Fiscal Year:	FY 2004	**Task Last Updated:**	FY 08/28/2004
PI Name:	Newman, Dava J. Ph.D.		
Project Title:	Microgravity Investigation and Crew Reactions in 0-G (MICRO-G) ISS Flight Experiment		
Division Name:	Human Research		
Program/Discipline:	ADVANCED HUMAN SUPPORT TECHNOLOGIES		
Program/Discipline--Element/Subdiscipline:	ADVANCED HUMAN SUPPORT TECHNOLOGIES--Space human factors engineering		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	Cambridge	**State:**	MA
Zip Code:	02139-4301	**Congressional District:**	8
Comments:			
Project Type:	FLIGHT	**Solicitation:**	96-HEDS-05
Start Date:	08/01/2003	**End Date:**	08/31/2004
No. of Post Docs:	0	**No. of PhD Degrees:**	
No. of PhD Candidates:	2	**No. of Master' Degrees:**	
No. of Master's Candidates:	1	**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:	2	**Monitoring Center:**	NASA JSC
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:	ISS		
Flight Assignment:	NOTE: Changed end date to reflect end of project (jp 1/07)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Coleman, Charles (MIT) Metaxas, Dimitri (Rutgers the State University of New Jersey)		
Grant/Contract No.:	None		
Performance Goal No.:			
Performance Goal Text:			
	The MICR0-G research effort will focus on operational procedures and training and quantify astronaut intravehicular activity (IVA) by developing a modular, kinetic and kinematic capability for ISS. The collection and evaluation of kinematics (whole-body motion) and dynamics (reacting forces and torques) of astronauts within the ISS will allow for quantification of human motion and performance in weightlessness, gathering fundamental human factors information for design, scientific investigation in the field of dynamics and motor control, technological assessment of microgravity disturbances, and the design of miniaturized, real-time space systems. The proposed research effort builds on a strong foundation of successful microgravity experiments, namely, the EDLS (Enhanced Dynamics Load Sensors) flown aboard the Russian Mir space station (1996-1998) and the DLS (Dynamic Load Sensors) flown on Space Shuttle Mission STS-62. In addition NASA ground-based research into sensor technology development and development of		

Task Description:	algorithms to produce three-dimensional (3-D) kinematics from video images have come to fruition and these efforts culminate in the collaborative MICR0-G flight experiment. The required technology and hardware capitalize on previous sensor design, fabrication, and testing and can be flight qualified for a fraction of the cost of an initial spaceflight experiment. Four DLS/restraints measure astronaut forces and torques. Two standard ISS video cameras record typical astronaut operations and prescribed IVA motions for 3-D kinematics. Forces and kinematics are combined for dynamic analysis of astronaut motion, exploiting the results of the detailed dynamic modeling effort for the quantitative verification of astronaut IVA performance, induced-loads, and adaptive control strategies for crewmember whole-body motion in microgravity. This comprehensive effort provides an enhanced human-factors approach based on physics-based modeling to identify adaptive performance during long-duration spaceflight, which is critically important for astronaut training as well as providing a spaceflight database to drive countermeasure design.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	The hardware, software, and analysis techniques proposed herein are a potentially rich source of information for anyone interested in human factors, medical assessment of human performance, and rehabilitation. With further development these prototype systems could be used in clinical and rehabilitation laboratories to assess gait, posture, and locomotion-related diseases. The design of miniature embedded electronics has forseen Earth Benefits for medical applications by providing much smaller data acquisition systems in clinics, for field research on Earth to supply wearable computing capabilities, and in the home where information technology systems with reduced size and greater capabilities are desired.
Task Progress:	The Experiment Requirements Review (ERR) is complete and the MICR0-G flight experiment was funded for the development phase. Preparations for initial prototype development are underway and actual prototype development will begin as soon as the funding begins. Please note: The MICR0-G ground study has been continued and is now a flight experiment and has gone through ED (Experiment Definition). The most recent award was in response to a flight experiment solicitation.
Bibliography Type:	Description: (Last Updated: 03/01/2018)