DTIC Current Awareness: February 2003

Banderet, L. E. and Shukitt-Hale, B. (2002). *Cognitive Performance, Mood, and Neurological Status at High Terrestrial Elevation (Report No. USARIEM-MISC-97-15)*. Natick, MA: Army Research Institute of Environmental Medicine. (DTIC No. ADA410036)

http://handle.dtic.mil/100.2/ADA410036

Abstract: Cognitive and psychomotor performance and mood states, including many critical behavioral functions such as sleep, memory, reasoning, and vigilance, are significantly impaired by ascent to HTE higher than 3,000 m. Impairments in behavior caused by HTE can degrade military operations because the judgment and rate and accuracy of performance of military personnel can be affected. Such adverse effects have distinct and measurable time courses; onset of some effects is immediate (cognitive performance), whereas the onset of others is delayed (symptoms of AMS or adverse moods). The behavioral consequences of HTE are primarily dependent on the level of altitude, the duration of exposure the rate of ascent, an individual's state of physiological acclimation or acclimatization, characteristics of the task performed, and characteristics of the individual such as hypoxic sensitivity. Military history documents that the adverse effects induced by HTE need to be considered when military operations at altitude are planned and undertaken. Current research indicates that some performance decrements induced by ascent to extremely high mountains (e.g., Mount Everest, 8,848 m) may persist for a year or longer after return to lower elevations. Psychological, operational, and medical strategies have been employed to minimize these adverse effects. Psychological strategies often involve training and familiarization with the adverse effects that will be experienced at high altitude.

Bellazzi, R., Carson, E. R., Cobelli, C., Hernando, E. and Gomez, E. J. (2001). *Merging Telemedicine with Knowledge Management: The M2DM Project.* United Kingdom: City University of London. (DTIC No. ADA409765)

http://handle.dtic.mil/100.2/ADA409765

Abstract: This paper describes the EU-funded M2DM project which is developing multi-access services for the management of diabetes mellitus. Key features of the proposed system include the merging of telemedicine with knowledge management. The issues needing to be addressed in this connection are considered, together with the setting of the project within an overall systemic, model-based framework.

Boquet, A., Cruz, C. E., Nesthus, T. E., Detwiler, C. A., Knecht, W. R. and Holcomb, K. A. (2002). *A Laboratory Comparison of Clockwise and Counter-Clockwise Rapidly Rotating Shift Schedules, Part III: Effects on Core Body Temperature and Neuroendocrine Measures (Report No. DOT/FAA/AM-02/20).* Oklahoma City, OK: Federal Aviation Administration, Civil Aeromedical Institute. (DTIC No. ADA409994)

http://handle.dtic.mil/100.2/ADA409994

Abstract: Most researchers suggest that shift rotation in a forward or clockwise direction produces less disruption of circadian rhythms than those that rotate in a backward or counter-clockwise direction. This is based upon extrapolation from quasi-experimental studies of shift-workers and research on the effects of jet lag, which indicate that westward travel results in less disruption of circadian rhythms. The effect of direction of rotation on cortisol, melatonin, and core body temperature was examined in participants randomly assigned to either a clockwise or counter-clockwise shift rotation. Twenty-eight participants worked a day shift (0800-1600) for one week followed by either a clockwise (n=14=14--) or counter-clockwise (n=14=14) shift rotation for two weeks. Participants wore a flexible rectal temperature sensor for the three weeks of the study and were allowed to remove the sensor for 90 minutes each day. Saliva samples were collected at the end of the baseline week for later assay for melatonin and cortisol, and were time-locked to collection times during the two "shiftwork" weeks. No group differences were found for cortisol for either of the workweeks. The clockwise group, however, had a significantly greater increase in melatonin during the early morning shift, compared with the counter-clockwise group. Finally, the analyses of core body temperature revealed a significantly lower amplitude and a delay of the acrophase for the counter-clockwise group during both weeks of testing. while cortisol levels did not appear to differ based on direction of shift rotation, there were inherent differences with melatonin secretion and core body temperature. Precisely why such differences exist remains unclear but may be similar to that seen with circadian resynchronization during westward travel. Furthermore, it is not clear if these differences would persist in individuals exposed to longer periods of shift rotations.

