FIGHT'S ON!

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Warfighter Training Research Supports Pilot Chem Gear Study

In a collaboration initiated by two Naval Postgraduate School (NPS) USAF F-16 pilots, AFRL Mesa facilitated the first-ever Aircrew Eye/Respiratory Protection System (AERPS) study during a week of Distributed Mission Operations (DMO) Training Research (TR). The Viper pilots flew scenarios designed to compare performance while wearing chemical gear against cohort data gathered from pilots not wearing the AERPS suite.

Endorsed by the USAF Counter Proliferation Division at the Pentagon and the USAF Institute for National Security Studies at the USAF Academy, the study required F-16C pilots to wear the AERPS suites while flying a week of four-ship TR events in AFRL Mesa's Viper simulators. Responding to the call for human subjects, willing pilots from the 56 Fighter Wing, Luke AFB AZ were joined by the Air Force Reserve Command (AFRC) 302 Fighter Squadron Life Support Supervisor at Luke AFB, who ensured each pilot was properly fitted. An Air Battle Manager (ABM) instructor from the 8 Weapons Squadron (WPS), USAF Weapons School, Nellis AFB NV, provided simulated Airborne Warning and Control System (AWACS) control while four Viper pilots in chem gear flew against multi-bogey, multi-group computer-generated forces (CGF) representing threat weapons systems in the DMO Testbed.

A Luke instructor pilot in Viper 1 demonstrates how the AERPS suite affects visual lookout and tactile functions during the chem gear study at AFRL Mesa

Through persistent coordination, the NPS leads gained approval within the time constraints of the NPS curriculum and AFRL Mesa's DMO Testbed availability. The enterprise came together to address fundamental questions: Can pilots accomplish complex mission objectives, effectively perform basic and high-level tasks, and sustain a level of mission success commensurate with existing war plans calling for combat multiple sorties over time?

As such, the primary objective of the five-day test was to gather comparative data for a performance effectiveness analysis to help shed some light on war planning assumptions. Other objectives included a subjective and empirical analysis of AERPS by the pilots and AFRC Life Support Supervisor. The results were summarized in the NPS thesis published in June. The AERPS test at AFRL Mesa raised the horizon for opportunities to use the DMO environment to improve procedures, equipment, and derive hard data about the effectiveness of pilots while wearing the aircrew chemical defense ensemble.

AFRL Mesa supported this test with all systems in the DMO Testbed and the digital brief/debrief (BDB) system in the

Capt "Spud" Mangahas, 56 Training Squadron, one of the Luke AFB pilots in the AERPS study, simulated "real world" operational conditions during pre-mission exposure to the Arizona heat before flying a 3-hour vulnerability period in the AFRL Mesa DMO Testbed

mission planning rooms. By providing established TR tools, robust simulator platforms, and human factors and physiological expertise, AFRL Mesa helped refine the test plan, assemble cohort baseline data, and collected and reported performance evaluation data.

Mission Essential Competency (MEC) development for weapons platforms, roles, and missions, is central to AFRL Mesa's warfighter TR programs. Developed in collaboration with Air Combat Command (ACC), MECs are defined as higher-order individual, team, and inter-team competencies fully prepared warfighters require for successful mission completion under adverse conditions and in a non-permissive environment.

MECs are demonstrated in the context of actual or simulated high-fidelity missions under wartime conditions. AFRL Mesa's MEC-based scenarios ensure DMO TR teams are immersed in events requiring the full spectrum of combat mission ready skills. The MEC-based benchmark mission profiles used to measure performance during the AERPS test were identical to those archived by AFRL scientists.

Through the Performance Evaluation and Tracking System (PETS) and the Mobile Operational Measurement System (MOMS) analysis, measurable skills can point to MEC measures of performance and impact of the AERPS suite. For example, the ability to properly threat react can be measured by comparing effectiveness of pilot action and the ability to manipulate controls (counter measures, fire control system, radar operation, etc.) can be measured in time.

The Luke pilots flew one of the two DMO TR syllabus options and participated in AFRL Mesa demographic research surveys used to measure skill and experience. Additional survey and questionnaire information targeted pilot experiences using chemical gear, and following each simulator period, the pilots provided feedback on AERPS, scenarios flown, and their ability to accomplish the mission.

