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ASSESSMENT OF THE ELPHS ANALOGUE MODULE DESIGN AGAINST THE LUNAR DESIGN FOR REPAIRABILITY FRAMEWORK

Abstract

In preparing for long-duration space and planetary exploration, mission success depends on the consistent habitability of designed spaces. However, in the extreme space environment, there is a myriad of hazards, acting as a constant disruptive pressure on the habitability of space and lunar habitats. To support resisting this pressure, resilience, defined as 'the ability of a system to repeatedly return to normal after a disruption' must be incorporated as a key characteristic into the design of habitats. However, Design for Repair Frameworks which support the integration of this characteristic into products and architecture on Earth have yet to be widely adopted. This indicates a gap in methodology for assessing how effectively a design enables future repair, or the repairability of the resulting architecture. Analogues are commonly used on Earth to test approaches to answering the challenges of a space environment, whether psychological or technical. This paper presents a case study where the as built design of the ELPHS Analogue Module based on the International Space Station (ISS) Columbus module is assessed against a proposed Lunar Design for Repairability Framework. The results of this assessment are then presented. Through assessing a readily accessible analogue module, researchers can gain further insights into how to optimize the Lunar Design for Repairability Framework to ensure astronaut well-being and performance during long-duration missions.