

Abstract for the AIAA Space 2008 Conference, Sept 9-11, 2008, San Diego, Cal.

## Constellation Architecture Team-Lunar Lunar Habitat Concepts

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This paper will describe lunar habitat concepts that were defined as part of the Constellation Architecture Team-Lunar (CxAT-Lunar) in support of the Vision for Space Exploration. There are many challenges to designing lunar habitats such as mission objectives, launch packaging, lander capability, and risks. Surface habitats are required in support of sustaining human life to meet the mission objectives of lunar exploration, operations, and sustainability. Lunar surface operations consist of crew operations, mission operations, EVA operations, science operations, and logistics operations. Habitats are crewed pressurized vessels that include surface mission operations, science laboratories, living support capabilities, EVA support, logistics, and maintenance facilities. The challenge is to deliver, unload, and deploy self-contained habitats and laboratories to the lunar surface.

The CxAT-Lunar surface campaign analysis focused on three primary trade sets of analysis. Trade set one (TS1) investigated sustaining a crew of four for six months with full outpost capability and the ability to perform long surface mission excursions using large mobility systems. Two basic habitat concepts of a hard metallic horizontal cylinder and a larger inflatable torus concept were investigated as options in response to the surface exploration architecture campaign analysis. Figure 1 and 2 depicts the notional outpost configurations for this trade set. Trade set two (TS2) investigated a mobile architecture approach with the campaign focused on early exploration using two small pressurized rovers and a mobile logistics support capability. This exploration concept will not be described in this paper. Trade set three (TS3) investigated delivery of a "core" habitation capability in support of an early outpost that would mature into the TS1 full outpost capability. Three core habitat concepts were defined for this campaign analysis. One with a four port core habitat, another with a 2 port core habitat, and the third investigated leveraging commonality of the lander ascent module and airlock pressure vessel hard shell.

The paper will describe an overview of the various habitat concepts and their functionality. The Crew Operations area includes basic crew accommodations such as sleeping, eating, hygiene and stowage. The EVA Operations area includes additional EVA capability beyond the suit-port airlock function such as redundant airlock(s), suit maintenance, spares stowage, and suit stowage. The Logistics Operations area includes the enhanced accommodations for 180 days such as closed loop life support systems hardware, consumable stowage, spares stowage, interconnection to the other Hab units, and a common interface mechanism for future growth and mating to a pressurized rover. The Mission & Science Operations area includes enhanced outpost autonomy such as an IVA glove box, life support, and medical operations.

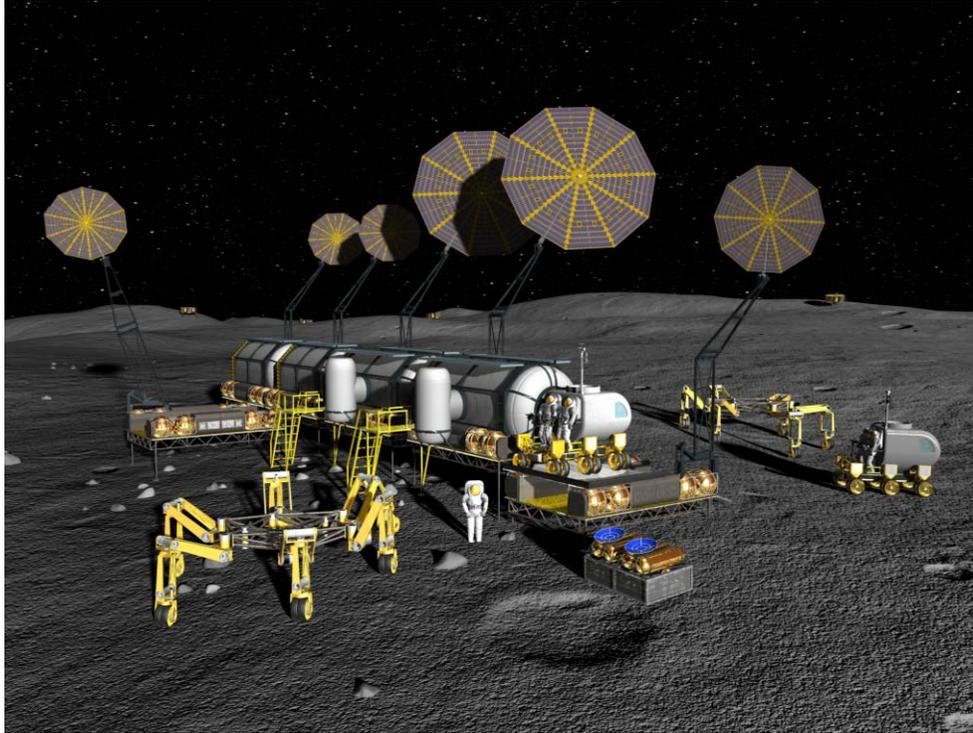


Figure 1: Horizontal Cylindrical Habitat Outpost

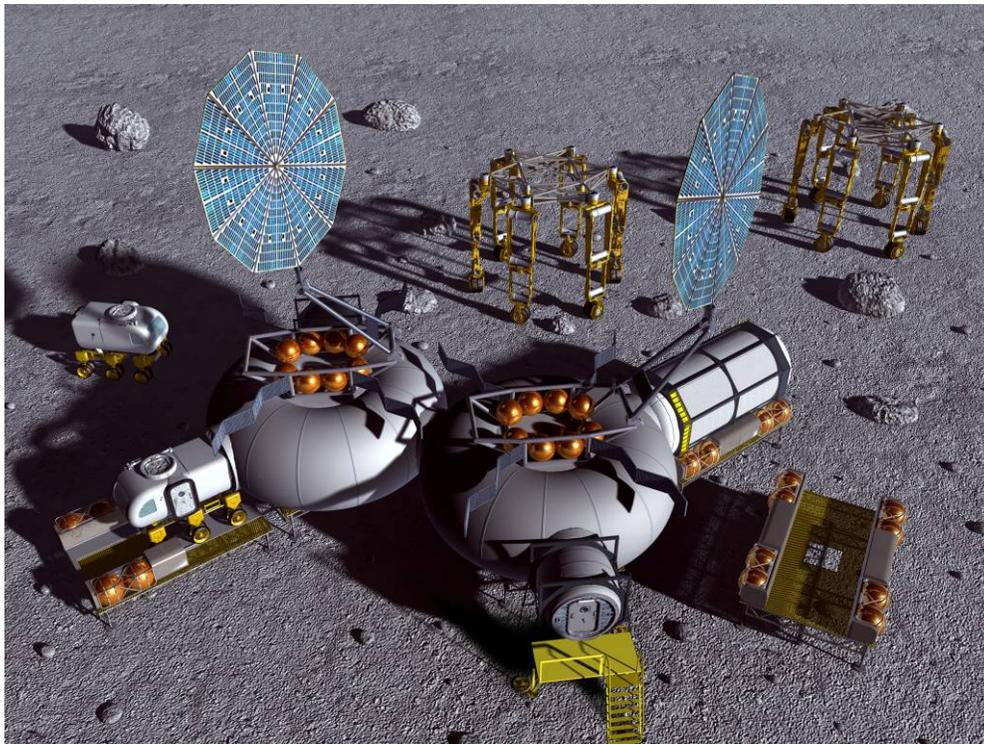


Figure 2: Inflatable Torus Habitat Outpost