Dror, I. (2002). *Enhancing Decision Performance.* United Kingdom: Southampton University. (DTIC No. ADA409912)

http://handle.dtic.mil/100.2/ADA409912

Abstract: This report results from a contract tasking University of Southampton as follows: The contractor will investigate the link between knowledge acquisition (via training) and usability (via testing), as well as between the stage of planning and decision-making and the stage in which plans & decisions are executed.

Experiments will investigate how people internalize and represent information, and how this influences their subsequent ability to use that information. Results will focus on the ability to generalize beyond examples used during training, the ability to use and incorporate new information, the capacity to be flexible, and the ability to develop creative solutions dictated by changing task demands under high information load and time pressure.

Goldman, S. M., Fiedler, E. R. and King, R. E. (2002). *General Aviation Maintenance-Related Accidents: A Review of Ten Years of NTSB Data (Report No. DOT/FAA/AM-02/23)*. Oklahoma City, OK: Federal Aviation Administration, Civil Aeromedical Institute. (DTIC No. ADA409385)

http://handle.dtic.mil/100.2/ADA409385

Abstract: NTSB accident investigation reports for general aviation accidents occurring between 1988 and 1997 were analyzed in order to provide a descriptive look at ten years worth of accident data. This sample included 1,503 reports, all of which indicated at least one maintenance-related issue as a cause or factor in the accident. Initial analyses describe the frequency of occurrence for type of maintenance task and type of aircraft. Accidents were compared on frequency of occurrence, number of fatalities, and number of serious injuries. Odds for each variable resulting in a fatality or injury are reported. Results indicated that installation errors were the leading maintenance-related cause or factor involved with the accidents. Since installation errors were most common further analyses focused on a more detailed description of installation error. Type of installation error, type of aircraft system involved in the installation, whether or not the installation was inspected, credentials of the mechanic performing the installation, and the operational impact of the installation error were investigated. Results indicate that reversed installation and wrong part were the two installation errors most likely to cause death or injury in GA aircraft accident.

Heil, M. C., Detwiler, C. A., Agen, R., Williams, C. A. and Agnew, B. O. (2002). *The Effects of Practice and Coaching on the Air Traffic Selection and Training Test Battery (Report No. DOT/FAA/AM-02/24)*. Oklahoma City, OK: Federal Aviation Administration, Civil Aeromedical Institute. (DTIC No. ADA409734)

http://handle.dtic.mil/100.2/ADA409734

Abstract: The Air Traffic Selection and Training (AT-SAT) test battery is the Federal Aviation Administration's (FAA's) recently developed computerized selection test for Air Traffic Control Specialists (ATCSs). Only one form of the AT-SAT

battery was developed as part of the initial development and validation effort, meaning that all people who take the test receive the exact same items. The goals of the current study were to: 1) determine if repeated test taking improves performance; 2) determine if coaching improves performance; 3) identify specific tests within the AT-SAT battery that are most susceptible to practice and coaching effects; and, 4) determine the extent to which practice and coaching effects potentially impact hiring decisions. Study participants were not ATCSs; however, they had to meet basic requirements for the ATC occupation to be eligible for participation. They were recruited through a contractor and randomly assigned to one of three experimental groups. Group 1 received a one-day coaching intervention before taking the first administration of AT-SAT. Group 2 took the first administration of AT-SAT, and then received the coaching intervention before the second administration. Group 3, the control group, took AT-SAT three times without coaching. Test scores were compared both between and within each group using ANOVA with repeated measures. The results suggest that performance on the AT-SAT battery may indeed be influenced by both practice and coaching effects. More specifically, the results demonstrate that the composite AT-SAT score that is used for hiring decisions increases with repeated administrations, although the greatest increase occurs following coaching. In terms of selection decisions, it is conceivable that coaching could move an individual from a failing status into a passing status and even from the qualified category into the well-qualified category, without improving their ability to perform on the job.

