

## **IMPACT OUTPUTS FOR A REPRESENTATIVE EXTENDED DURATION ARTEMIS MISSION**

Steller JG<sup>1</sup>, Levin D<sup>1</sup>, Lemery J<sup>2</sup>, Anderson A<sup>3</sup>, Stratton E<sup>1</sup>, Nelson A<sup>1</sup>, Kreykes A<sup>1</sup>, Kerstman E<sup>1</sup>, Lehnhardt K<sup>2</sup>, Easter B<sup>2</sup>.

<sup>1</sup>University of Texas Medical Branch and KBR; <sup>2</sup>IPA - NASA Johnson Space Center; <sup>3</sup>University of Colorado Anschutz Medical Campus

**BACKGROUND:** As NASA and private industry begin preparation for long-duration spaceflight, quantifying the impact that potential human health and performance capabilities have on crew health outcomes is imperative for medical risk mitigation. NASA's Informing Mission Planning via Analysis of Complex Tradespaces tool (IMPACT) applies Probabilistic Risk Assessment (PRA) methodology to estimate these outcomes.

**OVERVIEW:** As NASA prepares to return to the Moon, medical system planning has already begun for extended Artemis missions, which will see humans spending months at a time in cis-lunar space and on the surface of the Moon. The Long Duration Lunar Orbital and Lunar Surface (LDLOLS) design reference mission (DRM) lasts 9 months, including 3 months on the lunar surface, and involves 2 male and 2 female crewmembers. LDLOLS assumes no extravehicular activities (EVAs) in orbit, but, while on the lunar surface, involves 2-4 EVAs/month in a pressurized rover and 2-4 EVAs/month in an unpressurized rover or on foot. This DRM assumes a physician level Crew Medical Officer with commensurate knowledge, skills, and abilities. The IMPACT tool was utilized to estimate in-flight medical risk for this mission. More specifically, 100,000 simulations of this DRM were modeled, and overall estimates for loss of crew life (LOCL), need for evacuation (RTDC; return to definitive care), and crew task time lost (TTL; a measure of disability) were calculated. A recommended medical capability set, with appropriate mass and volume constraints, was also generated.

**DISCUSSION:** This abstract reviews the IMPACT-derived risk of these mission outcomes with and without treatment, a macroscopic look at the total mass and volume necessary for full diagnostic and treatment capability, and how these change with input mission parameters.