

Fiscal Year:	FY 2016	Task Last Updated:	FY 08/10/2016
PI Name:	Newby, Nathaniel M.S.		
Project Title:	Soyuz Landing Injury Risk Characterization		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Space Human Factors Engineering		
Joint Agency Name:	TechPort:	No	
Human Research Program Elements:	(1) HFBP: Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) Dynamic Loads: Risk of In-Mission Injury and Performance Decrements and Long-term Health Effects due to Dynamic Loads		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	77058	Congressional District:	36
Comments:			
Project Type:	Ground	Solicitation / Funding Source:	Directed Research
Start Date:	10/01/2015	End Date:	10/01/2018
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		
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Flight Program:			
Flight Assignment:	NOTE: Original task was with PI Jeffrey Somers and period of performance 7/2/2014-10/31/2016; PI change with the delayed start, per E. Connell/JSC SHFH element (Ed., 8/10/16)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Gernhardt, Michael Ph.D. (NASA Johnson Space Center)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>NOTE: Original task was with PI Jeffrey Somers and period of performance 7/2/2014-10/31/2016; PI change with the delayed start, per E. Connell/JSC SHFH element (Ed., 8/10/16)</p> <p>Currently, it is unknown how the current Soyuz landing injuries and accelerations relate to the new requirements levied on new vehicles. Understanding this connection will allow better quantification of the risk of injury for current crewmembers as well as allow NASA to relate this risk to the new design requirements recently enacted.</p> <p>The following are the specific aims for this task:</p> <ol style="list-style-type: none"> 1. Collect retrospective post-landing questionnaire data and develop injury database 2. Determine the occurrence of landing injuries to crewmembers 3. Determine whether the Soyuz meets current Multi-Purpose Crew Vehicle (MPCV) and Commercial Crew Program (CCP) requirements 4. Evaluate whether injury rates are consistent with the results of Finite Element (FE) modeling <p>Using data contained in the flight medicine databases, supplemented with data collected from crewmembers, flight surgeons, Russia sources, and international partner sources, an accurate estimation of the occurrences of injury during Soyuz landings will be determined. In addition, post-landing questionnaires will be developed for retrospective data collection to supplement the above sources.</p> <p>Through collaboration with our Russian colleagues, information about Soyuz landings will be collected to determine the dynamics of landing. The goal will be to obtain actual landing accelerations for individual landings; however, this may not be possible. If not available, all available information about nominal and off-nominal landings will be collected to develop a statistical model of possible landing distributions.</p> <p>In parallel, a Finite Element model of the Soyuz seat will be developed and the Test Device for Human Occupant Restraint (THOR), Hybrid III, and Human FE models will be fitted into the seat. Using the landing data obtained or calculated, landing simulations will be conducted.</p> <p>The resulting THOR, Hybrid III, and Human FE responses will be compared to the injury occurrences and current requirements. These comparisons will allow an estimation of the true risk of injury to deconditioned crew related to THOR and Hybrid III metrics.</p>
Rationale for HRP Directed Research:	<p>This task meets the criteria for a Directed Task due to the required access to operational data and because of insufficient schedule available to solicit this work. Because of the sensitive nature of the Soyuz injury and landing acceleration data, it would be very difficult to perform this task outside of NASA. In addition, based on the approved Path to Risk Reduction, this task is required to be completed by the end of FY18 in order to meet the Orion schedule for EM-2.</p>
Research Impact/Earth Benefits:	
Task Progress:	<p>New project for FY2016.</p> <p>NOTE: Original task was with PI Jeffrey Somers and period of performance 7/2/2014-10/31/2016; PI change with the delayed start, per E. Connell/JSC SHFH element (Ed., 8/10/16)</p>
Bibliography Type:	Description: (Last Updated: 02/12/2022)