Human Systems IAC Gateway. (2001, Volume 12,1). Wright Patterson AFB, OH: Human Systems Information Analysis Center. (DTIC No. ADA410023)

http://handle.dtic.mil/100.2/ADA410023

Abstract: This newsletter contains information on Aviation Systems, Cognitive Engineering, Cognitive Systems and how they should be engineered for aviation domains, balancing research and design, Cognitive Work Analysis for Air Defense Applications in Australia, Cognitive Cockpit Engineering, and analyzing the cognitive system from a perceptual control theory point of view. The letter also has a calendar of upcoming, and human systems events.

Ilgen, D. R. and Hollenbeck, J. R. (2002). *The Influence of Training and Structure Transitioning On Command and Control Team Performance: A Final Report (Report No. 02-01)*. East Lansing, MI: Michigan State University, Department of Management. (DTIC No. ADA409813)

http://handle.dtic.mil/100.2/ADA409813

Abstract: The work described in this report is part of an ongoing research program looking at the effects of team structure on the effectiveness of decision making teams. Team structures are investigated with respect to their fit to situational demands and to the characteristics of team members. Fit is considered both statically and dynamically. In the latter case, teams performing under one structure encounter situational demands that either are or are not consistent with the structure and, in the latter case, must reconfigure their structure to fit better the situations. During the time period intra-team processes of teamwork and learning also were investigated along with team task performance.

Johnson, R. F. and Kobrick, J. L. (2001). *Psychological Aspects of Military Performance in Hot Environments (Report No. USARIEM-MISC-98-6)*. Natick, MA: Army Research Institute of Environmental Medicine. (DTIC No. ADA409995)

http://handle.dtic.mil/100.2/ADA409995

Abstract: The military needs to understand how mental performance, psychomotor performance, and subjective responses vary with severity of heat stress. Understanding this relationship is important because heat stress can significantly impair military performance and because psychological changes often precede the onset of critical physiological changes. Establishing well-defined relationships between climatic conditions and psychological performance has been difficult. Thermal stress researchers have attempted to identify psychological breaking points in performance, but the environmental conditions employed to simulate the natural world (combinations of temperature, humidity, wind speed, and exposure time) do not lend themselves to systematic, real-world organization. Therefore, it is difficult to make broad generalizations about the effects of heat stress on psychological performance. Nevertheless, there is general agreement that (1) the upper limit of heat exposure for unimpaired psychomotor performance is 90 degrees F WBGT; (2) the upper limit of heat exposure for unimpaired mental performance is 85 degrees F WBGT if the service member is required to perform the task for 2 hours or longer; at less than 1 hour on the task, individuals can perform proficiently at higher ambient temperatures approaching 1090 WBGT; and (3) continuous repetitive tasks with relatively low arousal value tend to be the most affected. Psychological performance during ambient heat exposure is compounded for military personnel because they are often encumbered by mission-essential clothing and equipment, including, for example, chemical protective clothing or medications such as nerve-agent antidotes, or both. Realistic military training in hot environments followed by persistent practice of military tasks in hot environments will attenuate otherwise severe impairments in performance.

Krausman, A. S., Crowell III, H. P. and Wilson, R. M. (2002). *The Effects of Physical Exertion on Cognitive Performance (Report No. ARL-TR-2844)*. Aberdeen Proving Ground, MD: Army Research Lab. (DTIC No. ADA409534)

http://handle.dtic.mil/100.2/ADA409534

Abstract: This study examined the cognitive and physiological performance of soldiers as they exercised on a treadmill at various grades. Twelve soldiers walked at 1.56 m/sec on three grades, 0%, 3.5%, and 7.0%. The cognitive tasks performed by the soldiers were taken from the Walter Reed Performance Assessment Battery. The tasks chosen for this study included two reaction time tasks, an arithmetic task, and a decision-making task. Three measures were used to evaluate performance of the cognitive tasks: accuracy (percent correct), response time (responses per minute), and throughput (hits per minute). The physiological variables were heart rate and rating of perceived exertion. The findings of the research strongly support the fact that physical exertion does impact cognitive performance. Results indicate that the physical exertion facilitated performance of the two reaction time tasks and the decision-making task. Performance of the arithmetic task was degraded. The physiological results were compatible with those of progressive exercise.

