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REUTILIZE AN EMPTY SLS UPPER STAGE HYDROGEN TANK INTO HABITATION MODULE FOR LUNAR ORBITAL PLATFORM-GATEWAY

Abstract

NASA is currently working with international partners and private companies to develop Lunar Orbital Platform-Gateway (LOP-G) to extend human activities to the surface of the Moon and further deep space. LOP-G will accommodate four crew members to provide research opportunities to support scientific discovery and technological challenges of long-duration human missions in deep space. One of the commercial space companies, NanoRacks, is developing the concept of repurposing the upper stages of ULA's launch vehicles, such as Centaur III and V and ACES, into habitats with autonomous robotic systems under NASA's Next Space Technologies for Exploration Partnership-2 (NextSTEP-2) Habitat Systems contract. The NanoRacks Space Outpost Program, formerly called "Ixion," proposes the verification test by converting a spent ULA's Centaur V upper stage rocket on ISS. NanoRacks is also looking forward to building a deep-space outpost by converting the upper stage rocket of NASA's Space Launch Systems (SLS). This paper aims to propose two different new LOP-G configurations by converting an empty propellant tanks of SLS 1B upper stage rocket called Exploration Upper System (EUS) in lunar orbit. The repurposed fuel tanks provide large habitation volume to support long deep-space missions. Large research facilities can provide various research opportunities to develop new knowledge, technologies, and new economical commerce.