

NASA/NSF WORKSHOP ON ANTARCTIC RESEARCH

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Currently Supported Life Sciences Activities:

- * Crew Training Evaluation; Selection Strategies
 - * Automation/Crew Performance Effects
 - * Social/Organizational Influences on Team Performance
 - * Leadership Influences on Team Performance
 - * Workload Measurement Techniques (complex tasks)
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- * Meta-Analysis of Behavioral Effects of Isolation and Confinement

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**ANTARCTIC RESEARCH AREAS OF
SPECIAL INTEREST**

- * **CREW FACTORS**
- * **HUMAN/AUTOMATION/TELECOMMUNICATIONS**
- * **STRATEGIC BEHAVIOR/WORKLOAD**
- * **SLEEP/FATIGUE/CIRCADIAN RHYTHMS**
- * **VIRTUAL REALITY/SPATIAL INSTRUMENTATION**

CREW FACTORS

NEED:

To develop requirements and strategies for the selection and training of crews to work together on long-duration space missions.

EXAMPLE RESEARCH:

Systematically investigation of effects of crew size, structure, and organization. Examples include:

Crew Rotation - Learn to integrate new members

Crew Roles - How leadership, specialization, etc. change over time

Team Building - Evolution of relations over time

Multicultural/multinational crews

Meaning of "Performance" - Not just task mastery

Testing of Research Findings - "Select In" research suggests new approaches that much be confirmed.

HUMAN/AUTOMATION/TELECOMMUNICATIONS

NEED:

To formulate requirements for combining Human, Automation, and Telecommunication Systems into an integrated, synergistic and fully functioning crew system capable of supporting long-duration and distant space missions.

BACKGROUND:

Combining human and non-human intelligence has resulted in a significant number of serious errors. Methods for protecting against such failure and/or countermeasures for correcting them must be identified and incorporated.

EXAMPLE RESEARCH:

- * Determine nature and time-line of H/A errors (e.g. in monitoring behavior) in isolated and confined environments and identify design and procedural requirements.
- * Determine effect of automated (e.g., decision) systems on interactions within the crew.
- * Determine effect of telecommunications variable (e.g., choice of media, delays) on effectiveness of interactions with home or base camp support (ground).

STRATEGIC BEHAVIOR/WORKLOAD

NEED:

To understand the relationship between environmental stress (and its physical and mental correlates) and the ability to manage work requirements.

BACKGROUND:

"Strategic Behavior" is currently being investigated as an alternate and supplementary approach, in an effort to explain variance in performance not accounted for by workload.

EXAMPLE RESEARCH:

- Identify strategies (individual and group) successful in isolated settings for organizing information, making decisions, scheduling, pacing activities, etc. and determine how these strategies change over time.
- Determine methods for dealing with low workload conditions
- Develop training systems for potential use during low workload.

SLEEP/FATIGUE/CIRCADIAN RHYTHMS

NEED: To identify strategies to manage sleep/wake activities in space-relevant environments.

EXAMPLE RESEARCH:

- Determine quality and duration of sleep and objective/subjective measures of fatigue for varying conditions and durations of isolation and confinement.
- Determine course of changes in circadian rhythms for exploration-relevant cycles and relate circadian rhythm to phases of sleep.
- Identify countermeasures (e.g., light, exercise) and quantify effects on performance.
- Develop appropriate sleep/wake and work/rest schedules.

VIRTUAL REALITY/SPATIAL INSTRUMENTATION

NEED:

To Integrate interactive visual models and Interactive telepresence interfaces and to Investigate how these systems can be used in spaceflight, particularly planetary exploration.

BACKGROUND:

Virtual reality and telepresence interfaces have developed separately and without focused attention on how humans, using these aids, are able to perform real work in a real environment.

EXAMPLE RESEARCH:

Antarctica offers the opportunity to conduct real (geological) research, with humans utilizing virtual reality/telepresence systems. Through an applied research program, evaluation can be made in this space-relevant environment of:

- * Adequacy of Virtual Reality System for human user
- * Perceived quality and responsiveness of Telepresence System
- * Acceptability of total system, and
- * Quality of scientific product.

Attachment 10

