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Space Architecture: Habitats, Habitability, and Bases (1)

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LOCKHEED MARTIN NEXTSTEP-2 HABITATION STUDY: CISLUNAR GATEWAY ARCHITECTURE STATUS AND RESULTS TO DATE

Abstract

NASA and the international community are developing the next generation of habitats to serve as a deep space platform that will be the first of its kind, a Lunar Orbital Platform - Gateway (LOP-G). The LOP-G is evolvable, flexible, and modular. It will be positioned in the vicinity of the Moon and allow astronauts to demonstrate they can operate for months at a time well beyond Low Earth Orbit. The advancements in understanding and technologies developed by operating on the Gateway are critical to achieving the goal of landing humans on Mars.

As part of NASA's NextSTEP habitation project, Lockheed Martin continues to support human space flight missions near the moon, which will serve as a proving ground for Mars exploration. Lockheed Martin is partnering with NASA through the NextSTEP project to study the capabilities of what it will take to support long duration human missions in deep space. This includes developing a habitat that will provide accommodations for long-duration missions. In August of 2017, Lockheed Martin NextSTEP Habitat Program moved into Phase II. Phase II builds on the concepts developed in Phase I and is also focused on concept refinement and risk reduction, as well as the production of prototype hardware. Concept refinement will occur throughout the course of the project. This includes defining common interfaces and standards, which will ensure human safety and provide a robust infrastructure. The habitat will leverage all of Orion's advanced capabilities that can be used while a crew is there and will also operate with high levels of autonomy while unoccupied.

A full-scale prototype of the deep space habitat is currently being built by Lockheed Martin at Kennedy Space Center by refurbishing the Donatello Multi-Purpose Logistics Module (MPLM), one of three Italian cargo containers used to transfer cargo to the International Space Station. Lockheed Martin is implementing virtual prototyping, using virtual and augmented reality, to reduce cost, as well as identify risk early in the design phase.

Ensuring astronauts can safely dock to and transition into the LOP-G is critically important. Lockheed Martin is also building a Deep Space Avionics Integration Lab (DSAIL) as part of the NextSTEP program as part of a risk reduction effort to successfully prove the proper integration of Orion and the LOP-G.

This presentation will describe Lockheed Martin's activities under the NextSTEP habitation project and summarize key findings to date.