

DTIC Current Awareness: September 2002

Al-Nuaimi, N. H., Eveland, E. S., Goodyear, C. (2000). *Helmet Pointing Performance Differences Between Males and Females During High-Sustained Acceleration*. Wright State University, Dayton, OH. (DTIC No. ADA405631)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: Because females only recently became fighter pilots, the literature contains very little information on female performance during high-sustained acceleration. The hypothesis of this research was that female subjects would have similar helmet pointing task performance during high-sustained acceleration compared to males. Five female and five male subjects performed simple and complex tracking tasks at 1.4, 4.0, and 6.5 Gz in a human centrifuge. There was no significant difference in helmet pointing performance between males and females under the different gravity (G) settings. Overall, male subjects performed 17% better but this difference was not statistically significant. Means followed trends where increasing helmet weight or a movement in the center of gravity away from a reference position resulted in poorer tracking performance; however, the mean differences were very small compared to the effects of task and Gz.

Broach, D. M., Dollar, C. S. (2002). *Relationship of Employee Attitudes and Supervisor-Controller Ratio to En Route Operational Error Rates*, Report No. DOT/FAA/AM-02/9. Federal Aviation Administration, Aeromedical Institute, Oklahoma City, OK. (DTIC No. ADA405141)

<http://handle.dtic.mil/100.2/ADA405141>

Abstract: An operational error (OE) results when an air traffic control specialist (ATCS) fails to maintain appropriate separation between aircraft, obstacles, etc. Recent research on OEs has focused on situational and individual characteristics (Center for Naval Analyses Corporation, 1995; Della Rocco, 1999; Rodgers, Mogford, Mogford, 1998). In this study, the relationship of organizational factors to en route OE rates was investigated, based on an adaptation of the Human Factors Analysis and Classification System (HFACS; Shappell & Wiegmann 2000) to air traffic control as HFACS-ATC (Scarborough & Pounds, 2001). OE rates (errors per 100, 000 operations) for 1997 and 2000 were obtained from the National Airspace Incident Monitoring System (NAIMS) for 21 air route traffic control centers (ARTCC). Organizational factors were represented by facility mean scores on scales constructed from 1997 and 2000 FAA Employee Attitude Survey (EAS) data. Factors included employee perceptions of equipment/facilities, performance management, overall job satisfaction, and perceptions of other human resources management practices. The supervisor-controller ratio (SCR) was calculated for each ARTCC by year from agency personnel data. SCR and organizational factors facility mean scores were regressed on OE rate (N = 42). Two organizational factors and SCR accounted for 50% (adjusted R(sup 2) = .505, p < .001) of the variance in OE rates across ARTCCs for the two years. The standardized regression coefficients were -.290 for perceptions of equipment/facilities (t = - 2.07, p < .05), -.302 for perceptions of performance management (t = - 2.28, p < .05), and -.395 for SCR (t = - 3.360, p < .01). As expected from prior research, SCR was a significant predictor of en route CE rates. In addition, the results indicated that perceptions of how performance was managed and of facilities and equipment were also predictors of CE rates.

Caldwell, J. L., Caldwell Jr., J. A., Roberts, K. A. (2002). *A Comparison Between the Countermeasures Modafinil and Napping for Maintaining Performance and Alertness Using a Quasi-Experimental Analysis, Report No. USAARL-2002-14*. Army Aeromedical Research Lab, Fort Rucker, AL. (DTIC No.)

<http://handle.dtic.mil/100.2/ADA405112>

Abstract: The data from two separate studies were combined in order to statistically compare the efficacy of the wakefulness-promoting substance modafinil to a 2 hours nap for sustaining cognitive skill and psychological mood in helicopter pilots who have been deprived of sleep (other than the nap). Performance data from the Multiattribute Task Battery (MATB) and mood data from the Profile of Mood States (POMS) were analyzed for this comparison. Eighteen subjects' data from the Napping study were merged with six subjects' data from the Modafinil study (the data were collected at similar testing times). Baseline-adjusted difference scores were analyzed. A three-way mixed factorial analysis of variance (ANOVA) was used with one grouping factor (Modafinil study versus Napping study) and two repeated-measures factors -- Condition (Treatment or No Treatment) and Time (specific to each test). The two countermeasures were effective in combating the usual decline in cognitive performance and mood during sleep deprivation, but they were not comparable. It appears that modafinil was superior to naps in maintaining alertness. The subjective mood data indicated that both countermeasures were successful at decreasing fatigue and confusion, and increasing vigor when compared to no intervention at all. However, when comparing modafinil and a nap, modafinil maintained a higher level of vigor and a lower level of fatigue than the nap, particularly in the early morning hours when the circadian dip in alertness is most problematic. The performance data supported the subjective mood findings by showing that, while both strategies attenuated performance losses during sustained wakefulness, modafinil was more efficacious than a nap. This was especially true of reaction time and errors of omission. As with subjective mood, modafinil's superiority was particularly evident in the early morning hours.

