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Author: Prof. Giancarlo Genta
Politecnico di Torino, Italy

Dr. Marco Peroni
Marco Peroni Ingegneria – Faenza, Italy

Dr. Giacomo Ravaglia
Italy

Dr. alessandro genta
Italy

Dr. Margherita Ferragatta
I.D.T. SRL SOCIETA' BENEFIT, Italy

A GREENHOUSE FOR THE FIRST HUMAN MARS MISSION

Abstract

The time for the first human mission to Mars is closing. In the 74th IAC the authors presented the preliminary design of a fairly large Martian outpost based on additive manufacturing and passive radiation protection for the first human missions to Mars. A basic advantage of using Martian material is making it possible to build large buildings, the only limitation being the time the 3D-printing machine has for the construction work. The size of the habitat is sufficient to provide comfort to the astronauts which is much greater than that of a typical tin-can, or even inflatable, habitat, to host a greenhouse and a workshop and other specialized zones like a sick bay. In the present paper, the work is developed to study how it is possible to supply the outpost with all the internal devices minimizing the mass to be carried from Earth. Some details on the virtual windows and the equipment required to have a functional workshop and greenhouse are described, including provisions for making maintenance and repairs of the rovers and for running hydroponic cultivations using artificial light. If the locality chosen for the following exploration missions is the same where this outpost has been built, the outpost can be further enlarged by the robotic construction machine and can, in time, become a large permanent base. Similar habitats can be used also for a lunar base, although the lower gravitational acceleration can make things simpler from some viewpoints and more complex from others.