

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Going To and Beyond the Earth-Moon System: Human Missions to Mars, Libration Points and NEO's  
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NASA'S SPACE LAUNCH SYSTEM MISSION CAPABILITIES FOR EXPLORATION

**Abstract**

Designed to enable human space exploration missions, including eventual landings on Mars, NASA's Space Launch System (SLS) represents a unique launch capability with a wide range of utilization opportunities, from delivering habitation systems into the lunar vicinity to high-energy transits through the outer solar system. Developed with the goals of safety, affordability and sustainability in mind, SLS is a foundational capability for NASA's future plans for exploration, along with the Orion crew vehicle and upgraded ground systems at the agency's Kennedy Space Center. Substantial progress has been made toward the first launch of the initial configuration of SLS, which will be able to deliver more than 70 metric tons of payload into low Earth orbit (LEO), greater mass-to-orbit capability than any contemporary launch vehicle. The vehicle will then be evolved into more powerful configurations, culminating with the capability to deliver more than 130 metric tons to LEO, greater even than the Saturn V rocket that enabled human landings on the moon. SLS will also be able to carry larger payload fairings than any contemporary launch vehicle, and will offer opportunities for co-manifested and secondary payloads. Because of its substantial mass-lift capability, SLS will also offer unrivaled departure energy, enabling mission profiles currently not possible. Early collaboration with science teams planning future decadal-class missions have contributed to a greater understanding of the vehicle's potential range of utilization. This presentation will discuss the potential opportunities this vehicle poses for the planetary sciences community, relating the vehicle's evolution to practical implications for mission capture. As this paper will explain, SLS will be a global launch infrastructure asset, employing sustainable solutions and technological innovations to deliver capabilities for space exploration to power human and robotic systems beyond our Moon and in to deep space.