Task Book Report Generated on: 04/26/2024

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)  August 2020 Report: Added Brian Rodriguez as a co-investigator to assist with statistical analysis. Added Teresa Reibe as a co-investigator to assist with data collection and processing. August 2019 report: Preston Greenhalgh added to the project as a co-investigator. September 2018 report: Brett Siders and Jacob Putnam are no longer Co-Investigators. Nat Newby remains the PI, and Jeff Somers Co-I. September 2017 report: Brett Siders, University of Houston, and Jacob Putnam, KBRwyle, were added to the project as CoInvestigators. August 2016 report: Nathaniel Newby - new Principa Investigator (PI), KBRwyle Science, Technology and Engineering Group; Jeffrey T. Somers - now CoInvestigator				
Project Title: Soyuz Landing Injury Risk Characterization			Task Last Updated:	FY 09/28/2020
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) HFBF-Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program: Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Behavioral Performance (IRR Rev II) Human Research Program Risks: (1) Human Factors & Inbulability Human Research Risks of Insulator II Risks of Insulator II Revent Risks as a co-investigator to assist with statistical analysis, Added Teres Rebavated Langue (ID) (IRR) Perfendence (IRR Rev II) Human Research Program Risks of Insulator Risks with data cellection and processors, August 2019 report: Person (Irreshable) added to the Program Risks of Insulator Risks of I		•		
Program/Discipline: Program/Discipline- Element/Subdiscipline- Element/Subdiscipline- Element/Subdiscipline- Element/Subdiscipline- Element/Subdiscipline- Joint Agency Name:  IUMAN RESEARCII-Spuce Human Factors Engineering TechPort: No  No  No  Human Research Program Rikst:  (1) HFRP-Human Factors & Behavioral Performance (IRP Rev H) Human Research Program Rikst:  (1) Dynamic Loads-Riks of Injury from Dynamic Loads Space Biology Cross-Element None Space Biology Element: None Space Biology Element: None Space Biology Special Category: None PI Email: nathanic Inewby@iness.aprv PI Grganization Type: NASA CENTER Phone: 281-883-7749 POrganization Type: NASA CENTER Phone: 281-883-7749 POrganization Type: NASA CENTER Phone: 281-883-7749 Porganization Name: KRRNASA Johnson Space Conter PI Address 1: Haddress 1: Haddress 2: 2400 NASA Parkway PI Web Page: City: PI Address 2: 2400 NASA Parkway PI Web Page: City: Houston State: City: Houston Solicitation / Founding Directed Research Solicitation / Founding Directed Research Solicitation / Founding Directed Research Solicitation / Founding None of Post Duce: No. of Master's Candidates: No. of Master	Project Title:	Soyuz Landing Injury Risk Characterizat	ion	
HUMAN RESEARCH-Space Human Factors Engineering   Homan Factors Engineering   Homan Research Program Elements: (1) HFBP-Human Factors & Bchavioral Performance (IRP Rev H)   Human Research Program Risks: (1) HFBP-Human Factors & Bchavioral Performance (IRP Rev H)   Human Research Program Risks: (1) Dynamic Louds-Risk of Injury from Dynamic Loads   Space Biology Element: None   Performance (IRP Rev H)   Phone: 281-483-7749   Phone: 281-483-	Division Name:	Human Research		
Element/Subdiscipline: Joint Agency Name: Joint Agency Name: Illuman Research Program Elements: (I) HFBP/Human Factors & Behavioral Performance (RP Rev H)  Illuman Research Program Risks: (I) Dynamic Loads Risks of Injury from Dynamic Loads  Space Biology Cross-Element Discipline: Space Biology Special Category: None  PI Email: PI Organization Type: NASA CENTER Name: RIRNASA Johnson Space Center PI Address 1: MAILCODE: WYLE HACZ 262 PI Address 2: 2400 NASA Parkway  PI Web Page: City: Joyas Congressional District: Joyas Congressional Congressional District: Joyas Congres	Program/Discipline:			
Human Research Program Elements: (1)   Impriluman Factors & Behavioral Performance (IRP Rev II)		HUMAN RESEARCHSpace Human F	actors Engineering	
