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SLS CO-MANIFESTED CARGO DELIVERY CONFIGURATION OPTIONS

Abstract

In November 2022, the SLS rocket roared to life ushering in the Artemis era with the successful launch of the Orion spacecraft. For the next two mission, SLS will launch in a similar configuration with the Interim Cryogenic Propulsion Stage catapulting Orion on its journey to the moon; however, beginning with the Artemis IV mission in 2028, SLS will be upgraded to feature the powerful Exploration Upper Stage in its Block 1B configuration which will boost its lunar launch capability from 27 to 38 metric tons. This extra capacity will allow the rocket to launch a 10-ton co-manifested payload along with Orion on a direct transfer orbit to the moon. For Artemis IV, V, and VI, NASA will leverage this enhanced capability to build up Gateway with the launch of the I-HAB, ESPRIT, Canadarm3, and the Airlock module, but after the final elements of Gateway are delivered, the best use for this unique capability begins to enter uncharted territory. At this phase in the Artemis campaign, the missions will be transitioning from demonstrating initial operating capabilities to setting up sustained operations, and there will be an increasing need to launch logistics, science, and other resources to the moon. With its 10-ton co-manifested payload capability available with every Orion launch, SLS will play a key role in providing the critical up-mass needed to maintain the operating cadence and enable longer duration and more complex exploration missions. Options for this co-manifested element could include a logistics carrier to support operations on Gateway, a reentry capsule to allow for additional samples collected by EVA crew on the moon to be returned to earth, or a cargo lander to deliver logistics to the lunar surface. This paper will explore these various co-manifested cargo delivery options and seek to identify how NASA can best leverage the exceptional capabilities of the proven SLS launch vehicle to sustain lunar exploration after the initial Artemis missions.