MEDICAL DATA ARCHITECTURE PROJECT STATUS

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ABSTRACT

The Medical Data Architecture (MDA) project supports the Exploration Medical Capability (ExMC) risk to minimize or reduce the risk of adverse health outcomes and decrements in performance due to in-flight medical capabilities on human exploration missions. To mitigate this risk, the ExMC MDA project addresses the technical limitations identified in ExMC Gap Med 07: We do not have the capability to comprehensively process medically-relevant information to support medical operations during exploration missions. This gap identifies that the current in-flight medical data management includes a combination of data collection and distribution methods that are minimally integrated with on-board medical devices and systems. Furthermore, there are a variety of data sources and methods of data collection. For an exploration mission, the seamless management of such data will enable a more medically autonomous crew than the current paradigm. The medical system requirements are being developed in parallel with the exploration mission architecture and vehicle design. ExMC has recognized that in order to make informed decisions about a medical data architecture framework, current methods for medical data management must not only be understood, but an architecture must also be identified that provides the crew with actionable insight to medical conditions. This medical data architecture will provide the necessary functionality to address the challenges of executing a self-contained medical system that approaches crew health care delivery without assistance from ground support. Hence, the products supported by current prototype development will directly inform exploration medical system requirements.

In fiscal year 2017, the MDA project identified a preliminary architecture framework and developed the first build in a series of prototypes that will incrementally add capability as the medical system definition advances and matures. The main objective of the prototype system, Test Bed 1, was to identify key considerations for medically relevant data collection, management, display and retrieval necessary for a space-based medical diagnosis to occur. Test Bed 1 demonstrated the automated collection, storage and retrieval of time series physiological data from a wearable monitoring device and a diagnostic electrocardiogram (ECG) from a separate device. In addition, manual text entry was enabled to record medical exam notes. These data were retrieved and displayed through a customized user interface. Capabilities of the system were expanded in a Test Bed 1.5 iteration where Astroskin biometric data were sent via telemetry to a Core Flight Software (CFS) system. Simultaneously, the MDA system, using Consultative Committee for Space Data Systems (CCSDS) protocol, received and stored vehicle environmental data from an Environmental Control and Life Support System (ECLSS) simulator. As part of the Next Space Technologies for Exploration Partnerships (NextSTEP) ground test, Test Bed 1.5 capability was demonstrated at the NASA Johnson Space Center Integrated Power, Avionics and Software (iPAS) facility. The choice of data sources, operational scenarios and demonstrations enabled the team to explore relevant data sources and viewpoints to ensure that stakeholder concerns are being addressed in the development. Moving forward, additional use cases will be addressed to advance the medical data system data models, standards and principles that will inform the medical system requirements development.