

FIGHT'S ON!

Quarterly Newsletter from the Warfighter Training Research Division (AFRL/HEA) of the Air Force Research Laboratory Human Effectiveness Directorate

Volume 4, Issue 1
Spring 2004

Expanding Distributed Mission Operations Capabilities

The Warfighter Training Research Division (AFRL/HEA), Mesa Research Site (MRS), supported the 16th Weapons Squadron (WPS) instructor pilots and the ten students of Weapons Instructor Course (WIC) Class 04A for a week of realistic F-16 four-ship air-to-air scenarios in Mesa's Distributed Mission Operations (DMO) Testbed. Controlled by students and instructors of the Advanced Weapons Director School (AWDS), the groups from Nellis AFB NV augmented their live-fly WIC and AWDS syllabus with multiple DMO training research missions.

Prefaced by intense mission briefings, the WIC DMO syllabus tests each pilot's Mission Essential Competency (MEC) levels in high-fidelity four-ship engagements over the Nellis range

database. The USAFWS and AWDS teams spent countless hours in the MRS digital debrief facilities reviewing every nuance of every engagement. The groups broke into four flying teams and each day executed one DMO period filled

Comparing the syllabus flow at Nellis, comments such as "a week at Mesa is a perfect complement to our WIC flying program," and "the AWDS students advance their skills at an accelerated rate" highlighted roundtable discussions.

A pending Memorandum of Agreement will enable a two-year WIC study to confirm the potential of DMO to augment and enhance warfighter readiness through MEC-based training scenarios, which are imbedded in every DMO setup and data point at MRS.

In conjunction with the subjective assessments of subject-matter experts assigned to monitor each warfighter team, objective data is pulled from the DMO Testbed using the Performance Effectiveness Tracking System (PETS).

Essentially, PETS "listens" to DMO network traffic at the rate of 1.8 million data points per minute, parsing the data into cogent outputs from numerous variables.

The majority of these variables are used for statistical analysis, including key feedback information warfighters need during debriefings such as three-dimensional aircraft position, acceleration and velocity, positions relative to other aircraft, flight communications, and missile



Gen Ihde lines up the Nellis runways while flying in Viper 2, one of the four Multi-Task Trainers in Mesa's DMO Testbed, while visiting USAFWS pilots and WIC students during a week of MEC-based DMO scenarios

Left: Col Curt Papke welcomes Brig Gen Greg Ihde, 57 WG/CC, who piloted "his" F-16 to the Williams Gateway Airport (formerly Williams AFB). The ramp is adjacent to MRS



with complex multi-bogey/multi-group engagements against computer-generated Red Air entities and a two-ship of virtual simulators flown as "Red Air" by 56th Fighter Wing (FW) Viper pilots at Luke AFB AZ. The week marked the first concerted use of manned Red Air assets within MEC-based DMO scenarios. The 16th WPS instructors maximized the tactical flexibility of these manned threats by communicating directly from the MRS console with the pilots in the Network Training Center-Luke.



Gen Hal Hornburg, COMACC, discusses PETS applications with Col Papke and Team Mesa members



Mr. David "Bulldog" Greschke tells Gen Hornburg how a COTS-equipped Deployable Tactical Trainer (X-DTT) can support mission readiness training at austere operating locations by linking it to a more robust DMO environment

shot parameters. Blue and Red Air shot summaries go deeper into each aircraft's entity state at missile launch. The more detailed PETS Shot Log, which the 16th WPS used in debrief, automatically derives granular assessments of each hit or miss into 28 separate shot criteria, prints them in spreadsheet columns and is immediately ready for debriefs. The next version of PETS, with suggestions from the 16th WPS, will result in a 45-column user-selectable product. With helpful suggestions from USAFWS graduates, PETS "shot logs" from a DMO environment that includes live operations will be the tactical awareness and knowledge tools for future readiness training applications.

Endorsed by the 57th FW/CC and 16th WPS/CC during an MRS visit, the objective and subjective training research



Maj "Jabba" Steur, RNLAF Exchange Officer to the 77th FS at Shaw AFB SC, coordinates scenarios with Bart Raspotnik, DMO Testbed Director. Jabba has flown the Shaw Mission Training Center simulators, and offers unique perspective as a member of the Dutch DMO evaluation team

data gathered from the USAFWS and AWDS students and instructors will add to the body of knowledge enabling the Combat Air Force (CAF) to field DMO technologies and methods. Additionally, technologies such as the Next Generation Threat System (NGTS) and 20/20 Visual Immersion (Laser) Projector, under collaborative development with Team Mesa, will continue to transition "cheaper, better, faster" systems for CAF warfighters.

