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NASA Ramps up Space Launch System Sound Suppression Testing

By Megan Davidson

“Do you hear what I hear?”

That’s what engineers at NASA’s Marshall Space Flight Center determined as they launched the first round of acoustic tests on a scale model of the Space Launch System (SLS). The tests will allow engineers to verify the design of the sound suppression system being developed for the agency’s new deep space rocket.



Michael Martin, an InfoPro Corp. employee supporting Marshall’s Test Laboratory, installs a leak check fixture on one of the liquid oxygen (LOX)/hydrogen thrusters ahead of testing on the scale model. The thrusters simulate the four RS-25 engines that will power the core stage on the SLS. (NASA/MSFC/David Olive)

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Marshall’s Day of Remembrance Jan. 30 to Honor Sacrifices for NASA’s Mission

Marshall Space Flight Center team members are invited to join Center Director Patrick Scheuermann in the lobby of Building 4200 on Jan. 30 at 9 a.m. for this year’s Day of Remembrance ceremony.

The annual memorial allows the entire NASA community to recognize the brave men and women who died carrying out the agency’s mission of exploration.

This year, Scheuermann will participate in two separate events honoring the crews of Columbia, Challenger, Apollo 1, and other astronauts who have died. At the event in Building 4200, he will deliver remarks, light a candle and observe a moment of silence. All employees are invited. Transportation will not be provided.

Scheuermann also will commemorate the Day of Remembrance at the U.S. Space & Rocket Center at 10 a.m.

SLS Testing *Continued from page 1*

The testing, which began Jan. 16 at the Marshall Center, will focus on how low- and high-frequency sound waves affect the rocket on the launch pad. This testing will provide critical data about how the powerful noise generated by the engines and boosters may affect the rocket and crew, especially during liftoff.

“We can verify the launch environments the SLS vehicle was designed around and determine the effectiveness of the sound suppression systems,” said Doug Counter, technical lead for the acoustic testing. “Scale model testing on the space shuttle was very comparable to what actually happened to the vehicle at liftoff. That’s why we do the scale test.”

During the tests, a 5-percent scale model of the SLS is ignited for five seconds at a time while microphones, located on the vehicle and similarly scaled mobile launcher, tower and exhaust duct, collect acoustic data. A thrust plate, side restraints and cables keep the model secure.

Engineers are running many of the evaluations with a system known as rainbirds, huge water nozzles on the mobile launcher at NASA’s Kennedy Space Center. During launch, 450,000 gallons of water per minute will be released from five rainbirds just seconds before booster ignition. Water is the main component of the sound suppression system because it helps protect the launch vehicle and its payload from damage caused by acoustical energy. SLS, with NASA’s new Orion spacecraft on top, will be launched from Kennedy on deep space missions to destinations such as an asteroid and Mars.

A series of acoustics tests also is taking place at the University of Texas at Austin. Engineers are evaluating the strong sounds and vibrations that occur during the ignition process for the RS-25 engines that will power SLS.

First to be tested is the rocket’s core stage, which houses many of the launch vehicle’s critical pieces including the flight computer and avionics. The test of the fully assembled vehicle, which will include the solid rocket motors, will be conducted later this year.

The SLS core stage model has four liquid oxygen-hydrogen thrusters that simulate the four RS-25



A 5-percent scale model of the Space Launch System (SLS) is ignited for five seconds to measure the affect acoustic noise and pressure have on the vehicle at liftoff. The green flame is a result of the ignition fluid that is burned along with the propellant during this short-duration test. (NASA/MSFC/David Olive)

engines built by Aerojet Rocketdyne of Canoga Park, Calif. Two Alliant Techsystems Inc. (ATK) Rocket Assisted Take-Off (RATO) motors represent the five-segment solid rocket motors on SLS. ATK, based in Promontory, Utah, is building the boosters. The motors burn similarly to how a solid motor would burn for the initial SLS vehicle configuration.

The first flight test of the SLS in 2017 will be configured for a 70-metric-ton (77-ton) lift capacity and carry an uncrewed Orion spacecraft beyond low-Earth orbit to test the performance of the integrated system. As the SLS is evolved, it will be the most powerful rocket ever built and provide an unprecedented lift capability of 130 metric tons (143 tons) to enable missions even farther into our solar system.

For video of the scale model acoustics testing and more information on SLS, click [here](#).

