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SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems (4)

Author: Mr. Don Sauvageau
The Boeing Company, United States

Mr. Benjamin Donahue
The Boeing Company, United States
Mr. Mike Raftery
United States
Mr. Tom Martin
Aerojet Rocketdyne, United States

SPACE LAUNCH SYSTEM (SLS) TO SUPPORT BEYOND EARTH MISSIONS

Abstract

An evolved Space Launch System (SLS) will provide a critical heavy-lift launch capability and enable a diverse set of Human space flight, astronomy and deep space scientific missions. The SLS, the most powerful rocket ever built, will launch larger payloads farther in our solar system, faster than ever before possible. The SLS with a new 8.4m diameter Large Upper Stage (LUS) will significantly raise the SLS's payload launch capability and increase mission capture as compared to the SLS' 2017 initial Block 1 configuration. The SLS with the LUS will significantly enhance the ability to capture Beyond Earth Orbit missions, consistent with the NASA charter to expand human presence and scientific discovery into deep space. For Human Space Flight (HSF) the SLS will enable the building of a multi-module, Translunar Outpost which will be an important first step in returning to the moon, and venturing to Mars. The Outpost will provide a docking and refueling location for in-space based transfer stages. In-space transfer stage basing at the cis-lunar Outpost will facilitate the return and re-use of high specific impulse electrical propulsion (EP) stages, allowing for the reuse of expensive propulsion, power generation and crew habitation systems. Uncrewed, outer planet science missions will also be addressed. Comparative analysis of missions to Europa will be presented; these will show the significant reductions in Earth-Jupiter trip times that the SLS can provide. Europa missions of 7, 5 and 2.5 year trip times will be set forth. Missions to Titan, Uranus and other outer planet destinations also see significant reductions in trip time. SLS evolution, from the initial 2017 configuration to later, more capable configurations will also be presented to show how the SLS family might evolve over time.