

<b>Fiscal Year:</b>	FY 2010	<b>Task Last Updated:</b>	FY 06/08/2011
<b>PI Name:</b>	Holden, Kritina Ph.D.		
<b>Project Title:</b>	Human Factors Assessment of Vibration Effects on Visual Performance During Launch		
<b>Division Name:</b>	Human Research		
<b>Program/Discipline:</b>	HUMAN RESEARCH		
<b>Program/Discipline--Element/Subdiscipline:</b>	HUMAN RESEARCH--Space Human Factors Engineering		
<b>Joint Agency Name:</b>	<b>TechPort:</b>	No	
<b>Human Research Program Elements:</b>	(1) <b>SHFH</b> :Space Human Factors & Habitability (archival in 2017)		
<b>Human Research Program Risks:</b>	(1) <b>HSIA</b> :Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture		
<b>Space Biology Element:</b>	None		
<b>Space Biology Cross-Element Discipline:</b>	None		
<b>Space Biology Special Category:</b>	None		
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<b>PI Organization Type:</b>	NASA CENTER	<b>Phone:</b>	281-483-8829
<b>Organization Name:</b>	Leidos Corporation at NASA Johnson Space Center		
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<b>City:</b>	Houston	<b>State:</b>	TX
<b>Zip Code:</b>	77058-3607	<b>Congressional District:</b>	22
<b>Comments:</b>			
<b>Project Type:</b>	FLIGHT	<b>Solicitation / Funding Source:</b>	Directed Research
<b>Start Date:</b>	05/01/2008	<b>End Date:</b>	09/30/2010
<b>No. of Post Docs:</b>	0	<b>No. of PhD Degrees:</b>	0
<b>No. of PhD Candidates:</b>	0	<b>No. of Master' Degrees:</b>	0
<b>No. of Master's Candidates:</b>	0	<b>No. of Bachelor's Degrees:</b>	0
<b>No. of Bachelor's Candidates:</b>	0	<b>Monitoring Center:</b>	NASA JSC
<b>Contact Monitor:</b>	Woolford, Barbara	<b>Contact Phone:</b>	218-483-3701
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<b>Flight Program:</b>	Shuttle		
<b>Flight Assignment:</b>	STS-119, STS-128 NOTE: Start date is 5/1/2008 (instead of 10/1/2008) per B. Woolford/JSC (5/09) NOTE: End date will be 09/30/2010 (instead of 12/31/2009), per B. Woolford/JSC (4/17/2009) NOTE: End date will be 12/31/2009 (instead of 9/30/2011), per B. Woolford/JSC (4/14/2009)		
<b>Key Personnel Changes/Previous PI:</b>			
<b>COI Name (Institution):</b>	Thompson, Shelby ( Lockheed Martin, Houston, TX ) Ebert, Doug ( Wyle Integrated Science and Engineering Group ) Adelstein, Bernard ( NASA Ames Research Center ) Root, Philip ( NASA Johnson Space Center ) Jones, Jeff ( NASA Johnson Space Center )		
<b>Grant/Contract No.:</b>			
<b>Performance Goal No.:</b>			
<b>Performance Goal Text:</b>			

Task Description:	<p>The primary objective of the of Human Factors Short Duration Bioastronautics Investigation (SDBI) 1904 is to determine visual performance limits during operational vibration and g-loads, specifically through the determination of minimal usable font sizes using Orion-type display formats. Currently there is little to no data available to quantify human visual performance under these extreme conditions. Existing data on shuttle vibration magnitude and frequency is incomplete, does not address seat and crew vibration in the current configuration, and does not address human visual performance. There have been anecdotal reports of performance decrements from shuttle crews, but no structured data has been collected.</p> <p>The SDBI is a companion effort to the Detailed Test Objective (DTO) 695, which will measure shuttle seat accelerations (vibration) during ascent. Data from the SDBI will serve an important role in interpreting the DTO vibration data. SDBI 1904 plans to collect data during the ascent phase of three shuttle missions. Both SDBI1904 and DTO 695 are low impact with respect to flight resources, and combined they represent an efficient and focused problem solving approach.</p> <p>The SDBI and DTO data will be correlated to determine the nature of perceived visual performance under varying vibrations and g-loads. This project will provide:</p> <ul style="list-style-type: none"> <li>• Immediate data for developing preliminary human performance vibration requirements</li> <li>• Flight validated inputs for ongoing and future ground-based research</li> <li>• Information of functional needs that will drive Orion display format design decisions</li> </ul>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	<p>Data from Visual Performance may provide insight into display design for users who read displays under extreme vibration such as pilots or race car drivers. The project also offers methodologies for investigating visual performance in situ with real-world constraints.</p>