For more information on SLS, visit: <http://www.nasa.gov/exploration/systems/sls/>

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

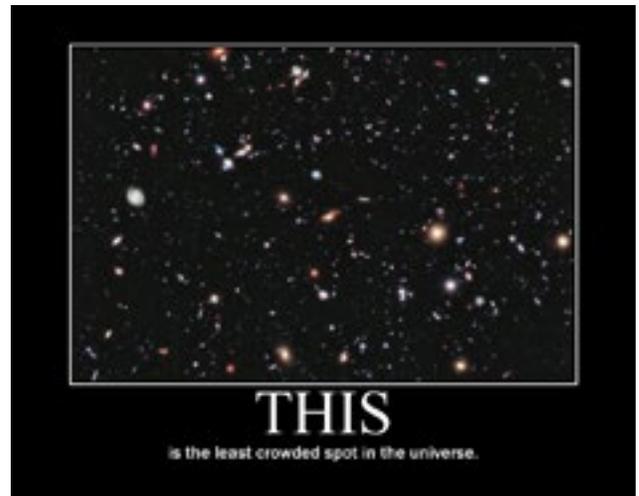
Marshall Center Instagram Account Launches with a 'Legacy to Inspire'

The old saying goes, "A picture is worth a thousand words." So, we are asking NASA Marshall Space Flight Center team members, "What inspires you?" Tell us your answer with an Instagram photo that captures the theme "Legacy to Inspire."

During Jan. 29-Feb. 7, we ask that employees and the public post a photo to your personal Instagram account, capturing what inspires you most. Tag the new [Marshall Instagram](#) account, NASA_Marshall, with your photo and a caption using the hashtag #legacytoinspire. The best photos will be reposted to the Marshall Instagram account.

The Marshall Center has a long legacy of contributions to NASA's space program. "I've been a NASA writer for almost 15 years, so it may come as no surprise the image that most inspires me is one of space," said Rick Smith, media specialist employed by ASRC Federal/Analytical Services, supporting the Office of Strategic Analysis & Communications. "In 2004, a Hubble Space Telescope image briefly caught the attention of the online world. Known as the 'Hubble Ultra Deep Field,' it depicts a relatively small area of space in the constellation Fornax. And it is teeming with galaxies and stars -- simply loaded with the possibilities of life out there, new discoveries, wonders untold.

"At the time, it was the deepest image of the universe ever taken. Now, of course, we've seen even more



This Hubble Space Telescope image and witty caption serves as a daily inspiration to Marshall team member Rick Smith, a media specialist supporting the Office of Strategic Analysis & Communications. (NASA)

breathtaking shots, but that 2003-2004 Hubble image still hangs on my office wall, a legacy to inspire -- especially since it was embellished by someone who wittily or wisely added the phrase 'This is the least crowded spot in the universe.' That striking notion, and the image itself, have captured my imagination and inspired me ever since!"

What inspires you? Tell us by sharing your photo on Instagram, tag NASA_Marshall, and it might get showcased on the Marshall Instagram account!

Office of Strategic Analysis & Communications Director, Bobby Watkins, Addresses National Society of Black Engineers' Aerospace Systems Conference

Bobby Watkins, right, director of NASA's Marshall Space Flight Center's Office of Strategic Analysis & Communications, was invited to speak at the recent National Society of Black Engineers' Aerospace Systems Conference. Watkins and fellow panelists Vanessa Wyche, left, acting director of NASA's Johnson Space Center's Human Exploration Development Support Office; and Joseph Fuller, CEO of Futron Corp., discussed a variety of stakeholder visions for human spaceflight. Watkins explained how commercial space programs fit into the overall exploration story, and focused on why Marshall's Space Launch System is the future of human spaceflight. The conference took place Jan. 22-25 in Los Angeles. (NASA/MSFC)



Expedition 35/36 Astronaut Chris Cassidy Thanks Marshall for Support and Shares Stories of Spaceflight

By Jessica Eagan

He spent 166 days in space, so Expedition 35/36 astronaut Chris Cassidy had many stories to share with Marshall Space Flight Center team members during his visit Jan. 22.

Cassidy returned to Earth on Sept. 10 after more than five months on the International Space Station. His launch in March was the first expedited trip in the 12-year history of the space station. The Soyuz spacecraft carrying him and his crew members docked to the orbiting laboratory in just six hours instead of the usual two days. The crew completed 2,656 orbits of Earth and traveled more than 70 million miles.

While at the center, Cassidy met with the Payload Operations Integration Center (POIC) team, telling them how much he appreciated their support.

“I want to say thanks to all the folks here that continue to make experiments run so flawlessly from our vantage point on the space station,” said Cassidy. “Thank you very much.”

