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## NASA Completes Key Review of World's Most Powerful Rocket in Support of Journey to Mars

*NASA news release*

NASA officials announced Aug. 27 that they have completed a rigorous review of the Space Launch System (SLS) -- the heavy-lift, exploration class rocket under development to take humans beyond Earth orbit and to Mars -- and approved the program's progression from formulation to development, something no other exploration class vehicle has achieved since the agency built the space shuttle.



*Artist concept of NASA's Space Launch System (SLS) 70-metric-ton configuration launching to space. SLS will be the most powerful rocket ever built for deep space missions, including to an asteroid and ultimately to Mars. (NASA)*

*See Key Review on [page 2](#)*

## Quiet, Please: NASA Engineers Wrapping Up Acoustic Testing for Space Launch System

*By Megan Davidson*

Engineers at NASA's Marshall Space Flight Center are wrapping up acoustic testing on a 5-percent scale model of NASA's Space Launch System -- the most powerful rocket ever built for deep space missions, including to an asteroid and ultimately to Mars.

The Aug. 28 test, the 34th in the series, will help NASA engineers understand how loud the SLS vehicle will be during liftoff. Data from the test series will

be used to design the water sound suppression system that reduces liftoff vibrations on the vehicle.

The scale model acoustic test article has four operational liquid engines and two solid rocket motors to represent the propulsion system for SLS. The launch structure also has working water delivery systems to represent its sound suppression system. The test article can be elevated to capture how the liftoff

*See [Testing Wrap Up on page 3](#)*

# Engineers Complete Successful Battery of Tests on Composite Cryotank at Marshall Center

By Tracy McMahan

NASA's Marshall Space Flight Center engineers completed a complex series of tests on one of the largest composite cryogenic fuel tanks ever manufactured, bringing the aerospace industry much closer to designing, building and flying lightweight, composite tanks on rockets. The demanding series of tests on the 18-foot (5.5-meter)

diameter tank was conducted inside a Marshall Center test stand where engineers added structural loads to the tank to replicate the physical stresses launch vehicles experience during flight.

"This is one of NASA's major technology accomplishments for 2014," said Michael Gazarik,

*See [Cryotank](#) on [page 4](#)*

## Key Review *Continued from [page 1](#)*

"We are on a journey of scientific and human exploration that leads to Mars," said NASA Administrator Charles Bolden. "And we're firmly committed to building the launch vehicle and other supporting systems that will take us on that journey."

For its first flight test, SLS will be configured for a 70-metric-ton (77-ton) lift capacity and carry an uncrewed Orion spacecraft beyond low-Earth orbit. In its most powerful configuration, SLS will provide an unprecedented lift capability of 130 metric tons (143 tons), which will enable missions even farther into our solar system, including such destinations as an asteroid and Mars.

This decision comes after a thorough review known as Key Decision Point C (KDP-C), which provides a development cost baseline for the 70-metric ton version of the SLS of \$7.021 billion from February 2014 through the first launch and a launch readiness schedule based on an initial SLS flight no later than November 2018.

Conservative cost and schedule commitments outlined in the KDP-C align the SLS program with program management best practices that account for potential technical risks and budgetary uncertainty beyond the program's control.

"Our nation is embarked on an ambitious space exploration program, and we owe it to the American taxpayers to get it right," said Associate Administrator Robert Lightfoot, who oversaw the review process. "After rigorous review, we're committing today to a funding level and readiness date that will keep us on track to sending humans to Mars in the 2030s – and we're going to stand behind that commitment."

The SLS, Orion, and Ground Systems Development and Operations programs each conduct a design review prior to each program's respective KDP-C, and each program will establish cost and schedule commitments that account for its individual technical requirements.

"Engineers have made significant technical progress on the rocket and have produced hardware for all elements of the SLS Program," said Todd May, SLS program manager. "The team members deserve an enormous amount of credit for their dedication to building this national asset."

"Thanks to Marshall team members near and far, civil service and contractors, the speed of development for this vehicle has been remarkable -- just 22 months from the announcement that SLS would be America's next advanced heavy-lift vehicle to preliminary design review," said NASA Marshall Space Flight Center Director Patrick Scheuermann. "The focus on mission and teamwork through it all has been phenomenal."

The next phase of development for SLS is the Critical Design Review, a programmatic gate that reaffirms the agency's confidence in the program planning and technical risk posture.

The Marshall Center manages the SLS Program for the agency.

To read the full release, click [here](#).

Watch highlights about the SLS milestone on [This Week at NASA](#).

