

Fiscal Year:	FY 2016	Task Last Updated:	FY 09/13/2016
PI Name:	Winther, Sean B.S.		
Project Title:	Biosensors for Exploration Medical System		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline-- Element/Subdiscipline:			
Joint Agency Name:	TechPort:	Yes	
Human Research Program Elements:	(1) <b>ExMC</b> :Exploration Medical Capabilities		
Human Research Program Risks:	(1) <b>Medical Conditions</b> :Risk of Adverse Health Outcomes and Decrements in Performance Due to Medical Conditions that occur in Mission, as well as Long Term Health Outcomes Due to Mission Exposures		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	94035	Congressional District:	18
Comments:			
Project Type:	FLIGHT,GROUND	Solicitation / Funding Source:	Directed Research
Start Date:	07/01/2011	End Date:	06/30/2016
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	0	No. of Master' Degrees:	0
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	1
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
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Flight Program:	ISS		
Flight Assignment:	NOTE: Project completed and transferred to Medical Operations; closeout as of 6/30/2016 (Ed., 4/4/18)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Toscano, William ( NASA Ames Research Center )		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

	<p>The current International Space Station (ISS) electrocardiogram (ECG) system for donning the biomedical sensors is time consuming and inconvenient, requiring shaving, application of electrodes, and signal checks. A more efficient ECG system will save crew time and reduce the overhead of stowing additional supplies. Additionally, the current ECG hardware requires dedicated ISS power and significant volume, but advances in microelectronics has significantly reduced the volume and power required for ECG applications. The Biosensors-EMSD (Exploration Medical System Demonstration) will demonstrate the integration of small, battery powered, easy to use biomedical sensors and data acquisition devices that will have the ability to measure, store, and transmit physiologic parameters during operational and ambulatory scenarios.</p> <p>Specific Aims:</p> <ol style="list-style-type: none"> <li>1. Demonstrate that commercial off the shelf (COTS) and emerging technologies satisfy exploration physiological monitoring requirements and operational requirements</li> <li>2. Reduce the time required of an on-orbit crew and ground personnel to store, access, transfer, and process physiological data</li> <li>3. Provide a mechanism for interfacing biomedical sensor technology with a common data management framework and architecture to enable the EMSD objectives.</li> </ol> <p>The functionality of the ECG system will be verified through a ground demonstration and an ISS flight demonstration, both as part of the Exploration Medical System Demonstration. The project will begin with a market survey of available COTS ECG systems that meet physiological monitoring requirements followed by a direct COTS procurement. The ECG system will then be tested and verified for proper capabilities by CMO analogs. Ground testing will require CMO analogs to don the ECG system and execute a series of predetermined tasks while a variety of ECG data and video is collected. ECG data and video will be examined to ensure data quality, appropriate data routing, and to demonstrate system efficiency. Flight testing will be similar to ground testing, but may not be as comprehensive given in-flight resource limitations. The availability of more varied medical condition simulations, more extensive supply of power, fewer time and space limitations, and enhanced system characterization capabilities will allow the ground demonstration to expand the on-orbit objectives by assessing system effectiveness and performance.</p> <p>NOTE: Project completed 6/30/2016 with transfer to Medical Operations at Johnson Space Center.</p>
<b>Rationale for HRP Directed Research:</b>	<p>The study team is uniquely positioned to perform this function because the physiological monitoring requirements and operational requirements needed for this task require specialized information that is unique to NASA. The study team will also help ensure that the ECG component of the overall Exploration Medical System Demonstration (EMSD) is well integrated with other components of the system.</p>
<b>Research Impact/Earth Benefits:</b>	<p>Our purpose is to better equip crew member medical monitoring for future exploration missions.</p>
<b>Task Progress:</b>	<p>The following items are critical topics for this task. Most of the work has been a continuation from last year; however, the scope of the hardware need has changed. With that in mind, our intentions for this project remains to be a demonstration or operational use on board International Space Station.</p> <p>ECG Device: No additional work has been done with this device and they remain in bonded storage at Ames Research Center (ARC).</p> <p>ECG Harness Development: The 12-Lead ECG Dry Electrode Harnesses have been delivered and remain in bonded storage at ARC. System has been demonstrated to potential stakeholders (Health Maintenance System (HMS) and Countermeasures System (CMS), and Medical Operations (MedOPs)); however, there has been no final decision to move forward for a flight manifest.</p> <p>ECG Glove: The Glove was purchased and demonstrated with the ECG device. The potential stakeholders (HMS, CMS, HHC, and MedOPs) were interested. Currently, HMS has decided to move forward with the ECG glove and ECG device into flight status.</p> <p>Procedure Development and Demonstration: Functional test procedures were developed and demonstrated for the ECG device. Procedures were written to fully satisfy qualification and acceptance for flight. Ground demonstrations procedures were developed and tested as a foundation for flight procedures. Flight procedures have been developed and completed for both the ECG device and ECG glove.</p> <p>Flight Certification: The flight safety data package 0/I/II was completed and accepted. Flight Data Safety Package III draft has been completed and final draft will be submitted May 2016.</p> <p>Flight Protocol Approval: Notification of Approval was received from Johnson Space Center (JSC's) IRB (Institutional Review Board) and is effective April 13, 2016 – April 30, 2017. Protocol Number: Pro1569; NASA MPA Number: NASA 7116301606HR; FWA Number: 00019876.</p> <p>NOTE: Project completed 6/30/2016 with transfer to Medical Operations at Johnson Space Center.</p>
<b>Bibliography Type:</b>	Description: (Last Updated: )