16th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Interactive Presentations - 16th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (IP)

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H.O.M.E. LAB

Abstract

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1 Introduction

In the last years, some space organizations realized many tests to simulate an extraterrestrial environment on Earth and to experiment efficient ways of cohabitation. Examples of this are MDRS (Mars Desert Research Station) from the Mars Society and HI-SEAS from NASA. What emerged from these experiments, as well from psychological studies on astronauts of ISS, is that the stress of being in an enclosed space with a small group of people for a long period can result in numerous problems, such as cognitive decline, depression and interpersonal conflicts.

2 Solution

We designed our own research base, H.O.M.E. Lab, pursuing not only the objective of granting its inhabitants a high liveability, but also trying to develop a structure easy to expand and remodulate and based on principles of environmentally friendliness and self-sustainability. H.O.M.E. (Hexagonal Open Modular Environment) Lab is an innovative solution for an isolated research base. It is a honeycomb-structure hab, divided into different hexagonal compartment modules. H.O.M.E. is designed to grant people inside it a comfortable place to stay and to be easy to set-up and expand, while being totally green. In fact, its key feature are:

- high index of liveability for 6 people;
- designed to reduce psychological stress;
- easy to set-up structure and possibility to add new modules or change the current configuration at any time;
- adoption of eco-friendly solution for heating, power source and waste management.

According to these feature, our basic habitat, for 6 people, is made up of:

- 6 personal rooms
- 1 laboratory (divided into a clean room and a dirty room)
- 1 clinic room
- 2 bathrooms
- 1 open space in the centre, containing a living room, a kitchen and a relax room.

H.O.M.E Lab is a modular environment whose basic unit is a hexagonal cell, called HEX (HEXagonal elementary cell). An HEX is made up of four elements:

- a base,
- six angular brackets,
- six removable and replaceable panels,
- a roof

One of the main feature of H.O.M.E. Lab is its layout flexibility. The hexagonal modularity allows adding new cells or re-organizing the existing ones to develop different hab dispositions. This way, different configurations can be designed to better suit the ground where the hab will be built and to make the cohabitation less stressing and more efficient