# Schumacher Recognized as UAH 2014 Alumni of Achievement

By Janet Anderson

It's an intimidating task to manage an office of more than 50 programs and projects that develop, operate and execute NASA's science and technology activities to expand scientific understanding of Earth and the universe and to create the innovative new space technologies that drive exploration.

Dr. Daniel Schumacher has taken that challenge on since 2010.

Schumacher, manager of the Science & Technology Office at NASA's Marshall Space Flight Center, was one of three individuals recently selected to

receive the Alumni of Achievement Award given by the University of Alabama in Huntsville Alumni Association.

The Alumni of Achievement Award is the highest honor bestowed by the UAH Alumni Association. The award recognizes graduates who have distinguished themselves professionally and personally and who exemplify the high standards of UAH.

A committee selects the winners from nominations made by alumni, faculty and friends.

See *Schumacher* on [page 5](#)

## Testing Wrap Up *Continued from page 1*

noise changes as the vehicle launches to space. Hot-fire testing began in January and will end this fall.

"We have almost completed testing to encompass all of the liftoff noise levels SLS could experience during launch," said Jeremy Kenny, SLS acoustics engineer at the Marshall Center. "The latest test will inform us of the liftoff noise levels as the vehicle is positioned approximately 150 feet above the deck that the model is positioned on."

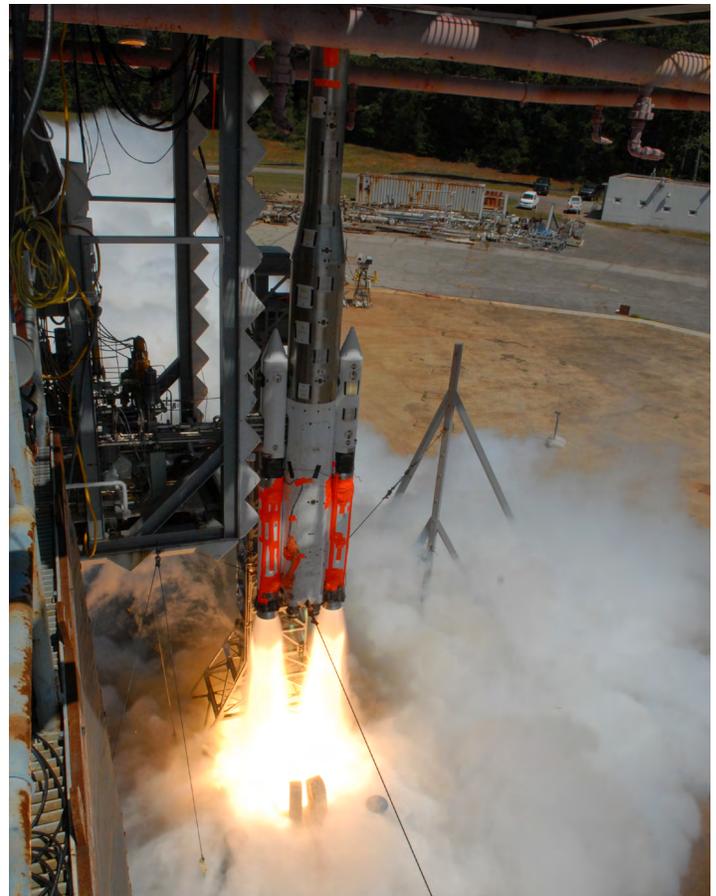
"This has been a very successful test program," Kenny added. "Not only does our team have a better understanding of the noise levels expected at launch, but we've also proven out the effectiveness of the water suppression systems currently being installed at NASA's Kennedy Space Center."

The test program is led by Marshall's Propulsion Department in the Engineering Directorate, with additional engineering support across several NASA centers. The Marshall Center manages the SLS Program for the agency.

For a video of the test, click [here](#).

Watch highlights from the test on [This Week at NASA](#).

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



*A 5-percent scale model of the SLS is ignited Aug. 28 at NASA's Marshall Space Flight Center. The model is being used for acoustic testing, which will help NASA engineers understand how loud the SLS vehicle will be during liftoff. Data from the test series will be used to design the water sound suppression system that reduces liftoff vibrations on the vehicle. (NASA/MSFC/David Olive)*

## Cryotank *Continued from page 2*

NASA's associate administrator for Space Technology. "This is the type of technology that can improve competitiveness for the entire U.S. launch industry, not to mention other industries that want to replace heavy metal components with lightweight composites. These tests, and others we have conducted this year on landing technologies for Mars vehicles, show how technology development is the key to driving exploration."

