

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)  
Utilization & Exploitation of Human Spaceflight Systems (3)

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## DEVELOPMENT OF A MOON'S SURFACE HUMAN HABITAT RELYING ON ISS TECHNOLOGY HERITAGE

### **Abstract**

Recent advancements in the field of space exploration have made humans' return to the Moon in the near future a top priority. NASA has already established, for the Artemis program, its mission concepts regarding Earth-Moon transfer, in orbit operations and surface operations. However, Artemis still hasn't devised a concrete plan to build a long-lasting lunar human habitat. Building a lunar human habitat would mean an ever more lasting presence of man on the lunar surface. Moreover, this could be useful to test for longer periods of times structures, equipment and devices in extreme conditions. It could be the first step towards future deep space human exploration.

With a quite pragmatic approach, SEEDS Master Students (Politecnico di Torino, ISAE-Supaero, University of Leicester) proposal is to deeply rely on current technologies used in the ISS in order to design a human base on the Moon's surface. The work therefore was primarily focused on studying adaptability of those technologies in different environment conditions of moon's surface: MMOD environment, reduced gravity conditions, dust-related issues just to mention few. The changes in environmental conditions between surface and orbit and in the activities to be carried out have been considered: some of the systems for the lunar human habitat have been modified starting from the long tested ISS technologies, while other systems have been designed from scratch. For example, a concept for a mobility element has been considered: this element is designed to operate as a fundamental block for building the outpost and for future surface operations; begin a moving habitat enables the possibility to travel for longer distances than a standard EVA suit. Due to the drastic change between microgravity and (reduced) gravity conditions in the two cases, the study has also taken into consideration the different requirements regarding habitable volume for a predefined number of astronauts; particular focus had been put on astronauts' perception of space, considering that on the Moon surface there are upward and downward directions, unlike in orbit.

The outcome of the work is a concept for a lunar human base that is feasible to be implemented a few years after the first human landing on the Moon surface of the Artemis program, which is scheduled for 2024. The consolidation and adaptation of ISS technologies to the lunar environment is a starting point, from which mission costs can be reduced in order to enable extended and constant human presence on Moon surface.