National Aeronautics and Space Administration

Space Launch System
Highlights

December 2012

SLS Core Stage Passes Major Milestone, Ready to Start Construction

The team designing America's new flagship rocket delivered a holiday gift on Dec. 21 to NASA by completing ahead of schedule a major technical review of the vehicle's core stage. The preliminary design review (PDR) of the core stage at NASA's Marshall Space Flight Center in Huntsville, Ala., included representatives from the agency and The Boeing Co. of Huntsville. Boeing is the prime contractor for the core stage and Marshall manages the Space Launch System Program.

The PDR ensured the design met system requirements within acceptable risk and stayed on schedule and within budget. An important part of the PDR was to prove the core stage could integrate safely with other elements of the rocket's main engines and solid rocket boosters, the Orion crew capsule managed at NASA's Johnson Space Center in Houston, and the launch facilities at the agency's Kennedy Space Center in Florida.

Tim Livengood, a welding engineer with The Boeing Co., confirms the setup on a friction stir weld test fixture at NASA's Michoud Assembly Facility in New Orleans in support of the agency's Space Launch System. The workforce at Michoud will build the core stage for SLS. *(Image: Boeing)*

"Each individual element of this program has to be at the same level of maturity before we can move the program as a whole to the next step," SLS Program Manager Todd May said. "The core stage is the rocket's central propulsion element and will be an optimized blend of new and existing hardware design.

(*continued on page 2)*

Tony Lavoie, manager of the Space Launch System Stages Element Office at NASA's Marshall Space Flight Center in Huntsville, Ala., addresses a board of engineers and scientists at the Preliminary Design Review for the Core Stage. *(Image: NASA/MSFC)*

SLS Core Stage

(*continued from page 1)*

We're building it with longer tanks, longer feed lines, and advanced manufacturing processes. We are running ahead of schedule and will leverage that schedule margin to ensure a safe and affordable rocket for our first flight in 2017."

The first flight test of the Space Launch System (SLS), which will feature a configuration for a 77-ton (70-metric-ton) lift capacity and carry an uncrewed Orion crew capsule beyond the moon, is scheduled for 2017. As the SLS evolves, a two-stage launch vehicle using the core stage will provide a lift capability of 143 tons (130 metric tons) to enable missions beyond low-Earth orbit and support deep space exploration.

Spaceflight Partners: ATI Ladish Forging

EDITOR'S NOTE: Every month, SLS Highlights turns the spotlight on one of the industry partners helping create the largest rocket ever built for human space exploration. In this issue, we profile ATI Ladish Forging in Cudahy, Wis., just south of downtown Milwaukee.

ATI Ladish Forging specializes in large forgings in standard and complex shapes. Founded in 1905, the Ladish Drop Forge Company began as a firm serving the automotive industry. Three decades later, the company began forging propellers for the emerging aerospace industry.

ATI Ladish Forging contributed to the early NASA programs that led to the first lunar landing. The operation provided lightweight ring and cylinder shapes for the solid rocket boosters, nozzle hardware, fuel tanks, and other major structural parts. The company now uses specialty equipment to create highly engineered forgings dedicated to supporting the nation's Space Launch System.

The forward dome of a solid rocket booster, forged by ATI Ladish Forging, is machined and finished for ATK in Promontory, Utah. The company's expertise and successful history in forging large complex shapes contributes to NASA's mission to send humans farther into space than ever before. *(Image: ATI Ladish)*

Just in Time for the Holidays: SLS Receives the Gift of Flight Hardware

In December, engineers at Marshall received materials to begin manufacturing the adapter that will connect the Orion crew capsule to a Delta IV heavy-lift rocket for Exploration Flight Test-1, or EFT-1. Two forward and two aft rings (top photo) will be welded to barrel panels (bottom photo) to form two adapters. This adapter design will be tested during EFT-1 for use during the first launch of NASA's SLS in 2017. Data from the adapter on the flight test will provide Marshall engineers with invaluable experience developing hardware early in the design process. Designing the adapter once for multiple flights also provides a cost savings. Of the two adapters welded at Marshall, one will attach Orion to the Delta IV heavy-lift rocket used for EFT-1. The other adapter will be a structural test article to gain knowledge about the design. (*Images: NASA/MSFC*)

‘Beating Heart’ of J-2X Engine Finishes a Year of Successful Tests

(Images: NASA/SSC)

The J-2X powerpack assembly was fired up one last time on Dec. 13 at NASA’s Stennis Space Center in Mississippi, finishing a year of testing on an important component of America’s next heavy-lift rocket. The powerpack assembly burned millions of pounds of propellants during a series of 13 tests in 2012 totaling more than an hour and a half of firing time. The powerpack is a system of components on top of the engine that feeds propellants to the bell nozzle of the engine to produce thrust.

“These tests at Stennis are similar to doctor-ordered treadmill tests for a person’s heart,” said Tom Byrd, J-2X engine lead in the Space Launch System Liquid Engines Office at the Marshall Center. “The engineers who designed and analyze the turbopumps inside the powerpack are like our doctors, using sensors installed in the assembly to monitor the run over a wide range of stressful conditions. We ran the assembly tests this year for far longer than the engine will run during a mission to space, and acquired a lot of valuable information that will help us improve the development of the J-2X engine.”

NASA engineers will remove the assembly from the test stand to focus on tests of the fully integrated engine in 2013. The J-2X engine, designed and built by NASA and industry partner Pratt & Whitney Rocketdyne of Canoga Park, Calif., will power the upper stage of the 143-ton SLS rocket.

For more SLS news, updates and resources, visit www.nasa.gov/sls

Follow SLS on: