Accommodations for Secondary Payloads in NASA's Space Launch System

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NASA's new heavy-lift launch vehicle, the Space Launch System (SLS), is moving closer to its planned 2019 launch, with the in-space stage and spacecraft adapters complete and all other major elements of the rocket manufactured and currently being outfitted for flight. Exploration Mission-1 (EM-1), the first flight of SLS and the new Orion crew vehicle, will verify and validate new systems and provide an unparalleled opportunity for 13 6U CubeSat-class payloads to be released into deep space. Payloads are being developed by NASA, industry, international and academic partners and were selected for the EM-1 flight to address strategic knowledge gaps in the agency's plans for human deep space exploration. Destinations range from the lunar surface to an asteroid to an orbit around the Earth-moon L2 libration point. Missions include studying the effects of space radiation on a living organism (yeast), landing the smallest lander to date on the moon, and searching for water in permanently shaded lunar craters. Propulsion technology demonstrations include solar sails, use of inert water to carry out lunar gravity assist maneuvers, and use of new "green" chemical propellants.

SLS employs an evolutionary design approach, with an initial capability of at least 26 metric tons (t) to trans-lunar injection (TLI). The later Block 1B configuration, which will become the Agency's workhorse launch vehicle into the 2020s, will lift at least 34 t to TLI in its crew configuration and at least 37 t in the cargo configuration. In addition to greater lift capability, Block 1B will also offer larger payload volume than Block 1 for both co-manifested and secondary payloads. In Block 1B, various combinations of 6U, 12U and 27U payloads may be accommodated in the vehicle's stage adapter. Opportunities for deep space research once out of reach for small science payloads will be within reach, opening many possibilities for exciting new technology demonstrations and scientific missions.

This paper will provide an overview of the capabilities and the status of the Block 1 vehicle, with particular emphasis on the secondary payload accommodations and the deployment system. Brief descriptions of the 13 6U EM-1 payloads will be included. In addition, a discussion of the payload developers' responsibilities and the Space Launch System Program's roles and responsibilities in accommodating these and future payloads will be included. Finally, the author will look ahead to SLS Block 1B and missions beyond EM-1 and the opportunities for 6U, 12U and 27U CubeSats.