Habitat Demonstration Unit (HDU) Vertical Cylinder Habitat

Modular habitats maximize floor area and are easy to join together.

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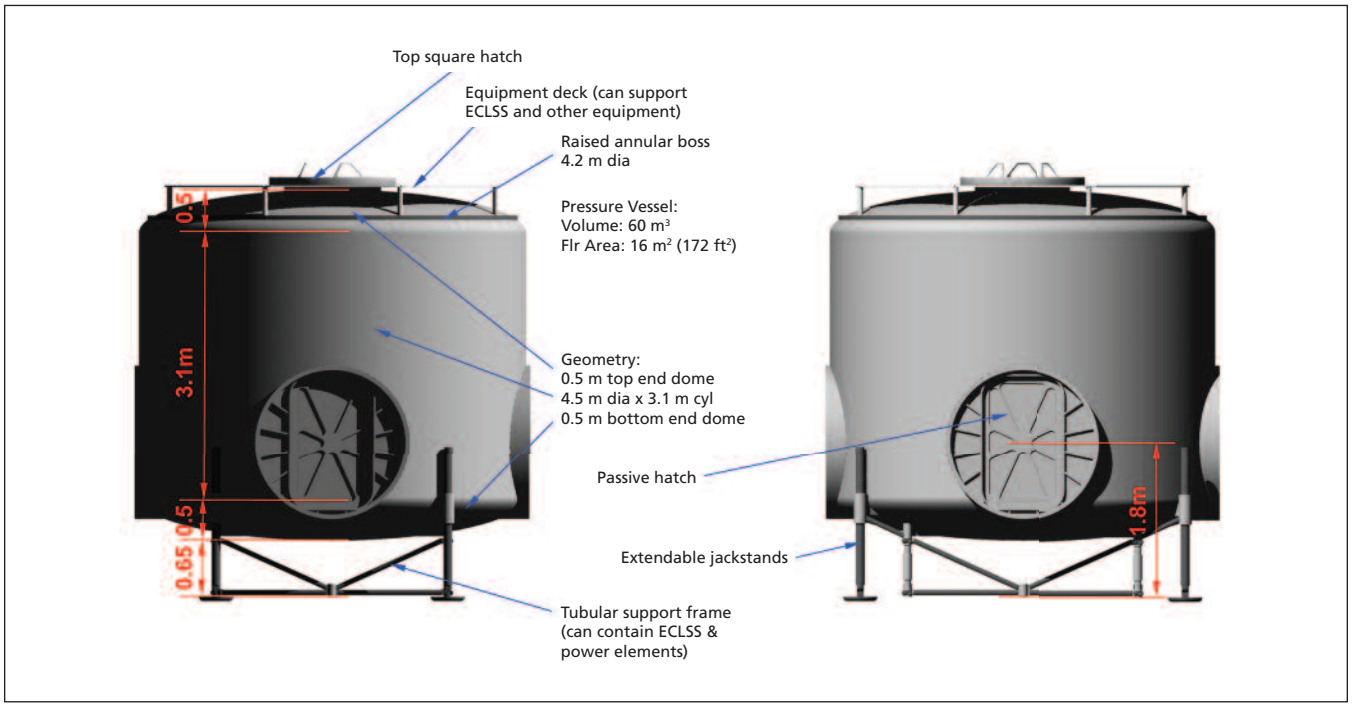
NASA's Constellation Architecture Team defined an outpost scenario optimized for intensive mobility that uses small, highly mobile pressurized rovers supported by portable habitat modules that can be carried between locations of interest on the lunar surface. A compact vertical cylinder characterizes the habitat concept, where the large diameter maximizes usable flat floor area optimized for a gravity environment and allows for efficient internal layout. The module was sized to fit into payload fairings for the Constellation Ares V launch vehicle, and optimized for surface transport carried by the All-Terrain Hex-Limbed Extra-Terrestrial Explorer (ATHLETE) mobility system. Launch and other loads are carried through the barrel to a top and bottom truss that interfaces with a structural support unit (SSU). The SSU contains self-leveling feet and docking interfaces for Tri-ATHLETE grasping and heavy lift.

A pressurized module needed to be created that was appropriate for the lunar environment, could be easily relocated to new locations, and could be docked together in multiples for expanding pressurized volume in a lunar outpost. It was determined that horizontally oriented pressure vessels did not optimize floor area, which takes advantage of the gravity vector for full use. Hybrid hard-inflatable habitats added an unproven degree of complexity that may eventually be worked out. Other versions of vertically oriented pressure vessels were either too big, bulky, or did not optimize floor area.

The purpose of the HDU vertical habitat module is to provide pressurized units that can be docked together in a modular way for lunar outpost pressurized volume expansion, and allow for other vehicles, rovers, and modules to be attached to the outpost to allow for IVA (intra-vehicular activity) transfer between them. The module is a vertically oriented cylinder with a large radius to allow for maximal floor area and use of volume. The modular, 5-m-diameter HDU vertical habitat module consists of a 2-m-high barrel with 0.6-m-high end domes forming the 56-cubic-meter pressure vessel, and a 19-square-meter floor area. The module has up to four docking ports located orthogonally from each other around the perimeter, and up to one docking port each on the top or bottom end domes. In addition, the module has mounting trusses top and bottom for equipment, and to allow docking with the ATHLETE mobility system.

Novel or unique features of the HDU vertical habitat module include the node-like function with multiple pressure hatches for docking with other versions of itself and other modules and vehicles; the capacity to be carried by an ATHLETE mobility system; and the ability to attach inflatable 'attic' domes to the top for additional pressurized volume.

This work was done by Alan Howe, Kriss J. Kennedy, Tracy R. Gill, Terry O. Tri, Larry Toups, Robert I. Howard, Gary R. Spexarth, Stephen Cavanaugh, William M. Langford, and John T. Dorsey of Johnson Space Center. Further information is contained in a TSP (see page 1). MSC-25517-1



The **Habitat Demonstration Unit (HDU) Vertical Cylinder Node** features multiple pressure hatches for docking with other versions of itself and other modules and vehicles. (Note: ECLSS is Environmental Control and Life Support System.)