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Using the ISS to Prepare for Exploration (01)
ISS as the Foundation for Exploration (1)

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DEEP SPACE HABITAT CONFIGURATIONS BASED ON INTERNATIONAL SPACE STATION SYSTEMS

Abstract

A Deep Space Habitat (DSH) is the crew habitation module designed for long duration missions. Although humans have lived in space for many years, there has never been a habitat beyond low-Earth-orbit. As part of the Advanced Exploration Systems (AES) Habitation Project, a study was conducted to develop weightless habitat configurations using systems based on International Space Station (ISS) designs. Two mission sizes are described for a 4-crew 60-day mission, and a 4-crew 500-day mission using standard Node, Lab, and Multi-Purpose Logistics Module (MPLM) sized elements, and ISS derived habitation systems. These durations were selected to explore the lower and upper bound for the exploration missions under consideration including a range of excursions within the Earth-Moon vicinity, near earth asteroids, and Mars orbit. Current methods for sizing the mass and volume for habitats are based on mathematical models that assume the construction of a new single volume habitat. In contrast to that approach, this study explored the use of ISS designs based on existing hardware where available and construction of new hardware based on ISS designs where appropriate. Findings included a very robust design that could be reused if the DSH were assembled and based at the ISS and a transportation system were provided for its' return after each mission. Mass estimates were found to be higher than mathematical models due primarily to the use of multiple ISS modules instead of one new large module, but the maturity of the designs using flight qualified systems have potential for improved cost, schedule, and risk benefits.