

SubTAG Report

TAG 63, Tempe, AZ May 2010

SubTAG Name: Human Factors in Training

Number of members present: 27

Organizations represented:

DDL Omni; Naval Aerospace Medical Research Laboratory; Army Research Institute; Office of Naval Research; NAVAIR; Air Force Research Laboratory; Sandia National Labs; NAVEODTECHDIV; NASA; Canadian National Research Council; Naval Surface Warfare Center; Society for Simulation in Healthcare; SA Technologies; Army Research Institute – JFCOM; Naval Research Laboratory; USAF Academy; US Army Combat and Automotive Systems; SPAWAR Systems Center Pacific; Human Factors and Ergonomic Society

Agenda Covered:

1500-1600 Human Factors Issues in Training for UAV Operators

Bob Nullmeyer, Air Force Research Laboratory. Lessons Learned from Air Force Predator Training and Operations.

David Keller, Naval Surface Warfare Center. Can System-Wide Automation Aids be Trained Out in UAV Operators?

John Stewart, US Army Research Institute. US Army UAS Training Issues: Case of the RQ-B7 Shadow

1600-1700 Papers on Human Factors Issues in Training

Chris Forsythe, Sandia National Laboratories. Enhanced Training Effectiveness Using Automated Student Assessment

Wallace Wulfeck, Space and Naval Warfare Systems Center. Retention and Re-training of Complex Skill

Lisa Scott Holt, Lumir Research Institute. FoCuS Windows: Evaluating the Impact of Dynamic Fidelity on Performance

Abstracts:

Bob Nullmeyer: Lessons Learned from Air Force Predator Training and Operations

We analyzed the human factors cited in Air Force Safety Center Predator Class A, B, and C mishap reports and hazardous air traffic reports (HATRs) that occurred from the introduction of Predators into the operational Air Force inventory in 1997 through the end of fiscal year 2009. Substantial changes over time were observed in annual mishap counts, annual mishap rates, and causal human factors. Mishap counts steadily increased, as did Predator flying hours. Mishap rates dropped considerably compared to early years, but appear to have leveled out at about 6 per 100,000 flying hours over the past few years compared to about 1.5 service-wide. Early mishap reports typically cited mechanical problems and operator station design issues. Mishap reports from about 2004-2006 often cited shortfalls in operator skill and knowledge to include checklist error, task prioritization, lack of training

for task attempted, inadequate system knowledge, channelized attention, and crew coordination. Both mechanical problems and crew error were much less frequently cited in the most recent three years. Approximately 85% of recent Class A mishap reports cited causal human factors, but the majority of these factors reflected organizational issues, especially inadequate guidance and publications, rather than crew error. These trends span a period characterized by a rapidly growing UAS crew force and highlight the need to revisit both individual and team Predator training objectives and consider alternative training interventions. The trends suggest that many older problems appear to be decreasing, but new challenges are emerging including how to operate safely in shared airspace and staying current with changing tactics, techniques, and procedures.

David Keller: Can System-Wide Trust in Multiple Automation Aids be Trained Out in UAV Operators?

Given the complex operations of many UAV platforms, operators are often aided by multiple automation aids to ensure successful missions. When dealing with multiple automation aids, research has demonstrated that operators may exhibit a system-wide trust strategy (Keller & Rice, 2010). In other words operators may merge their trust across the various automation aids. System-wide trust suggests that the performance of one aid will influence how reliable operators perceive other aids to be (e.g. operators may treat highly reliable aids as less reliable when paired with less reliable aids). System-wide trust presents risks to the operation of UAVs in that an inappropriate level of mistrust in the automation aids could entail unnecessary monitoring and/or inappropriate overruling of perfectly good recommendations made by the automated aids. Several unsuccessful attempts have been made to mitigate system-wide trust. One example includes altering physical characteristics of automation components so that the aids appear to be more independent and separate from each other with the goal that operators may develop levels of trust independently for each of the automation aids. The next step in this line of research is to determine if some training technique can be developed that may teach operators how to independently determine the reliability level of each automation aid.

John Stewart: US Army UAS Training Issues: Case of the RQ-7B Shadow

In 2003, The U. S. Army transferred Proponency for Unmanned Aircraft Systems (UAS) from Military Intelligence (MI) to the Aviation (AVN) Branch. The UAS, once regarded as an intelligence data collection platform, is now a pilotless scout-reconnaissance aircraft with functionalities similar to a manned scout helicopter. Currently, the Army's most common UAS is the RQ-7B Shadow. UAS crews as well as battle staff must become familiar with this new role, which includes missions such as route/ zone reconnaissance, target designation, and target handoffs to armed helicopters. One consequence of the transition is that training lags behind organizational and technological changes. This should be evident at the schoolhouse, where institutional training takes place, and in the Brigade Combat Team (BCT), each of which has one RQ-7B Platoon. This lag produces training gaps, in that current training strategies may be more relevant to yesterday's than today's UAS operations. Likewise, knowledge of UAS assets and how to employ them may be outdated or lacking at all command levels, including BCT leadership. In order to pinpoint and document training shortfalls for the RQ-7B, a research effort was undertaken by ARI under sponsorship of the Training Capabilities Manager-UAS at Ft. Rucker, AL. This included: (a) structured interviews with trainer-mentors at the Joint Readiness Training Center (JRTC, Ft. Polk, LA) to tap perceptions of UAS crew performance at Brigade, Battalion, and Company levels; (b) analysis of RQ-7B programs of instruction (POI) for Ft. Huachuca, AZ, to determine the degree to which aeroscout reconnaissance and other AVN mission skills are taught and trained at the schoolhouse; (c) structured interviews with BCT principal officers (Brigade S2,S3, and AVN Officer) involved in planning and executing RQ-7B missions, and with senior members of UAS Platoons (Platoon Leader, Platoon Sergeant, Instructor-Operator), and (d) analyses of team-level human error accidents involving the RQ-7B. This

