Deep Space Habitat Concept Demonstrator

Project Manager(s)/Lead(s)

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Sponsoring Program(s)

Human Exploration and Operations Mission Directorate Advance Exploration Systems, Exploration Augmentation Module Project (former AES Deep Space Habitat Project), Technology Excellence

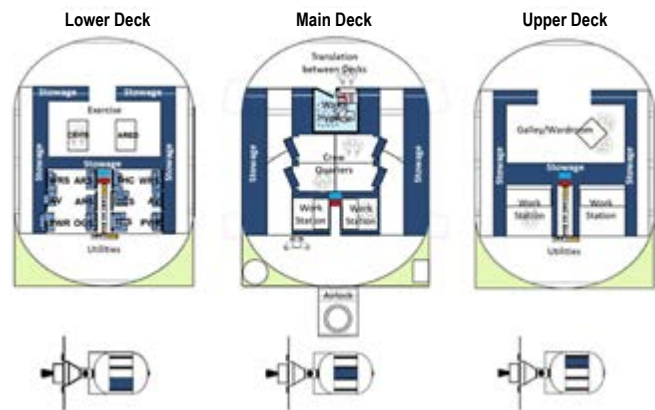

Skylab Gen 2 concept with Orion.

Project Description

This project will develop, integrate, test, and evaluate Habitation Systems that will be utilized as technology testbeds and will advance NASA's understanding of alternative deep space mission architectures, requirements, and operations concepts. Rapid prototyping and existing hardware will be utilized to develop full-scale habitat demonstrators.

FY 2014 focused on the development of a large volume Space Launch System (SLS) class habitat (Skylab Gen 2) based on the SLS hydrogen tank components. Similar to the original Skylab, a tank section of the SLS rocket can be outfitted with a deep space habitat configuration and launched as a payload on an SLS rocket. This concept can be used to support extended stay at the Lunar Distant Retrograde Orbit to support the Asteroid Retrieval Mission and provide a habitat suitable for human missions to Mars.
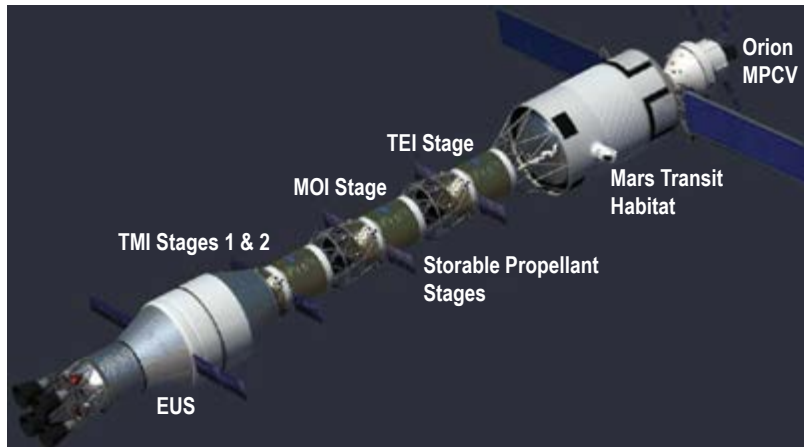

Skylab Gen 2 internal layout.
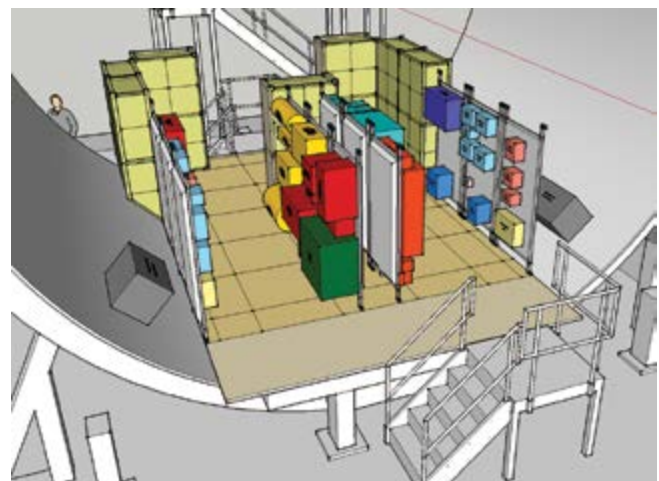
Utility room concept.

Mars transit concept vehicle.

Skylab Gen 2 current build.

Anticipated Benefits

The Skylab Gen 2 concept supports the SLS program by advancing the development of a future payload for launch on the SLS, utilizing SLS components as a long-duration outpost, and providing a platform for habitat and subsystem development trades while supporting NASA Marshall Space Flight Center (MSFC) interests and investments in future capabilities beyond SLS. It will provide a testbed for groups, projects, and/or other Centers to utilize for advancing Technology Readiness Levels of their designs. It also fosters collaboration and partnerships within MSFC and NASA Johnson Space Center communities focused on deep space exploration.

Potential Applications

The Skylab Gen 2 deep space habitat can serve multiple purposes. At the Lunar Distant Retrograde Orbit it can serve as a facility for deep space human research programs, asteroid resources research, and commercial and international lunar mission objectives. Due to the large size of the habitual volume, the Skylab Gen 2 concept is suitable for human Mars transit missions.

Notable Accomplishments

A trade study was performed to determine the optimized interior layout (vertical—similar to Skylab and horizontal—similar to the International Space Station). The final design will utilize the horizontal configurations, due to weight, usable volume, size variations, and other benefits identified in the trade study.

The flooring system for the concept demonstrator was designed, procured, and installed. The flooring system was designed to be versatile for ease of modifying interior layout configurations. The staircase system to access each level was procured. The interior wall building material was also procured.

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