

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Launch Vehicles in Service or in Development (1)

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NASA'S SPACE LAUNCH SYSTEM

**Abstract**

NASA's Space Launch System (SLS) program made significant progress in 2019 and is scheduled to transfer more hardware to the launch site in 2020 for its first launch the following year. SLS is the key transportation element for NASA's plans to expand exploration of the Moon as an important step toward an eventual human Mars mission in the 2030s. NASA's plans for a return to the Moon include partnerships with both commercial space companies and international space agencies. The new effort is dubbed "Artemis" after the twin sister of Apollo in Greek mythology and as an homage to NASA's first human lunar exploration program. The first launch of SLS will be the un-crewed Artemis I mission to cis-lunar space in 2021, followed by the similar crewed Artemis II mission and then a landing mission in 2024. The magnitude of this effort will require the movement of huge cargos safely and reliably into deep space, the job for which SLS was designed. The SLS architecture includes both crew and cargo variants and is designed to evolve as mission requirements increase. The initial Block 1 vehicle will send approximately 27 metric tons (t) to trans-lunar injection (TLI). It will evolve with a new upper stage and other improvements to the Block IB configuration with 38 t to 42 t to TLI for the crew and cargo variants, respectively. Additional improvements, primarily replacing the existing boosters with new Evolved Solid Rocket Boosters, will give the Block 2 crew and cargo vehicles 43-46 t to TLI. Manufacturing of the Artemis I core stage at NASA's Michoud Assembly Facility, Louisiana, was completed in 2019. Following a series of system checkouts, the stage was transported to NASA's Stennis Space Center (SSC) for a "green run" test series to verify its performance. Artemis I solid rocket booster segments are complete and will be shipped by train to NASA's Kennedy Space Center (KSC) in 2020. The Orion Stage Adapter (OSA) and Interim Cryogenic Propulsion Stage (ICPS) were shipped to KSC in 2017 and will be joined in 2020 by the Launch Vehicle Stage Adapter (LVSA), which will partially enclose the ICPS. This paper will discuss SLS 2019 progress and work ahead in 2020.