Human Research Program Risks: (1) Dynamic Loads-Risk of Injury from Dynamic Loads Space Biology Cross-Element Discipline:  None  Space Biology Cross-Element Discipline:  pathonic Loads-Risk of Injury from Dynamic Loads Space Biology Special Category: None  PI Email:  nathonic Incubey@nass.gov Fax: FY  Phone: 281-483-7749  State: TX  Zip Code:  Comments:  Project Type:  GROUND Solicitation / Funding Source: Directed Research Source: Drected Research Source: Drected Research Source: Drected Research Source: Drected Research Source: On. of PhD Degrees: On. of PhD Candidates: On. of PhD Candidates: On. of Bachelor's Candidates: Onetiact Email: alexandra.m.whitmitre@nass.gov  Plight Program:  NOTE: End date change to 101/2021 per Pl (Ed., 9/18/18)  NOTE: End date change to 101/2020 per Pl (Ed., 9/18/18)  NOTE: End date change to 101/2020 per Pl (Ed., 9/18/18)  NOTE: End date change to 101/2020 per Pl (Ed., 9/18/18)  NOTE: End date change to 101/2020 per Pl (Ed., 9/18/18)  NOTE: End date change to 101/2020 per Pl (Ed., 9/18/18)  NOTE: End date change to 101/2020 per Pl (Ed., 9/18/18)  NOTE: End date change to 101/2020 per Pl (Ed., 9/18/18)  NOTE: End date change to 101/2020 per Pl (Ed., 9/18/18)  NOTE: End date change to 101/2020 per Pl	Joint Agency Name:		TechPort:	No
Space Biology Cross-Element Space Biology Cross-Element Space Biology Cross-Element Space Biology Special Category: None  PI Email:  pathanicia newby/firasas.gov Fax: FY  PI Organization Type: NASA CENTER Phone: 281-483-7749  PI Organization Name: KBR/NASA Johnson Space Center  PI Address 1: MAILCODE: WYLE/HAC/ 262  PI Address 2: 2400 NASA Parkway  PI Web Page: City: Houston State: TX  Zip Code: 77058 Congressional District: 26  Comments:  Project Type: GROUND Solicitation / Funding Source: Directed Research Source: No. of Post Does: 0 No. of Post Does: 0 No. of Post Does: 0 No. of Master's Candidates: 0 No. of Bachelor's Candidates: 0	Human Research Program Elements:	(1) <b>HFBP</b> :Human Factors & Behavioral	Performance (IRP Rev H)	
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Discipline: "None Space Biology Special Category: None Space Biology Special Category: None PI Canalization Type: NASA CENTER Phone: 281-483-7749 PI Organization Type: NASA CENTER Phone: 281-483-7749 Organization Name: KBRNASA Johnson Space Center PI Address 1: MAILCODE: WYLE/HAC/ 262 PI Address 2: 2400 NASA Parkway PI Web Page: City: Houston State: TX Zip Code: 77058 Congressional District: 36 Comments: Project Type: GROUND Solicitation / Funding Source: Directed Research Source: Directed Research Source: No. of Post Docs: O No. of PhD Degress: 0 No. of Post Docs: O No. of Master' Degrees: 0 No. of Post Docs: O No. of Master' Degrees: 0 No. of Master's Candidates: O No. of Master' Degrees: 0 No. of Master's Candidates: O Monitoring Center: NASA JSC Contact Monitor: Whitmire, Alexandra Contact Honitor: Whitmire, Alexandra Contact Honitor: Whitmire, Alexandra Contact Email: alexandra m.whitmire@nasa.gov Flight Program:  NOTE: End date change to 10/1/2021 per PI (Ed., 928/20) NOTE: End date change to 10/1/2020 per PI (Ed., 978/18) NOTE: Endement change to Human Factors & Behavioral Performance: previously Space Human Factors & Habitability (Ed., 1/19/17) NOTE: Original task was with PI Jeffrey Somers and period of performance ryze/10/14-110/31/2016; PI change with the delayed start, per E. Connell/JSC SHFH clement (Ed., 8/10/16) Now, Personnel Changes/Previous PI: Key Personnel Changes/Previous PI: New Yearnains the PI, and JGR Somers Co. 1/20 September 20/17 report. Previous force-shalgh added to the project as a co-investigator to assist with data collection and processing. August 20/19 report: Previous force-shalgh added to the Puman, KBRwyle, were added to the project as Colnvestigators. August 20/19 report: Previous force-shalgh added to the Puman, KBRwyle, were added to the project as Colnvestigators. August 20/16 report: Nathanical Newby - new Principal new Signator (PD), KBRWyle Science, Technology and Engineering Group, Jeffrey, Commers, anow Colnvestigator Newby remains the PI. and JGR Somers Co. 1/20 S	Space Biology Element:	None		