Cardello, A. V., Schutz, H. G., Winterhalter, C. (2002). *Development and Application of New Psychophysical Methods for the Characterization of the Handfeel and Comfort Properties of Military Clothing Fabrics, Report No. NATICK/TR-02/022*. Army Soldier and Biological Chemical Command, Natick, MA. (DTIC No. ADA405383)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: The analysis of fabric characteristics that contribute to military clothing comfort was addressed in a series of studies. Trained panel sensory descriptive data on 13 military fabrics were obtained using a standardized handfeel evaluation method. A labeled magnitude scale of comfort was developed from consumer magnitude estimates of the semantic meaning of 26 verbal phrases denoting different levels of comfort/discomfort. This scale was used by 36 consumers to rate the handfeel comfort of the 13 test fabrics. The descriptive sensory data and comfort data were then combined with Kawabata data obtained on a subset of the test fabrics and the data were analyzed using principal components analysis. Multiple regression analyses were performed on the component scores to predict consumer comfort from the sensory and instrumental data. The results showed a high degree of predictability of comfort responses from a combination of sensory and Kawabata parameters. The analysis of fabric characteristics that contribute to military clothing comfort was addressed in a series of studies. Trained panel sensory descriptive data on 13 military fabrics were obtained using a standardized handfeel

evaluation method. A labeled magnitude scale of comfort was developed from consumer magnitude estimates of the semantic meaning of 26 verbal phrases denoting different levels of comfort/discomfort. This scale was used by 36 consumers to rate the handfeel comfort of the 13 test fabrics. The descriptive sensory data and comfort data were then combined with Kawabata data obtained on a subset of the test fabrics and the data were analyzed using principal components analysis. Multiple regression analyses were performed on the component scores to predict consumer comfort from the sensory and instrumental data. The results showed a high degree of predictability of comfort responses from a combination of sensory and Kawabata parameters.

Chaturvedi, A. K., Smith, D. R., Soper, J. W., Canfield, D. V., Whinnery, J. E. (2002). *Characteristics and Toxicological Processing of Postmortem Pilot Specimens from Fatal Civil Aviation Accidents, Report No. DOT/FAA/AM-02/14*. Federal Aviation Administration, Civil Aeromedical Institute, Oklahoma City, OK. (DTIC No. ADA405378)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: Autopsied biological samples from civil aviation accident pilot fatalities are submitted to the Civil Aerospace Medical Institute (CAMI) for toxicological evaluation. However, such evaluation is dependent upon types and amounts of submitted samples, and obtaining suitable samples is governed by the nature of an accident. Characteristics of those samples and associated toxicological processing have not been well documented in the literature. Therefore, the CAMI Toxicology Database was searched for these aspects. CAMI received samples from the pilot fatalities (CAMI cases) of approximately 80% of the 1990-2000 aviation accidents reported by the National Transportation Safety Board. Accidents and cases during June-September were higher than the other months, and more than half of the received cases had multiple samples in sufficient amounts. For example, out of 1,891 cases processed for the 1996-2000 accidents, 1,211 had at least adequate amounts of blood, urine, and/or vitreous humor; 324 had inadequate amounts of blood and urine; and 356 had no blood or urine. Muscle, liver, lung, and/or kidney samples were submitted in 90% of the cases, while cerebrospinal fluids were submitted in only 8% of the cases. The toxicologically preferred samples, blood and urine, were available in 78% and 56% of the 1,891 cases, respectively. Out of 51 cases containing only one sample type, 46 had muscle and the remaining 5 had other sample types. Samples were primarily analyzed for combustion gases, alcohol/volatiles, and drugs. Generally, the presence of analyses is demonstrated in at least 2 different sample types by using 2 different analytical techniques for reporting a particular case as 'positive'. An effective quality-assurance/quality-control is maintained throughout the process. In the majority of the aviation accidents, sufficient amounts and types of biological samples were submitted for toxicological evaluation.

