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TRANSMEDIUM SPACE HABITAT FOR HUMAN COLONISATION IN OUTER SPACE

Abstract

As humanity's ambitions extend towards interplanetary exploration and colonisation, the development of habitats capable of withstanding diverse extraterrestrial conditions becomes imperative. Human life beyond any form of planetary magnetic shielding is unknown, currently deemed impossible, and therefore only feasible depending on the human capacity to shield itself from cosmic radiation. While existing spacecraft incorporate multiple layers of radiation shielding, including aluminium sheets, Kevlar nets, epoxy materials, and air gaps, these systems offer only limited protection and are inadequate for extended journeys beyond Earth's orbit. Embarking on the journey of space exploration and colonisation demands a significantly more intricate and resilient strategy than only shuttling humans to and from the Moon within a week's timeframe. This paper is inspired by the resilience found in celestial bodies that for billions of years journey through the universe, particularly noting their common composition of rock. It delves into the human colonisation in outer space by proposing a transmedium habitat designed to seamlessly transverse outer space and transition between space, air, and water environments. This study integrates principles of architecture design, materials science, and space engineering to conceptualise and propose the design for an habitat suited for extended space missions and extraterrestrial habitation across different environments. We explore the unique properties and potential applications of concrete as an artificial rock in space design and construction, considering its properties of strength, durability, structural integrity, thermal insulation, radiation shielding, amongst others. The approach presented in the paper aims to develop space architecture design proposals based on the implementation of concrete-based habitats for sustainable human habitation beyond Earth's orbit and hopes to contribute with novel insights into the field of space architecture, offering a pathway towards the discussion of resilient habitats capable of supporting human life in the harsh environments of Earth, outer space and other celestial bodies.