

Life Sciences as Related to Space (F)

There and Back Again - An Astronaut's Tale: NASA (F5.2)

## **USE OF ISS AND ARTEMIS AS ANALOGS FOR FUTURE MARS MISSIONS: A STRATEGIC VIEW**

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The International Space Station (ISS) from its inception has served as a key place for doing research on the effects of microgravity on human physiology and developing mitigations and countermeasures to those effects to enable future exploration. The ISS international partnership is working on periodic modifications to operations so that ISS could be used more effectively as an analog to simulate long-duration crew missions beyond low earth orbit. Ongoing planning includes: (1) demonstration of autonomous medical care with significant communications delay, (2) simulation of other types of operations with communications delay, crew autonomy, or simulated hardware autonomy, and (3) surface operations after the physiological effects of a long transit. Exploration simulations are challenging because there can be operational impacts on nominal ISS activities, but when well-designed can offer a unique degree of fidelity to understand and reduce risks of future missions.

Human spaceflight is entering a new phase where simultaneous operations of multiple platforms can improve the quality of Mars mission simulations beyond what can be done on ISS alone. Artemis offers opportunity to test human operations in a partial gravity and deep space radiation environment, with value for understanding human performance across multiple phases of surface operations: early operations with little surface infrastructure, the ramp up to frequent surface extra-vehicular activity, and if durations in microgravity can be extended, a potential full simulation of a Mars mission.

By developing a strategy that treats all human spaceflight missions in Low Earth Orbit (LEO)

and the lunar vicinity as analogs for future Mars missions, human research and technology demonstration can be conducted that is more robust to the limitations of any one analog. This paper will provide the latest integrated strategy being used internationally with updates on the implementation progress and challenges as planning and development continue.