Habitat for Humanity needs people Dec. 2 and Dec. 4 for home-building and repair projects.

Team members can view a [detailed volunteer schedule](#) to learn more and sign up.

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

Daily Planet: Keeping Marshall Center Informed

By Jena Rowe

In the hustle and bustle of full schedules and busy days many people only have time to catch up with daily news while on their way to the next calendar event. The new Daily Planet is an easy way for team members at NASA's Marshall Space Flight Center to do just that -- keep up with daily news about NASA and the center while on the go.

Populated with the day's news headlines and summaries relating to Marshall and the missions of NASA, the Daily Planet can be viewed on Employee TVs located in center building lobbies, elevator bays, and conference rooms; ExplorNet; or on your mobile device or tablet. The Daily Planet also offers quick and easy access to Marshall's social media outlets for up-to-the-minute information about what's happening at the center.

"In the midst of demanding work schedules and a desire to improve and streamline employee communications, using ExplorNet and social media can help to keep Marshall team members informed of news, events and activities," said Johnny Stephenson, acting director of Marshall's Office of Strategic Analysis & Communications. "The new Daily Planet is designed for today's world of information and speed; it is intended to provide relevant news nuggets from Marshall and around the agency in a concise and timely manner."

We have all experienced those mornings when unforeseen circumstances seem to set us back. For just those types of situations, the Daily Planet will be available on Marshall's Employee TV program from 9-10 a.m. But no need to worry if you miss it then; it will be shown as part of the regular employee television programming throughout the day.

Maybe you're unable to step away from your desk and it's easier to access information electronically in between emails? The Daily Planet blog also can be viewed on ExplorNet. The blog features the daily news content, Marshall's Twitter feed and a "Popular Tags" section highlighting popular topics covered in each issue of the Planet. It also contains an archive of previous issues. Each story headline and summary that can be linked to a full story will do so on the blog.



The Daily Planet will be available to Marshall team members beginning Nov. 24. (NASA/MSFC)

To view the Planet and other employee communications on your mobile device, you can download the Jive app. It allows Marshall team members to log in to ExplorNet from a mobile device or tablet using any wireless Internet connection. Once logged in, simply search for the Daily Planet. Each blog post will appear in mobile view with the same convenience and features available in the desktop view.

So, while you're working through your daily schedule, from meeting to meeting or navigating through emails or ExplorNet, check out the Daily Planet to stay updated with the latest Marshall news.

Rowe, an ASRC Federal/Analytical Services employee and Marshall Star editor, supports the Office of Strategic Analysis & Communications.

Marshall Team Members Invited to Celebrate Native American History Month

The U.S. Space & Rocket Center, the official visitor center for NASA's Marshall Space Flight Center, will celebrate Native American History Month with a Heritage Program on Nov. 25. Marshall team members are invited to attend any of the three sessions, to be held at 10 a.m., 11 a.m. and 12 p.m.

Featured speakers will include NASA astronaut [John Herrington](#), the first enrolled member of a Native American tribe to fly to space and to also perform a spacewalk. Herrington, an enrolled member of the Chickasaw Nation of Oklahoma, flew as a mission specialist aboard the [STS-113 space shuttle mission](#) from Nov. 23 to Dec. 7, 2002. During his 13 days in space, he conducted three spacewalks to install truss electrical components and external video systems on the [International Space Station](#).

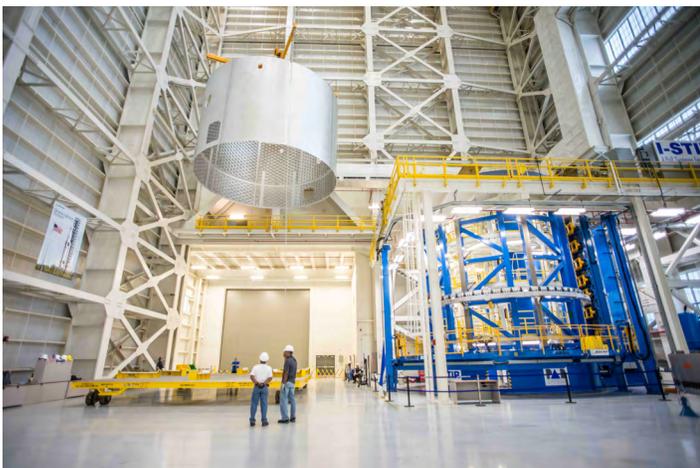
Also speaking at the event will be Native American educator Little Big Mountain, a fourth-generation dancer, singer and expert on Native American culture. Other invited guests to the event include approximately 760 fifth-grade students from area schools.

