Fiscal Year:	FY 2011	**Task Last Updated:**	FY 07/18/2011
PI Name:	Bloomberg, Jacob J. Ph.D.		
Project Title:	Physiological Factors Contributing to Postflight Changes in Functional Performance (Functional Task Test)		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
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) **Sensorimotor**:Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	jacob.j.bloomberg@nasa.gov	**Fax:**	FY 281-244-5734
PI Organization Type:	NASA CENTER	**Phone:**	281-483-0436
Organization Name:	NASA Johnson Space Center		
PI Address 1:	NASA Emeritus Scientist, Biomedical Research and Environmental Sciences Div		
PI Address 2:	2101 NASA Parkway, SK272		
PI Web Page:			
City:	Houston	**State:**	TX
Zip Code:	77058-3607	**Congressional District:**	36
Comments:			
Project Type:	FLIGHT	**Solicitation / Funding Source:**	Directed Research
Start Date:	06/19/2008	**End Date:**	05/05/2015
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:	Shuttle/ISS		
Flight Assignment:	ISS NOTE: End date changed to 5/5/2015 and Risk/Gaps changed per JSC MTL dtd 11/11/11 (Ed., 11/18/2011) NOTE: End date changed to 3/17/2014 (previously 9/30/13) per JSC (2/2010)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Feeback, Daniel (NASA Johnson Space Center) Feiveson, Alan (NASA Johnson Space Center) Lee, Stuart (Wyle Laboratories/NASA Johnson Space Center) Mulavara, Ajitkumar (USRA) Peters, Brian (Wyle Labs/NASA Johnson Space Center) Platts, Steven (NASA Johnson Space Center) Reschke, Millard (NASA Johnson Space Center) Ryder, Jeffrey (USRA) Spiering, Barry (Wyle Labs/NASA Johnson Space Center) Stenger, Michael (Wyle Labs/NASA Johnson Space Center) Ploutz-Snyder, Lori (USRA)		
Grant/Contract No.:	Directed Research		

Performance Goal No.:	
Performance Goal Text:	
Task Description:	Exposure to space flight causes alterations in multiple physiological systems including changes in sensorimotor, cardiovascular, and neuromuscular systems. These changes can affect the ability of crewmembers to perform critical mission tasks immediately after landing on a planetary surface. The overall goal of this project is to determine the effects of space flight on functional tests that are representative of critical mission tasks and to identify the key underlying physiological factors that contribute to decrements in performance. To achieve this goal we developed an interdisciplinary testing regimen (Functional Task Test, FTT) that evaluates both astronaut functional performance and related physiological changes. A set of functional tests were designed to test astronauts in tasks that simulate high priority exploration mission activities. These include ladder climbing, hatch opening, jump down, manual manipulation of objects and tool use, emergency vehicle egress, recovery from a fall and object translation tasks. Corresponding physiological measures include assessments of postural and gait control, dynamic visual acuity, fine motor control, plasma volume, orthostatic intolerance, upper- and lower-body muscle strength, power, endurance, control, and neuromuscular drive. Crewmembers perform this integrated test regimen before and after short (Shuttle) and long-duration (ISS) space flight. Data are collected on two sessions before flight, on landing day (Shuttle only) and 1, 6 and 30 days after landing. Using a multivariate regression model we will identify which physiological systems contribute the most to impaired performance on each functional test. This will allow us to identify the physiological systems that play the largest role in decrement in functional performance. Using this information we can then design and implement countermeasures that specifically target the physiological systems most responsible for the altered functional performance associated with space flight.
Rationale for HRP Directed Research:	This research is directed because it contains highly constrained research, which requires focused and constrained data gathering and analysis that is more appropriately obtained through a non-competitive proposal.
