Payload Utilization in NASA's Space Launch System

Stephen D. Creech, Manager, Spacecraft Payload Integration & Evolution Office
NASA's Space Launch System Program
steve.creech@nasa.gov

Dr. Kimberly F. Robinson, Exploration Mission-1 Payload Mission Manager
NASA's Space Launch System Program
kimberly.f.robinson@nasa.gov

A revitalized National Space Council has directed NASA to return to the moon, with a series of preparatory missions paving the way for eventual human exploration. NASA's new deep space exploration system -- the heavy-lift Space Launch System (SLS), the Orion crew spacecraft and revitalized launch facilities at Kennedy Space Center -- will enable NASA and its commercial and international partners to meet these goals for human deep space exploration. SLS will be the most capable launch vehicle for these efforts, with an initial Block 1 capability of at least 26 metric tons (t) to trans-lunar injection (TLI). A more powerful Block 1B, available in crew and cargo configurations, with have the power to loft more than 37 t to TLI; the ultimate Block 2 variant will lift more than 45 t to TLI. For payload utilization, the Block 1 vehicle will carry 13 6U CubeSats as secondary payloads while the Block 1B crew vehicle will provide as much volume as the space shuttle payload bay in a Universal Stage Adapter (USA). Block 1B cargo vehicles will offer 8.4 m fairings in 19.1 m and 27.4 m lengths, with enough volume to accommodate habitat modules and landers. For missions beyond the Earth-moon system, SLS offers greater characteristic energy (C3), enabling faster transit or heavier payloads to the outer planets.

The first mission of SLS and Orion, launching no earlier than December 2019, will send Orion into lunar distant retrograde orbit (DRO) on an approximately 25-day shakedown cruise known as Exploration Mission-1 (EM-1), enabling NASA to verify and validate new systems before sending astronauts to deep space on the next exploration mission. The SLS program and its prime contractors have made significant progress toward first launch, with several major components of the vehicle completed and delivered to the Exploration Ground Systems (EGS) Program at Kennedy Space Center. Major forward work includes integrating tanks, engines and other major sections into the EM-1 core stage at Michoud Assembly Facility and then shipping the entire core stage assembly to Stennis Space Center. There, it will be installed in the refurbished B-2 test stand for a series of integrated stage tests culminating in a green run hotfire test.

The Program's Spacecraft Payload Integration and Evolution (SPIE) Office, responsible for the in-space stage, adapters and payload interfaces, has largely completed its effort on the Block 1 vehicle and is supporting manufacture of the first Block 1B vehicle. This paper will provide an overview of the Block 1 vehicle, its expected capabilities, secondary payload accommodations and manufacturing status, including structural testing and the challenges of developing a new launch vehicle. A lookahead to the Block 1B vehicle and the payload utilization opportunities it will provide in the 2020s will also be discussed, including the unique capabilities of the vehicle.