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EXPANDING THE IMPACT OF ARCHITECTURE: NEW INSIGHTS FROM ANALOGUE FACILITIES

Abstract

Ground research investigating human health in outer space includes analogue activities often run under conditions able to initiate acclimatisation processes like those seen in space. Such activities are a crucial component of each astronaut's training and include crewed missions conducted in isolated, confined and extreme environments on Earth. Up to date, the research's primary focus is on investigating potential hazards and factors that could impact human health in space. Architecture and interior design impact health and well-being. Analogue missions run in facilities that vary in altitude, volume, distribution of spaces, materials and illumination. Although published literature shows a link between operational stressors and architecture, it is not clear which aspects of the architecture are most likely to impact health-related parameters when a crew is in hostile conditions, analogous to space. In this regard, this work analyses the typical architecture of existing analogue facilities, like HI-SEAS and Lunares, where spacious common areas, mainly devoted to working, leisure, meal preparation and training, and small private cabins represent the primary key aspects. We seek to raise awareness on aspects of architecture that could have a markable impact on ongoing efforts in interplanetary missions. The goal is to investigate possible gaps in architecture constraints (such as volume and shape of a vehicle or a habitat) and requirements for preserving human health and well-being. Such insight of analogue architecture allows for defining a new design methodology that integrates the human factor design principles directly into the form-finding process of the interiors and exteriors of the habitat using the most advanced computational design techniques. The objective is to adopt a parametric human-centred design approach where essential variables are mission duration, crew members, research, leisure and team-building activities. This framework is already applied to existing analogue architectures to evaluate its adaptability and integrability. Findings might help anticipate human health issues in permanent human settlements or deep space missions.