Brenda Wade, launch operations support specialist in the Engineering Directorate, represented the

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Astronaut Chris Cassidy, center, gathers with the payload operations' control room's Redesign and Reconstruction Team representatives for the honorary Expedition 35/36 mission plaque hanging. From left are Chris Reid, systems engineer, and Bill Pendleton, manager of the Consolidated Maintenance Group, both with COLSA Corp., whose employees support Marshall's Engineering Directorate; Doug Fooshee, team lead of Engineering's Systems Integrations and Operations Maintenance Team; Cassidy; Angela Marsh, chief of Engineering's Mission Operations Systems Branch; Bobby Pruitt, systems engineer with COLSA; Debra Mynatt, project manager in the Logistics Services Office, and Freddy Steele, facilities construction program manager in the Facilities Construction Office, both in the Office of Center Operations. Hanging the plaque is Brenda Wade, Engineering launch operations support specialist. (NASA/MSFC/Emmett Given)

Volunteers Needed for First NASA Human Exploration Rover Challenge

The Marshall Space Flight Center is seeking workforce volunteers for the first NASA Human Exploration Rover Challenge, to be held in April at the U.S. Space & Rocket Center in Huntsville.

Volunteers are needed for morning and afternoon race shifts on Friday, April 11, and Saturday, April 12. Available positions include judges for pre-race qualification, obstacles and start and finish lines; scorekeepers; timers; and crossing guards. Each

volunteer will receive lunch and a race T-shirt, courtesy of corporate event sponsors.



There are several changes in this year's race -- which is evolving from the Great Moonbuggy Race to the NASA Human Exploration Rover Challenge

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POIC control room's Redesign and Reconstruction Team in hanging the Expeditions 35/36 mission plaques in the updated room. It is a tradition for each mission plaque to be hung by a flight control team member who has made a significant contribution to the success of the expedition. The team was awarded this honor for working to ensure the control room's new capabilities enhanced collaboration and enabled the ground team to efficiently help space station crew and researchers around the world perform science in the unique space environment. The room was unveiled last June.

Cassidy presented highlights from his mission in Morris Auditorium to Marshall team members, U.S. Space & Rocket Center trainers and Space Campers, and visiting students. The audience included Jackie Dannenberg, wife of the late von Braun team member Konrad Dannenberg, and Heidi Collier, daughter of the late Fritz Weber, who also was a member of the von Braun team.

During his time aboard the station, Cassidy worked on hundreds of research experiments and science investigations that will have benefits for future human spaceflight and life on Earth. He also saw the arrival of the European Automated Transfer Vehicle-4 cargo spacecraft, the Japanese H-II Transfer Vehicle-4 cargo spacecraft and two Russian Progress resupply spacecraft.

To learn more about the different studies performed on the station, watch [Space to Ground](#), a new weekly [Web series](#) available every Friday. This series summarizes the week's station activities in around two minutes and showcases the diversity of activities aboard the world's only orbiting laboratory. This video is posted to the agency's social media accounts and can be shared and downloaded by the public.

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



Astronaut Chris Cassidy shares with Marshall team members mission highlights from his 166-day mission in space -- from March 29 through Sept. 10, 2013 -- as part of the Expedition 35 and 36 crews. (NASA/MSFC/Emmett Given)

Astronaut TJ Creamer to Share Space Station Experience Jan. 30 at National Space Club Meeting

On Jan. 30, astronaut TJ Creamer will discuss the status of International Space Station payloads during the National Space Club (NSC) meeting at 11:30 a.m. at the Jackson Center. This event is open to members and guests. The cost is \$25 for members, \$35 for non-members, which includes membership to NSC. To attend, you must register [here](#).

Creamer lived aboard the space station for almost five months during Expeditions 22 and 23 from Dec. 21, 2009 to June 2, 2010 and conducted many science experiments working with controllers in the Payload Operations Integration Center at NASA's Marshall Space Flight Center. The operations center controls station science 24/7, 365 days a year.

Now, Creamer spends time in Houston as part of the astronaut corps and in Huntsville where he works as a payload operations director in the science control room at Marshall.

For more information, visit: <http://spaceclub-hsv.org/events.php?e=NSCU>.

2013 Combined Federal Campaign Finishes Strong

By Bill Hubscher

When the final pennies and dollars were counted earlier this month, the tally for the Marshall Space Flight Center's annual Combined Federal Campaign, or CFC, came to \$678,224 raised for non-profit groups from the Madison County area.

Along with the financial donations, the Marshall Center team contributed many hours of personal time to volunteering since the campaign started in September, with more than 400 employees donating a cumulative total of more than 141 days with local groups to help improve the quality of life for the less fortunate in our community.

"This is such an important annual event," said Renee Higgins, manager of the Training and Incentives Office in the Marshall Center's Office of Human Capital, and this year's CFC executive chairperson. "It's a chance to give back to the communities that support us and the work we do at NASA. I am so proud to work with employees who always come together to participate in this campaign and make a positive impact to the lives of others."

