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FIRST MARS HABITATS: REVIEW OF ARCHITECTURAL CONCEPTS

Abstract

This paper presents a comparative review of the most important design concepts for Mars exploration surface habitats that have appeared over the nearly three decades since the Space Exploration Initiative (SEI) under President George H. W. Bush. Beginning with the “90-Day Study” in 1989, NASA and its academic and industrial partners began to think seriously for the first time about a long-term strategy to expand human presence enduringly beyond low Earth orbit.

In some cases the habitat serves exclusively as a Mars surface habitat. In other cases, it does double or even triple duty as an interplanetary vehicle, crew entry and descent vehicle, and as a surface habitat. This review covers both cases and many variations in between them. The review describes and evaluates the following habitat and surface base concepts:

1. “Apollo on Steroids” to Mars (Vladimir Garin), 1980s
2. NASA 90-Day Study (JSC) 1989
3. Mars Design Reference Mission (MDRM) 1.0 600-Day Habitat (Kent Joosten) 1993
4. Human Exploration Demonstration Project (Ames Research Center) 1994
5. Strategies for Mars (Cohen, Stoker Emmart, Eds.) 1995
6. TransHab prototype (Kriss Kennedy, Constance Adams) 1998
7. MDRM 3.0 “Hybrid” Partially Inflatable Habitat (Bret Drake) 1998
8. FMARS Habitat, Devon Island, Canada (Kurt Micheels, Mars Society) 2001
9. Habot Mobile Lunar Base (Cohen, Mankins) 2004-2006
10. Mobitat (A. Scott Howe) 2008
11. Mars Design Reference Architecture MDRA 5.0 (Bret Drake) 2009
12. Surface Endoskeletal Inflatable Module (SEIM) (Adams, Petrov) 2010
13. MarsOne (Lansdorp, Von Bengtson) 2013.