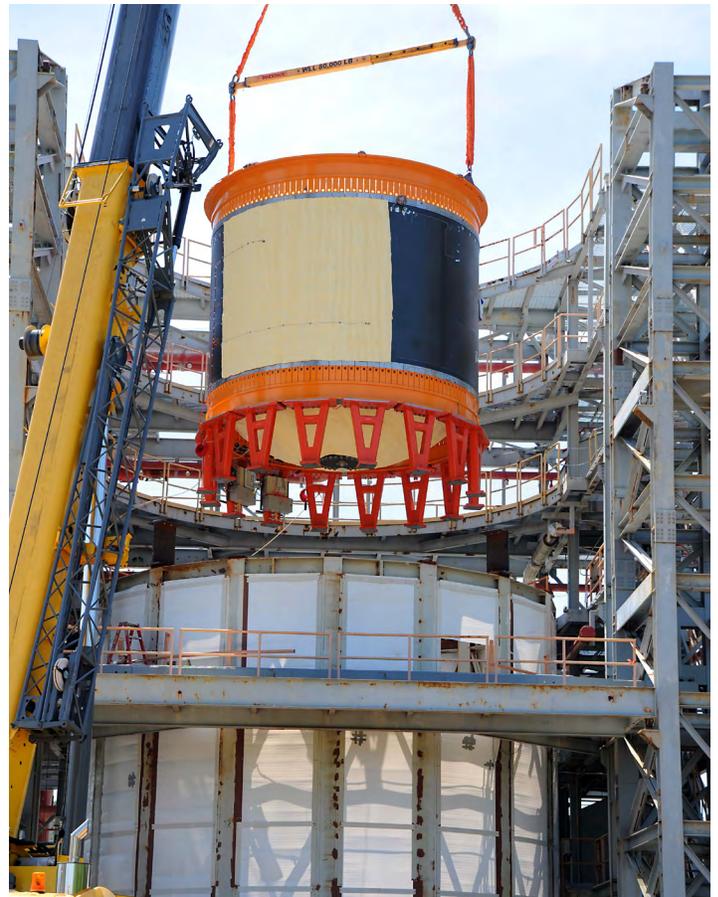
During the tests, the tank successfully maintained fuels at extremely low temperatures and operated at various pressures. Engineers filled the tank with almost 30,000 gallons of liquid hydrogen chilled to -423 degrees Fahrenheit, and repeatedly cycled the pressure between 20 to 53 pounds per square inch -- the pressure limit set for the tests.

"This is the culmination of a three-year effort to design and build a large, high-performance tank with new materials and new processes and to test it under extreme conditions," said John Vickers, project manager for the Composite Cryogenic Technology Demonstration Project, which is one of the key technologies funded by NASA's Game Changing Development Program. "We are a step closer to demonstrating in flight a technology that could reduce the weight of rocket tanks by 30 percent and cut costs by at least 25 percent."

The Boeing Co. near Seattle built the composite rocket fuel tank, which arrived at Marshall on March 26 aboard NASA's Super Guppy airplane.

"Never before has a tank of this size been proven to sustain the thermal environment of liquid hydrogen at these pressures," said Dan Rivera, Boeing program manager for the cryotank project. "Our design is also more structurally efficient than predecessors'. This is a significant technology achievement for NASA, Boeing and industry. We are looking at composite fuel tanks for many aerospace applications."

The project is part of NASA's Space Technology Mission Directorate, which is innovating, developing, testing and flying hardware for use in NASA's future missions. Over the next year, the directorate will make significant new investments to address several high-priority challenges in achieving safe and affordable deep space



*One of the largest composite cryotanks ever built recently completed a battery of tests at Marshall. The tank was lowered into a structural test stand where it was tested with cryogenic hydrogen and structural loads were applied to simulate stresses the tank would experience during launch. (NASA/David Olive)*

exploration. Next-generation technologies including composite systems have the potential to make rockets, including NASA's Space Launch System -- a deep space rocket being developed at Marshall -- more capable and affordable.

For more information about how the Composite Cryotank Technologies and Demonstration project will revolutionize tank design, visit [here](#).

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

## Earth's Moon is the Focus of International Observe the Moon Night

Marshall team members are invited to participate in the annual International Observe the Moon Night event on Sept. 6, from 5:30-8:30 p.m. at NASA's Education Training Facility located next to the U.S. Space & Rocket Center. The free event, hosted by the Discovery and New Frontiers Program at NASA's Marshall Space Flight Center, will feature moon-related exhibits and hands-on activities for children and adults, including an inflatable planetarium show that will allow visitors to learn more about the moon's shape, color and terrain.

Several large amateur telescopes will be set up to

view the moon, stars and visible planets. Visitors can take 3-D trips to the moon on the astronomy van, getting a magnified, command-module-like window view of the moon's lunar surface.