Equally impressive in their pursuit of readiness excellence were the Royal Netherlands Air Force (RNLAF) warfighters, who flew for a week in the DMO Testbed and displayed unparalleled levels of expertise while assessing the ability of high-fidelity systems to enhance their training program. Comprised of front-line Viper pilots with combat experience and their "Bandbox" weapons controller, the RNLAF team worked closely with their national engineers and scientists to make a concerted case for high-fidelity simulation to their Air Commodore during his fact-finding visit. Setting the standard for thorough mission briefs, superb execution, and insightful debriefs, the RNLAF team digested DMO technologies and methods and quickly embraced MEC-based training, PETS as a training tool, and the concept of acquiring high-fidelity commercial-off-the-shelf (COTS) simulation solutions at low costs.

To that end, the RNLAF can look to Canada for a successful example of a "low cost, high benefit" program, as the MRS-developed CF-18 Hornet simulator joined the growing DMO world during the official "Heat

& Light" dedication in Toronto. Attended by senior USAF and Canadian dignitaries, a CF-18 pilot flew with USAF Viper pilots while linked with the DMO Testbed, and scenarios were orchestrated by 42nd Radar Squadron controllers who deployed to MRS from Cold Lake. Built largely from COTS equipment, the MRS team integrated the AFRL-developed common core Multi-Task Trainer (MTT) open architecture into the simulator. The AFRL-developed Mobile Modular Display for Advanced Research and Training (M2DART) serves as the visual display system.

On another low cost, high benefit front, the A-10 Close Air Support Network (CASNET) project conducted a proof-of-concept networking demonstration through a central hub at the Air National Guard (ANG) Distributed Training Operations Center (DTC) in Des Moines, IA. Through the DTC, five A-10 Full Mission Trainer (FMT) sites, supporting a Total Force of ANG, Air Force Reserve Command, and Air Combat Command (ACC) pilots, linked with the A-10 FMT engineering testbed at MRS. Together, these widely separated Hawk drivers flew virtual Close Air Support and Combat Search and Rescue missions over a common database. This CASNET demonstration used encrypted servers and included data rate and time delay recordings for engineering analysis as part of the "Training-Bang-Per-Buck" assessment of this low-cost DMO approach.

In the Joint arena, RADM George Mayer, Chief, Naval Aviation Training Command, and CAPT David Wooten, Program Manager, Naval Undergraduate Flight Training Systems (PMA-273) and



RADM Mayer is "met at the jet" by CDR Sam Griffith, liaison to MRS, prior to DMO training research discussions to leverage low-cost solutions for the US Navy

their staffs paid visits to MRS. As the US Navy comes up to speed on the latest developments in DMO and related training research, Navy leadership is looking for ways to leverage COTS and proven technologies to meet aviation training requirements. For example, the Navy selected NGTS as the threat system for their F/A-18 Hornet 4-ship simulators, with M2DARTs as their visual display systems.



Col Papke updates US Representative Jeff Flake (AZ-06) on the warfighter training research programs conducted in his District at MRS and at the Division's off-site branch at Wright-Patterson AFB OH

Command & Control (C2): Key Link in “Image-to-Iron” Kill Chain

Team Mesa members recently visited Al Udeid Air Base, Qatar, to collect training data from US warfighters as they conducted actual missions with international coalition partners in the Combined Air and Space Operations Center (CAOC). The data will be used to help validate and guide ongoing and future US Air and Space Operations Center (AOC), Intelligence, Surveillance, and Reconnaissance (ISR), and aircrew training research initiatives at MRS. This unique opportunity to visit an active CAOC was made possible through a mutual effort with the Air Force Combat Support Office (AFCSO).

Prior to the CAOC “excursion,” Team Mesa conducted US field validations of mission areas through extensive survey administration among the many units who support and man worldwide AOCs. For the CAOC visit, data collection with 38 CAOC operators and aircrew took the form of questionnaires and guided interviews about training issues relating to individuals. Ranging from AOC technicians and division chiefs, and including a flying squadron commander, interviewees shared their unique experiences across a broad spectrum of CAOC training issues. Team Mesa came away with numerous suggestions to improve AOC training before, and during, future deployments.

Even with prior experience gained from AOC operations, exercises, or formal courses, warfighter performance can deteriorate in stressful time-critical situations and be exacerbated if mission

skills are infrequently practiced. Team Mesa plans to develop a process tutor to quickly review procedures and associated C2ISR actions, feeds, and links in the Kill Chain, enabling operators to train for all levels of CAOC mission areas. Exercises are major factors for an AOC training program. Their embedded scenarios, vignettes, and events are core elements that the MEC process can effectively target as mission critical knowledge and skills to enhance AOC team-level training. MEC-based performance measurement and assessment criteria will be the foundation for training tools for AOC mission analysis and after-action reviews. Team Mesa’s process tutor approach will enable eight-hour training cycles of brief, train, and debrief for on demand team-level training.



