

Unmanned Systems Special Interest Group Session Summary

DoD HFE TAG-63, 3 May - 6 May, 2010, Tempe, AZ

The Tempe Mission Palms Hotel
60 East Fifth Street
Tempe, Arizona 85281
480-894-1400

The Unmanned Systems Group had 2 sessions, and was well attended (27 and 21 attendees). The presentations were well received, and there was a lively discussion after each speaker. Each primary speaker had about 25-30 minutes for their presentations and about 5-10 minutes for the Q&A. A draft charter was also circulated for comments by the chair, but had to be distributed by email (will be done when BAH sends the email list of attendees).

Notes from Unmanned System Interest Group

May 03, 2010

Chair: Ajoy Muralidhar

Air Force Predator Mishaps and Implications for Training – Bob Nullmeyer

Dr. Nullmeyer's presentation was directed at the implications of the increasing records of mishaps with AF predators and the issues with training. Very well received presentation, with a spirited discussion on the data collection methods and the interpretation. Implications for future were also discussed.

May 05, 2010

Chair: Ajoy Muralidhar

Logistical Support Challenges for Unmanned Systems – David Frye

Questions about spare parts, reliability.

Faith Chandler - Have you looked at JPL robots?

Cynthia Null explains how to design tracks for vehicles. Different surfaces require different tracks. Interchangeable tracks suggested.

Mixed Initiative Machine for Instructed Computing – Sylvain Bruni

Ajoy: Macros – did you do task analysis? Where did actions come from? From observing operators. Two strategies observed.

Null: Using tools requires additional work.

Bruni: no automated support currently used.

Null: categorization of what info needed – people assume new info better than old. E.g. car interiors should be quiet – noise is bad. But lose information about speed. Stay away from expensive cars. Information coming in from a different source.

711 HPW/HP research, Analysis, and Consultation for UAS – John Plaga

Bruni: MAC – operators will not be pilots, but supervisors. Require high automation. What is current state of art?

Plaga – problem of switching control.

Support for Unmanned Systems in US Public Law – Ajoy Muralidhar

Faith Chandler explains language in budget laws to AJ. The laws enable the agencies to spend the necessary funds. May vs. Shall.

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SCHEDULE

Monday May 03 Session 1000 – 1130

1000 – 1015 - Setup/Welcome

Ajoy Muralidhar

1015 - 1100 - Air Force Predator Mishaps and Implications for Training

Dr. Bob Nullmeyer

Operator Readiness Research Division

Human Effectiveness Directorate

711th Human Performance Wing (711 HPW/RHAS)

Abstract

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.

Bio

Dr. Bob Nullmeyer is a senior research psychologist in the Warfighter Readiness Research Division of the Human Effectiveness Directorate, 711th Human Performance Wing at Mesa, AZ. He has conducted research on training system evaluation, simulator training effectiveness, and training needs analysis. He extensively analyzed remotely piloted aircraft mishap and incident reports and generated training implications. He is currently managing a Small Business Innovative Research project with Crew Training International to develop and demonstrate several team training interventions for Predator crews at Creech AFB and working with the University of North Dakota to help establish a university UAS training center of excellence at Grand Forks. He earned a Ph.D. in Experimental Psychology from the University of New Mexico in 1979.

1100-1130 - Unmanned Systems Business Meeting

Ajoy Muralidhar, Chair

Wednesday May 05 1500-1700

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1500-1510 hrs –

Setup and Welcome

Ajoy Muralidhar

1510 - 1540 hrs

Logistics Support Challenges for EOD Unmanned Systems

David Frye

Logistics Management Specialist,
Navy Explosive Ordnance Disposal Technology Division,
2008 Stump Neck Rd, Indian Head MD 20640

Abstract

Supporting the unmanned systems required by the Joint Service EOD Operators to perform their mission is a challenge. Faced with the restrictions of limited budget and restricted manpower, Navy EOD Technology Division (NAVEODTECHDIV) is tasked with providing worldwide support while maintaining maximum operational availability. With system complexity, operational environment, similarity to commercial products, and configuration management major considerations, a real time adaptive solution was required. To meet these needs, a business model was developed in conjunction with a web based tracking system. This combination provides greater overall visibility, which allows for proactive responses to correct issues before they become problems.

Bio

Mr. David Frye is currently a Logistics Management Specialist at the Naval Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV) Logistics Branch. He is the Lead Logistician and Subject Matter Expert for the Joint Service Explosive Ordnance Disposal (JSEOD) Man Transportable Robotic System (MTRS). Prior to joining the Logistics Branch he served in the United States Navy as a Senior Chief Petty Officer. In that capacity, he deployed to Al Taqaddum, Iraq in direct support of establishing the initial repair and maintenance capability for the U.S. Marine Corps' EOD robotics systems deployed there. He is currently responsible for ensuring the operational availability of over 2,000 MTRS platforms fielded in two theaters of operation as well as to JSEOD technicians throughout the world. Through failure data analysis, trend development and cost estimate information provided to engineers, contracting officer's representatives, and project managers, he ensures the latest and most accurate data is available to make real-time, proactive decisions. Mr. Frye has been instrumental in maintaining the operational availability of deployed systems above 95% for four years.

