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Author: Ms. Sabrina Kerber
ESA/ESTEC, ILEWG & VU Amsterdam, Austria, sabrina.kerber@outlook.com

Prof. Bernard Foing
ESA/ESTEC, ILEWG & VU Amsterdam, The Netherlands, Bernard.Foing@esa.int
Dr. Michaela Musilova
International MoonBase Alliance, United States, musilova@moonbasealliance.com

SEMI-PRIVACY AND COLOR APPLICATION AS ELEMENTS OF HABITABILITY IN CONCEPT DESIGNS FOR EXTRA-TERRESTRIAL HABITATION

Abstract

Introduction Concepts for designs of extra-terrestrial habitats are experiencing a growing importance in the space industry. New technologies and innovative materials bring the need for novel spatial arrangements in these habitats. They also enhance the possibility to address not only the question of creating a safe and functional environment for the astronauts, but also that of amplify the psychological wellbeing through architectural elements. Two of the most important components to improve habitability in extra-terrestrial habitats - the situation of privacy and color application - have been addressed in a lunar simulation (EMMIHS-II) at the Hawaii Space Exploration Analog and Simulations (HI-SEAS) habitat. This analog astronaut mission was initiated by the European Space Agency's (ESA) EuroMoonMars (EMM) and International Lunar Exploration Working Group (ILEWG) in cooperation with the International MoonBase Alliance (IMA). The question of how much privacy is necessary to create a liveable environment in an extra-terrestrial habitat has engaged space architects for the last decades. [1] Less attention has been paid to the issue of semi-private space. Past analog astronaut missions at the HI-SEAS facility came across not only a lack of private space but also a scarcity of areas crew members could retreat to without completely leaving the common space. [2] Such semi-private areas bear great potential both from a spatial and psychological point of view. Especially in the color-reduced environments astronauts face on extra-terrestrial missions, color is a key factor in guiding the effects of such architectural conceptions. [3] By investigating how much privacy and which forms of it are most beneficial to crew mood, effectiveness and cohesion, and how the introduction of color can further affect these aspects, the paper defines guidelines on how the combination of semi-private spaces and color applications could improve future space architectural designs. Methodology The research results presented here are based on several experiments conducted at the HI-SEAS Mars/Moon Research Facility. To assess the potential benefits on crew cohesion, work effectiveness and personal mood, a semi-private area was set up in the main space of the HI-SEAS habitat during the EMMIHS-II lunar simulation. Observations on how often and in what manner this space was used provided insightful information on the requirements of such areas. Different situations of privacy were implemented during the mission, including a zero-privacy period. Further experiments investigated the analog astronauts' reaction to disparate color situations inside the habitat and the semi-private area. Leaning heavily on the architectural components of the habitat, an environment devoid of color was created for the first half of the mission.

Daily comparative surveys were undertaken by the crew to evaluate the effects of the altered privacy and color situations. The findings will serve as a basis for future architectural design concepts in extra-terrestrial habitats and also offer the potential for further investigations during future analog missions.

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