Research Impact/Earth Benefits:	This research will provide a better understanding of the underlying physiological mechanisms that contribute to changes in functional performance. In the elderly population activities of daily living are often impaired by mutifactorial physiological causes. The information obtained from this interdisciplinary study will aid in identifying the relative contributions of sensorimotor, cardiovascular, and muscle function on comprehensive performance outcomes. This has direct application in the design of clinical interventions and rehabilitation programs that can target specific systems responsible for decline in functional performance.
Task Progress:	To date we have completed full sets of pre/postflight data collection on 6 Shuttle crewmembers and 3 ISS crewmembers. We have collected preflight on three more ISS crewmembers. Preliminary results from both Shuttle and ISS crewmembers indicate decrement in performance of the functional tasks after both short and long-duration space flight with associated changes in cardiovascular, sensorimotor and muscle performance measures. Ongoing data collection continues to improve the statistical power required to map changes in functional task performance to alterations in physiological systems. We have also completed five astronaut data debriefs. During this review period 13 presentations/abstracts related this project were completed at four international scientific meetings. These include: 18th IAA Humans in Space Symposium, Houston, TX April 11-15, 2011. 8th Symposium on the Role of the Vestibular Organs in Space, Houston, TX, April 8-10, 2011. American College of Sports Medicine Annual Meeting, Denver, CO, May 31-June 4, 2011. 82nd Annual Scientific Meeting of the Aerospace Medical Association, Anchorage, AK, May 9-12, 2011.
Bibliography Type:	Description: (Last Updated: 05/21/2021)
Abstracts for Journals and Proceedings	Bloomberg JJ, Arzeno N, Buxton RE, Feiveson AH, Kofman I, Lawrence E, Lee SMC, Mulavara AP, Nash R, Peters BT, Platts SH, Ploutz-Snyder L, Reschke MF, Ryder J, Spiering BA, Stenger MB, Wood S. "Defining the physiological factors that contribute to postflight changes in functional performance." NASA Human Research Program Investigators' Workshop, Houston, Texas, February 3-5, 2010. NASA Human Research Program Investigators' Workshop, Houston, Texas, February 3-5, 2010. http://www.dsls.usra.edu/meetings/hrp2010/pdf/Integrated/1054Bloomberg.pdf , Feb-2010
Abstracts for Journals and Proceedings	Spiering BA, Lee SMC, Mulavara AP, Bentley JR, Buxton RE, Lawrence EL, Sinka J, Guilliams ME, Ploutz-Snyder LL, Bloomberg JJ. "Reliability of a test battery designed for quickly and safely assessing diverse indices of neuromuscular function." American College of Sports Medicine 57th Annual Meeting, Baltimore, MD, June 2-5, 2010. Medicine & Science in Sports & Exercise. 2010 May;42(5 Suppl 1):80. http://dx.doi.org/10.1249/01.MSS.0000385570.74150.74 , May-2010
Abstracts for Journals and Proceedings	Stenger MB, Arzeno NM, Bloomberg JJ, Platts SH. "Validation of cardiovascular parameters during NASA's functional task test." American College of Sports Medicine 57th Annual Meeting, Baltimore, MD, June 2-5, 2010. Medicine & Science in Sports & Exercise. 2010 May;42(5 Suppl 1):536-7. http://dx.doi.org/10.1249/01.MSS.0000385318.34346.48 , May-2010
Abstracts for Journals and Proceedings	Arzeno NM, Stenger MB, Bloomberg JJ, Platts SH. "Spaceflight-induced cardiovascular changes and recovery during NASA's Functional Task Test." 18th IAA Humans in Space Symposium, Houston, TX April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX April 11-15, 2011. , Apr-2011