Please direct any questions regarding this event to Cindy Spidel at 256-544-0144 or cindy.spidel@nasa.gov; or contact Betty Humphery at 256-544-8992 or betty.b.humphery@nasa.gov.



Astronaut John B. Herrington -- mission specialist aboard STS-113 and the first Native American to go to space -- will be a guest speaker for the Native American Heritage Program. (NASA)

SLS Engine Section Barrel Hot off the Vertical Weld Center at Michoud



The barrel for the engine section of NASA's new rocket, the Space Launch System, is taken off the Vertical Weld Center at NASA's Michoud Assembly Facility. The barrel is flight hardware to be used on the first uncrewed test flight of the 70-metric-ton configuration of the rocket. The engine section, made up of the barrel and a ring -- also welded at Michoud -- will hold four RS-25 engines that will power the core stage of the SLS. The [core stage](#), towering more than 200 feet tall with a diameter of 27.5 feet, will store cryogenic liquid hydrogen and liquid oxygen that will feed the vehicle's RS-25 engines. NASA's Marshall Space Flight Center manages Michoud and the SLS Program for the agency. (NASA/Michoud)

Registration Opens for NASA 2015 Rover Challenge, to be Hosted by Marshall Center

By Chris Blair

The 2015 [NASA Human Exploration Rover Challenge](#) is now open for team registration. Organized by [NASA's Marshall Space Flight Center](#), the event will be held April 16-18, 2015, at the [U.S. Space & Rocket Center](#) in Huntsville.

To compete in the Rover Challenge, student teams must design, engineer and test human-powered rovers on a mock course designed to simulate the harsh and demanding terrains that future NASA explorers may find on distant planets, moons and asteroids. Rover Challenge engages high school, college and university students in hands-on, experiential learning activities, while testing potential technologies needed for future deep space exploration.

“Throughout the months-long process, students gain real-world experience and valuable feedback, while receiving encouragement to pursue technical careers in the STEM fields of science, technology engineering and mathematics,” said Diedra Williams, an education specialist in the Marshall Center’s Academic Affairs Office. “Students must use their educational background to apply practical designs and solve engineering problems similar to that of NASA scientists and engineers.”

Rover Challenge encourages research and development in new technologies and engages students in real-world engineering and problem-solving concepts that may be needed on future exploration missions. Through innovative challenges such as this, NASA continues to demonstrate its commitment toward inspiring new



A human-powered rover, one of many designed and driven by students from high school, college and university teams, completes the simulated course during the 2014 Rover Challenge, held at the U.S. Space & Rocket Center. (NASA/MSFC/Emmett Given)

generations of scientists, engineers and astronauts.

To learn more about Rover Challenge, visit the [Human Exploration Rover Challenge](#) website.

Follow Rover Challenge on [Facebook](#), [Twitter](#) and [Instagram](#) for the latest news and updates.

View images from last year’s race on the [2014 Rover Challenge Flickr Gallery](#).

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

Obituaries

Joseph Lombardo, 81, of Huntsville, died Sept. 30. He retired from the Marshall Center in 1989 as an aerospace engineer. He is survived by his wife, Carol Ann Lombardo.

Paul Cameron Perry, 90, of Huntsville, died Oct. 24. He retired from the Marshall Center in 1983 as a staffing specialist.

Sam E. Smith, 90, of Huntsville, died Oct. 28. He retired from the Marshall Center in 1985 as a computer systems analyst. He is survived by his wife, Evelyn Pence Smith.

George Butler Jr., 88, of New Hope, Alabama, died Nov. 13. He retired from the Marshall Center in 1986 as an aerospace engineer. He is survived by his wife, Barbara B. Butler.