

# Space Launch System Development Status

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## Abstract

Development of NASA's Space Launch System (SLS) heavy lift rocket is shifting from the formulation phase into the implementation phase in 2014, a little more than three years after formal program approval. Current development is focused on delivering a vehicle capable of launching 70 metric tons (t) into low Earth orbit. This "Block 1" configuration will launch the Orion Multi-Purpose Crew Vehicle (MPCV) on its first autonomous flight beyond the Moon and back in December 2017, followed by its first crewed flight in 2021. SLS can evolve to a 130-t lift capability and serve as a baseline for numerous robotic and human missions ranging from a Mars sample return to delivering the first astronauts to explore another planet. Benefits associated with its unprecedented mass and volume include reduced trip times and simplified payload design. Every SLS element achieved significant, tangible progress over the past year. Among the Program's many accomplishments are: manufacture of Core Stage test panels; testing of Solid Rocket Booster development hardware including thrust vector controls and avionics; planning for testing the RS-25 Core Stage engine; and more than 4,000 wind tunnel runs to refine vehicle configuration, trajectory, and guidance. The Program shipped its first flight hardware – the Multi-Purpose Crew Vehicle Stage Adapter (MSA) – to the United Launch Alliance for integration with the Delta IV heavy rocket that will launch an Orion test article in 2014 from NASA's Kennedy Space Center. Objectives of this Earth-orbit flight include validating the performance of Orion's heat shield and the MSA design, which will be manufactured again for SLS missions to deep space. The Program successfully completed Preliminary Design Review in 2013 and Key Decision Point C in early 2014. NASA has authorized the Program to move forward to Critical Design Review, scheduled for 2015 and a December 2017 first launch. The Program's success to date is due to prudent use of proven technology, infrastructure, and workforce from the Saturn and Space Shuttle programs, a streamlined management approach, and judicious use of new technologies. The result is a safe, affordable, sustainable, and evolutionary path to development of an unprecedented capability for future missions across the solar system. In an environment of economic challenges, the nationwide SLS team continues to meet ambitious budget and schedule targets. This paper will discuss SLS program and technical accomplishments over the past year and provide a look at the milestones and challenges ahead.