PI Email:    nathaniel newby@nasa.eov   Fax: FY		None		
PI Organization Type:  NASA CENTER  Phone: 281-483-7749 Organization Name:  KBR/NASA Johnson Space Center  PI Address 1:  MAILCODE: WYLE/HAC/ 262 PI Address 2:  2400 NASA Parkway  PI Web Page:  City:  Houston  State: TX  Zip Code:  77058  Congressional District: 36  Comments:  Project Type:  GROUND  Solicitation / Funding Source:  Directed Research Source:  No. of PhD Degress:  0  No. of PhD Degress: 0  No. of PhD Degress: 0  No. of PhD Degress: 0  No. of PhD Candidates: 0  No. of Master' Degrees: 0  No. of Bachelor's Candidates: 0  No. of Monitoring Center: NASA JSC  Contact Monitor:  Whitmire, Alexandra alexandra m.whitmire/@nasa.gov  Flight Program:  NOTE: End date change to 101/2021 per PI (Ed., 7/28/19)  NOTE: End date change to 101/2020 per PI (Ed., 7/24/19)  NOTE: Element change to Human Factors & Behavioral Performance; previously Space Human Factors & Habitability (Ed., 1/19/17)  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:  Key Personnel Changes/Previous PI:  NEW Personnel Changes/Previous PI:  NEW Pintann, KBRwyle, were added to the project as Colnvestigator to assist with statistical analysis. Added Teresa Reibs as a co-investigator to assist with data collection and processing. August 2019 report: Preston Greenhalph added to the project as a co-investigator (P), KBRWyle, were added to the project as Colnvestigators. Nagust 2016 report: Preston Greenhalph added to the project as Colnvestigator. Somers - now Colnwestigator. Principe Investigator (P), KBRWyle, Science, Technology and Engineering Group; Erffeyt, Nomers - now Colnwestigator. Somers - now Colnwestigator.	Space Biology Special Category:	None		
Organization Name: KBR/NASA Johnson Space Center  PI Address 1: MAILCODE: WYLE/HAC/ 262  PI Address 2: 2400 NASA Parkway  PI Web Page:  City: Houston State: TX  Zip Code: 77058 Congressional District: 36  Comments:  Project Type: GROUND Solicitation / Funding Source: Directed Research Source: 10/01/2015 End Date: 10/01/2015  No. of Post Docs: 0 No. of PhD Degrees: 0 No. of PhD Degrees: 0  No. of PhD Candidates: 0 No. of Master' Degrees: 0  No. of Master's Candidates: 0 No. of Master's Degrees: 0  No. of Master's Candidates: 0 No. of Bachelor's Candidates: 0 Monitoring Center: NASA JSC  Contact Monitor: Whitmire, Alexandra Contact Phone:  Contact Email: alexandra.m.whitmire@nasa.gov  Flight Program:  NOTE: End date change to 101/1/2021 per PI (Ed., 9/28/20)  NOTE: End date change to 101/1/2020 per PI (Ed., 7/24/19)  NOTE: End date change to 101/1/2020 per PI (Ed., 7/24/19)  NOTE: End date change to 101/1/2020 per PI (Ed., 9/18/18)  NOTE: Cinginal task was with PI Jeffrey Somers and period of performance; previously Space Human Factors & Habitability (Ed., 1/19/17)  NOTE: Original task was with PI Jeffrey Somers and period of performance; previously Space Human Factors & Habitability (Ed., 1/19/17)  NOTE: Original task was with PI Jeffrey Somers and period of performance; Previously Space Human Factors & Habitability (Ed., 1/19/17)  NOTE: Original task was with PI Jeffrey Somers and period of performance; Previously Space Human Factors & Habitability (Ed., 1/19/17)  NOTE: Original task was with PI Jeffrey Somers and period of performance; Previously Space Human Factors & Habitability (Ed., 1/19/17)  NOTE: Original task was with PI Jeffrey Somers and period of performance; Previously Space Human Factors & Habitability (Ed., 1/19/17)  NOTE: Original task was with PI Jeffrey Somers and period of performance; Previously Space Human Factors & Habitability (Ed., 1/19/17)  NOTE: Original task was with PI Jeffrey Somers and period of performance; Previously Space Human Factors & Habitability (Ed., 1/19/17)  NOTE: Origina	PI Email:	nathaniel.newby@nasa.gov	Fax:	FY
