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MARS SPACE STATION: A PRELIMINARY DESIGN

Abstract

As space travel evolves beyond research purposes, the future where Mars becomes an easily accessible planet, for future human space flights and Martian settlement, is taking its shape. The paper envisions the system concept of Mars Space Station (MSS) that will play a vital role in Martian expeditions and study the feasibility of the first step towards building a Human Base Camp on Mars. Before humans can completely construct a base station and settle on mars, a Mars Space Station (MSS) can help study the impact of Martian weather on astronauts, assist and monitor autonomous robots in constructing the Martian Base modules along with performing experiments on Martian soil samples, thus saving the cost of multiple back and forth spaceflights to Earth. The paper includes the comparison between design requirements for the MSS and International Space Station (ISS). The process of construction and formation of the MSS will be performed in several stages called modules that will dock to a single parent body. Further, trajectory for each module of MSS along with the docking procedure is discussed. This paper proposes a preliminary design of MSS module docking and assembly in the orbit around the Red planet. This design explains the method and operations of subsystems, supporting a crew of maximum six astronauts at a time, on the space station. Further, the complexity of the design is divided into several verticals including thermal control system, power budget, radiation shielding, precautionary measurements, on board computing, telemetry, communication with Martian base camp and earth, experimental analysis, life support systems, and simulations are performed to verify and optimise existing literature. The life support system discusses maintenance of air pressure, oxygen, other essential resource procurement from Mars, and the fire protection system. Rigorous calculations are performed to evaluate appropriate orbital parameters, in addition to the space station design optimization.

Keywords: Astronauts, International Space Station, Mars Space Station, Martian Base Camp, Space Travel