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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

ANTARCTIC RESEARCH AREAS OF SPECIAL INTEREST

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* 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:

Systemmatically 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