DTIC Current Awareness: June 2003

Caldwell, J. (2003). *An Overview of the Utility of Stimulants as a Fatigue Countermeasure for Aviators.* Brooks City-Base, TX: Air Force Research Lab. (DTIC No. ADA413128)

http://handle.dtic.mil/100.2/ADA413128

Abstract: Sleepiness and fatigue are common in the aviation environment even during peacetime, but during combat, fatigue can reach critical levels due to the necessity for sustained operations and the consequent requirement for lengthy duty schedules. Effective nonpharmacological countermeasures are often difficult to implement in these settings due to the situational demands and the unpredictable nature of war. Thus, during combat, pharmacological countermeasures (stimulants or Go Pills) may represent the only feasible alternative for the maintenance of aviator performance when sleep deprivation is inevitable Caffeine is a first line choice, but might not be sufficiently effective for long durations or for those who are heavy caffeine users Modafinil is a new alertness-promoting compound that appears to hold promise for use in military aviation, but is not yet recommended because of a lack of field-oriented aviation research. Dextroamphetamine has been successfully used by the military in past conflicts, and its effectiveness and safety are well established. Commanders, flight surgeons, and individual aviators may wish to examine what has been determined from past research in order to make the best possible decision concerning the appropriateness of Go Pills for future aviation sustained operations.

Doane, S. (2002). *New Measures of Complex Spatial Processing Abilities: Relating Spatial Abilities to Learning and Performance.* Mississippi State, MS: Mississippi State University Department of Psychology. (DTIC No. ADA413799)

http://handle.dtic.mil/100.2/ADA413799

Abstract: The purpose of this research was to (1) develop new tests of spatial-visual ability that relate to later learning and performance, (2) relate the new measures to existing measures of cogitative ability, and (3) provide the new measures to the Navy for further investigation as personnel classification tools. The theoretical goal of this research was to improve our understanding of how spatial abilities relate to later learning and performance. We have completed seven experiments that examine the role of individual differences in cognitive ability and how they effect strategic processing of meaningful stimuli and inter-stimuli strategic transfer. Our findings suggest that spatial ability plays a central role in the ability to acquire and transfer optimal strategic processing skills Individuals with

medium ability (those most likely to enter the Navy) are most sensitive to the initial training context during the formation of their strategic processing skills.

Evans, K. L. and Christ, R. E. (2003). *Development and Evaluation of Communication-Based Measures of Situation Awareness*. Fort Benning, GA: Army Research Institute for the Behavioral and Social Sciences. (DTIC No. ADA413106)

http://handle.dtic.mil/100.2/ADA413106

Abstract: The present investigation sought to develop and field test two new behavioral measures of situation awareness (SA) that rated the content of small unit radio transmissions. Initially, a four-person team generated an item pool of 318 critical incidents of communication behavior, each intended to represent either an outstanding, typical, or poor level of SA on the part of small unit leaders. A group of 24 independent evaluators then rated the degree to which they thought each of the 318 items was related to the concept of SA. The 20 items having the highest levels of agreement among the independent evaluators within each SA level were chosen to comprise the Radio Communications Checklist of Leader Awareness (RCCOLA) and the Future Expectations of Likely Leader Awareness (FELLA) scale. Six field trials were then conducted with each of seven squad leaders and their respective squads. Based on their monitoring of squad and platoon radios, two independent raters completed separate RCCOLA checklists during each of the 42 total trials, as well as separate FELLA scales after the completion of each trial. Interrater agreement was generally high for both measures. Based on their methods of construction, we can also assume they possess some content-related validity.

Faaborg, T. P. (2003). *Human Error Analysis of Fatal General Aviation Accidents, 1990-1998; Application of a Revised Taxonomy of Unsafe Acts (Report No. C102-930)*. Urbana, IL: Illinois University at Urbana. (DTIC No. ADA414093)

http://handle.dtic.mil/100.2/ADA414093

Abstract: Civil flights (non-military) in the United States (U.S.) are classified as either General Aviation (GA) or air carrier operations. General aviation activities include recreational flying, flight instruction, agricultural operations, sightseeing, and business travel (U & Baker, 1999). The aircraft involved in GA flying may be piloted by a variety of people with a valid pilot license and approved medical history, but belonging to a wide range of age groups. The aircraft flown by GA pilots include airplanes, helicopters, balloons, and gliders. Each year, the National Transportation Safety Board (NTSB) records about 2000 GA crashes, which claim about 750 lives (National Safety Council, 1997).

