



# Human Factors in Training

Human Research Program - Space Human Factors & Habitability  
 Space Human Factors Engineering Project  
 Immanuel Barshi (PI)<sup>1</sup>, Vicky Byrne<sup>2</sup>, Lucia Arsintescu<sup>3</sup>, Erin Connell<sup>2</sup>  
<sup>1</sup>NASA Ames Research Center (ARC)  
<sup>2</sup>NASA JSC, Lockheed Martin, <sup>3</sup>NASA ARC, San Jose State University Foundation

## TRAINING DIRECTED RESEARCH PROJECT OVERVIEW

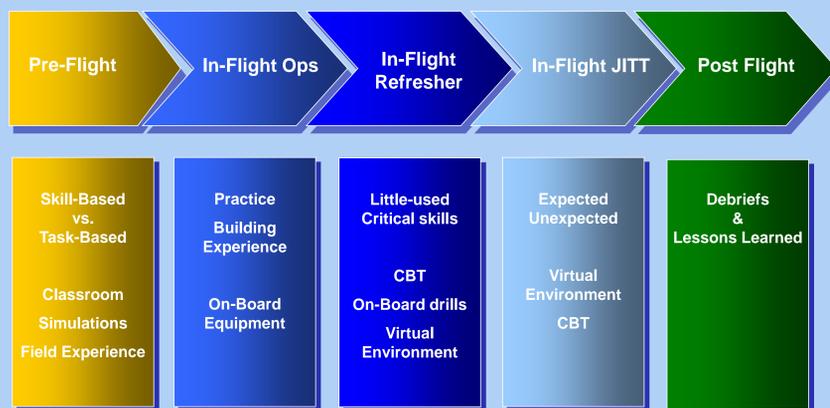
Future space missions will be significantly longer than current shuttle missions and new systems will be more complex than current systems. Increasing communication delays between crews and Earth-based support means that astronauts need to be prepared to handle the unexpected on their own. As crews become more autonomous, their potential span of control and required expertise must grow to match their autonomy. It is not possible to train for every eventuality ahead of time on the ground, or to maintain trained skills across long intervals of disuse. To adequately prepare NASA personnel for these challenges, new training approaches, methodologies, and tools are required. This research project aims at developing these training capabilities. By researching established training principles, examining future needs, and by using current practices in space flight training as test beds, both in Flight Controller and Crew Medical domains, this research project is mitigating program risks and generating templates and requirements to meet future training needs. Training efforts in Fiscal Year 09 (FY09) strongly focused on crew medical training, but also began exploring how Space Flight Resource Management training for Mission Operations Directorate (MOD) Flight Controllers could be integrated with systems training for optimal Mission Control Center (MCC) operations. The Training Task addresses Program risks that lie at the intersection of the following three risks identified by the Project:

- Risk associated with poor task design
- Risk of error due to inadequate information
- Risk associated with reduced safety and efficiency due to poor human factors design

## FY09 Deliverables



## Future Research Direction The Training Continuum



### Some Research Questions:

- What are the basic and generalizable skills underlying different tasks?
- What is the optimal distribution of topics across training opportunities?
- What is the optimal delivery method and media for a given training topic?
- How do we assess proficiency?

### Stakeholders:

Jeanne Lynch, *Chief, Expedition Vehicle Division, JSC/DI*  
 Dr. Joseph Schmid, *Lead, Space Medicine Training, Medical Operations, JCS/SD*

## Space Flight Resource Management Training

Based on the understanding of MOD needs, constraints, and current practices, a prototype that can be used to train SFRM skills (such as situation awareness, communication, and decision making) was developed.

This prototype integrates research on adult learning principles, lessons learned in analog domains, and the results of multiple extensive discussions with MOD training and operations personnel.

To improve performance on Space Flight Resource Management (SFRM) skills, to enable early recognition of SFRM challenges, and to increase the overall effectiveness of Flight Controllers' training, our prototype introduces SFRM early in the training flow, to integrate SFRM skills with the technical skills, and to provide continuous explicit guidance and feedback on SFRM performance throughout training and operations.



### SFRM Generic Paper Sim Concept Prototype

The report describes a game which is a generic training tool prototype for multi-agent interactions, and as such can be used to develop the foundational SFRM skills needed by Flight Controllers for effective teamwork in MCC operations. The game teaches how to identify early signs of increased workload and stress in one's self and in others, and how to anticipate information needs including pushing information to other team members before they have to request it, and pulling information when necessary. Furthermore, the game teaches and reinforces critical communication, decision making, and debriefing skills.

### SFRM WG receives the United Space Alliance Quest for Excellence - Safety Award (12/08)



(Left to Right)

Amanda (Evelyn) Baldwin, Chris Benson, Therese Huning, and Lacey Schmidt  
 Not Pictured: Ken Bain, Immanuel Barshi, Monica Lee, Michael Mistoro, and Dan Nelson

MOD SFRM WG members receive USA Award



SHFE/Training PI receives USA Award