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The Marshall Star is published every Wednesday by the Public and Employee Communications Office at the George C. Marshall Space Flight Center, National Aeronautics and Space Administration. The Star does not publish commercial advertising of any kind.

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NASA Achieves Key Milestone Leading to RS-25 Engine Testing

By Rebecca Strecker

Engineers at NASA's Stennis Space Center achieved a major milestone May 1 as they prepare to test RS-25 rocket engines that will help power the new Space Launch System (SLS) on missions to deep-space destinations.

A-1 Test Stand operators at Stennis completed a cold-shock test of the new structural piping system needed for the RS-25 engine, setting the

stage for engine installation in the coming weeks and hotfire testing this summer. RS-25 engines will power the core stage of NASA's SLS, which is being built to carry humans deeper into space than ever before, including to an asteroid and eventually Mars. The SLS Program is managed at NASA's Marshall Space Flight Center.

"This is a very exciting time at
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Breaking Ground: Making History Space Launch System Structural Test Stands to be Built at Marshall Space Flight Center

By Megan Davidson

NASA's Space Launch System (SLS) will have the largest cryogenic fuel tanks ever used on a rocket. Stands to test the tanks and other hardware to ensure that these huge structures can withstand the incredible stresses of launch will be built at NASA's Marshall Space Flight Center.

NASA is contracting for the

construction of the test stands through the U.S. Army Corps of Engineers, which has awarded a \$45.3 million contract to Brasfield & Gorrie of Birmingham, Alabama.

SLS will be the most powerful rocket in history and the launch vehicle that will send astronauts in NASA's Orion spacecraft beyond low-Earth orbit

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NASA,” said Gary Benton, RS-25 rocket engine test project manager. “We are moving closer and closer to making unprecedented space exploration missions a reality.”

Renovation of the A-1 Test Stand at Stennis has been underway since last fall with installation of new equipment and components needed to accommodate RS-25 engines, including the cryogenic piping system tested May 1. The piping system is an intricate network that must handle rocket propellants flowing at extremely cold temperatures. Liquid oxygen flows at almost -300 degrees Fahrenheit, while liquid hydrogen is colder than -400 degrees Fahrenheit. RS-25 engines burn a mixture of the two to generate thrust.

The piping must be able to “move” as it expands and contracts due to the extreme temperature changes caused by the propellant flows. The temperature change can be as much as 500 degrees during a hotfire test. To ensure the piping system design allows the necessary movement, Engineers at Stennis flowed liquid nitrogen through it at -320 degrees Fahrenheit and monitored the effects. The data now will be evaluated and any necessary adjustments made.

“A test like this may sound benign since no flammable propellant is used, but it is very significant to make sure we have the proper piping design and setup for engine testing,” said Jeff Henderson, the A-1 Test Stand director.

In addition to the piping test, engineers performed checks of the liquid oxygen tank and vent system. They also conducted a calibration run of the new thrust measurement system (TMS), which is particularly critical so engineers can obtain accurate measurements of engine thrust during tests.

A number of additional milestones remain. The upcoming schedule includes installation of additional TMS components and various sequence and equipment checks. All work leads to delivery and installation of RS-25 engine No. 0525 in early summer. Preliminary tests will be run on the engine to collect data on the performance of its new controller and other modifications.

The engine controller regulates valves that control



A member of the A-1 Test Stand operations team examines the progress of a cold-shock test on the new A-1 structural piping system May 1. The test marked a milestone in preparing the stand to test the RS-25 rocket engines that will power the core stage of NASA’s new Space Launch System. Delivery and installation of the first RS-25 engine is planned for early summer. (NASA/Stennis)

the flow of propellant to the engine, which determines the amount of thrust generated during a hotfire. In flight, propellant flow and engine thrust determine the speed and trajectory of a spacecraft, allowing it to follow the proper flight and orbit path. The controller also regulates the engine startup sequence, including valve positioning and timing. That sequence is especially important on an engine as sophisticated as the RS-25. Likewise, the controller determines the engine shutdown sequence, ensuring it will occur properly in both normal and emergency conditions. Stennis tests will provide data to verify controller performance and its engine startup and shutdown sequences.

Later, NASA will conduct flight acceptance tests of all RS-25 engines planned for SLS use.

“Morale is high as we continue to move forward,” Henderson said.

Strecker is a public affairs officer at NASA’s Stennis Space Center.

