IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Advanced Systems, Technologies, and Innovations for Human Spaceflight (7)

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USING COMPUTATIONAL TECHNIQUES FOR THE OPTIMAL DESIGN OF EVOLVING HABITATS

Abstract

The goal of this paper is to demonstrate the possibility of using existing solutions and concepts developed and used for earth applications as a design architecture for outer-space habitats. The future habitats/cities will need to evolve constantly, fixing a form, a system or a program is not the solution to adapt to an environment that we will learn a lot from when we get there. The design for an habitat and its systems will require constant modifications to adapt to changes in the environment, our knowledge of it and/or our reaction to it. Interior and exterior organizations will certainly change rapidly depending on new requirements. To produce an optimal design at a fast pace and correctly we need to use computational techniques such as parametric design or topology optimization. The first step is to modify the parameters of the habitat, its users and its environment such as gravity, total population, required luminosity or others. We can then adapt the shape and the different life support systems to new conditions very rapidly. The second step is to apply shape optimization and/or evolutionary solver methods to create the optimal solution to this new set of requirements. The new design solution should be the best according to a chosen set of conditions, for example: well-being, comfort, ease of operation and construction. With the help of software such as Rhino/Grasshopper we can demonstrate the practicality and the necessity of this approach for future human settlements in any extreme environment.