NASA's Space Launch System Moves Into Testing and Integration

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NASA's Space Launch System (SLS) has moved from design and manufacturing into testing and integration for its first flight as early as December 2019. In 2017, the NASA/industry team completed manufacturing of all major structural elements for the launch vehicle for Exploration Mission-1 (EM-1). That work included shipping the first major flight hardware element to the launch site. The team processed all four RS-25 engines for stage integration, cast all 10 booster flight motor segments, and manufactured all five major sections of the core stage. The program also completed major structural work on the B-2 test stand at Stennis Space Center, which will be used for the core stage "green run" test; delivered the core stage and engine simulators used for training; and much of the transportation equipment for the core stage. Engineers completed structural testing on the upper stage/payload section of the vehicle as well as the engine section test article. In 2018, the program will deliver the Orion Stage Adapter (OSA) to Exploration Ground Systems (EGS) at KSC and send the test articles for the core stage liquid hydrogen tank, liquid oxygen tank, and intertank to NASA's Marshall Space Flight center for structural testing. Additionally, workers will begin the challenging process of integrating the major sections of the 212-foot EM-1 core stage. This work is focused on the initial Block 1 variant of SLS, capable of launching more than 70 metric tons (t) to low Earth orbit (LEO). However, work concurrently is underway on the Block 1B variant, which will enable 105 t to LEO and more than 37t to trans-lunar injection (TLI). Block 1B will be the workhorse vehicle of NASA's lunar exploration plans. As the needs of the nation's deep space exploration program grow, SLS performance is designed to evolve to a payload mass of 130 t to LEO and up to 45t to TLI. The advantages of this mass – as well as volume – are critical to the entire exploration architecture for deep space exploration. They translate to greater capability, greater infrastructure and operational simplicity, less overall mission risk, and opportunities to accomplish unprecedented exploration and discovery. This paper will discuss SLS progress to date and planned future work.