Between 1990-1996, GA accounted for 93% of all aviation crashes and 78% of all aviation fatalities. In fact, a pilot flying under the auspices of general aviation is nearly 10 times more likely to be involved in an accident than a military air crewmember (USAF, 2003), more than 11 times more likely than a commercial air crewmember (NTSB 2003b; NTSB, 2003c), and almost 50 times more likely to be involved in a fatal crash than large scale commercial pilots (NTSB, 2003a).

Foster, R. E. and Fletcher, J. D. (2002). *Computer-Based Aids for Learning, Job Performance, and Decision-Making in Military Applications: Emergent Technology and Challenges (Report No. IDA/HQ-D-2786).* Alexandria, VA: Institute for Defense Analysis. (DTIC No. ADA413872)

http://handle.dtic.mil/100.2/ADA413872

Abstract: Technology-based systems for education, training, and performance-aiding (including decision-aiding) may pose the ultimate test for validating approaches to integrate humans with automated systems. These systems need to model students and users. The models they generate, as well as the interactions based on them, must adapt to the evolving knowledge and skills of individual students and users. Evaluation findings suggest that such adaptations are feasible, worthwhile, and cost effective. Data drawn from many evaluations of technology-based education and training indicate overall that these systems can reduce costs by one-third and that they can also either reduce the time to achieve instructional objectives by one-third or increase achievement (holding time constant) by one-third. The likely impact on military readiness and effectiveness suggested by these findings is significant. Evaluations of technology-based performance aiding systems have suggested similar results of increased personnel effectiveness and cost-savings. They suggest a need to determine and readjust the balance between resources allocated to training and resources allocated to performance-aiding systems. Development of sharable, reusable objects and capabilities for assembling these objects on demand and in real time will substantially increase accessibility and will reduce costs of education, training, and performance-aiding while making them asynchronously and continuously available regardless of distance and time. Specifications and capabilities for such objects are the goals of much current research and development (R&D).

Harding, T. H. (2002). *Contributive Research in Aviation Medicine, Bioengineering, Human Performance Analytic and Modeling Systems.* Dayton, OH: UES. (DTIC No. ADA414143)

http://handle.dtic.mil/100.2/ADA414143

Abstract: The U.S. Army Aeromedical Research Laboratory (USAARL) at Fort Rucker, Alabama, is tasked with a broad range of applied research and engineering programs designed to answer biomedical questions dealing with aviator and soldier performance issues in an operational environment. In carrying out its mission, the Laboratory encounters unique and complex research requirements that demand maximum flexibility in its response capability. In order to achieve such flexibility, UES, Inc. was contracted to provide engineering and scientific research support in the areas of aviation medicine; biological and human factors engineering; crash modeling and research on airbags, restraint systems and head supported weight; aeromedical equipment air worthiness evaluations; research on flat panel and advanced cockpit displays, evaluations of developmental optical systems, and visual performance with military displays; and biochemical support of research in pharmaceutical intervention in army air crew. This report provides a brief summary of the extensive work performed by UES engineers and scientists during this task order contract. This report covers work completed during a seven year, five month research effort.

NATO Research And Technology Organization. (2003). *Spatial Disorientation in Military Vehicles: Causes, Consequences and Cures (Report No. RTO-MP-086, AC/323(HFM-085)TP/42).* Neuilly-Sur-Seine, France: NATO Research and Technology Organization. (DTIC No. ADA413343)

http://handle.dtic.mil/100.2/ADA413343

Abstract: Spatial disorientation (SD), a condition in which the operator fails to sense correctly the position, motion or attitude of the vehicle or of him/herself, continues to be a cause of aircraft accidents, with accident rates that, unlike the overall rate, have not fallen over the past 15 years. The Symposium was convened to review current knowledge of the causes of SD and preventative measures, applicable to air land and maritime environments. Thirty two oral and 14 poster presentations covered following topics: Causal Mechanisms; Operational and psychophysiological consequences of SD; Incidence of SD in air, land and maritime environments; SD training programmes and training devices; Cognitive and sensory aids for the maintenance of spatial orientation, with an emphasis on the use of tactile cures.

