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Medical Care for Humans in Space (3)

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CIS-LUNAR ORBITAL MEDICAL FACILITY AND ROADMAP

Abstract

Exploration is intrinsic to human nature and is accompanied by inherent risks to the explorer, particularly in the extreme environment of long-duration space habitation due to the distance from assistance, services, and replenishment of consumables. One major risk to extreme environment survivability is lack of access to emergency medical care. This risk is further amplified in the microgravity environment.

Problem Statement – What is the best practice for handling a medical casualty in which access to advanced medical care necessitates rapid stabilization and evacuation utilizing NASAs Lunar Gateway?

Hypothesis – When a medical casualty is time critical, it is imperative that rapid access to a stabilization-for-transport facility is readily available. To best meet this requirement, it is suggested to provide a fully functional medical facility on Lunar orbit as well as provide a Medical Operations Roadmap for its use.

Microgravity presents unique challenges to human psychology and physiology with the added risk of limited access to emergency medical care. In this environment, minor trauma is exacerbated by time to next level care and mundane injuries can become life-threatening. As such, systems should be in place to prevent initial injuries as well as to mitigate exacerbation of existing traumas or those occurring during or as a result of the mission and be designed with casualty response as a critical component of a trauma stabilization-for-transport system as a high priority alongside allowing for complete autonomy and provision for all other necessary services, automations, and self-sustainability during the lifespan of long-duration missions. These systems must be conceptualized with microgravity as a primary driving factor. Emphasis is placed on physical and cognitive ergonomics including traffic flow analysis, system resilience to major disruption, and modularity in congruence with the usability of legacy and novel space systems. Design methodology used herein is from nominal to worst-case scenario based with a focus on emergency evacuation from the Lunar surface all within the scope of Human Centered Design.

Given the complexities of off-planet habitation and the increased risk during prolonged missions, especially wherein mining operations and construction are considered, it is imperative to maintain a fully functional medical facility within close proximity to the operations. This will be beneficial in time-critical medical emergency scenarios.