Fiscal Year:	FY 2017	**Task Last Updated:**	FY 01/05/2017
PI Name:	Somers, Jeffrey M.S.		
Project Title:	ATD (Anthropomorphic Test Dummy) Injury Metric Sensitivity and Extensibility Study		
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 Injury from 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:	01/01/2016	**End Date:**	01/03/2018
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
Contact Monitor:	Williams, Thomas	**Contact Phone:**	281-483-8773
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Flight Program:			
Flight Assignment:	NOTE: Element change to Human Factors & Behavioral Performance; previously Space Human Factors & Habitability (Ed., 1/10/17) NOTE: Period of performance changed to 1/1/2016-1/3/2018 due to refinement of and delays in starting this task (original period of performance was 7/2/2015-3/31/2016), per E. Connell/JSC HRP (Ed., 5/24/16) NOTE: End date changed to 1/3/2018 (original end date 3/31/2016) per PI (Ed., 2/16/16)		
Key Personnel Changes/Previous PI:	January 2017 report: PI information=Jeffrey T. Somers, MS, KBRwyle, 2400 NASA Pkwy., Houston, TX 77058 ; Co-I(s) Name(s), Affiliation, Contact Information: Jacob B. Putnam, MS, KBRwyle, 2400 E NASA Pkwy., Houston, TX 77058, Jacob.b.putnam@nasa.gov, 281.244.6938 ; Jessica A. Wells, BS, Leidos, 901 Bay Area Blvd, Houston, TX 77058, Jessica.a.wells@nasa.gov, 281.483.7216 ; Nathaniel Newby, MS, KBRwyle, 2400 E NASA Pkwy., Houston, TX 77058, nathaniel.newby@nasa.gov, 281.483.7749.		
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Grant/Contract No.:	Directed Research		
Performance Goal No.:			

Performance Goal Text:	
Task Description:	Currently, injury assessment reference values (IARV) are based on volunteer and post-mortem human subjects tested in non-spaceflight setups specific to the environment of interest. In automotive research, the occupant is put in the "super-slouched" position and is subjected to either frontal or side impacts at specific velocities with a 3-point restraint and airbags. In military research, test configurations are commonly based on ejection seats. These tests employ seating geometries, restraint, and loading directions that are not consistent with spaceflight configurations. Acute seat pan angles, non-extended legs (fetal position), combined axis loading, as well as other seat, restraint, and loading conditions may induce unforeseen changes in injury risk. Because the current data available do not account for these variations, a sensitivity and extensibility study is needed. Aims: 1. Validate the response of each finite element model against matched physical ATD tests in the baseline seat from existing datasets. 2. Quantify ATD and human numerical model response variance and sensitivity to a limited set of small perturbations in seat, and restraint initial conditions. 3. Quantify the effects of spacecraft-specific seating and restraint configurations on ATD and human numerical model responses.
Rationale for HRP Directed Research:	This task meets the criteria for a Directed Task because of insufficient schedule available to solicit this work. Based on the approved Path to Risk Reduction, this task is required to be completed by the end of FY16 in order to meet the Orion CDR date.
Research Impact/Earth Benefits:	This research directly impacts life on Earth by improving analytical tools for developing safer vehicles.
Task Progress:	Specific Aims: 1. Validate the response of each finite element (FE) model against matched physical ATD tests in the baseline seat from existing datasets. Work started in July 2016. Appropriate testing conditions have been chosen and data sets gathered to validate responses of each FE model. Seat and restraint configuration models to match chosen test conditions have been developed. Wake Forest University (WFU) is currently performing pretest simulations to fit each surrogate occupant model into respective test setup configurations. Preliminary test simulations have been performed ensure surrogate occupant and environmental model stability. 2. Quantify ATD and human-numerical model-response sensitivity to a limited set of perturbations in seat and restraint initial conditions. This work will begin after model validation is complete. 3. Quantify the degree to which ATD and human numerical model responses track each other over a range of spaceflight-relevant loading conditions in conjunction with several spacecraft-specific seat and restraint configurations. This work will begin after model sensitivity analysis is complete.
Bibliography Type:	Description: (Last Updated: 12/29/2020)