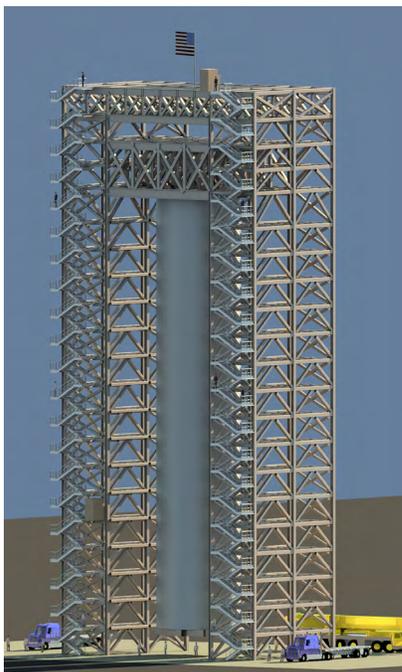
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into the solar system on missions to an asteroid and eventually to Mars.

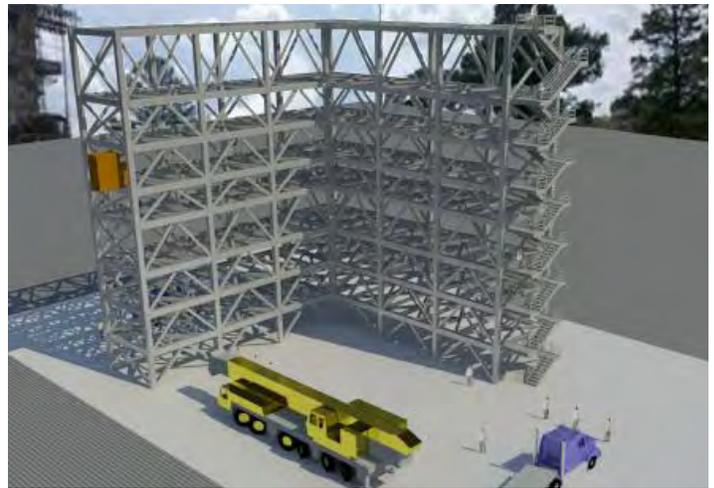
The test stands will be used for the SLS [core stage](#), which will store cryogenic liquid hydrogen and liquid oxygen. The core stage is made up of the engine section, liquid hydrogen tank, intertank, liquid oxygen tank and forward skirt. As the five parts of the core stage are manufactured, they will be shipped by barge from NASA's Michoud Assembly Facility to Marshall for testing.

“These stands are necessary to accommodate the sheer size of the core stage components, and the extreme loads we are putting on them -- some up to 9 million pounds,” said Tim Gautney, element discipline lead engineer for SLS core stage testing. “We will use hydraulic cylinders to push, pull, twist and bend these pieces to make sure they can withstand the loads and environments they may experience on the launch pad and upon ascent. The tests also will verify the models already in place that predict the amount of loads the core stage can endure.”

The 215-foot stand, Test Stand 4693, with a twin-tower configuration, will be made with 2,150 tons of



Artist concept of Test Stand 4693 to be constructed at the Marshall Center. The 215-foot stand will be used for structural loads testing on the liquid hydrogen tank for the Space Launch System core stage. (NASA/MSFC)



Artist concept of Test Stand 4697 at the Marshall Center. The 692-ton steel structure will be used for structural loads testing on the Space Launch System core stage liquid oxygen tank and forward skirt. (NASA/MSFC)

steel. It will be used for testing the liquid hydrogen tank, which will be 185 feet tall, or 20 stories tall, when completed. The tank will be placed in the stand vertically, and be loaded with liquid nitrogen for stress testing. It is being built on the foundation of the stand where the Saturn V F-1 engine was tested.

The second test stand, Test Stand 4697, is a 692-ton steel structure about eight stories high, or 85 feet tall. It will be used to test the liquid oxygen tank and forward skirt in Marshall's West Test Area. “Within the foundation of this stand, we have 1.75 miles of embedded anchor rods -- that gives you an idea of the type of stability we need to test these parts with such high-level force,” said Byron Williams, project manager for the liquid oxygen tank and forward skirt test stand.

The estimated year-long construction is expected to begin in late May.

NASA and the Corps entered into an agreement for construction of the test facilities and NASA transferred funds to the Corps for this purpose. The facilities were designed by a joint venture team of the architecture and engineering firms Goodwyn Mills and Cawood, of Montgomery, Alabama, and Merrick & Company of Greenwood Village, Colorado.

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

Marshall to Host Reddit 'Ask Me Anything' with Student Launch Organizers May 8

As excitement mounts among student rocketeers and event planners for the [2013-14 NASA Student Launch rocketry challenge](#) -- set for May 15-17 at the Bonneville Salt Flats in Tooele County, Utah -- the Marshall Space Flight Center and ATK Aerospace Group of Magna, Utah, are preparing an online event to spread that enthusiasm among Reddit users.

