

SPACE ACTIVITY AND SOCIETY (E5)

The Architecture of Space: New Frontiers of 21st Century Space Architecture and Entrepreneurship for a New Generation of Explorers. (3)

Author: Prof. Olga Bannova

University of Houston, United States, obannova@central.uh.edu

DESIGNING FROM MINIMUM TO OPTIMUM FUNCTIONALITY

Abstract

This paper discusses a multifaceted strategy to link NASA Minimal Functionality Habitation Element (MFHE) requirements to a compatible growth plan leading forward to evolutionary deployable and outpost development stages. The discussion begins by reviewing fundamental geometric features inherent in small scale vertical and horizontal pressurized module configuration options to characterize applicability to meet stringent MFHE constraints.

A scenario is proposed to incorporate a vertical core MFHE concept into an expanded architecture to provide continuity of structural form and geometric logic bridging between “minimum” and “optimum”. The paper describes how habitation and logistics accommodations can be pre-integrated into a common Hab/Log Module that serves both habitation and logistics functions. This is offered as a means to reduce unnecessary redundant development costs and to avoid EVA-intensive on-site adaptation and retrofitting requirements for augmented crew capacity. An evolutionary version of the hard shell Hab/Log design would have an expandable middle section to afford even larger living and working accommodations.

In conclusion, the paper illustrates that a number of cargo missions referenced for NASA’s 4.0.0 Lunar Campaign Scenario can be eliminated altogether to expedite progress and reduce budgets. The plan concludes with a vertical growth geometry that provides versatile and efficient site development opportunities using a combination of hard Hab/Log modules and a hybrid expandable “CLAM” element.