National Aeronautics and Space Administration

OCTOBER 2014

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SPACE LAUNCH SYSTEM HIGHLIGHTS

Work Begins on a Welding Wonder for SLS

A ring and barrel were loaded in early October onto the Vertical Assembly Center at NASA's Michoud Assembly Facility. The tool, one of the largest in the world, will join domes, rings and barrels to complete the tanks or dry structure assemblies for the core stage of SLS. The tool also will perform nondestructive evaluation on the completed welds. These are the first confidence welds performed on the tool, which ensures it works as it is designed to do before welding actual flight hardware. *(NASA/Michoud)*

Space Launch System Booster Separation Testing Brings Confidence to First Flight

Bryan Falman, right, a test engineer at NASA's Langley Research Center, observes the SLS booster separation 32-inch model. To understand the aerodynamic forces exerted on the SLS as it flies through the atmosphere, Langley engineers recently tested the model in Langley's Unitary Plan Wind Tunnel, with air speeds of over 2,400 mph. The engineers collected high-fidelity data from 800 runs. "Booster separation is a very critical phase of flight for the Space Launch System because the clearance between the core stage and the boosters is very small as they are pushed away," said Langley engineer Jeremy Pinier. "It's only about an inch full-scale so the boosters are almost grazing the core stage, but we can't allow any contact whatsoever between the two in the real flight." For the full story, click **here**. *(NASA/Langley)*

It's Anchors Aweigh on Modifications to NASA's Pegasus Barge

NASA's Pegasus barge, which transported the external tank during the space shuttle era, is now undergoing major modifications required to carry the core stage of the SLS for testing and launch. Crews at Conrad Shipyard LLC in Morgan City, Louisiana, are building a new 165-foot section for the barge, which will lengthen the vessel from 260 feet to 310 feet. A 115-foot center section of the existing barge will be removed and the new piece installed later this fall. Work is expected to be completed in early 2015. For the full story, click **here**. *(NASA/Michoud)*

Getting to Know You, Rocket Edition: Interim Cryogenic Propulsion Stage

Some elements of a rocket can be familiar, like the boosters and engines. But there are several important parts on the SLS that may be less widely known. Case in point? The interim cryogenic propulsion stage (ICPS).

If the SLS was dissected, the ICPS lies just below the Orion capsule, at the top of the SLS. The ICPS is a liquid oxygen/liquid hydrogen-based system. On the first test mission of Orion and SLS together, called Exploration Mission-1, the ICPS will give Orion the big push needed to fly beyond the moon before the spacecraft returns to Earth. For later long-duration missions in deep space, this interim stage will be replaced with a more powerful upper stage on SLS needed to carry crews and their spacecraft farther than ever before, including to an asteroid and ultimately Mars.

For the ICPS, The Boeing Co. will modify its existing Delta Cryogenic Second Stage, used on United Launch Alliance's Delta IV family of launch vehicles. It will be powered by an Aerojet Rocketdyne RL-10B2 engine—also currently used on the Delta Cryogenic Second Stage. NASA recently signed a contract agreement with Boeing for the ICPS—completing all definitization contracts for the major SLS elements. For the full story, click **here**. *(NASA/MSFC)*

Construction Underway on SLS Test Stands at Marshall

Crews pour concrete and embed anchor rods Oct. 17 to stabilize a new, 215-foot test stand at NASA's Marshall Space Flight Center. Test Stand 4693 will be used for structural loads testing on the liquid hydrogen tank for the SLS core stage. The 4693 structure—being built on the foundation of the stand where the Saturn V F-1 engine was tested—will have a twin-tower configuration and be made with 2,150 tons of steel. The liquid hydrogen tank will be placed in the stand vertically and be loaded with liquid nitrogen for stress testing. A second test stand also is under construction at the Marshall Center and will be used to test the liquid oxygen tank. The stands are on track to being completed in 2015. For more information on the test stands, click **here**. *(NASA/MSFC)*

Spaceflight Partners: Spincraft

EDITOR'S NOTE: Every month, SLS Highlights turns the spotlight on one of the many industry partners helping to create the largest rocket ever built for human space exploration. In this issue, we profile Spincraft, with facilities in New Berlin, Wisconsin; North Billerica, Massachusetts; and the United Kingdom.

Spincraft's North Billerica, Massachusetts, facility, above, where work for the SLS is being done. *(Spincraft)*

Boeing spaceflight partner Spincraft—a division of Standex International Corporation and part of Standex's Engineering Technologies Group—produces the fuel tank caps for the SLS core stage.

Spincraft spin forming, heat treating, aging and machining are completed in-house at the North Billerica, Massachusetts, facility. The Engineering Technologies Group provides single-source customized solutions using a wide variety of world-class precision manufacturing capabilities, including metal spinning, heat treating, machining, press forming and other fabrication services for virtually all workable metal alloys.

Spincraft also produced the demonstrator domes for the advanced booster fuel tanks using the Massachusetts in-house dome manufacturing process. Additional SLS hardware includes J-2X engine combustion chamber liner and development on the J-2X engine nozzle assembly.

The advantages of using Spincraft manufacturing processes include a reduced part count by eliminating welds, as well as weight reduction—both benefits achieved by utilizing single-piece construction techniques.

SLS On the Road...

An inflatable SLS model casts a long shadow Oct. 18 at Ames Research Center's 75th Anniversary Open House in Moffett Field, California. *(NASA/MSFC)*

SLS representatives talk with students Oct. 24 at Mill Creek Elementary's STEM Expo 2014 in Madison, Alabama. *(NASA/MSFC)*

SLS took part in the Marshall Center's Technology Expo Oct. 27 at the U.S. Space & Rocket Center in Huntsville, Alabama. *(NASA/MSFC)*

Follow SLS on:

SLS on Deck:

- New section for NASA's Pegasus barge installed
- Vertical Weld Center weld complete on first confidence article
- Stage adapter connects Orion to Delta IV