

<b>Fiscal Year:</b>	FY 2020	<b>Task Last Updated:</b>	FY 04/15/2020
<b>PI Name:</b>	Stirling, Leia Ph.D.		
<b>Project Title:</b>	HCAAM VNSCOR: Responsive Multimodal Human-Automation Communication for Augmenting Human Situation Awareness in Nominal and Off-Nominal Scenarios (80NSSC20K0409)		
<b>Division Name:</b>	Human Research		
<b>Program/Discipline:</b>			
<b>Program/Discipline--Element/Subdiscipline:</b>			
<b>Joint Agency Name:</b>	<b>TechPort:</b>	No	
<b>Human Research Program Elements:</b>	(1) <b>HFBP:</b> Human Factors & Behavioral Performance (IRP Rev H)		
<b>Human Research Program Risks:</b>	None		
<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>Zip Code:</b>	48109	<b>Congressional District:</b>	12
<b>Comments:</b>	NOTE: PI moved to University of Michigan in fall 2019; previous affiliation was Massachusetts Institute of Technology		
<b>Project Type:</b>	GROUND	<b>Solicitation / Funding Source:</b>	2017-2018 HERO 80JSC017N0001-BPBA Topics in Biological, Physiological, and Behavioral Adaptations to Spaceflight. Appendix C
<b>Start Date:</b>	12/04/2019	<b>End Date:</b>	12/03/2023
<b>No. of Post Docs:</b>	<b>No. of PhD Degrees:</b>		
<b>No. of PhD Candidates:</b>	<b>No. of Master' Degrees:</b>		
<b>No. of Master's Candidates:</b>	<b>No. of Bachelor's Degrees:</b>		
<b>No. of Bachelor's Candidates:</b>	<b>Monitoring Center:</b> NASA JSC		
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<b>Flight Program:</b>			
<b>Flight Assignment:</b>			
<b>Key Personnel Changes/Previous PI:</b>			
<b>COI Name (Institution):</b>	Blossom, Jonathon ( NASA Jet Propulsion Laboratory ) Atkins, Ella Ph.D. ( University of Michigan )		
<b>Grant/Contract No.:</b>	80NSSC20K0409		
<b>Performance Goal No.:</b>			
<b>Performance Goal Text:</b>			

<b>Task Description:</b>	<p>[Ed. note April 2020: Continuation of "HCAAM VNSCOR: Responsive Multimodal Human-Automation Communication for Augmenting Human Situation Awareness in Nominal and Off-Nominal Scenarios," grant 80NSSC19K0703, with the same Principal Investigator (PI) Leia Stirling, Ph.D., due to PI move to University of Michigan from Massachusetts Institute of Technology in fall 2019]</p> <p>his task is part of the Human Capabilities Assessments for Autonomous Missions (HCAAM) Virtual NASA Specialized Center of Research (VNSCOR).</p> <p>Crew extravehicular activity (EVA) is limited on spaceflight missions. Multiple, small robotic spacecraft with varying levels of autonomy are needed to perform tasks that might have been completed by an astronaut (e.g., an exterior surface inspection or repair). Crews on long duration exploration missions (LDEM) will have less access to ground support during task operations. As a result, they will need to process more information and communicate with autonomous robots effectively to ensure tasks are progressing safely and on schedule.</p> <p>The objective of these studies is to investigate the use of augmented reality (AR) multimodal interface displays and communication pathways for improving human-robot communication, situation awareness (SA), trust, and task performance. This will lead to developing guidelines for designing human-robot system interactions that enable operational performance for crews on spaceflight missions.</p> <p>The specific aims are to:</p> <ol style="list-style-type: none"> <li>1) Develop a simulation testbed for examining communication between human-robot teams.</li> <li>2) Develop a hardware testbed for examining communication between human-robot teams.</li> <li>3) Evaluate human SA, trust, and task performance within a short duration and long-duration ground-based study (simulation and/or hardware) through testing various interface communication modalities and information displays.</li> <li>4) (Option) Perform additional studies for alternate parameters of interest that could be tested using the study testbeds. Additional parameters include timing and persistence of information, gesture command mapping, varying the levels of robot automation, evaluating precision enabled by each command mode.</li> </ol>
<b>Rationale for HRP Directed Research:</b>	
<b>Research Impact/Earth Benefits:</b>	<p>Augmented Reality (AR) has opportunity to support decision making across a variety of use-case scenarios, including but not limited to manufacturing, automated vehicles, military training, and entertainment. This research compares AR to other visual modalities for telerobotics applications, specifically considering robotic control and anomaly inspection. Results from this study can inform how AR is integrated for task-specific applications, as there may be tasks that have increased benefit from AR, whereas others may have additional considerations that emerge.</p>
<b>Task Progress:</b>	<p>New project for FY2020.</p> <p>NOTE (Ed., 4/15/2020) this is a continuation of "HCAAM VNSCOR: Responsive Multimodal Human-Automation Communication for Augmenting Human Situation Awareness in Nominal and Off-Nominal Scenarios," grant 80NSSC19K0703, due to PI Dr. Leia Stirling's move to University of Michigan from Massachusetts Institute of Technology in fall 2019. See that project for previous reporting.</p>
<b>Bibliography Type:</b>	<p>Description: (Last Updated: 11/09/2023)</p>