Abstracts for Journals and Proceedings	Bloomberg JJ, Lawrence EL, Arzeno NM, Buxton RE, Feiveson AH, Kofman IS, Lee SMC, Mulavara AP, Peters BT, Platts SH, Ploutz-Snyder LL, Reschke MF, Ryder JW, Spiering BA, Stenger MB, Taylor LC, Wood SJ. "The Functional Task Test (FTT): An interdisciplinary testing protocol to investigate the factors underlying changes in astronaut functional performance." 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. , Apr-2011
Abstracts for Journals and Proceedings	Buxton RE, Spiering BA, Ryder JW, Ploutz-Snyder LL, Bloomberg JJ. "Effects of short- and long-duration space flight on neuromuscular function." 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX, April 11-15. , Apr-2011
Abstracts for Journals and Proceedings	Fisher EA, Reschke MF, Kofman IS, Cerisano JM, Lawrence EL, Peters BT, Bloomberg JJ, Harm DL. "The walk on floor eyes closed tandem step test as a quantitative measure of ataxia after space flight." 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. , Apr-2011
Abstracts for Journals and Proceedings	Kofman IS, Reschke MF, Cerisano JM, Fisher EA, Lawrence EL, Peters BT, Bloomberg JJ. "Changes in jump-down performance after space flight: Short- and long-term adaptation." 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. , Apr-2011
Abstracts for Journals and Proceedings	Reschke MF, Kofman IS, Fisher EA, Cerisano JM, Lawrence EL, Peters BT, Harm DL, Kulecz W, Mulavara AP, Fiedler MJ, Bloomberg JJ. "Postflight quiet stance stability of astronauts following recovery from a simulated fall." 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. , Apr-2011
Abstracts for Journals and Proceedings	Arzeno NM, Lee SMC, Stenger MB, Lawrence EL, Platts SH, Bloomberg JJ. "Heart rate response during mission-critical tasks after space flight." American College of Sports Medicine 58th Annual Meeting, Denver, CO, May 31-June 4, 2011. Medicine & Science in Sports & Exercise. 2011 May;43(5 Suppl):820. http://dx.doi.org/10.1249/01.MSS.0000402284.13108.1c , May-2011
Abstracts for Journals and Proceedings	Peters BT, Brady RA, Miller CA, Lawrence EM, Mulavara AP, Bloomberg JJ. "Reduction in dynamic visual acuity reveals gaze control changes following spaceflight." 8th Symposium on the Role of the Vestibular Organs in Space, Houston, TX, April 8-10, 2011. 8th Symposium on the Role of the Vestibular Organs in Space, Houston, TX, April 8-10, 2011. http://www.dsls.usra.edu/meetings/IAA/vestibular/pdf/3006.pdf , Apr-2011
Abstracts for Journals and Proceedings	Reschke MF, Fisher EA, Kofman IS, Cerisano JM, Harm DL, Peters BT, Bloomberg JJ. "Walk on floor eyes closed test as a measure of postflight ataxia." 8th Symposium on the Role of the Vestibular Organs in Space, Houston, TX, April 8-10, 2011. 8th Symposium on the Role of the Vestibular Organs in Space, Houston, TX, April 8-10, 2011. http://www.dsls.usra.edu/meetings/IAA/vestibular/pdf/3051.pdf , Apr-2011
Abstracts for Journals and Proceedings	Peters BT, Brady RA, Miller CA, Mulavara AP, Cohen HS, Wood SJ, Bloomberg JJ. "Dynamic visual acuity: a functionally relevant research tool." 82nd Annual Scientific Meeting of the Aerospace Medical Association, Anchorage, AK, May 8-12, 2011. Aviation, Space, and Environmental Medicine, 2011 Mar; 82(3):243-4. , Mar-2011
Articles in Peer-reviewed Journals	Spiering BA, Lee SM, Mulavara AP, Bentley JR, Buxton RE, Lawrence EL, Sinka J, Guilliams ME, Ploutz-Snyder LL, Bloomberg JJ. "Test battery designed to quickly and safely assess diverse indices of neuromuscular function after unweighting." Journal of Strength and Conditioning Research. 2011 Feb;25(2):545-55. PMID: 21217531 ; http://dx.doi.org/10.1519/JSC.0b013e3181f56780 , Feb-2011