

From Earth Missions to Deep Space Exploration (05)
Exploration Capabilities (1)

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SPACE LAUNCH SYSTEM MISSION FLEXIBILITY ASSESSMENT

Abstract

The Space Launch System (SLS) is envisioned as a heavy lift vehicle that will provide the foundation for future beyond low Earth orbit (LEO) missions. While multiple assessments have been performed to determine the optimal configuration for the SLS, another effort was undertaken to determine the flexibility that various concepts offered with respect to the missions that may be required of this system. That effort will be discussed in this paper including a high-level discussion of the vehicle concepts that were assessed, the functional analysis by mission that was performed, and a performance assessment in a variety of scenarios and to multiple destinations. The mission scenarios include single launch crew and/or cargo delivery to low Earth orbit (LEO), single launch cargo delivery missions to LEO in support of multi-launch mission campaigns, and single launch beyond LEO missions. Specifically, options were assessed for the single launch beyond LEO mission scenario using a variety of in-space stages and vehicle staging criteria. This was performed to determine the most flexible (and perhaps optimal) method of designing this particular type of mission. A specific mission opportunity to the Jupiter system was further assessed to determine potential solutions that may meet currently envisioned science mission objectives. This application sought to significantly reduce mission cost by allowing for a direct, faster transfer from Earth to Jupiter and to determine the order-of-magnitude mass margin that would be made available from utilization of the SLS.