As the campaign drew to a close Jan. 15, organizers were pleased with this year's contributions and look forward to a successful campaign in 2014.

"We had a great team of givers this year," said Ola Metcalfe, a public support specialist with the Office of Strategic Analysis & Communications and Marshall Center coordinator for CFC. "I'm so glad I got the opportunity to be a part of it. Everyone banded together to forge ahead with a great campaign and we will definitely carry the things we learned this year into the future."



T.K. Pendergrass, a resource team lead, left, and Beverly Reynolds, a program analyst, both in the Marshall Center's Spacecraft & Vehicle Systems Department, help clear brush and fallen leaves at the home of a senior citizen as part of a CFC Community Service Day with Friends, Inc. The charity organization offers multiple support services to Madison County citizens whose lifestyles suddenly change due to serious illnesses or disabilities, helping them to cope with their new situations. Volunteers offer services based on their interests and availability with no minimum time commitment. (NASA/MSFC/Fred Deaton)

Visit the [CFC page on ExplorNet](#) to learn more about the charity drive and to see the photo albums of some of the volunteer events featuring Marshall Center team members.

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

Volunteer for Rover Challenge *Continued from page 4*

-- and organizers encourage those interested in volunteering to familiarize themselves with the new rules, new course and new design challenges. Volunteers should [visit the rover challenge Web presence](#) for an introductory video and complete race guidelines, and learn how the event will tie into NASA's ongoing exploration of solar system destinations -- providing students with valuable experience in the technologies and concepts needed

to develop and fly future missions of discovery.

To volunteer, Marshall team members [must sign up in advance](#) and must attend the volunteer meeting April 9 at 3 p.m. at the Space & Rocket Center's Davidson Center theater.

For more information, contact Amy McDowell at 256-544-8411 or amy.mcdowell@nasa.gov.

Extreme Power of Black Hole Revealed

From web release

Astronomers have used NASA's Chandra X-ray Observatory and a suite of other telescopes to reveal one of the most powerful black holes known. The black hole has created enormous structures in the hot gas surrounding it and prevented trillions of stars from forming.

The black hole is in a galaxy cluster named RX J1532.9+3021 (RX J1532 for short), located about 3.9 billion light years from Earth. The image here is a composite of X-ray data from Chandra revealing hot gas in the cluster in purple and optical data from the Hubble Space Telescope showing galaxies in yellow. The cluster is very bright in X-rays, implying that it is extremely massive, with a mass about a quadrillion -- a thousand trillion -- times that of the sun. At the center of the cluster is a large elliptical galaxy containing the supermassive black hole.

The large amount of hot gas near the center of the cluster presents a puzzle. Hot gas glowing with X-rays should cool, and the dense gas in the center of the cluster should cool the fastest. The pressure in this cool central gas is then expected to drop, causing gas farther out to sink in toward the galaxy, forming trillions of stars along the way. However, astronomers have found no such evidence for this burst of stars forming at the center of this cluster.

This problem has been noted in many galaxy clusters, but RX J1532 is an extreme case, where the cooling of gas should be especially dramatic because of the high density of gas near the center. Out of the thousands of clusters known to date, less than a dozen are as extreme as RX J1532. The [Phoenix Cluster](#) is the most extreme, where, conversely, large numbers of stars have been observed to be forming.

What is stopping large numbers of stars from forming in RX J1532? Images from the Chandra X-ray Observatory and the National Science Foundation's Karl G. Jansky Very Large Array (VLA) have provided an answer to this question. The X-ray image shows two large cavities in the hot gas on either side of the central galaxy. The Chandra image has been specially processed to emphasize the cavities. Both cavities are aligned with jets seen in radio images from the VLA. The location of the supermassive black hole between the cavities is strong evidence that the supersonic jets generated



(X-ray: NASA/CXC/Stanford/J.Hlavacek-Larrondo et al, Optical: NASA/ESA/STScI/M.Postman & CLASH team)

by the black hole have drilled into the hot gas and pushed it aside, forming the cavities.

Although the energy to power the jets must have been generated by matter falling toward the black hole, no X-ray emission has been detected from infalling material. This result can be explained if the black hole is “ultramassive” rather than supermassive, with a mass more than 10 billion times that of the sun. Such a black hole should be able to produce powerful jets without consuming large amounts of mass, resulting in very little radiation from material falling inwards.

A paper describing this work was published in the Nov. 10, 2013, issue of *The Astrophysical Journal* and is [available online](#). The first author is Julie Hlavacek-Larrondo from Stanford University. The Hubble data used in this analysis were from the [Cluster Lensing and Supernova survey](#), led by Marc Postman from Space Telescope Science Institute.

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.