In addition, a lunar science discussion will be held from 6:15-7 p.m. with planetary scientists Dr. Barbara Cohen and Dr. Renee Weber, both of the Marshall Science Research Office. Attendees will learn about the moon's origin and surface features including craters, mountains and lava flows that can be observed with the naked eye, through telescopes and by orbiting cameras.

## Schumacher *Continued from page 3*

"I am honored to be recognized by the UAH Alumni Association with this award," said Schumacher. "I appreciate the graduate education I received at UAH with practicing professors allowing me to broaden my knowledge with real-life experience."

He received his master's degree and doctorate in industrial and systems engineering from the University of Alabama in Huntsville in 1990 and 2005, respectively.

"UAH graduates are contributing to the world around us every day and having amazing success doing so," said Rachel Osby, senior director of alumni relations and executive director of the UAH Alumni Association. "In true spirit of the Alumni of Achievement Award, this year's recipients are distinguished both personally and professionally in their respective fields and are shining examples of the high standards of UAH."

Schumacher received a plaque in recognition of his achievements during the award ceremony Aug. 21. Additionally, a brick paver will be engraved with his name and permanently installed on the UAH campus.

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



*Dr. Daniel Schumacher receives the 2014 UAH Alumni of Achievement Award. (UAH/Michael Mercier)*

## September Kicks Off More Than Football -- It's Aurora Season!

September is not only the beginning of football season, but it is also "aurora season." Join Marshall scientist, Jim Spann, on Sept. 9 at 1 p.m. to chat about aurora.

Autumn is special, in part because nights are getting longer and pleasant evenings tempt skywatchers outside to see things they ordinarily wouldn't. But there's more to it than that. Autumn really does produce a surplus of geomagnetic storms -- almost twice the annual average.

The aurora is the most obvious evidence of space weather and the connection between Earth and the sun. It is simply the greatest light show on Earth. Join us [here](#) on Sept. 9 and learn more about the beautiful aurora!



*An Expedition 40 crew member aboard the International Space Station recorded this colorful image of Aurora Australis on July 15, 2014. Achernar (just to the right of center) is the brightest and most easily recognizable star in this generally southward view. Two solar array panels are partially visible in an edge-on angle on the right side of the frame. (NASA/International Space Station)*

## Marshall Exchange Hosts Team Spirit Social



*Team members from NASA's Marshall Space Flight Center represented their favorite sports teams with pride at a Team Spirit Social hosted by the Marshall Exchange on Aug. 28. Marshall's Deputy Center Director Teresa Vanhooser, standing at right, donned her Auburn attire and showed good sportsman-like conduct by sampling dips and desserts made by rival Alabama fans Whitney Young, seated left, and Laura Hardin, seated right, both of the Partnerships Office. Participants voted for their favorite dip and dessert and those with the most votes were awarded a prize -- and bragging rights of course. (NASA/MSFC/ Fred Deaton)*

## Multiple Marshall Center Programs Featured on NASA-TV

The Marshall Space Flight Center's busy week of testing and major program milestones drew considerable attention and all were featured in the latest edition of "[This Week @NASA](#)," a weekly video program broadcast nationwide on NASA-TV and posted online.

The continued progress on NASA's Space Launch System, or SLS -- the agency's flagship rocket program managed at the Marshall Center -- led the report with the successful completion of Key Decision Point C, a rigorous review transitioning NASA from formulation to actual development of the vehicle. The review also

outlined development cost and launch readiness schedules.

Other featured stories included the test of a rocket injector with 3-D printed parts in the Marshall Center's East Test Area; the scale model firing of SLS to test a sound suppression system; and an important round of testing of a new composite fuel tank.

This and previous episodes of [This Week @NASA](#) are available for viewing at the [NASA-TV YouTube channel](#).

## Obituaries

**Edward Joyce Shelton**, 80, of Gurley, Alabama, died July 30. He retired from the Marshall Center in 1990 as an electronics technician.

**Jerry L. Mack**, 84, of Huntsville, died July 31. He retired from the Marshall Center in 1981 as an aerospace engineer. He is survived by his wife, Ruth Morris Mack.

**Polly Akers Madden**, 63, of Huntsville, died Aug. 5. She retired from the Marshall Center in 2011 as a management support assistant.

**Gene Engle**, 84, of Huntsville, died Aug. 7. He retired from the Marshall Center in 1988 as a mechanical engineer.

**John Joseph Milly**, 91, of Huntsville, died Aug. 8. He retired from the Marshall Center in 1979 as an aerospace engineer.

**William Haynes Fortenberry**, 87, of Huntsville, died Aug. 12. He retired from the Marshall Center in 1979 as a digital computer systems administrator.