

**NASA's Space Launch System:
A Transformative Capability for Deep Space Missions**

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Abstract

Already making substantial progress toward its first launches, NASA's Space Launch System (SLS) exploration-class launch vehicle presents game-changing new opportunities in spaceflight, enabling human exploration of deep space, as well as a variety of missions and mission profiles that are currently impossible. Today, the initial configuration of SLS, able to deliver more than 70 metric tons of payload to low Earth orbit (LEO), is well into final production and testing ahead of its planned first flight, which will send NASA's new Orion crew vehicle around the moon and will deploy 13 CubeSats, representing multiple disciplines, into deep space. At the same time, production work is already underway toward the more-capable Block 1B configuration, planned to debut on the second flight of SLS, and capable of lofting 105 t to LEO or of comanifesting large exploration systems with Orion on launches to the lunar vicinity. Progress being made on the vehicle for that second flight includes initial welding of its core stage and testing of one of its engines, as well as development of new elements such as the powerful Exploration Upper Stage and the Universal Stage Adapter "payload bay." Ultimately, SLS will evolve to a configuration capable of delivering more than 130 t to LEO to support humans missions to Mars. In order to enable human deep-space exploration, SLS provides unrivaled mass, volume, and departure energy for payloads, offering numerous benefits for a variety of other missions. For robotic science probes to the outer solar system, for example, SLS can cut transit times to less than half that of currently available vehicles or substantially increased spacecraft mass. In the field of astrophysics, SLS' high payload volume, in the form of payload fairings with a diameter of up to 10 meters, creates the opportunity for launch of large-aperture telescopes providing an unprecedented look at our universe. This presentation will give an overview of SLS' capabilities and its current status, and discuss the vehicle's potential for human exploration of deep space and other game-changing utilization opportunities.