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HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
How Can We Best Apply Our Experience to Future Human Missions? (2)

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HUMAN FACTORS IN THE SPACE STATION DESIGN PROCESS

Abstract

Until now, human factors in the discipline that is concerned with the interactions between humans and other elements of a system have not been taken into account appropriately, which is why the level of performance on space stations, from the Mir to the current International Space Station, is reportedly low. As underlined by the European Cooperation for Space Standardization, the integration of sound human factors into all project phases related to human space mission, starting from the very beginning, has become a primary necessity, in particular considering the approaching scenario of long duration/range missions. As a means for dealing with this need, this work proposes a new conceptual model, which focuses on incorporating human factors principles right from the preliminary design phase into all aspects of long-duration/range human mission projects in order to improve habitability. The new conceptual model developed during five years of research at TU-Berlin, referred to herein as the Integrated Design Process (IDP), incorporates three key design principles: habitability factors, a user-centered approach, and a holistic methodology. The conceptual model was tested against existing models in four separate studies, specifically: a study on Moon Base design at the SSDW 2009; a study to investigate habitability on the Mars Desert Research Station; a study to design space equipment for system operations at the TU-Berlin; and a study to design a closed-loop habitat for long duration missions with the DLR. The results suggest that employing such a model during the design phase of a space mission will improve habitability and usability of the item under development, thus improving user performance, safety, and ultimately mission success. The implications of such a model extend beyond application in space and include other environments where individuals are expected to live and work in confined areas for extended periods of time, such as in research laboratories in Antarctica. It can also be applied in megacities as well as in retirement homes.