Flanked by NPS leads, Maj "Huck" Cook and Maj "Ajax" McCune, with Maj "Carp" Carpenter, ABM expert from the 8 WPS, Viper pilots from Luke AFB endured a week of DMO research missions in full AERPS gear

AFRL Mesa has an extensive cohort database of pilot performance gathered during DMO TR events. Objective data is extracted during MEC-driven scenarios while the four-ship of Viper pilots and ABM or Weapons Controller execute tactics against threat CGF systems. The PETS software reads the Distributed Interactive Simulation traffic and parses the data into usable formats for team BDB (shot logs) and archival research analysis. Subjective survey data is amplified by observation of mission briefs, scenarios, and debriefs by AFRL Mesa subject-matter experts (SME) who record their evaluations on the MOMS research tool.

Although this first-ever AERPS test in a controlled DMO TR setting was limited in scope, PETS and MOMS data collection were identical to the research protocols used during a DMO TR week. In addition to the surveys specific to the AERPS study, these warfighters also completed the interactive Pathfinder assessment tool and TR demographic surveys given to every DMO TR participant. AFRL Mesa scientists reviewed and consolidated the data collected during the DMO TR scenarios into a useable form for the final NPS thesis.

This test may lead to larger and more comprehensive analysis of the AERPS and future generations of fighter aircrew chemical equipment, specifically, the Joint Protective Aircrew Ensemble and the Joint Aircrew Service Aviation Mask V2. The USAF Counter Proliferation Division acknowledged that the scientific basis for the AERPS study represented a significant improvement over previous guidelines regarding operations in a contaminated environment. Further research could best benefit USAF and may lead to recommendations for improvement and refinement of chemical protection gear and employment considerations, particularly with regard to flight operations.

ABM Integration for Training Research

As a result of a Cooperative Research and Development Agreement with Plexsys, Inc., the Division now has a full-up AWACS Block 30/35 simulator console. The Block 30/35 is the system hardware and software currently on the E-3A "Sentry" for use by AWACS crews in the operational environment, and visiting ABM controllers will be able to use the consoles during DMO TR events at AFRL Mesa.

The next upgrade to the AWACS will be the Block 40/45, scheduled to come online in 2009. The Division has acquired the Block 40/45 simulation hardware and plans to complete the DMO integration process by fall 2005. The ABM TR team will have three operational mission computing systems, the two current Raytheon-Solypsis Tactical Display Framework consoles (voice and scope actions included in digital BDB), the Plexsys AWACS Block 30/35 console, and the Boeing Primary AWACS Display for the Block 40/45. In addition, AFRL Mesa has the capability to digitally capture and replay engagements in real time.

Capt "T-Dub" Wallace, an Instructor Air Weapons Officer from the 966 Airborne Air Control Squadron at Tinker AFB OK, controls Viper pilots from the AWACS Block 30/35 console during research scenarios in the AFRL Mesa DMO Testbed

The current DMO TR scenario debriefs allow pilots and controllers to view scope actions, the god's eye view of the battle, the system displays from each Viper, and hear the UHF and VHF communications during missions. Once integrated, these systems will enable the ABM TR team to conduct command and control (C2) scenarios and build tools and methods to best train ABM operators in the DMO and operational environments.

In July, the MEC gap analysis results were delivered to the AWACS community. Four air control squadrons participated in the three-day workshop to review more than 70 experiences across all major AWACS positions. The results will guide research in training strategies and metrics for DMO and will support the integration of DMO into the AWACS Ready Aircrew Program. Combat-proven MECs will be incorporated into an ABM-specific TR syllabus serving as the springboard for ABM-focused scenarios and performance measurement tools, techniques, and metrics.

BRIEFS AND DEBRIEFS

During the USAF Weapons School (USAFWS) Mission Employment phase of the Weapons Instructor Course (WIC) at Nellis AFB, the AOC TR team tested the **Scenario-based Performance Observation Tool for Learning in Team Environments** (SPOTLITE). This performance measurement capability assesses individuals working within a Dynamic Targeting Cell. SPOTLITE's functionality was deemed excellent and the metrics "spot-on" by the SMEs of Combined AOC-Nellis (CAOC-N).

The USAFWS instituted an AOC familiarization requirement for WIC students, and SPOTLITE was used in the CAOC-N Dynamic Targeting Cell to evaluate actions of WIC Class 05A warfighters in the final Time Sensitive Targeting (TST) vulnerability period. SPOTLITE proved to be an outstanding "first-ever" performance measurement tool for actions taken during the fast-paced TST cycle. Collected data is archived for analysis and training documentation.

