Fiscal Year:	FY 2013	**Task Last Updated:**	FY 07/09/2014
PI Name:	Levinson, Mitchell M.S.		
Project Title:	Preventing Secondary Brain Injury by Early Detection of Cerebral Bleeding and Edema		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	NSBRI--Smart Medical Systems and Technology Team		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **SANS**:Risk of Spaceflight Associated Neuro-ocular Syndrome (SANS)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	mlevinson@cerebrotechmedical.com	**Fax:**	FY
PI Organization Type:	INDUSTRY	**Phone:**	925-399-5392
Organization Name:	Cerebrotech Medical Systems, Inc.		
PI Address 1:	1249 Quarry Lane Suite 120		
PI Address 2:			
PI Web Page:			
City:	Pleasanton	**State:**	CA
Zip Code:	94566	**Congressional District:**	15
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	NSBRI-RFA-SMARTCAP
Start Date:	04/01/2013	**End Date:**	03/31/2014
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NSBRI
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):			
Grant/Contract No.:	NCC 9-58-SMST03301		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Astronauts coming back from the International Space Station (ISS) can experience significant and permanent ocular damage which appears to be correlated with elevated intracranial pressure (ICP). To date, little is known about the causes of these pathologies, and NASA wants a non-invasive device to monitor the astronauts' brains in space. Cerebrotech is developing the first completely non-invasive monitor to detect changes to intracranial fluid (ICF). The device uses a proprietary technology called Volumetric Integral Phase-shift Spectroscopy (VIPS), which was developed at the University of California at Berkeley. VIPS exploits the changes in electrical properties of tissue as a result of small changes in fluids. These changes in electrical properties can be detected by measuring the frequency response of the phase angle between a transmitter and receiver antenna as depicted below. The phase angle is a measure of the speed of propagation of the waves through the tissue, which is a function of frequency, impedance and dielectric constant. By taking a baseline reading, we can compare subsequent readings to detect changes to fluids in the brain. Since the bone and protein remain essentially constant, the changes we see are solely the result of fluid changes, such as bleeding and edema. The Cerebrotech device consists of at least one transmitter and one receiver antenna placed to measure the fluids in the brain. Low-power electromagnetic waves at multiple frequencies are transmitted through the brain and the phase shift between the transmitter and receiver are measured. Because the different fluids in the brain cause different phase shifts at different frequencies, VIPS can differentiate between the fluid compartments. For example, we can see edema forming, movement of CSF, increases and decreases in intracranial blood volume.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	There is a glaring gap in diagnosing and monitoring patients for brain edema and bleeding. At most, CT and MRI only provide daily snapshots, and other probes like intracranial pressure (ICP) monitors are extremely invasive and are only used in the most serious cases. Most patients are left largely unmonitored in their hospital beds, except for periodic subjective clinical neurological exams, leaving them exposed to a risk of undetected brain edema or bleeding, until it causes a significant and detectable neurological deficit—and by then it is too late. During this period, the physician knows little about the status of the brain, and orders thousands of dollars on serial medical imaging and nursing examinations, with little chance of detecting the problem in time to prevent secondary brain injury. VIPS technology uses magnetic induction to detect small changes in the fluid volume of the brain. Patients wear it like a headband without requiring electrical contact with the skin. The monitor can be worn continuously to detect brain fluid changes from baseline, aiding the physician in detection of increasing brain edema or bleeding, as well as providing objective feedback for medical management and medication dosing. The product will address a market of millions of patients worldwide, for an addressable market size of several billion dollars annually. The initial target application is patients in hospitals after stroke, traumatic brain injury or other conditions which put them at risk for secondary brain injury as the result of bleeding or edema. This application alone addresses the needs of 3.3 million patients worldwide.
Task Progress:	New project for FY2013. [Ed. Note: Added to Task Book 7/9/2014, when received information about the task.]
Bibliography Type:	Description: (Last Updated:)