Sponsored by the AFCSO, Team Mesa members prepare to visit the CAOC at Al Udeid AB Qatar for unique opportunities to speak with warfighters during operations. From top left, clockwise: Mr Geoff Barbier, Maj Mike Miller (AFCSO), Capt Julie Miller, Capt Larry Beer, and Capt Dave Rodriguez

Working closely with ACC, AFRL/HEA helped pioneer the concepts behind DMO and competency-based training and is now facilitating MEC criteria development for all major weapon systems. MECs are already completed for some mission areas, and approximately 40 systems and missions are being addressed including AOC, Distributed Common Ground System, Information Operations Center, Airborne Warning and Control System (AWACS) aircraft, Joint Surveillance Target Attack Radar System aircraft, Rivet Joint surveillance aircraft, and Joint Force Air Component Commanders.

The MEC process involves building the structure, methods, and tools to describe skilled performance for core platforms and missions (such as AWACS and Air Superiority). Readily identifiable, MECs are defined in the context of mission phases during actions in the “Image-to-Iron” Kill Chain, and have supporting competencies, knowledge, skills, and experiences (KSE) subsumed in each MEC. As an example, one of the Air Superiority MECs is: “Determines the need/ability to engage follow-on forces, return to the Combat Air Patrol, go to an airborne tanker, or return to base.” The associated competencies and KSEs entail a series of critical decisions and measurable supporting actions to demonstrate the high levels of proficiency required by this MEC.



BRIEFS AND DEBRIEFS

Next Generation Threat System Revolutionizes Electronic Warfare Training

Through collaborative efforts spearheaded by AFRL/HEA, Air Force Special Operations Command (AFSOC) now has a standalone Electronic Warfare (EW) training capability in the AC-130U “Spooky” Gunship Weapons Systems Trainer (WST). AFSOC and the Ogden Air Logistics Center enlisted the scientific and engineering expertise of AFRL’s Weapon Systems Simulation Technology Team to imbed threat signal recognition in the WSTs located in the 19th Special Operation Squadron at Hurlburt Field FL.

Leveraging the team’s successes with NGTS development and the Imbedded Electronic Warfare System (IEWS) Education and Technical Training Applications Program (ETTAP), existing WST simulators now support high-fidelity EW training at very low cost. The team inte-

grated a display unit, control panel, and digital input/output board from the radar warning receiver (RWR) of an AC-130U Gunship with their RWR simulation and NGTS. This success furthered AFSOC’s ability to train in a realistic EW environment unconstrained by range scheduling or restrictions, geographical extents, or concomitant costs generated by flying aircraft over expensive ground-based emitters.

In a complementary initiative, the team delivered onboard EW training capability for AFSOC’s MC-130P, “Combat Shadow,” obviating the need for range space or emitters. With ETTAP support, the team melded the NGTS and the bit-wise accurate RWR simulation to produce a rack mounted IEWS from COTS personal computer parts. Requiring no permanent modification to the aircraft, this capabilities demonstrator plugs directly into the MC-130P system. This onboard physics-based training device helps aircrews identify, teach, and rein-

force learned behaviors while responding in real-time to EW threats, to include practicing evasive maneuvers in flight during any tactical training mission.



Lt Col “Odie” Park works with NGTS onboard Electronic Warfare Trainer Equipment Rack mounted on the cargo floor of the MC-130P “Combat Shadow” Aircraft

TARGETS OF OPPORTUNITY



Maj “Simple” Symons briefs 163rd FS (Ft Wayne IN) pilots with the PETS system

✈ The Warfighter Readiness Assessment and Performance Measurement Tracking System program was accepted as a Category 1 Advanced Technology Demonstration. Human-centered measurements, enabled by automated training technology performance assessment and tracking tools (such as PETS), will deliver consistent readiness assessments in live fly and DMO environments. By measuring and tracking individual and team warfighter performance on critical knowledge and skills, the system will support CAF core capability

requirements for transition to a MEC-based training approach.

✈ AFRL/HEA signed a Cooperative R&D Agreement with Lockheed-Martin to facilitate transfer of Lab-developed performance evaluation tools and technologies to existing F-16 Mission Training Centers (MTC). Anticipating mutual benefits on the road to DMO readiness training integration, Team Mesa members are coordinating with ACC and the 20th FW for a proposed MEC impact study using the MTC at Shaw AFB SC.



Fight's On! is published quarterly by the Warfighter Training Research Division of the Air Force Research Laboratory's Human Effectiveness Directorate, 6030 S. Kent Street, Mesa, AZ 85212-6061. Visit the Division's website at www.mesa.afmc.af.mil
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AFRL/HEA UPAR Case File No. HEA-04-043

