Fiscal Year:	FY 2007	**Task Last Updated:**	FY 11/29/2007
PI Name:	Lang, Thomas F. Ph.D.		
Project Title:	An Integrated Musculoskeletal Countermeasure Battery for Long-Duration Lunar Missions		
Division Name:	Human Research		
Program/Discipline:	NSBRI Teams		
Program/Discipline--Element/Subdiscipline:	NSBRI Teams--Bone Loss Team		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Bone Fracture**:Risk of Bone Fracture due to Spaceflight-induced Changes to Bone (2) **Osteo**:Risk Of Early Onset Osteoporosis Due To Spaceflight		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	94143-0649	**Congressional District:**	8
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2007 NSBRI-RFA-07-01 Human Health in Space
Start Date:	09/01/2007	**End Date:**	08/31/2011
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):	Bloomberg, Jacob (NASA JSC) Cavanagh, Peter (The Cleveland Clinic Foundation) Grodsinsky, Carlos (NASA GRC) Lee, Stuart (Wyle Laboratories) Mulavara, Ajitkumar P. (USRA) Sibonga, Jean (USRA)		
Grant/Contract No.:	NCC 9-58-BL01301		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The degree to which the musculoskeletal system will maintain its integrity during prolonged sojourns in the reduced gravity of the lunar surface is presently unknown. It is, however, likely that without countermeasures there will be adaptive changes in muscle strength, bone mineral density, bone geometry and sensorimotor status. When the combined effects of these changes are considered in the context of the construction and exploration tasks that will be performed at the lunar base or at other lunar sites, the risk of injury secondary to a fall is likely to be elevated. We aim to devise a time-efficient integrated battery of countermeasures that can be conducted in the confines of the lunar habitat to minimize the risk of musculoskeletal injury. These countermeasures will be validated using a 10-degree head-up bed-rest simulation of a lunar mission. The specific objectives of the countermeasure battery will be to preserve muscle strength and cardiovascular fitness; to minimize decrements in postural stability, dynamic balance and the ability to make corrective actions prior to a fall; to preserve functional performance on mission-relevant tasks; and to minimize bone loss in the proximal femur. This will be accomplished through a combination of novel resistance exercises on a device designed by our commercial partner that will load specific muscle groups at the hip and in the lower extremity. It will also allow balance and coordination training. We hypothesize that the combined effect of this multifaceted intervention will be to significantly reduce the risk of a work-related falls and subsequent injuries. We will test our hypothesis by randomizing half of our subjects to a group which will undergo the integrated countermeasure and the other half to a control group. Pre- and post-bed rest, we will compare indices of balance, muscle strength, and skeletal density and function using a combination of functional and strength tests, serum and urine bone markers, and CT and DXA imaging of the hip, spine and tibia.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2007.
Bibliography Type:	Description: (Last Updated: 03/20/2017)