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PI Address 2: 2400 NASA Parkway  PI Web Page:  City: Houston State: TX  Zip Code: 77058 Congressional District: 36  Comments:  Project Type: GROUND Solicitation / Funding Source: Directed Research Source: 10/01/2015 End Date: 10/01/2021  No. of Post Docs: 0 No. of PhD Degrees: 0  No. of PhD Candidates: 0 No. of Master' Degrees: 0  No. of Master's Candidates: 0 No. of Master' Degrees: 0  No. of Master's Candidates: 0 No. of Bachelor's Degrees: 0  No. of Bachelor's Candidates: 0 Monitoring Center: NASA JSC  Contact Monitor: Whitmire, Alexandra Contact Phone:  Contact Email: alexandra.m. whitmire@nasa.gov  Flight Program:  NOTE: End date change to 10/1/2021 per PI (Ed., 9/28/20)  NOTE: End date change to 10/1/2020 per PI (Ed., 9/18/18)  NOTE: End date change to 10/1/2020 per PI (Ed., 9/18/18)  NOTE: Element change to Human Factors & Behavioral Performance: previously Space Human Factors & Habitability (Ed., 1/19/17)  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)  August 2020 Report: Added Brian Rodriguez as a co-investigator to assist with statistical analysis. Added Teresa Reibs as a co-investigator to assist with data collection and processing. August 2019 report: Preston Greenhalgh added to the project as a co-investigator. September 2018 report: Brett Siders and Jacob Putnam are no longer Co-Investigators. Nature (Ed., 8/10/16)  Key Personnel Changes/Previous PI:  Key Personnel Changes/Previous PI:  North Contact Propert Preston Green Natural Properts Prestigator No. Natural Properts Prest Sides and Jacob Putnam are no	Organization Name:	KBR/NASA Johnson Space Center		
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Comments:  Project Type: GROUND Solicitation / Funding Source: Directed Research  Start Date: 10/01/2015 End Date: 10/01/2021  No. of Post Docs: 0 No. of PhD Degrees: 0  No. of PhD Candidates: 0 No. of Master' Degrees: 0  No. of Master's Candidates: 0 No. of Master' Degrees: 0  No. of Master's Candidates: 0 Monitoring Center: NASA JSC  Contact Monitor: Whitmire, Alexandra Contact Phone:  Contact Email: alexandra.m.whitmire@nasa.gov  Flight Program:  NOTE: End date change to 10/1/2021 per PI (Ed., 9/28/20)  NOTE: End date change to 10/1/2019 per PI (Ed., 7/24/19)  NOTE: End date change to 10/1/2019 per PI (Ed., 9/18/18)  NOTE: Element change to Human Factors & Behavioral Performance; previously Space Human Factors & Habitability (Ed., 1/19/17)  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)  August 2020 Report: Added Brian Rodriguez as a co-investigator to assist with statistical analysis. Added Teresa Reib as a co-investigator to assist with data collection and processing. August 2019 report: Preston Greenhalgh added to the project as a co-investigator. September 2018 report: Brett Siders and Jacob Putnam are no longer Co-Investigators. Nat Newby remains the PI, and Jeff Somers Co-I. September 2017 report: Brett Siders, University of Houston, and Jacob Putnam, KBRwyle, were added to the project as Colnvestigators. August 2016 report: Nathaniel Newby - new Principe Investigator (Fig. NBRwyle) Science, Technology and Engineering Group; Jeffrey T. Somers - now Colnvestigator.	City:	Houston	State:	TX
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	Key Personnel Changes/Previous PI:	Putnam, KBRwyle, were added to the project as CoInvestigators. August 2016 report: Nathaniel Newby - new Principal		

Task Book Report Generated on: 04/26/2024

Somers, Jeffrey M.S. (KBR/NASA Johnson Space Center) Greenhalgh, Preston M.S. (KBR/NASA Johnson Space Center) **COI** Name (Institution): Reiber, Teresa M.S. (KBR/NASA Johnson Space Center) Rodriguez, Brian (University of Texas Medical Branch) **Grant/Contract No.:** Directed Research Performance Goal No.: **Performance Goal Text:** NOTE: Original task was with Principal Investigator (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) Currently the impact load imparted to crewmembers landing in the Soyuz vehicle is unknown. This study is the first systematic assessment of the number and types of injuries