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The International Space Station in LEO and the Deep Space Habitat in Cis? Lunar Space as platforms for simulated Mars voyages (4)

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UTILIZING THE INTERNATIONAL SPACE STATION AS A SIMULATION PLATFORM FOR DEEP SPACE TRAVEL

Abstract

As both private companies and governmental agencies lay future plans to send humans to Mars and near Earth asteroids, many challenges lie ahead on such journeys. Some of the biggest hurdles in attaining this goal will be ensuring that the human body and mind can cope with various physiological and psychological effects of long duration spaceflight which place astronauts in jeopardy for both short and long term health risks.

The limitations inherent with both historical and present day Earth-based and space-based simulations support the findings that there has yet to be a simulation of a long duration deep space mission that incorporates both microgravity and the accurate long-term isolation of its crewmembers. Thus, one of the ideal possibilities for such a simulation method would be to conduct a space-based study aboard a pre-existing facility, such as the ISS. Due to its impending retirement in 2024, this simulation would perhaps best be suited to serve as a final research mission for the station.

Preparing the ISS for a long term flight simulation of this nature will require a number of specific adaptations to the payload, the platform's subsystems, and how daily flight operations are to be conducted. This paper, therefore, will discuss the factors and variables that would need to be accounted for and controlled during such an experiment in order to accurately ascertain the psychological effects of crew isolation in microgravity. It will also explore and compare the mission simulation objectives with current capabilities and the required adaptation efforts, and propose a set of low risk, low effort measures to prepare the ISS for a long term simulation mission, enabling both a valuable and affordable approach. Additionally, it will also address the specificities of the astronaut training as a key success element.

With the useful lifespan of the ISS soon coming to an end, and plans to launch humans to Mars in the coming decade, it is crucial that such a simulation be attempted. The data gained from this method of improved simulation could very well go a long way towards not only alleviating some of the hazards to human health, but also towards defining the selection process for future crewmembers and helping to identify and mitigate the risks to future deep space missions.