The Division's **Logistics Readiness Branch** completed the first phase of a project initiated by the Commander, Air Force Materiel Command, to produce a next-generation maintenance technical manual based on modern media. A team evaluated military and commercial Interactive Electronic Technical Manuals (IETM). These job guides enable users to navigate through vast amounts of tagged technical information.

This project emphasizes low-cost, media-rich simulation tools designed to support work site task performance and on-the-job training for the "digital generation" of USAF maintenance technicians. The team assessed how media can augment current IETMs and eventually replace paperbound technical orders used in the field. Team members captured baseline task analysis data from field engineers and maintenance technicians to identify areas for improvement.

As the system of choice for upcoming proof-of-concept demonstrations, the team targeted the highly-mobile Tunner (60K) Aircraft Cargo Loader. Designed and built for worldwide service, the Tunner (60K) Loader's deck elevates from 39 inches to 18 feet 6 inches and employs a powered conveyor. This complex system is an ideal testbed for evaluating the usability of advanced-media job aids and for measuring how they impact task performance.

Joint Force Air Component Commander (JFACC) MEC Survey

The Division's leadership in MEC development received a boost when the Chief of Staff, USAF (CSAF) authored a letter to general officers with current or recent JFACC experience. With the guidance of USAF Senior Mentors, JFACC MECs were developed and surveys were sent to 26 flag officers (Joint active and retired) with combat AOC experience, such as OIF/OEF, under cover of the CSAF letter.

Maj (PhD) Heather "Chips" Pringle describes the AOC Testbed to visiting Viper pilots and C2 experts during a program orientation at AFRL Mesa. MEC-based scenarios are essential for initial qualification through continuation training

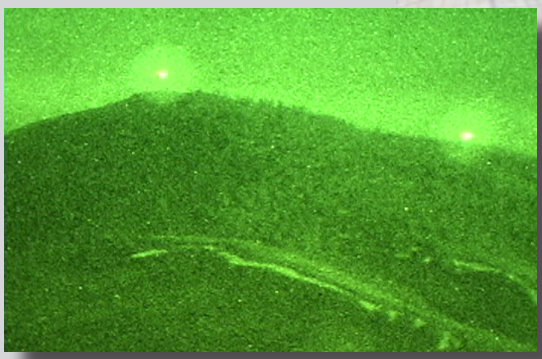
These surveys are designed to validate products from the JFACC MEC workshops, where the USAF Senior Mentors refined the knowledge, skills, supporting competencies, and experiences that form the basis for MECs. Of the seven MECs identified for the JFACC, the Personal Contribution MEC is an example of how several attributes pull together in an effective AOC: Proactive approach towards future strategy and planning, execution, and assessment; maintain strategic perspective and theater focus vice current tactical operations; anticipate, articulate, and respond to the changing nature of the campaign.

Results of the JFACC MEC surveys will be analyzed and delivered to ACC for integrated mission qualification and continuation training for top decision-makers in the AOC. The AOC TR Testbed at AFRL Mesa is designed to evaluate training technologies and methods to avoid "trial and error" testing in an actual AOC.

TARGETS OF OPPORTUNITY

Supported by AFRL Mesa, the **57 Weapons Squadron** operated three C-17 Globemaster IIIs from the Williams Gateway Airport during missions flown for WIC Class 05A pilots. This collaboration yielded new insights into the world of night tactical airlift employment. During a night low-level "ride along," a Division scientist collected data during tactical airfield approaches and two-ship formation air drops. This data will be incorporated in the Night Vision Device (NVD) instructor course materials and used by database engineers to refine how simulated NVDs depict scenes in the synthetic DMO environment.

C-17 Globemaster III jets on the ramp near AFRL Mesa. Three aircraft and maintenance crews from Charleston AFB SC supported the pilots from the 57 WPS, McGuire AFB NJ, during two weeks of WIC 05A missions over the Southwest USA



Left: An AFRL Mesa PhD captured NVG (Night Vision Goggle) imagery for Division programs during a 57 WPS night low-level over the Colorado Rockies. This warfighter collaboration and attention to detail results in world-class R&D

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Visit the Division's website at www.mesa.afmc.af.mil
Fight's On! Government Point of Contact: Mr. Jeff Carr, 480-988-6561 x 201, DSN 474-6201, and e-mail jeff.carr@mesa.afmc.af.mil

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