

Space Launch System, Core Stage, Structural Test Design and Implementation

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Abstract—As part of the National Aeronautics and Space Administration's (NASA) Space Launch System (SLS) Program, engineers at NASA's Marshall Space Flight Center (MSFC) in Huntsville, Alabama are working to design, develop and implement the SLS Core Stage structural testing. The SLS will have the capability to return humans to the Moon and beyond and its first launch is scheduled for December of 2017. The SLS Core Stage consist of five major elements; Forward Skirt, Liquid Oxygen (LOX) tank, Intertank (IT), Liquid Hydrogen (LH2) tank and the Engine Section (ES). Structural Test Articles (STA) for each of these elements are being designed and produced by Boeing at Michoud Assembly Facility located in New Orleans, La. The structural test for the Core Stage STAs (LH2, LOX, IT and ES) are to be conducted by the MSFC Test Laboratory. Additionally, the MSFC Test Laboratory manages the Structural Test Equipment (STE) design and development to support the STAs.

It was decided early (April 2012) in the project life that the LH2 and LOX tank STAs would require new test stands and the Engine Section and Intertank would be tested in existing facilities. This decision impacted schedules immediately because the new facilities would require Construction of Facilities (C of F) funds that require congressional approval and long lead times. The Engine Section and Intertank structural test are to be conducted in existing facilities which will limit lead times required to support the first launch of SLS. With a SLS launch date of December, 2017 Boeing had a need date for testing to be complete by September of 2017 to support flight certification requirements. The test facilities were required to be ready by October of 2016 to support test article delivery. The race was on to get the stands ready before Test Article delivery and meet the test complete date of September 2017.

This paper documents the past and current design and development phases and the supporting processes, tools, and methodology for supporting the SLS Core Stage STA test stands and related STE. The paper will address key requirements, system development activities and project challenges. Additionally, the interrelationships as well as interdependencies within the SLS project will be discussed.¹