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PI Name:	Schreckenghost, Debra M.E.E.		
Project Title:	Automation in Procedures: Guidelines for Allocating Tasks for Performance		
Division Name:	Human Research		
Program/Discipline:	NSBRI		
Program/Discipline--Element/Subdiscipline:	NSBRI--Human Factors and Performance Team		
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Human Research Program Risks:	(1) **HSIA**:Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture		
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As crewed missions move deeper into space and communication latency increases, strategies for carrying out tasks must shift. Astronauts will be unable to depend on real-time support from flight controllers; controllers will not be able to perform procedures in the same way they do for Station, nor to advise on changed applicability of procedures in real-time. This change threatens to increase astronaut workload, decrease efficiency, and increase the risk of suboptimal task execution.

Automation is an important resource for adapting to this altered environment. To help rather than harm, however, automation must be effectively integrated with the humans it supports. The proposed research will 1) identify and refine candidate strategies for allocating tasks to automation and the factors when guidelines apply, 2) define effectiveness measures for these task allocation strategies, 3) conduct empirical assessment of the effectiveness of human-automation integration based on the proposed allocation strategies, and 4) integrate our findings as proposed task allocation strategies with automation.

Task Description:	Our approach to automation investigates the use of procedures as the basis of automation. By using a human-oriented procedure to organize automation, automation is designed to be more comprehensible to operators. For procedure automation, the actions in a procedure are enabled for automatic execution when instrumentation is available to perform the action. The degree of automation can be varied by changing which actions are designated for automatic execution. Strategies for determining which steps should be automated range from pre-defined allocations to flexible adjustment while the procedure is being executed. It is not clear how these strategies affect human-automation performance. Research is needed to determine how these different allocation strategies affect task performance and learnability. Additionally it is not clear how robust these strategies are to changes in situation that invalidate the procedure as written.
	Our aim is identification of several candidate guidelines and factors that define effective task allocation strategies, within our procedure-automation approach. These guidelines consider where benefits may be greatest and how automation can be structured to realize the potential benefits. However, the ability to automate will depend upon reliably determining whether a procedure should be applied exactly in the circumstances and, if not, how to provide human skills to ensure appropriate application. The way in which human and automated actions are coordinated also needs to make the work organization meaningful to humans, as well as reliably executable by the automation. Specifying how to identify meaningful units of work that serve as the foundation for coordination between human and automated actions is a core part of the research.
	TRACLabs and its partners from NASA and San Jose State University propose to evaluate human performance for different task allocation strategies for procedure automation and use the results to articulate a set of allocation strategies. We will define operational scenarios for the evaluation, including a set of multi-step procedures and simulation that works with these procedures. We will provide procedure automation software for executing these procedures on the simulation. We will perform ground-based human subject testing where subjects use the procedure automation to perform the procedures. We will select the task allocation strategies for evaluation that include both predefined and flexible allocation of tasks. We will measure and analyze human and automation performance for each of these strategies under both nominal and off-nominal circumstances. We will use experimental results to derive strategies for task allocation that are an important step toward developing technology to guide the allocation for tasks among humans and automation.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2013.
Bibliography Type:	Description: (Last Updated: 03/25/2025)