HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)
Human Exploration of Mars (2)

Author: Mr. Mark Schaffer
SpaceWorks Enterprises, Inc., United States

Dr. John Bradford
SpaceWorks Enterprises, Inc. (SEI), United States
Dr. Douglas Talk
SpaceWorks Enterprises, Inc. (SEI), United States

100-PERSON MARS TRANSFER VEHICLE USING TORPOR INDUCING HABITATS

Abstract

The idea of suspended animation for interstellar human spaceflight has often been posited as a promising far-term solution for long-duration spaceflight. A means for full cryo-preservation and restoration remains a long way off still. However, recent medical progress is quickly advancing our ability to induce deep sleep states (i.e. torpor) with significantly reduced metabolic rates for humans over extended periods of time. Since 2013 the authors have been investigating the feasibility and systems-level impact of applying this medical technology to human spaceflight, specifically for human missions to Mars.

In a paper presented at IAC 2014 (IAC-14-A5.2.8), the authors presented the results of an initial study funded by the NASA Innovative Advanced Concepts (NIAC) program that considered the application of torpor-enabled habitats to near-term, exploration-class missions to Mars. Based on the promising results of that initial study, the authors have begun to consider the impact of torpor-enabled habitats to far-term, colonization-class missions to Mars. This paper summarizes the results of a design study of a torpor-enabled 100-person deep space habitat for transporting a crew of long-term explorers to Mars.

The transfer vehicle is comprised of a collection of ISS-class pressurized modules docked around central nodes. Eight of these modules are identical: habitation for 12 crew (per module) kept in an unconscious torpor state for the duration of the transit from Earth to Mars orbit. An inflatable module provides the living quarters for the active crew of 4 who serve as caretakers for the others. The other modules include connection nodes and a power-generation module. The total mass of this habitat is 200t, and it requires 300 kW of electrical power. Detailed engineering diagrams and mass breakdown statements for the habitat modules and overall transfer vehicle are provided.