

25th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Human Exploration of Mars (2)

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RADIATION SHIELDING BUILDING METHOD

Abstract

“We don’t want to conquer space at all. We want to expand Earth endlessly.” – Stanislaw Lem, ‘Solaris’

Humanity’s next major space mission is to establish a human settlement on Mars. Expecting to be on Mars in the 2030’s, we have experienced an increased number of initiatives facilitating this goal. One of the primary impediments preventing humanity from living on Mars is dangerously high levels of radiation - approximately 40-50 times higher than earth. When building a shelter for human residency, the foundational objective is to provide residents with protection from radiation. From the research carried out, it is seen that Regolith, the martian soil, could prevent such radiation. In this way, regolith can be used to protect astronauts from external radiation, as it is easily accessible in-situ. Our previous paper which describes the project “D-MARS habitat prototype 2.0”, mentions a structural approach which is centered around three principles; rigidity, expandability and accessibility (of materials). This paper presents solutions to achieve improved expandability in these structures as well as how to utilize locally acquired materials for this shelter. Expandability in the context of this structure implies a flexible, inflatable roof, which will increase the interior space of the habitat and also provide a framework for the utilization of regolith as the protective material layer. There are several options offered in the paper to make a soil shield around the basic structure to make it more suitable for the harsh martian conditions. The paper also considers possible impediments such as pressure and gravity differences from that of earth. As our testing prototype, we are repurposing an existing habitat which was used in the last AMADEE 20, a Mars analogue mission carried out in October 2021. Using the existing double-walled structure of this prototype, we are promoting a series of different trials involving filling this chamber with various types of soil and analyzing the effectiveness of the radiation prevention with each version. The combination of the 3 key components of habitat establishment and application of the earlier published design will allow us to make a comfortable, safe and durable construction which can become the foundation for the large-scale settlement on Mars. It can be safely assumed through our technique of utilizing regolith to create a protective structure that we will be successful in protecting humanity from the pernicious levels of radiation, and create a future for life on mars. Thank you