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Promoting Technology and Collaboration

A Space Habitat Surgical Bay—A Collaborative & Interdisciplinary Model for Space Surgery Research, Simulation, Training, & Education

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Background: As we prepare for deep space exploration and other-world habitation, we anticipate medical issues that will require treatment beyond our current capacity. Space stations in low Earth orbit permit only stabilization and evacuation to Earth for medical emergencies. With longer returns from the Moon and Mars, medical capabilities must increase to manage severe clinical conditions.

Technology Overview: Our team recently completed a 100-year survey of medical and surgical care paradigms in military, expeditionary, remote and spaceflight medicine. We recognize advances in innovation, technology, training, and expertise have improved patient outcomes. However, care capabilities decrease with tightly constrained medical systems. In space, microgravity, differences in level of training of astronauts, as well as mass, volume, and power constraints limiting available area and diagnostic/treatment tools for care needs, all challenge management of severe medical and surgical conditions.

Potential Application in Surgical Simulation and Education: It is critical to understand current and future capabilities and limitations in procedural and critical care surgery through surgical simulation, training, and education in small spaces applicable to any transit vehicle or habitat on the Moon or Mars. We propose developing a comprehensive, compact, full-featured, low-resource, and readily deployable medical-surgical bay (“med bay") at an existing hermetically sealed and pressurized space analog and research facility. Focusing scope of care on general/trauma surgery and dental care, the med bay will be a testbed for research and ground-based experiments related to space medicine and surgery.

Potential Opportunities to Collaborate: We have begun and seek to grow a collaboration of space medicine and engineering professionals at Space Analog for the Moon and Mars (SAM) at Biosphere 2, University of Arizona. The iterative med bay design process will be guided by NASA requirements and commercial needs, incorporating contemporary technology and innovation.