Cruz, C. E., Boquet, A., Detwiler, C., Nesthus, T. E. (2002). *A Laboratory Comparison of Clockwise and Counter-Clockwise Rapidly Rotating Shift Schedules, Part II: Performance, Report No. DOT/FAA/AM-02/13*. Federal Aviation Administration, Civil Aeromedical Institute, Oklahoma City, OK. (DTIC No. ADA405385)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: Many Air Traffic Control Specialists (ATCSs) work a relatively unique counter-clockwise, rapidly rotating shift schedule. Although arguments against these kinds of schedules are

prevalent in the literature, few studies have examined rotating shifts such as those seen with ATCSs. The present study directly compared clockwise and counter-clockwise rapidly rotating shiftwork schedules on measures of complex task performance from the Multiple Task Performance Battery (MTPB) and vigilance from the Bakan Vigilance Task. Participants (n = 28) worked day shifts for the first week of the study (0800-1600), followed by two weeks of either a clockwise (n = 14) or counter-clockwise (n = 14) shiftwork schedule. Participants completed three 1.5 hours sessions on the MTPB on each shift following the first day of training. Each session contained low, medium, and high workload periods, as well as active- and passive-task components. In addition, participants completed a .5 hours Bakan Vigilance Test at the beginning and end of each shift. There were no group differences in the overall or passive task composite scores for the MTPB. Instead, a shift by session interaction, $F(8, 19) = 5.2, p = .001$, indicated that performance was maintained across the afternoon shifts, was lower at the end of the early morning shifts, but fell by a much greater margin at the end of the midnight shift. Results for the active task composite scores indicated a 3-way interaction between week, shift, and rotation condition, $F(4, 23) = 4.7, p = .006$. This complex relationship indicated that performance was consistently higher in the counter-clockwise rotation and was less variable across shifts than in the clockwise rotation. Results of the Bakan Vigilance Task revealed a significant Rotation Condition by Shift interaction, $F(4, 23) = 6.2, p = .001$.

Donahoo, C., Gorman, M., Kancler, D., Quill, L., Revels, A. R. (2002). *Point of Maintenance Usability Study Final Report (Spiral 1 Usability Test, Spiral 3 Synthetic Usability Test, and Spiral 3 Field Usability Test)*. University of Dayton Research Institute, Dayton, OH. (DTIC No. ADA405542)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: The goal of the Point of Maintenance (P-O-Mx) program is to demonstrate timely, accurate, and effective data collection, and logistics operations processing to meet the maintainer's needs at the point of origin. As part of the P-O-Mx efforts, the Air Force Research Laboratory, Logistics Readiness Branch (AFRL/ HESR) funded a series of Human Factors usability tests for the purpose of evaluating the maintenance hardware devices to be used at the Point of Maintenance. Three usability tests were conducted: Spiral 1 Usability Test, Spiral 3 Synthetic Usability Test, and Spiral 3 Field Usability Test. The purpose of the Spiral 1 testing was to evaluate various hardware platforms for their potential usability on the flightline. The Spiral 1 Usability Test compared 5 computing systems for their usability for opening work orders from the aircraft location. The overall purpose of the Spiral 3 testing (both the synthetic and field tests) was to evaluate the use of potential P-O-Mx target platforms for presenting technical data on the flightline. The Spiral 3 Synthetic Usability Test compared 3 computing systems, evaluating their usability for viewing technical manuals and job guides on the flightline. All testing was conducted at the 16th SOW, Hurlburt Field AFB, FL. This final report documents test results and acknowledges technician's preference for small, lightweight devices to perform flightline tasks. In addition, features such as touch screen, voice recognition, and screen quality are major considerations for future selection of hardware platforms to be used at the Point of Maintenance.