Task Progress:	<p>FY10 Accomplishments: A Final Report was produced using all data collected. Final results were presented at the 2009 Houston Human Factors and Ergonomics Society Symposium. Interim and final results were presented at Investigators Workshop. An interim report was generated using data from STS-128. All planned data collection was completed. In collaboration with Detailed Technical Objective (DTO) 695, Short Duration Bioastronautics Investigation (SDBI) 1904 collected visual performance data during Shuttle ascent, using spacecraft systems displays printed on a placard. Data were collected from two crewmembers on STS-119, and three crewmembers on STS-128. All participants were seated on the middeck with accelerometers mounted at three locations on their seats. Only data from the headrest were used in the current analysis based on the assumption this was the area of vibration that would most impact visual performance. This document represents the final report combining the data from both flights.</p> <p>The goal of this project was to examine the effect of vibration (combined with acceleration) during Shuttle launch on participants' ability to perceive different size fonts and graphic information. In addition to the primary objective, information was collected on the readability of various characteristics of the display, such as text case, graphical information, and colors used for graphics.</p> <p>An effect of vibration on readable font size was demonstrated, whereby minimum usable font size increased with vibration magnitude, as would be expected. Based on the operational data collected, it appears that with vibration below 0.2 grms, participants can perceive font sizes about 0.14 inches in height at a corrected 20 inch visual distance. However, when the vibration is above 0.2 grms, font sizes greater than 0.14 inches are needed for optimal visual performance. Trend analysis revealed that x- (chest-spine) and y- (side-to-side) axis vibration were the primary contributors to the font size effect.</p> <p>Participants experienced difficulty distinguishing small valve graphics, gray flow lines, and red valves. Contrast issues become exacerbated with vibration, according to subjective data. Due to the limited number of participants in this investigation, ground-based studies should be conducted to further explore these results. Recommendations are provided, and potential forward work is suggested.</p>
Bibliography Type:	Description: (Last Updated: 10/29/2023)
Abstracts for Journals and Proceedings	<p>Thompson S, Holden K, Ebert D, Root P, Adelstein B, Jones J. "Short Duration Bioastronautics Investigation (SDBI) 1904: Human Factors Assessment of Vibration Effects on Visual Performance During Launch." Presented at the Seventh Annual One-Day Symposium of Human Factors and Ergonomics, Houston, TX, May 21, 2010. Seventh Annual One-Day Symposium of Human Factors and Ergonomics, Houston, TX, May 21, 2010. <a href="http://www.houstonhfes.org/conferences/conference2010/program.html">http://www.houstonhfes.org/conferences/conference2010/program.html</a> , May-2010</p>
Abstracts for Journals and Proceedings	<p>Thompson S, Holden K, Ebert D, Root P, Adelstein B, Jones J. "Short Duration Bioastronautics Investigation (SDBI) 1904: Human Factors Assessment of Vibration Effects on Visual Performance During Launch." Presented at the 2010 NASA Human Research Program Investigators' Workshop, Houston, TX, February 3-5, 2010. 2010 NASA Human Research Program Investigators' Workshop, Houston, TX, February 3-5, 2010. <a href="http://www.dsls.usra.edu/meetings/hrp2010/pdf/SHFH/1060Thompson.pdf">http://www.dsls.usra.edu/meetings/hrp2010/pdf/SHFH/1060Thompson.pdf</a> , Feb-2010</p>
Abstracts for Journals and Proceedings	<p>Holden K, Thompson S, Ebert D, Adelstein B, Root P, Jones J, Woolford B, Whitmore M. "Short Duration Bioastronautics Investigation (SDBI) 1904: Human Factors Assessment of Vibration Effects on Visual Performance During Launch. Interim Results for STS-119." Presented at the 2009 NASA Human Research Program Investigators' Workshop, League City, TX, February 2-4, 2009. 2009 NASA Human Research Program Investigators' Workshop, League City, TX, February 2-4, 2009. , Feb-2009</p>
Awards	<p>Thompson S, Holden K, Ebert D, Root P, Adelstein B, Jones J. "Best Poster Award for 'Short Duration Bioastronautics Investigation (SDBI) 1904. Human Factors Assessment of Vibration Effects on Visual Performance During Launch,' Seventh Annual One-Day Symposium of the Houston Human Factors and Ergonomic Society, May 2010." May-2010</p>