

28th IAA SYMPOSIUM ON SPACE AND SOCIETY (E5)

Architecture for humans in space: design, engineering, concepts and mission planning (1)

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SPACE MISSIONS**Abstract**

As of 2017, there has been serious and renewed public, private, and government interest in the human exploration of Mars. At the NASA level, as specified in the most recent NASA Mars Design Reference Architecture, and the 2014 NASA Strategic Plan, by the 2040s the agency intends to send human crews to the surface of Mars with an intended surface mission duration of at least 500 days. Private sector interest has also expanded to the ambition of establishing large permanent colonies on the surface of Mars. Economies of scale indicate that in these extended surface mission and large crew scenarios, in-situ food production may be preferable over the current baseline of prepackaged food, and may also be used as a biological oxygen production system or as part of a wastewater reclamation system. Collectively, these systems are commonly referred to as “biologically regenerative life support systems” (BLiSS). For the purposes of this project, our BLiSS team at the University of Michigan chose to focus on parameters regarding plant growth, operations, and structural considerations regarding future greenhouses to be used on Mars. This report will describe the results of the preliminary design of the transparent deployable greenhouse in detail including potential plant candidates, results from structural analysis, challenges that we currently face, and future plans for continuing with the design of this project.