Hah, S. (2002). *Coordination Between Airway Facilities Specialists and Air Traffic Personnel, Report No. DOT/FAA/CT-TN02/07*. Federal Aviation Administration Technical Center, Atlantic City, NJ. (DTIC No. ADA404990)

<http://handle.dtic.mil/100.2/ADA404990>

Abstract: Airway Facilities (AF) is responsible for providing services and conducting operations that deliver the highest possible levels of National Airspace System (NAS) safety and efficiency. To accomplish this, AF specialists perform maintenance tasks for the NAS. This requires coordination between AF and various organizations including AT. Maintenance Control Center (MCC) specialists have been the focal point of coordination in AF, and AT supervisors are responsible for coordination in AT. AF specialists have been coordinating with AT successfully in the past. However, there has been no empirical research on this important coordination. This report presents the results of the empirical study on coordination. The Human Factors Group (ACB-220) surveyed MCC specialists and AT supervisors about their experience and opinions on coordination. Based on 95 AF and 179 AT respondents, we present recommendations for improving current coordination. The most critical recommendations are to facilitate mutual understanding between AF and AT and to redesign information-related aspects of coordination between them.

LeDuc, P. A., Reardon, M. J., Persson, J. L., Gallagher, S. M., Dunkin, S. (2002). *Heat Stress Evaluation of Air Warrior Block I MOPPO and MOPP4 Ensembles With and Without Microclimate Cooling, Report No. USAARL-2002-19.* Army Aeromedical Research Laboratory, Fort Rucker, AL. (DTIC No. ADA405658)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: The current study evaluated the feasibility of a 5-hour flight in MOPP4 with environmental conditions of 100 F and 50% relative humidity. Eight volunteer pilots participated in a within subject, repeated measures design. The test conditions included 70 F without nuclear, biological and chemical (NBC) gear (Cool Standard (CS)), 70 F with NBC gear (Cool MOPP (CM)), and 100 F with NBC gear and microclimate cooling (Hot MOPP (HM)). The test sessions consisted of an initial 20-minute warm up, two flight sorties and an intervening break (without NBC gear removal). Physiological parameters, flight performance, mood, and reaction time were measured during the test sessions. The peak mean core temperature did not exceed 99.8 F. Mean core temperature in the HM condition was about 0.4 F higher than CM and about 0.6 F higher than CS. The absolute increase was quite modest compared to the approved upper limit of 102.5 F. Mean percent dehydration was greatest for the HM condition despite the use of the cooling vest. However, the fluid deficit of approximately 300 cc per hour was a totally compensable rate. The results indicated that the cooling vest was effective in preventing heat stress during an extended rotary-wing mission in a hot, humid condition.

Lickteig, C. W., Sanders, W. R., Shadrick, S. B., Lussier, J. W., Holt, B. J. (2002). *Human-System Integration for Future Command and Control: Identifying Research Issues and Approaches.* Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA. (DTIC No. ADA405044)

<http://handle.dtic.mil/100.2/ADA405044>

Abstract: The Army's transformation to Future Combat Systems (FCS) poses an unprecedented alliance of humans and machines, particularly for Command and Control (C). Creating a human-machine alliance that actually improves command and control is a severe challenge in human-system integration for FCS. First, this report selectively identifies four overarching research issues for command and control: Allocation, Autonomy, Authority, and Awareness. Second, two complementary research approaches, mid-scale and small-

scale transformation environments, for investigating human-system integration issues are described. An example of a mid-scale transformation environment from the FCS C2 program is provided with selected results from Experiment 1 on human-system integration. The value added by small-scale transformation environments, however, is needed to maintain a human-centric focus and provide two unique roles: a breeding ground for innovation to larger environments, and proving ground for issues from larger environments. An example of an emerging small-scale transformation environment directed at FCS concept exploration and training is provided. The core technical, operational and human performance assets currently available for this small-scale transformation environment are described. The report's intended audience includes any members of the user, researcher, and developer community who might benefit from, or provide benefit to, the Army's ongoing FCS research program.

