



Air Force Research Laboratory



Uninhabited Air Vehicle Behavioral Research and Training System Development

System Development

The role of Uninhabited Air Vehicles (UAVs) in Air Force operations is expanding. This expansion is accompanied by an increased emphasis on training UAV operators. As new concepts in UAV control and operator interface are developed, there will inevitably be new challenges in operator training.

AFRL/HEA is conducting both basic and applied behavioral research that will inform future Air Force choices regarding the development of a UAV operator training pipeline and the impact of new training technology on operational readiness. We are also designing and building new prototype UAV training systems. These systems will not only help train Predator UAV crews, but will also give us added insight into the future of UAV training.

Currently there are three major AFRL/HEA UAV projects. The UCAV Training Research Testbed Project is a basic research project examining various facets of UAV/UCAV operation. The Predator Air Vehicle Operator Flying Experience Study is a large behavioral research study addressing the relevance of manned-cockpit flying experience to UAV Air Vehicle Operator training. The Predator Multi-Task Trainer is a low-cost simulation system that AFRL/HEA is developing for training Predator Air Vehicle Operators and Payload Operators.

UCAV Training Research Testbed

The goals of the UCAV Training Research Testbed are threefold: (1) to provide a medium-fidelity simulation environment to be used by Air Force laboratories and universities for basic behavioral research on UAV/UCAV operation; (2) to design synthetic

research tasks that tap key components of controlling air vehicles from a ground station; and (3) to conduct basic research on cognitive aspects of UAV/UCAV operator skill, both for existing UAVs and possible future UCAV designs.

The simulation environment is a PC-based system that initially replicates most of the functions of the Predator Air Vehicle Operator and Payload Operator stations, but will be



Uninhabited Combat Air Vehicle training research testbed

expanded to incorporate future experimental interface designs. It will be used to study UAV skill analysis and training issues both for existing and possible future UAV/UCAVs. The simulation uses inexpensive off-the-shelf equipment for controls and

displays. The synthetic research tasks are relatively short-duration abstract tasks that nevertheless accurately reflect the cognitive sources of difficulty involved in operating UAVs. The design of the initial synthetic tasks was based on structured interviews with experienced Predator operators. Software implementations of these tasks will be distributed to DOD laboratories and universities to support research on UAV/UCAV training and interface design issues. The initial basic research studies will test the idea that prior airborne-cockpit flight experience develops air sense that cannot be obtained from ground-only training of the predator AVO. The Air Force Office of Scientific Research funds this project.

Predator AVO Flying Experience Study

A recent survey of Predator AVOs conducted by AFRL indicated that some airborne-cockpit flight experience is necessary to operate the Predator proficiently. Currently, Predator Air Vehicle Operators (AVOs) are chosen from among rated pilots of other military aircraft. However, removing experienced pilots from their primary aircraft exacerbates existing pilot shortages. Thus, AFRL (HEA & HEJ) has responded to inquiries from Air Combat Command with a proposal to explore alternative approaches for the selection and training of Predator AVOs. This amounts to answering the following four questions:

- How do non-rated officers compare with rated officers in learning a set of Predator flying tasks?
- Is real world flight experience beneficial in preparing a person for Predator IQT?

- If so, how much and what type of experience is required?
- Can high-fidelity simulator experience substitute for real-world flying experience?

This study will consist of a set of two experiments in which AF officers and civilian aviation students with different amounts of flying experience undergo monitored training on selected Predator tasks and mission segments. Training will be conducted using the UCAV Training Research Testbed. Prior to the beginning of these experiments, the Predator tasks and the associated performance criteria will be validated using a small group of trained Predator AVOs. The purpose of the validation study is to ensure that the synthetic tasks used in the experiments validly represent Predator skill requirements, and that the performance criteria for those tasks do in fact distinguish between trained Predator operators and those who have not been trained.

As part of this study, an analysis will be conducted comparing the Predator program with UAV programs of other services and nations in terms of AVO selection, training, mission, and concept of operations to establish the reasons for differences in AVO skill requirements.

Predator UAV Multi-Task Trainer

HEA is collaborating with AC2ISRC and TRSS to design and construct multi-task trainers for Predator UAV crews. These trainers are deployed to provide training at the 11th and 15th Reconnaissance Squadrons at Indian Springs AFF, Nevada. Each MTT consists of stations for the Air Vehicle Operator (AVO), Sensor Operator (SO), and Instructor. The system uses a network of high-end PCs to generate 3D imagery simulating the Predator daylight TV sensors. The AVO and SO stations include high-fidelity simulation of heads-up displays, electronic map displays, command and status displays, and the full set of Predator controls. The instructor station will include the ability to edit scenarios, insert emergencies, and store/replay/reset missions. The system will be DIS and HLA compliant.

A defining feature of this MTT is its low-cost, PC-based architecture. The system provides realistic training that addresses the existing Predator training bottleneck. AFRL/HEA is responsible for the extensive software development effort in this project, and for procuring and configuring the computer hardware. TRSS designed and constructed the cabinets for mounting the equipment. The 11th and 15th Reconnaissance Squadrons are providing Predator subject-matter expertise. AC2ISRC is providing funding for the project.

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