**Human Factors in Training**

**Human Research Program - Space Human Factors & Habitability**

**Space Human Factors Engineering Project**

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**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**

**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.

**Future Research Direction**

**The Training Continuum**

- Pre-Flight
- In-Flight Ops
- In-Flight Refresher
- In-Flight JITT
- Post Flight

**Skill-Based vs Task-Based**

- Practice Building Experience
- On-Board Equipment
- Little-used Critical skills
- Expected Unexpected
- CBT
- Virtual Environment
- Debriefs & Lessons Learned

**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

**Medical Errors – A Review of the Literature**
Space Human Factors Engineering Training Directed Research Project
March 30, 2009

**SFRM Generic Paper Sim**

**Just-in-Time Training Comparison**
Space Human Factors Engineering Training Directed Research Project
June 30, 2009

**Flight Surgeon Performance Support Tool Evaluation**
Space Human Factors Engineering Training Directed Research Project
September 30, 2009

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