Fiscal Year:	FY 2011	**Task Last Updated:**	FY 12/13/2010
PI Name:	Hanson, Andrea M Ph.D.		
Project Title:	Enhancing the Efficacy of Musculoskeletal Countermeasures Using Computer Simulation		
Division Name:	Human Research		
Program/Discipline:	NSBRI		
Program/Discipline--Element/Subdiscipline:	NSBRI--Musculoskeletal Alterations Team		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Muscle**:Risk of Impaired Performance Due to Reduced Muscle Size, Strength and Endurance		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	andrea.m.hanson@nasa.gov	**Fax:**	FY
PI Organization Type:	NASA CENTER	**Phone:**	
Organization Name:	NASA Johnson Space Center		
PI Address 1:	Mail Code SK		
PI Address 2:	2101 NASA Parkway		
PI Web Page:			
City:	Houston	**State:**	TX
Zip Code:	77058	**Congressional District:**	36
Comments:	NOTE: formerly at University of Washington		
Project Type:	GROUND	**Solicitation / Funding Source:**	2010 NSBRI-RFA-10-01 Postdoctoral Fellowships
Start Date:	11/01/2010	**End Date:**	10/30/2011
No. of Post Docs:	1	**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:	NOTE: End date change to 10/30/2011 per HRP Master Task List information dated 11/11/11 and PI (Ed., 1/27/2012)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Cavanagh, Peter (MENTOR/University of Washington)		
Grant/Contract No.:	NCC 9-58-PF02302		
Performance Goal No.:			
Performance Goal Text:			
	POSTDOCTORAL FELLOWSHIP The project addresses the shortcoming in musculoskeletal maintenance by examining the current International Space Station (ISS) exercise protocols through computer simulation. Specifically, this project will use the LifeMOD/MD Adams biomechanics simulation software to characterize how Advanced Resistive Exercise Device (ARED)-like exercises impact hip joint contact forces. The hip is a region of the skeleton that experiences the greatest loss in bone mineral density (1.2-1.5% per month) and strength during long-duration missions in microgravity. This study aims to examine why current exercise countermeasures are not sufficiently maintaining bone health and to characterize the hip-loading forces during ARED-like exercise. Characterizing the hip forces experienced during ISS		

Task Description:	exercise protocols assigned to crews will provide a baseline from which to adjust exercises to better protect the hip. Ultimately, the study will result in a recommendation of more efficacious exercise protocols with the goal of increasing loading forces to better protect the hip joint based on computer simulations. In addition to ISS exercise, an examination of similar exercises in reduced-gravity environments will also be performed. Specific Aims 1. Characterize the hip joint contact forces that result during ARED-like exercise through computer simulation. 2. Examine how the use of gravity replacement loads affect hip joint forces in microgravity and partial gravity environments. 3. Perform a sensitivity analysis to examine and optimize the contributions of muscle forces to joint forces. The proposed project fulfills the following anticipated deliverables of the NSBRI Musculoskeletal Alterations Team: 1) ground-based simulation of on-orbit exercise devices; 2) specific exercise prescriptions tailored to individual astronauts; and, 3) designing improved exercise devices. Additionally, gender-specific models can be developed to address the questions of gender-specific effects of bone loss and exercise countermeasures outlined throughout the NASA Human Research Program's Integrated Research Plan.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2011.
Bibliography Type:	Description: (Last Updated: 03/19/2019)