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PROPOSAL FOR A FLOATING HABITAT DESIGN FOR MANNED MISSIONS TO VENUS

Abstract

While Mars has been the focus of most recent attention as a target for human exploration in the near future, human exploration of other bodies in the Solar System may yield scientific advances in areas that cannot be studied in Martian conditions. One of these bodies is Venus, a planet commonly considered Earth's "sister planet" due to its similar size, in addition to possessing an atmosphere more comparable in thickness to Earth's than that of Mars. In this work, we propose a potential design concept for a manned mission to Venus, accounting for the challenges that such a mission would face.

We begin by exploring the anticipated challenges faced by manned missions to Venus, including harsh surface conditions, challenging atmospheric characteristics, exposure to radiation, and questions regarding energy sources. We then review previously proposed ideas for manned missions to Venus. Finally, we propose a floating habitat design as a possible concept for addressing the challenges that a manned Venus mission would face. Specifically, we propose a floating habitat that would allow establishment of a four- to six-member crew within the cloud layer of Venus at an altitude of 50 km. We propose this in preference to a surface-based habitat due to the harsh surface conditions of Venus that preclude easy establishment of a manned station. We quantify the expected solar power available for such a design, highlight features of the proposed design that address challenges discussed previously, and discuss areas that will require further research to make this concept a reality. We further discuss possible mission designs that would be facilitated by such a platform, including exploring the planet and performing required mission tasks. Ultimately, in proposing this design, we intend to stimulate further discussion and research into manned missions to Venus, both to advance knowledge in the scientific community, and to foster humankind's curiosity in space exploration.