Meisenhelder, H. M. (2002). *Collective Efficacy and Group Functioning: The Effect of Performance Feedback on Efficacy Assessments, Goal Setting, Task Persistence and Overall Performance*, Report No. AFIT-CI02-167. Air Force Institute of Technology, Wright-Patterson AFB, OH. (DTIC No. ADA405062)

<http://handle.dtic.mil/100.2/ADA405075>

Abstract: This study examined the effect of collective efficacy on group functioning across a series of cognitive tasks. Specifically, this experiment used performance feedback to manipulate efficacy levels in order to investigate the effect of efficacy on group goal setting, task persistence, and overall performance. The effect of experimental manipulations and sequence were investigated at both the task specific (prediction for current task) and general efficacy (estimates of general competence on such tasks) levels. Finally, group behavior was examined across a series of tasks in order to investigate the dynamic properties of collective efficacy.

Messinese, N. J., Sheldon, H. K., Lilly, C. M., Sonna, L. A. (2002). *Environmental Medicine Genome Bank (EMGB): Annual Report and Project Summary*, Report No. USARIEM-TN-T-02-19. Army Research Institute of Environmental Medicine, Thermal and Mountain Medicine Division, Natick, MA. (DTIC No. ADA405492)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: The Environmental Medicine Genome Bank (EMGB) project is an ongoing effort to identify and characterize genes relevant to environmental illnesses and to human physical performance. To accomplish this, the EMGB banks DNA samples from human volunteers who have participated in environmental and human performance studies or material obtained under approved Brigham and Women's Hospital protocols that would otherwise have been discarded. The EMGB maintains a registry of this phenotypic information. The EMGB can be used to identify polymorphisms in genes that are potentially of interest to environmental medicine and to obtain an estimate of the frequency of these polymorphisms in young, healthy U. S. adults because of the ethnically diverse and geographically dispersed backgrounds of the donors. Additionally, this resource also serves as a valuable source of control material for genetic studies of human diseases, such as asthma. The project is performed as part of a cooperative research and development agreement (CRDA) with the Division of Pulmonary and Critical Care Medicine at Brigham and Women's Hospital. This report provides updated information about the samples currently stored in the EMGB. It is intended as a reference

document for researchers who wish to make use of this resource, and fulfills the annual reporting requirement of CRDA number DAMD 17-00-0017.

Pounds, J., Isaac, A. (2002). *Development of an FAA-EUROCONTROL Technique for the Analysis of Human Error in ATM, Report No. DOT/FAA/AM-02/12*. Federal Aviation Administration, Civil Aeromedical Institute, Oklahoma City, OK. (DTIC No. ADA405379)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: Human error has been identified as a dominant risk factor in safety-oriented industries such as air traffic control (ATC). However, little is known about the factors leading to human errors in current air traffic management (ATM) systems. The first step toward prevention of human error is to develop an understanding of where it occurs in existing systems and of the system variables which contribute to its occurrence. This paper reports on the project to harmonize the Human Factors Analysis and Classification System (HFACS) and the Human Error Reduction in ATM (HERA) technique. Two groups of air traffic control subject-matter experts (SMEs) participated. The first group analyzed incident cases using each technique and identified the useful concepts from each technique for these cases. The second group evaluated the concepts identified by the first group. Based on these activities, the techniques were deemed to be compatible and harmonization proceeded. Elements from both techniques were retained and many were elaborated based on the SMEs' feedback. The integrated approach, called JANUS, is currently undergoing beta testing by seven European nations and the U.S. Federal Aviation Administration.

Schor, C. M., Lunn, R. J., Task, H. L. (1996). *Effects of Overlay Symbology in Night Vision Goggles on Accommodation and Attention Shift Reaction Time, Report No. AL/CF-WP-TR-1995-0211*. Armstrong Laboratory, Wright-Patterson AFB, OH. (DTIC No. ADA405485)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: Binocular night vision goggles that have a monocular symbology overlay provide potential conflicts between perceived symbology distance and optical vergence cues for accommodation. Accommodative response was measured in subjects who perceived symbology nearer than the background to determine if accommodation could respond to the optical stimulus and override the perceptual cues. Symbology was presented to the right eye under two conditions (clear and blurred to 20/50 resolution) and the background was presented binocularly with and without added speckle noise that is typical of the NVG at low light levels. On average, subjects accommodated by less than 0.1 diopters (D) to all 4 of the stimulus combinations even though the perceived proximal depth difference between background and symbology was 10 times greater. No perceptive blur resulted from this small change in accommodation because it is well below the depth of focus of the human eye. A control experiment illustrated that an accommodative response, at least as small as 0.25 D, could easily be stimulated optically and detected by the experimental apparatus. In a final experiment, the duration required to shift attention away from the background to a peripheral symbol, acquire critical information, and return attention to the background was 0.69 s which included saccade latency and scan time of the symbol. These results indicate that small changes in accommodation that occur when pilots shift attention from background to symbology do not produce perceived blur of the symbology or the background and thereby do not impair performance.

