

<b>Fiscal Year:</b>	FY 2011	<b>Task Last Updated:</b>	FY 07/19/2011
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<b>Project Title:</b>	A Scheduling and Planning Tool in NEEMO 14		
<b>Division Name:</b>	Human Research		
<b>Program/Discipline:</b>	HUMAN RESEARCH		
<b>Program/Discipline--Element/Subdiscipline:</b>	HUMAN RESEARCH--Behavior and performance		
<b>Joint Agency Name:</b>	<b>TechPort:</b>	No	
<b>Human Research Program Elements:</b>	(1) <b>BHP:</b> Behavioral Health & Performance (archival in 2017)		
<b>Human Research Program Risks:</b>	(1) <b>Team:</b> Risk of Performance and Behavioral Health Decrements Due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team		
<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>Comments:</b>			
<b>Project Type:</b>	GROUND	<b>Solicitation / Funding Source:</b>	Directed Research
<b>Start Date:</b>	07/20/2009	<b>End Date:</b>	12/27/2010
<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>	NOTE: change in end date per 1/11/2012 HRP Master Task List information (Ed., 1/25/2012)		
<b>Key Personnel Changes/Previous PI:</b>			
<b>COI Name (Institution):</b>	McCurdy, Mike ( NASA Ames Research Center ) Li, Jack ( NASA Ames Research Center )		
<b>Grant/Contract No.:</b>	Directed Research		
<b>Performance Goal No.:</b>			
<b>Performance Goal Text:</b>			

**Task Description:**

The NASA/JSC Behavioral Health and Performance (BHP) Element of Space Medicine Division, Human Research Program (HRP) is proposing a research study that will explore with providing a fully-functional scheduling and planning system that can be easily used by the users and staff personnel to support both ground and flight activities as well as crewmembers for the capability to plan and organize their tasks to fit their needs in real-time within given and developing constraints of a mission.

Future Constellation mission concepts will require a new suite of scheduling and planning tools that deliver improvements to current state-of-the-art technology and processes, including but not limited to: (a) the ability to plan and reason about complex constraint networks on long-range, mid-range, and tactical real-time schedules, (b) the ability for human operators to effectively manipulate and explain schedules generated by automated planning software, and ultimately (c) the ability for the crew to assume the scheduling and planning roles currently reserved for ground personnel.

This proposed pilot study will test the feasibility of using the Scheduling and Planning Interface for Exploration (SPIFe) tool, which is already developed by the Ames Research Center (ARC). The software tool will be revised according to lessons learned from each of the pilot studies (up to three) in simulated space analog environments.

The overarching goal is to develop a technology to assist with scheduling, planning, and training of the astronauts when they are working and living during long duration spaceflight missions. The findings of this study will help determine whether additional countermeasures are needed due to the impact of autonomy.

Objectives of the tool:

1. Provide a fully-functional scheduling and planning system that can be easily used by the users and staff personnel to support both ground and flight activities.
2. Provide NEEMO crewmembers with the capability to plan and organize their tasks to fit their needs in real-time within given and developing constraints.

SPIFe will provide:

SPIFe system shall provide capability to read OSTPV plans or other appropriate format for integration with existing tools.

- The SPIFe system shall incorporate the capability that allows an activity to be only completed by a specific crewmember (i.e., operator vs assistant).
- The SPIFe system shall incorporate the capability that allows editing input of multiple users to sync into one timeline.
- The SPIFe system shall incorporate the capability that allows color-coded status with activities.
  - o The color of an activity will change based on the value of a user-entered attribute called "status."
- The SPIFe system shall incorporate the capability that allows priority status capability.
  - o Each activity will have a numeric attribute called "priority."
- The SPIFe system shall incorporate the capability that allows checking and addition of the resources.
- The SPIFe system shall incorporate the capability that allows the ability to change tracking and conflicts.
  - o The system will display changes made in a plan from one version to another and handle conflicts between edits made to a plan. (Between the topside plan and the plan changed by a crewmember.)
  - o The system will display the changes between a planned schedule and the as-run schedule.

**Rationale for HRP Directed Research:****Research Impact/Earth Benefits:**

Behavioral Health & Performance Research Element  
Human Research Program/Space Medicine Division

Team Gap 6: Given the context of long duration missions, what are the optimal ways to support and enable multiple, distributed, autonomous teams to support task performance, teamwork, and psychosocial performance?

Decision Point: Are additional studies of SPIFe's effectiveness needed?

Summary: The Behavioral Health & Performance Element (BHP) is one of six elements in the Human Research Program and comprises four Risks, namely the Risk of Behavioral Conditions, the Risk of Psychiatric Disorders (BMed), the Risk of Performance Decrements due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team (Team), and the Risk of Performance Errors due to Sleep Loss, Circadian De-synchronization, Fatigue, and Work Overload (Sleep).

The Team Risk is composed of four primary risk factors: cooperation, coordination, communication, and psychosocial adaptation. These primary risk factors represent the dimensions of teamwork as well as the component of individual and team adaptation to the unique spaceflight environment. Within the Team Risk, specific gaps exist that represent the areas in which critical knowledge is unknown or an adequate mitigation strategy has not yet been developed. As crews on long-duration missions are expected to have increased autonomy as a result of communication delays and other logistical constraints, Team Gap 6 focuses on identifying how issues related to increased autonomy of crewmembers may be best addressed. Within Team Gap 6, a task was supported that focused on the design, development, and implementation of a scheduling tool that would allow the crew to be more autonomous. The scheduling tool (SPIFe) was intended to give the crew the independence and control to create their own schedule in order to effectively complete their assigned tasks. SPIFe was supported by BHP and tested most recently in the NEEMO 14 environment.

**Task Progress:**

The objectives of the SPIFe tool included these:

1) Provide a fully functional scheduling and planning system that can be easily used by the users and staff personnel to support both ground and flight activities.

2) Provide crewmembers with the capability to plan and organize their tasks to fit their needs in real time within given and developing constraints.

For NEEMO 14, the following were tested using the SPIFE tool:

1) ability to create and maintain the timeline schedule

2) ability to track actual duration times of scheduled activities

3) effectiveness during degraded communication (the ease with which the crew can maintain and edit their schedule with SPIFE)

Results from the data were mixed, due in part to technical difficulties. However, the above items were tested and were generally supported. Future work on the SPIFE will be focused on fine-tuning the systems and the features that are utilized with this tool as well as incorporating feedback received from the participants to improve the tool's design and functionality.

Outcome: The Behavioral Health & Performance Research Element recommends that additional studies are not needed, and BHP will not proceed with identifying future research tasks associated with SPIFE at this time.

**Bibliography Type:**

**Description: (Last Updated: )**