May 05, 1540 - 1610hrs

Mixed-Initiative Machine for Instructed Computing (MIMIC)

Sylvain Bruni

Aptima, Inc.

Work sponsored by the Office of Naval Research

Unmanned Aerial Vehicles (UAVs) have transitioned from a curiosity on the battlefield to a core capability for intelligence. However, the intelligence that drives tactical decision making and flight control remains uncoded and firmly lodged in the heads of expert operators. To address this challenge, Aptima and the Cognitive Engineering Research Institute (CERI) at Arizona State

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University are developing machine learning algorithms that learn from expert Intelligence, Surveillance and Reconnaissance (ISR) UAV operators during mission planning, and use what is learned to aid subsequent mission planners. The prototype capability is called MIMIC: Mixed-Initiative Machine for Instructed Computing.

The MIMIC system integrates machine learning algorithms based on Markov Decision Processes (MDPs) and Bayesian inference to train a model of the human operator's strategies. This strategy model supports human operators in a continuously adjustable manner through a unique user interface to a UAV mission simulator.

MIMIC enables UAV planning systems to learn human planning strategies, recognize them during mission planning, and assist the human in ways that accelerate and improve plans. In addition, MIMIC facilitates a concept of operations for multi-UAV control. This will aid future multi-UAV operators and mission managers, who must quickly learn the space of strategies available to them.

The MIMIC project represents a step toward increasing levels of UAV autonomy allowing for multi-UAV control by single operators. In this presentation, we report first on the function and form of the MIMIC machine learning algorithm, which seeks to capture the goals, strategies, and actions of UAV operators during multi-UAV mission planning tasks.

The ongoing, MIMIC research will increase our understanding of how planners craft complex missions for unmanned vehicles, develop algorithms that infer human goals and actions accurately, and apply these algorithms to support planners with a new generation of intelligent, interactive tools.

Bio

Sylvain Bruni is a Human Systems Engineer at Aptima, Inc., where he provides expertise in human-automation interaction, interface design, and the statistical design of experiment. His research targets the design of computer-supported interactive training systems and the conceptualization of human-automation collaboration interfaces for multi-vehicle command and control. Prior to joining Aptima, Mr. Bruni conducted research at the Massachusetts Institute of Technology (MIT), focusing on designing and testing collaborative decision-support systems, specifically in military environments. His work further included the detection and classification of operators' cognitive strategies as a means to assess interface and system design. Mr. Bruni's background also includes investigating the effects of information display and levels of automation on system performance, as well as defining evaluation tools and methodologies for complex human-computer systems. While at MIT, he managed the Mobile Advanced Command and Control Station (MACCS) project under funding from the Office of Naval Research. MACCS is a commercial vehicle outfitted with a fully autonomous replica of a US Navy multi-modal workstation. MACCS is used as a mobile experimental testbed, which allows researchers to travel with their equipment where subject-matter experts and military personnel are located, with minimal schedule disruption and at a fraction of typical experimental costs. Mr. Bruni holds a S.M. in Aeronautics and Astronautics from MIT and a Diplôme d'Ingénieur from the Ecole Supérieure d'Electricité (Supélec, France). He is currently a doctoral candidate in Aeronautics and Astronautics at MIT's Humans and Automation Laboratory. He is a member of the Human Factors and Ergonomics Society, the IEEE Systems, Man, and Cybernetics Society, the Association for Computing Machinery, the Usability Professionals Association, the American Society of Naval Engineers, the American Institute of Aeronautics and Astronautics, the Society for Automotive Engineers, and the Department of Defense Human Factors Engineering Technical Advisory Group.

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May 05, 1610-1640 hrs

711th Human Performance Wing Research, Analysis, and Consultation for UAS

John A. Plaga
Senior Research Aerospace Engineer
Lead for HSI Transition
Human Performance Integration Directorate
711th Human Performance Wing

Abstract

The Human Performance Integration Directorate (HP) of the 711th Human Performance Wing, Air Force Research Laboratory, has been conducting research, performing analyses, and providing consultation for the UAS community for several years. Early efforts included conducting Human Factors Analysis on Predator mishaps, studying the effects of shift work and sustained operations on Predator crews, and development of Medical Standards for UAS pilots. Recent efforts now include crew station evaluations, workload modeling of UAS maintenance personnel, pilots and sensor operators and analysis of Multi-Aircraft Control systems. As the UAS arena continues to expand, HP is working within the 711th HSW, with the Predator/Reaper Program Office, and with the individual operational units to ensure that Human Factors Engineering and Human Systems Integration are effectively being implemented in the Acquisition and Sustainment of UAS's across the Air Force. This briefing will present an overview of those programs, the collaboration with the Predator/Reaper Systems Group, and future plans.

May 05, 1640-1650 hrs

Unmanned Systems Support in US Public Law
Informational Presentation

May 05, 1650-1700 hrs

Wrap up, Closing

Unmanned Systems Charter Draft for comments
Ajoy Muralidhar, Chair