

Technology Roadmaps for Space Exploration (09)  
Advancing Propulsion Technologies (4)Author: Mr. Jack Mulqueen  
NASA, United States, jack.mulqueen@nasa.govAN EVOLVED SPACE LAUNCH SYSTEM DEVELOPMENT PROGRESSION TO ENABLE SPACE  
EXPLORATION CAPABILITIES**Abstract**

This paper describes potential capability development options for the NASA Space Launch System (SLS) space transportation architecture. The objective of the study, performed by the Marshall Space Flight Center Advanced Concepts Office, was to identify opportunities to utilize various potential evolved SLS capabilities to perform a broad range of science, robotic exploration and human exploration missions. The evolved SLS space transportation system architecture options include advanced core stage boosters, SLS upper stage options and in-space propulsion stage options. The analysis of these evolved SLS capabilities includes assessment of performance capabilities as well as an assessment of potential development progression and timelines for implementing the evolved capabilities. Several potential development progression options are presented, which cover all likely system evolution paths. To provide a perspective on the potential various evolved SLS progression options the study includes an overlay of key SLS capability milestones over a broad set of potential space exploration missions. Evolved SLS capabilities are mapped to various mission applications including commercial, Department of Defense, planned technology demonstration missions, NASA Decadal Survey science missions and Human spaceflight Architecture Team (HAT) missions. Mission options corresponding to each of the evolved SLS development processes are mapped into timeline showing a comprehensive outline of mission capabilities tied to SLS evolution. This integration of SLS development options with a broad set of space exploration mission options provides visibility into the various strategies available for maximizing the use of the NASA Space Launch System to benefit the future progress of scientific and human space exploration objectives.