Fiscal Year:	FY 2010	**Task Last Updated:**	FY 10/07/2009
PI Name:	Rajulu, Sudhakar Ph.D.		
Project Title:	Spinal Elongation and Its Effects on Seated Height in a Microgravity Environment		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Space Human Factors Engineering		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **SHFH**:Space Human Factors & Habitability (archival in 2017)		
Human Research Program Risks:	(1) **HSIA**:Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	NASA CENTER	**Phone:**	281-483-3725
Organization Name:	NASA Johnson Space Center		
PI Address 1:	Code SF3		
PI Address 2:	2101 NASA Pkwy		
PI Web Page:			
City:	Houston	**State:**	TX
Zip Code:	77058	**Congressional District:**	22
Comments:			
Project Type:	Flight	**Solicitation / Funding Source:**	Directed Research
Start Date:	12/11/2007	**End Date:**	10/01/2011
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:**	NASA JSC
Contact Monitor:	Woolford, Barbara	**Contact Phone:**	218-483-3701
Contact Email:	barbara.j.woolford@nasa.gov		
Flight Program:	ISS		
Flight Assignment:	ISS 20, 21, 22 NOTE: End date should be 10/1/2011, per E. Connell/JSC (Ed., 9/16/2011) NOTE: Start date should be 12/11/2007 (from 6/02/2008) per B. Woolford/S. Steinberg-Wright/JSC (5/19/2009) NOTE: End date should be 06/30/2012 (from 9/30/2011) per B. Woolford/S. Steinberg-Wright/JSC (4/17/2009) NOTE: End date corrected to 9/30/2011 (from 9/30/2010) per S. Steinberg-Wright/JSC (4/2009)		
Key Personnel Changes/Previous PI:	Leah Norrell is no longer a Co-Investigator. Miranda Mesloh has been added as the current Co-Investigator.		
COI Name (Institution):	Young, Karen (Lockheed-Martin / NASA Johnson Space Center) Mesloh, Miranda Sue (Lockheed-Martin / NASA Johnson Space Center)		
Grant/Contract No.:			
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The primary objective of this project is to provide information pertaining to changes in seated height due to spinal elongation in a microgravity environment. The proposed experiment aims to collect seated height data for subjects exposed to microgravity environments, provide information relating to seated height rate of change over time, and feed new information regarding the elongation of the spine forward into the design of Constellation systems. Historical data indicates that spinal elongation occurs when crewmembers are subjected to microgravity. In as little as two days, the typical crewmember will exhibit increases in stature of up to 3 percent. However, data has been collected only for crewmembers in standing postures, and a limited pool of subjects was available. Due to the criticality of seated height in the design of the Crew Exploration Vehicle (CEV), a better understanding of the effects of microgravity on seated height is necessary. Small changes in seated height that may not have impacted crew accommodation in previous programs will have significant effects on crew accommodation due to the layout of seats in the CEV. The proposed study will directly measure changes in seated height for crewmembers in the Shuttle cockpit. An anthropometer will be used to record measurements to the top of the head of a seated subject, and an orthogonal photograph will be taken in order to measure seated height based on scaling references of known sizes as well as verify the posture and positioning remained consistent throughout the study. Data gained from this study will provide better information to CEV designers. Accurate measurements of crew seated height will be valuable for vehicle and habitation designers for future programs as well. See also http://www.nasa.gov/
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	This study will provide information on spinal elongation and how space flight will affect accommodation requirements. This information may also be useful for people who suffer from back pain and back compression on Earth.
Task Progress:	During the FY09, this project has progressed in development of the flight hardware, including microgravity flights; crew training; and crew baseline data collection for several subjects. The Spinal Elongation PI team completed three microgravity flights, assessing the restraint methods and techniques to be used for the in-flight procedures and simulating the preliminary in-flight procedures to be performed by the crewmembers in orbit. The three flights provided much insight into the procedure for restraining a person in microgravity in the Shuttle seat. The first flight proved that the restraint system on the seat, used in a nominal configuration, was not sufficient to restrain a person in the seat. The subjects were not in full contact with the seat pan, resulting in inaccurate sitting height data. As a result, a second flight was performed to test different restraint system options, adding additional Velcro restraints, rerouting the restraint system currently on the seat, etc. The results showed that rerouting the restraint system was the best method to restrain a subject and had the least cost and schedule impact. A third flight occurred, testing out the final restraint system routing and additional measurements were collected to verify the results from flight number 2. A final summary report was submitted during FY09 with the results from each of the three microgravity flights. The information obtained from the microgravity flights resulted in updates to the crew procedures and the design of the custom anthropometer hardware. This fiscal year, the custom anthropometer assembly was fabricated and shipped to KSC in preparation for the first flight of the experiment, STS-128. Flight data from STS-128 is now in-house and will be compared to the baseline data.
Bibliography Type:	Description: (Last Updated: 03/25/2020)