Sonna, L. A., Sharp, M. A., Knapik, J. J., Cullivan, M., Angel, K. C., Patton, J. F., Lilly, C. M. (2001). *Angiotensin-Converting Enzyme Genotype and Physical Performance During U.S. Army Basic Training, Report No. USARIEM-M-01-21*. Army Research Institute of Environmental Medicine, Natick, MA. (DTIC No. ADA405469)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to STINET and search for the documents DTIC No.

Abstract: Prior studies have suggested that angiotensin I-converting enzyme (ACE) genotype correlates with superior physical performance in highly selected populations. This study assessed whether such an association exists in a heterogeneous population. Using polymerase chain reaction techniques, we determined the ACE genotypes (insertion/insertion, deletion/insertion, or deletion/deletion) of 62 male and 85 female US Army recruits. Before and after 8 wk of basic training, we determined peak oxygen uptake and performance on the Army Physical Fitness Test (APFT), which includes standardized measures of muscular endurance (sit-ups, push-ups) and a 2-mile run. Subjects of different ACE genotypes had similar peak oxygen uptakes and APFT scores, both before and after training. Subjects with genotype II had higher APFT scores than others, but the differences were not statistically significant. Furthermore, no ACE genotype group had a performance advantage in analyses that adjusted for baseline fitness. We conclude that ACE genotype does not have a strong effect on aerobic power or muscular endurance in healthy, young American adults drawn from an ethnically and geographically diverse population.

Turner, S. L. (2002). *Coupling Retinal Scanning Displays to the Human Visual System: Visual System Response and Engineering Considerations*. Air Force Institute of Technology, Wright-Patterson AFB, OH. (DTIC No. ADA405084)

<http://handle.dtic.mil/100.2/ADA405084>

Abstract: A retinal scanning display (RSD) is a visual display that presents an image to an observer via a modulated beam of light that is directed through the eye's pupil and rapidly scanned in a raster-like pattern across the retina. As compared to conventional displays that create a real image for viewing, the RSD induces a virtual image only in the mind of the observer. The spatio-temporal characteristics of the RSD retinal stimulation are unique, as are the optical geometries of the small Maxwellian view exit pupil and the entry of image forming rays into the eye. This body of research examined the retinal and opto-physiological responses of the human visual system to RSD stimuli and derived human interface and engineering concepts founded upon unique visual system responses. The retinal response to RSD stimuli was found to be consistent with accepted theories of human visual response. The physiological response of the eye pupil to the Maxwellian view RSD was found to be different from natural view pupillary response models in literature. A broad set of RSD pupillary response models was empirically derived from experimental data. An examination of the RSD interface concept of arrayed small Maxwellian view exit pupils was conducted. The arrayed exit pupil concept was found to be a viable solution to some RSD interfacing challenges. Fundamental perceptual characteristics of arrayed exit pupil RSD's were qualified and basic human observer preferences for arrayed pupil parameters was modeled. Human factors engineering guidelines for implementation of arrayed exit pupil displays were derived.

Walters, B. A., Huber, S., French, J., Barnes, M. J. (2002). *Using Simulation Models to Analyze the Effects of Crew Size and Crew Fatigue on the Control of Tactical Unmanned Aerial Vehicles (TUAVs)*. Micro Analysis and Design, Boulder, CO. (DTIC No. ADA405012)