Mammas, K. S., Madellos, G. J., Economou, G. P and Lymberopoulos, D. K. (2001). *Structuring Expert-leaded Medical Protocols for Tele-Medicine Systems.* Greece: Patras University. (DTIC No. ADA409652)

http://handle.dtic.mil/100.2/ADA409652

Abstract: The structuring of standardized medical protocols that can be used in distributed tele-medicine systems (TS) is dealt. The protocols are needed to handle the medical data exchange between TS; TS can be considered as an aggregation of medical data sources and communication servers. The medical protocols have been integrated in an already presented TS tested on the field by means of a pilot project consisting of twenty-two (22) medical nodes.

McIntyre, R. M., Strobel, K., Hanner, H., Cunningham, A. and Tedrow, L. (2003). *Toward an Understanding of Team Performance and Team Cohesion Over Time Through the Lens of Time Series Analysis (Report No. RN-2003-07)*. Norfold, VA: Old Dominion University. (DTIC No. ADA409456)

http://handle.dtic.mil/100.2/ADA409456

Abstract: This final report summarizes the results of two phases of research involving the effects of theory-based teamwork training on team cohesion and team performance. In the first phase, the research used a relatively straightforward pre-training, post- training, and post-post-training design to determine the effects of theory-based teamwork process training on team cohesion. Results indicated significant and reasonably long-lasting effects on team cohesion as measured by the System for the Multiple Level Observation of Group (SYMLOG) measurement system. The second phase of the research was extremely labor intensive. It involved the use of 11 student teams who participated in an advanced undergraduate psychology course. A somewhat surprising finding was that team performance and team cohesion were not related as expected. The four studies in two phases provided more questions than answers.

Morucci, J. P. (2001). *The Recognition of Biomedical Engineering Within the International Council for Science.* Toulouse, France: Purple Hospital, Neurology Department. (DTIC No. ADA410155)

http://handle.dtic.mil/100.2/ADA410155

Abstract: Forty years separate the emergence of Biomedical Engineering in a meeting in Paris at UNESCO in 1959 from its recognition together with Medical Physics in 1999 by the International Council for Science. The main problems of definition and of identity of Biomedical Engineering as a scientific discipline are discussed and the different steps which have favored this recognition are outlined.

Williams, K. W., Yost, A., Holland, J. and Tyler, R. R. (2002). *Assessment of Advanced Cockpit Displays for General Aviation Aircraft - The Capstone Program (Report No. DOT/FAA/AM-02/21)*. Oklahoma City, OK: Federal Aviation Administration, Aeromedical Institute. (DTIC No. ADA409997)

http://handle.dtic.mil/100.2/ADA409997

Abstract: Since the inception of the Capstone Program, approximately 150 aircraft in the area of Bethel, Alaska have received a suite of ADS-B displays. Despite the opportunity provided by the large number of ADS-B-capable aircraft in the Bethel area, very little information has been collected from the owner/operators and pilots of these aircraft that might help in transitioning the technology to the rest of the country. To remedy this situation, a team of human factors experts was tasked with traveling to Bethel in March 2002 to collect data regarding the use of these displays in day-to-day flight activities. A total of 41 pilots participated in the interview process, representing nine different flight companies in the Bethel area. All of the pilots were male. The average age was

37, ranging from 21 to 58. The average number of flight hours for the pilots was 4,962 hours, ranging from 950 hours to 30,000 hours. The median number of total flight hours was 3,250. Over 95% (39) of the pilots were instrument rated. Results from the pilot interviews and self-administered questionnaires revealed a number of human factors design, safety, and training issues. Discussion of these results will focus on display design and training recommendations for ADS-B displays that will ease the training burden, mitigate safety hazards, and accentuate safety improvements.