Fiscal Year:	FY 2017	**Task Last Updated:**	FY 05/09/2017
PI Name:	Laurie, Steven Ph.D.		
Project Title:	Integrative Physiology of VIIP: Cardiopulmonary, Sleep, and Cognitive Function Assessment During Hypercapnic Bed Rest		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Biomedical countermeasures		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Immune**:Risk of Adverse Health Event Due to Altered Immune Response (2) **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:	steven.laurie@nasa.gov	**Fax:**	FY
PI Organization Type:	NASA CENTER	**Phone:**	281-244-0029
Organization Name:	KBR/NASA Johnson Space Center		
PI Address 1:	Cardiovascular and Vision Laboratory		
PI Address 2:	2400 NASA Pkwy		
PI Web Page:			
City:	Houston	**State:**	TX
Zip Code:	77058-2749	**Congressional District:**	36
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2014-15 HERO NNJ14ZSA001N-MIXEDTOPICS. Appendix E: Behavioral Health & Human Health Countermeasures Topics
Start Date:	04/01/2016	**End Date:**	09/30/2018
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:**	0
No. of Bachelor's Candidates:	0	**Monitoring Center:**	NASA JSC
Contact Monitor:	Norsk, Peter	**Contact Phone:**	
Contact Email:	Peter.norsk@nasa.gov		
Flight Program:			
Flight Assignment:	NOTE: Extended to 9/30/2018 per JSC HHC element info (Ed., 2/5/18)		
Key Personnel Changes/Previous PI:	May 2017: Robert Ploutz-Snyder was dropped from this protocol as CoInvestigator due to leaving JSC and Millenia Young was added as the local statistician to replace Robert. Drs. Scott Smith and Sara Zwart were added to this protocol as CoInvestigators due to expertise in one-carbon genetics and biochemistry and there will be studies as part of this project.		

COI Name (Institution):	Hu, Xiao Ph.D. (University of California, San Francisco) Lathan, Corrinna Ph.D. (AnthroTronix, Inc.) Lee, Stuart (KBRwyle/NASA Johnson Space Center) Lovering, Andrew (University of Oregon) Martin, David (KBRwyle./NASA Johnson Space Center) Stenger, Michael (NASA Johnson Space Center) Young, Millennia Ph.D. (NASA Johnson Space Center) Smith, Scott M Ph.D. (NASA Johnson Space Center) Zwart, Sara Ph.D. (University of Texas Medical Branch/NASA Johnson Space Center)
Grant/Contract No.:	Internal Project
Performance Goal No.:	
Performance Goal Text:	
Task Description:	Over 70% of crew members completing long-duration space flight missions have developed ocular structural or functional changes that characterize the Vision Impairment Intracranial Pressure (VIIP) syndrome, yet no ground-based analogs have successfully replicated these symptoms. Carbon dioxide (CO2) is elevated on the International Space Station (ISS) and has been hypothesized to contribute to the development of VIIP, which may explain why previous ground-based analog studies which have not included elevated CO2 levels in the ambient air have not successfully replicated VIIP. The research outlined in this grant proposal seeks to link physiological changes that occur during exposure to chronic hypercapnia (elevated carbon dioxide, 0.5% CO2 inspired) similar to that occurring on ISS, in subjects undergoing the space flight analog of 6° head-down tilt bed rest, with changes associated with the VIIP syndrome and decrements in cognition, sleep quality, and circadian alignment. Optical coherence tomography, intraocular pressure, cerebral and ocular blood flow, and sensitivity to carbon dioxide will be used to assess the development of VIIP and determine the relationship between physiological changes associated with hypercapnic bed rest and VIIP symptoms. Cognitive function will be assessed using two tools: the Cognition battery currently being tested on ISS crew members, and the Digital Automated Neurobehavioral Assessment, the only FDA-cleared computerized cognitive assessment tool which has been validated in thousands of active military personnel. The Philips Respironics Alice PDx Sleep System will be used to assess sleep quality and core body temperature will be measured to determine circadian misalignment. This research proposal addresses multiple risks within NASA's Integrated Research Plan, including determining if this unique ground-based analog can simulate VIIP, and if the mild hypercapnic environment represents a threat to behavioral health and performance, sleep quality, and normal circadian rhythm.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	This study received approval from the Johnson Space Center Institutional Review Board and is in review with the Institutional Review Board at the German Aerospace Center (DLR). The estimated start of data collection is October 2017.
Bibliography Type:	Description: (Last Updated: 05/05/2023)