<http://handle.dtic.mil/100.2/ADA405012>

Abstract: This report describes a study conducted by Micro Analysis and Design, Inc., for the U.S. Army Research Laboratory (ARL). One area of research examined by ARL was the staffing required to operate tactical unmanned aerial vehicles (TUAVs). The primary objective of the study was to use simulation modeling to analyze how fatigue, crew size, and rotation schedule affect operator workload and performance during the control of a TUAV. Computer simulation models were developed with the Micro Saint Discrete Event Simulation software to simulate the tasks that operators perform when controlling a TUAV. These models, which contain system-specific attributes of the Shadow 200 TUAV, included a fatigue function to predict performance effects for day and night missions. Subject matter experts (SMEs) provided the list of tasks involved in controlling a TUAV (during normal operations and emergencies), the order of these tasks, and the visual, auditory, cognitive, and psychomotor workload values associated with each task. Twelve different crew configurations were examined for the tactical operations center (TOC) and the launch and recovery station (LRS), which ranged in size from 8 to 15 crew members. The conclusions from executing the models and interviewing SMEs (during 12- and 18-hour missions) indicate that reducing the number of aerial vehicle operators (AVOs) and mission payload operators (MPOs) in the TOC can result in more aerial vehicle mishaps during emergencies, increased search time, and a decreased number of targets detected. For example, compared to six AVOs or MPOs in the TOC, the addition of two crew members resulted in only slight performance gains of a 6% increase in target detection and a 4% decrease in target search time. However, when the members of the crew were reduced to four AVOs or MPOs in the TOC, there was substantial performance loss (20% decrease in target detection and a 15% increase in target search time).

Witmer, B. G., Jerome, C. (2002). *Modeling Human Performance: Effects of Personal Traits and Transitory States, Report No. ARI-RN-2002-12*. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA. (DTIC No. ADA405297)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: In a recently published report, Gillis, Hursh, Guest, Sweetman, & Ehrlich (2000) reported the development of a Human Performance Model (HPM) for representing realistic behavior by Computer Generated Forces (CGF) Command Entities (CEs). The model as described by Gillis et al. (2000) includes the effects of experience, stress, sleep, and circadian rhythm on the decision-making performance of CEs, but does not completely describe some other variables (e.g., the effects of intelligence, aggressiveness, and personality type) represented in the implemented version of the model. This report supplements the Gillis et al. (2000) report by fully documenting the implemented RPM to include the effects of these additional variables. This documentation includes flow charts that show how each variable is calculated and how the model components relate to each other. Separate model flow charts are provided for positive, negative, and neutral personality types, along with the equations for computing all model variables. Model deficiencies are identified and improvements are suggested, including better representation of emotions, and inclusion of attention, situational awareness, learning, and leader goals and expectations. Finally a conceptual model showing how these parameters interrelate is presented.

Witmer, B. G.; Jerome, C.; Goldberg, S. L. (2002). *Modeling Human Performance: Effects of Personal Traits and Transitory States, Report No. ARI-RN02002-12*. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA. (DTIC No. ADA405062)

<http://handle.dtic.mil/100.2/ADA405062>

Abstract: In a recently published report, Gillis, Hursh, Guest, Sweetman, & Ehrlich (2000) reported the development of a Human Performance Model (HPM) for representing realistic behavior by Computer Generated Forces (CGF) Command Entities (CEs). The model as described by Gillis et al. (2000) includes the effects of experience, stress, sleep, and circadian rhythm on the decision-making performance of CEs, but does not completely describe some over variables (e.g., the effects of intelligence, aggressiveness, and personality type) represented in the implemented version of the model. This report supplements the Gillis et al. (2000) report by fully documenting the implemented HPM to include the effects of these additional variables. This documentation includes flow charts that show how each variable is calculated and how the model components relate to each other. Separate model flow charts are provided for positive, negative, and neutral personality types, along with the equations for computing all model variables. Model deficiencies are identified and improvements are suggested, including better representation of emotions, and inclusion of attention, situational awareness, learning, and leader goals and expectations. Finally, a conceptual model showing how these parameters interrelate is presented.

Zehner, G. F., Hudson, J. A. (2002). *Body Size Accommodation in USAF Aircraft*. Sytronics Inc., Dayton, OH. (DTIC No. ADA405598)

Not Downloadable from DTIC. Must order hard copy. To order hard copy, please go to [STINET](#) and search for the documents DTIC No.

Abstract: The USAF is considering relaxing body size entrance requirements for Undergraduate Pilot Training (AFI 48-123) to provide equal Opportunity for both genders. The research described here was undertaken from 1997 through 2000 to determine the smallest and largest people that can safely and efficiently operate each current USAF aircraft.