

Conceptual Drivers for an Exploration Medical System

E. Antonsen^{1,2}, M Canga²

¹Baylor College of Medicine, 1504 Taub Loop, Houston, TX 77030, ²Human Research Program, NASA Johnson Space Center, 2101 NASA Parkway, Houston, TX 77058

Interplanetary spaceflight provides unique challenges that have not been encountered in prior spaceflight experience. Extended distance and timeframes introduce new challenges such as an inability to resupply medications and consumables, inability to evacuate injured or ill crew, and communication delays that introduce a requirement for some level of autonomous medical capability. Because of these challenges the approaches used in prior programs have limited application to a proposed three year Mars mission. This paper proposes a paradigm shift in the approach to medical risk mitigation for crew health and mission objectives threatened by inadequate medical capabilities in the setting of severely limited resources. A conceptual approach is outlined to derive medical system and vehicle needs from an integrated vision of how medical care will be provided within this new paradigm. Using NASA Design Reference Missions this process assesses each mission phase to deconstruct medical needs at any point during a mission. Two operational categories are proposed, nominal operations (pre-planned activities) and contingency operations (medical conditions requiring evaluation) that meld clinical needs and research needs into a single system. These definitions are used to derive a task level analysis to support quantifiable studies into a medical capabilities trade. This trade allows system design to proceed from both a mission centric and ethics-based approach to medical limitations in an exploration class mission.