associated with Soyuz landing. To date, we have found than more than a third of US Orbital Segment (USOS) crewmembers are experiencing injuries. Most of these injuries are minor, but they exceed expected rates based on analysis of seat accelerometer data from airborne and drop tests of the vehicle. The yet to be answered question is whether spaceflight deconditioning renders crewmembers more susceptible to landing impact injuries. Another possibility is that the Soyuz landing load is higher than our current estimates. It could also be that our analytical tools are insufficient to predict injury rates accurately for space vehicles. A final possibility is that some combination of these factors are responsible. The following are the specific aims for this task: 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 **Task Description:** 4. Evaluate whether injury rates are consistent with the results of Finite Element (FE) modeling 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 have been developed for retrospective data collection to supplement the above sources. 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. Initial scope of this investigation included development of a Finite Element model of the Soyuz seat to be used in conjunction with the Test Device for Human Occupant Restraint (THOR), Hybrid III, and Human FE models. Using the landing data obtained or calculated, landing simulations would then be conducted. The resulting THOR, Hybrid III, and Human FE responses would be compared to the injury occurrences and current requirements. These comparisons would allow for an estimation of the true risk of injury to deconditioned crew related to THOR and Hybrid III metrics. However, NASA has currently descoped this aspect of the investigation. 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, Rationale for HRP Directed Research: 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. This research benefits life on Earth by contributing to knowledge about how the body responds to multi-axial impact, Research Impact/Earth Benefits: particularly after exposure to microgravity. NASA Johnson Space Center Institutional Review Board (JSC IRB) approval for this investigation was obtained on June 16, 2016. The post-landing questionnaire was drafted and approved by the IRB. The Human Research Multilateral Review Board (HRMRB) approved the study in January 2017, extending the study to USOS crewmembers and spaceflight participants. The potential subject pool (from TM-34, which returned one USOS crewmember from International Space Station (ISS), to MS-15) is 94 total crew missions. Some crewmembers flew multiple missions, so the total number of astronauts is less than 94. Americans crewed 57 of these missions. USOS participants crewed 31 missions, and the remaining 6 spots were crewed by spaceflight participants. Two US and 1 USOS crewmember have declined participation in the study, reducing the total potential dataset to 91. This aim consists of data collection from two sources. One is flight medical records from a database maintained by the NASA Lifetime Surveillance of Astronaut Health (LSAH). This data is only obtainable for US astronauts. To date, medical information from the database has been obtained for 48 of 50 crewmembers from TMA-1 through TMA-MS07. Task Progress: Two crewmembers from these missions declined release of their medical data. The other data source is from a survey that crewmembers are asked to complete. The survey can be completed by US and USOS astronauts, and spaceflight participants. The survey requires an additional consent process. Out of the 57 US crewed missions, 49 have consented to

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Task Book Report Generated on: 04/26/2024

Bibliography Type:	Description: (Last Updated: 02/12/2022)
Articles in Other Journals or Periodicals	Newby N, Greenhalgh P, Somers J. "Soyuz Landing Risk Characterization." SAFE Journal 39:1-6. In press as of September 2020. , Sep-2020