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Architecture for humans in space: design, engineering, concepts and mission planning (1)

Author: Mr. Craig McCormack
The University of Western Australia (UWA), Australia

Dr. Olga Bannova
University of Houston, United States
Dr. Sheryl Bishop
The University of Texas Systems, United States
Dr. Jorge D. Camba
University of Houston, United States

DESIGNING FOR MAXIMUM ADAPTABILITY BEFORE, DURING AND AFTER SPACEFLIGHT

Abstract

Possible psychological complications of a long space flight beyond the Earth low orbit have been under discussion since such missions were first proposed. Those complications are related to the confined environment of a spacecraft during the flight and habitats on the moon or Mars surface, crewmembers' personalities, cultural and social differences, and work-related stressors. As a result of crew exposure to all or some of these difficulties, crewmembers may not be able to perform at their best capacity and fulfill their mission requirements. This exploratory paper examines architectural and design strategies that address and potentially alleviate stressors through stimulating crew adaptability to new environments and circumstances. These strategies are analyzed based on following dimensions for adaptive performance:

• Self-controlled behavior in emergencies and crisis situations. • Managing work-related stress especially in critical situations. • Innovative approach to problem solving. • Maintaining productive operations in unpredictable and unknown situations. • Continuing learning and applying new technologies and procedures. • Facilitating social and cultural adaptability. • Displaying adaptability to physical environment and managing it to fit the purpose.

The paper aims to analyze these listed dimensions through relevant case studies and to identify any potential opportunities for the development and integration of supportive design strategies to increase adaptability in crewmembers. In a summary, a platform for further inquiry into architectural and design strategies is proposed for more in-depth discussion in the future.