Sanders, W. R. (2003). *Measurement Methods for Human Performance in Command and Control Simulation Experiments (Report No. ARI-RN-2003-11).* Alexandria, VA: Army Research Institute for the Behavioral and Social Sciences. (DTIC No. ADA413273)

http://handle.dtic.mil/100.2/ADA413273

Abstract: The U.S. Army's proposed Future Combat System of Systems (FCS) will include automated Command and Control (C2) capabilities that will allow tactical commanders, assisted by a small command group, to effectively lead a future force composed of large numbers of manned and robotic elements. This paper describes research conducted by the U.S. Army Research Institute (ARI) to develop measurement methods to enhance the existing Human Functional Analysis (HFA) approach (Sanders, Lickteig, 2002) for estimating human performance requirements associated with FCS C2 design concepts. Measurement techniques are demonstrated that can address C2 human performance requirements through the evaluation of verbal communications, Human-Computer Interaction (HCI) behavior events, and subjective survey data. Specifically, automated word count, and task-time estimation methods were applied to existing HFA data sets to provide estimates of the frequency and time duration of verbal communications for individual members of the FCS C2 command group, and task time estimates for all HCI actions. Data gathered in a series of U.S. Army battle simulation experiments were reanalyzed to demonstrate how the new methods can provide estimates of human performance that support decisions regarding workload, task allocation, and training requirements.

Shappell, S. A. and Wiegmann, D. A. (1998). *A Human Error Analysis of General Aviation Controlled Flight into Terrain Accidents Occurring Between 1990-1998.* Oklahoma City, OK: Federal Aviation Administration, Civil Aeromedical Institute. (DTIC No. ADA413731)

http://handle.dtic.mil/100.2/ADA413731

Abstract: Although all aviation accidents are of interest to the Federal Aviation Administration (FAA), perhaps none is more disconcerting than those in which a fully functioning aircraft is inexplicably flown into the ground. Referred to as controlled flight into terrain (CFIT), these accidents continue to be a major safety concern within aviation, in particular general aviation (GA). A previous study as part of the FAA's Safer Skies agenda examined 165 CFIT accidents using root cause analysis and developed 55 interventions to address their causes. While the study represented the work and opinions of several experts in the FAA and industry, the findings might have benefited from a more detailed human error analysis involving a larger number of accidents. In this study, five pilot-raters independently analyzed more than 16,500 GA accidents occurring between 1990-1998 using the Human Factors Analysis and Classification System (HFACS). Of the GA accidents examined, 1407 were identified as CFIT and compared with non-CFIT accidents using HFACS. The analysis revealed a number of differences in the pattern of human error associated with CFIT accidents. Findings from this study support many of the interventions identified by the CFIT Joint Safety Analysis Team (JSAT) and Joint Safety

implementation Team (JSIT), permitting safety professionals to better develop, refine, and track the effectiveness of selected intervention strategies.

Sollenberger, R. L., McAnulty, D. M. and Kerns, K. (2003). *The Effect of Voice Communications Latency in High Density, Communications-Intensive Airspace (Report No. DOT/FAA/CT-TN03/04)*. Atlantic City, NJ: Federal Aviation Administration Technical Center. (DTIC No. ADA413279)

http://handle.dtic.mil/100.2/ADA413279

Abstract: The Federal Aviation Administration (FAA) Next Generation Air-Ground Communications program plans to replace aging analog radio equipment with the Very High Frequency Digital Link Mode 3 (VDL3) system. VDL3 will implement both digital voice and data link communications and will include special features such as controller override, anti-blocking, and a transmit status indicator. There are two human factors concerns with the VDL3 system: voice quality and voice throughput delay. Previous research has determined that digital voice technology is highly intelligible and acceptable for Air Traffic Control (ATC) operations. Researchers from the National Airspace System Human Factors Group (ACB-220) of the FAA William J. Hughes Technical Center conducted a high fidelity, human-in-the-loop simulation to examine the impact of voice throughput delay on ATC operations. The communications equipment simulated the VDL3 system with controller override, anti-blocking, and transmit status indicator features. The researchers examined ground system delays of 250 ms (current specification), 350 ms (practical alternative), and 750 ms (to demonstrate the sensitivity of the simulation measures) each with their appropriate airborne system delays. Ten controllers from Level 11 and 12 Air Route Traffic Control Centers participated in the study. The results indicated that there were no significant differences between the 250 ms and 350 ms delay conditions. However, the 750 ms condition did produce a significant increase in controller overrides, and the controllers rated it as interfering with some aspects of their communication (e.g., providing optional services). The researchers concluded that the VDL3 system with controller override, anti-blocking, and a transmit status indicator can be implemented with a 350 ms ground system delay without causing problems for controllers.