

20th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)

Interactive Presentations - 20th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (IPB)

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INTERNAL CONCEPTUAL SYSTEM DESIGN OF AN INFLATABLE LUNAR SURFACE HABITAT, EUROHAB

Abstract

For a future human mission on the Moon, a project of EUROHAB is presented with its real-size prototype by Spartan space at the IAC 2021 in Dubai. The EUROHAB is a habitat on the lunar surface for a crew of 2 to 4 for a mission duration of 14 or 28 terrestrial days. It is an inflatable module on a lunar lander in the timeframe of 2024-2030. Thanks to the inflatable structure, the habitat is transportable by a cargo vehicle or a lander. It can be autonomously deployed when it landed on the Moon surface and fully prepared before the crew's arrival. This habitat can be used as a secondary habitat with other space missions.

Various interior design has been studied so far by several universities students, but there is still a lack of concrete system details of maintaining the habitation systems and deployment of the module. Therefore, a materiality, environmental control and life support system (ECLSS) and deployment of inflatable structure and retractable wall systems are presented in this paper. The surface operation scenario of this concept study is for 4 astronauts to carry out an exploration mission of 14 days on the Moon. This study of internal conceptual system design is the first phase of two projects for next 2-3 years to improve its functionality and habitability through digital and physical tests as following: first, developing digital twin for a virtual simulation. Second, upgrade the previous prototype and using it as an analogue mission with a wearable XR assets and sensors. The XR testing framework make use of the Task Load Index by NASA (TLX) to assess the task workload. This equipment will allow to collect biometric data to validate and evaluate this internal system design through quantitative and qualitative data. This paper also provides a framework for future research of these 2 future projects.