HUMAN SPACEFLIGHT SYMPOSIUM (B3)
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THE REALITIES OF HUMAN OPERATIONS IN DEEP SPACE

Abstract

NASA's deep space exploration system is currently in production and on track to enable the human exploration of destinations across our solar system including Mars. The Orion spacecraft and Space Launch System (SLS) rocket are foundational elements of this deep space exploration system that together will transport humans from our home planet, sustain them in the harsh environment of deep space and return them safely back to Earth. The complexities of operating crewed missions in deep space are far more intricate than is commonly appreciated.

This paper will discuss the realities of conducting human missions in deep space using Orion and SLS. Operational complexities, key technical challenges and strategies to mitigate those risks will be examined. Human demands on the flight crew include the need to maintain human health and performance beyond the safety afforded by the Earth's magnetic and gravitational fields. Physical realities include operating with time delays that increase with distance to Earth based resources, navigating without the use of the Global Positioning Satellite (GPS) system or line of sight capabilities back on Earth and conserving of life sustaining consumables such as water and oxygen.

This paper will put each challenge into the context of human exploration on NASA's new deep space-craft and rocket launching from the revitalized spaceport located at the Kennedy Space Center. The discussion will center on the Exploration Mission One (EM-1) flight test demonstrating these founda-tional capabilities across critical mission phases. The paper and outbrief will walk through individual mission phases including prelaunch, ascent, trans-lunar injection, in-space transit, entry into and exit from cis-lunar space, Earth reentry, descent, landing and ocean recovery necessary with a focus on risk drivers and complex operations.