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AN ASSESSMENT OF RADIATION AND IMPACT PROTECTION OF HUMAN SHELTERS ON THE MOON BUILT USING IN-SITU RESOURCES

Abstract

Space radiation and micrometeorites pose two of the most significant environmental risks to inhabitants of space habitats; Micrometeorites present a hazard to structural integrity and space radiation is a serious risk to crew members' immediate and long-term health, as well as to electronic equipment. Conventional space habitats have been manufactured on Earth and launched to space, however future sustainable missions will require use of materials found locally, an approach known as in-situ resource utilisation (ISRU). Reduction of future mission payload mass by exploiting ISRU is vital if we are to conduct sustainable long-term missions on another planetary body. Planetary regolith is an obvious ISRU test case for structural applications thanks to the abundance of this material in-situ. Nevertheless, an assessment of the required habitat wall thickness built with these techniques with regards to its suitability to protect inhabitants from micrometeorites and the space radiation environment is required. The purpose of our work is to evaluate and quantify micrometeorite collision and space radiation hazards on structures built on the Moon using in-situ resources. These figures are assessed together to create a guideline for required habitat wall thickness to protect inhabitants and equipment against these hazards.