On May 8, starting at 1:30 p.m. CDT, the Marshall Center will host a Reddit "Ask Me Anything" Q&A session with key organizers of the NASA education event, which will challenge student teams from colleges and universities around the country to launch rockets they designed to heights up to 20,000 feet, carrying onboard science and engineering experiments. It also will showcase the student rocketry event's full-scale inspiration -- NASA's Space Launch System (SLS), the biggest, most powerful launch vehicle ever built, set to carry a new generation of explorers on new solar-system missions to Mars, asteroids and other destinations.

Participating in the live web chat will be Bruce Tiller, deputy manager of the SLS Program Booster Office at Marshall; Gordon Russell, ATK Launch Systems project manager at Marshall; and Marshall Center education specialist Julie Clift, who leads the Student Launch planning team. ATK is the corporate sponsor for the NASA Student Launch event.



Participants in a previous NASA Student Launch challenge watch their rocket lift off. (NASA/MSFC)

To participate in the Reddit AMA, visit <http://www.reddit.com/r/IAMA> between noon and 1:30 p.m. May 8.

Read the May 14 issue of the Marshall Star for complete details about how to watch the NASA Student Launch rocketry competition live via [UStream](#) and [NASA TV](#). Web users also can follow the Student Launch challenge on [Twitter](#).

SLS Takes Over Philadelphia

Trey Cate, background, strategic communication lead for the Space Launch System (SLS) Program Office at NASA's Marshall Space Flight Center, talks to visitors April 30 at the Fumo Family Library in Philadelphia about the agency's new rocket, the Space Launch System (SLS). SLS will be the biggest, most powerful launch vehicle for deep-space missions, including an asteroid and Mars. The library event was part of several NASA activities surrounding the annual Philadelphia Science Festival. While in the "City of Brotherly Love," the SLS team also talked up the rocket at several schools, a Philadelphia Phillies game for "Science Night at the Ballpark" and staffed a NASA exhibit at the Science Carnival on the Parkway. (NASA/MSFC)



Digna Carballosa Named New Marshall Association Executive Vice President; Next Meeting to Feature Social Media Panel Discussion

By Shannon Ridinger

Digna Carballosa has learned a lot about leadership and partnering with others over her varied career, which included a 13-year stint in the U.S. Office of Personnel Management in Washington. For the last seven years she has shared that knowledge with NASA's Marshall Space Flight Center as the deputy director of the Office of Human Capital.

The Office of Human Capital has many functions at the center, including overseeing Academic Affairs, training, workforce strategy and planning, federal labor relations, employee services and leadership development. Carballosa will use the lessons she has learned from being such a critical part of this multi-faceted organization in her new position as the Marshall Association's executive vice president.

The Marshall Association is composed of NASA and contractor employees, and community partners. The purpose of the organization is to help members network with each other and become more involved in their communities. Guest speakers deliver timely and useful presentations on topics of interest at the monthly meetings.

The executive vice president is a new position, created to allow for smoother transition of year-to-year operations and to support the association president. For the remainder of the year, Carballosa will serve under Johnny Stephenson, current association president, and deputy of the Office of Strategic Analysis & Communications.



Digna Carballosa, deputy director of the Office of Human Capital, and the new Marshall Association executive vice president. (NASA/MSFC)

"I'm very excited to have the honor of serving our Marshall community in this way," said Carballosa. "The Marshall Association is a great organization, and one of our goals for this year was to find speakers to talk about things people really want to hear about. In our last meeting, Huntsville Hospital CEO David Spillers spoke on healthcare and the changes that industry has seen recently. We had a great response, and I'm looking forward to working with the other officers to bring in more speakers to discuss current topics."

One of those current topics is using social media, and the association's next meeting May 14 will feature a panel discussion on the subject. Panelists will include Charity Stewart, social media and advertising manager at the U.S. Space & Rocket Center; Jessica Carlton, marketing manager at the Huntsville/Madison County Convention & Visitors Bureau; and Shannon Ridinger, public affairs officer and social media lead at Marshall. This dynamic group will talk about lessons learned from their successes and failures within the realm of social media. They will give best practices on how to be most effective in Facebook, Twitter, Instagram and other social platforms. The meeting, in the Activities Building 4316, will begin with networking at 11:30 a.m. followed by the panel discussion at noon.

For more information on the Marshall Association and to RSVP for the next meeting, visit the association's [ExplorNet](#) page.

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



David Spillers, CEO of Huntsville Hospital, speaks to the Marshall Association during the April meeting. (NASA/MSFC)