presentation reviews the findings of this research, much of it ongoing. Some representative findings were: (a) opportunities for realistic unit level practice were severely limited at home station; (b) performance criteria appropriate to the tactical AVN mission were not employed at JRTC; (c) POI analysis showed that schoolhouse training still had an MI emphasis.; (d) most mission-relevant skills were trained in the unit, and realistic unit level training did not take place until deployment of the BCT to theatre; (e) many RQ-7 accidents reflected team coordination problems. Based on preliminary findings, the presentation summarizes possible approaches for reducing those unit level training issues identified.

Summary: The take away lesson from this panel is that training is required for all personnel involved in UAV operations and that enhanced training should not be focused solely on the UAV operators. All personnel including those generating the taskings, mission planners, operators, and those receiving feeds from the vehicles will require additional training to achieve mission success.

Chris Forsythe: Enhanced Training Effectiveness Using Automated Student Assessment

Training simulators have become increasingly popular tools for instructing humans on performance in complex environments. However, the question of how to provide individualized and scenario-specific assessment and feedback to students remains largely an open question. In this work, we follow-up on previous evaluations of the Automated Expert Modeling and Automated Student Evaluation (AEMASE) system, which automatically assesses student performance based on observed examples of good and bad performance in a given domain. The current study provides an empirical evaluation of the enhanced training effectiveness achievable with this technology. In particular, we found that students given feedback via the AEMASE-based debrief tool performed significantly better than students given only instructor feedback.

Wallace Wulfeck: Retention and Re-training of Complex Skill

Maritime Patrol Anti-Submarine Warfare (ASW) tasks are incredibly complex, in that they involve extremely complicated judgment, planning, and decision making. These skills take a long time to train, and, like many complex skills, are subject to loss during periods of non-performance. We describe training and decision-aiding systems developed specifically to help counter the effects of long periods of non-performance of critical ASW skills during desert deployments. The Air Tactical ASW Proficiency (ATAP) program is a decision-aiding system and light-weight ASW analysis tool used by flight crews for tactical planning and analysis. In use, it assists crew members in analyzing complicated tactical tradeoffs among target characteristics, employment parameters for remote sensors, and environmental effects on sensor performance. PC-IMAT scenario-based training and the prototype ATAP module were integrated into a Maritime Patrol squadron proficiency program during their deployment to the Middle East and throughout the follow-on Inter-Deployment Readiness Cycle in preparation for subsequent deployment to the Western Pacific region. Performance results from simulator exercises, WING evaluations, and live at-sea exercises show substantial improvement in re-acquisition of warfighting skill.

Lisa Scott Holt: FoCuS Windows: Evaluating the Impact of Dynamic Fidelity on Performance

Varying levels of dynamic fidelity are used to support combat mission training. At one extreme are static simulators (no motion cues) and at the other are costly live-fly exercises (high dynamic fidelity). Dynamic simulators employing force-cueing devices (e.g., motion platforms, g-suits, motion seats) fall somewhere between. It is believed that increased dynamic fidelity in simulators will result in more effective training but the empirical evidence is lacking. Numerous studies have been conducted over the past few decades, but the conclusions are mixed and often contradictory, with each study employing different motion cueing devices, simulation platforms, evaluation tasks, and measures of effectiveness.

Both the tasks and objective performance measures used in these studies have been challenged, suggesting that they lack sensitivity to the effects of force cues.

More sensitive methodology is needed to evaluate the impact of dynamic fidelity on performance. Although there are established criteria to identify force cue-sensitive flight maneuvers, the maneuver is not the appropriate unit of analysis for detection of performance differences. There are specific windows of time within each maneuver where the force cues play an important role in the pilot's execution that result in quantitative, measureable performance differences. Building on the research progress that has been made (defining critical phases of maneuvers and dividing them into segments), we introduce a novel unit of analysis: the force cueing sensitivity (FoCuS) window. FoCuS windows not only divide maneuvers into meaningful segments, but also include associated objective measures quantifying the role of the force cues for each segment of performance. This paper describes the application of the FoCuS window methodology to evaluate the impact of a motion seat on pilot performance in AFRL Mesa's deployable tactical trainers. Preliminary performance results demonstrate the sensitivity of the method and its promise for future studies of dynamic fidelity in full-fidelity simulators.

Elections: n/a

Open action items: none

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