FIGHT'S ON!

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

Volume 3, Issue 3
Fall 2003

AFRL/HEA's Training Systems Technology Team garnered the 2002 DoD Modeling & Simulation Award in the Training Category. The team includes military, civilian, and contractor members at the Mesa Research Site (MRS), as well as Air Combat Command (ACC) staff members and Small Business Innovative Research partners. Dr. Henk Ruck, Human Effectiveness Director, attended the September 2003 Pentagon presentation ceremony with Team Mesa representatives.

Combat Lessons Learned Guide Warfighter Training Research and Development

In the aftermath of intensive air-to-surface campaigns waged during the height of *Operation Iraqi Freedom* and *Operation Enduring Freedom*, USAF and sister-Service organizations are gathering information to analyze lessons learned in combat. At the Warfighter Training Research Division in Mesa, AZ, scientists, engineers, and subject-matter experts (SME) are collaborating with strategic, operational, and tactical level warfighters. Their goal is to align research and development (R&D) programs to meet requirements for the next generation in mission readiness training systems.

Team Mesa routinely gathers front-line warfighter feedback during Distributed Mission Operations (DMO) training research weeks at MRS, gleaning valuable insights on the intricacies of the Kill Chain. Currently, team and inter-team research at MRS occurs while Command and Control (C2) and F-16 warfighters execute complex 4-v-many DMO scenarios. While MRS needs warfighters to conduct DMO training research, front-line units and the USAF Weapons School (USAFWS) see DMO as a supplement to live-fly syllabus, upgrade, and continuity training at the individual, unit, large-force, and schoolhouse levels. Supported by Advanced Weapons Director School instructors and their C2 students, USAFWS instructor pilots (IP) and Weapons Instructor Course F-16 students augment their syllabus with an intensive training week in Mesa's high-fidelity DMO Testbed prior to the USAFWS live-fly Mission Employment phase at Nellis AFB NV.

Expansion of DMO technologies and methods relies heavily on the optimal mix of live, virtual, and constructive assets to supplement warfighter training programs. As the Services grapple with integrating simulation capabilities with live events, ACC's leadership in DMO applications enables Team Mesa to assess impact on warfighter readiness through a Mission Essential Competency (MEC) approach.

As a proposed evolution of the Ready Aircrew Program, which currently measures numbers of training events, MEC-based assessment can demonstrate and validate mission readiness for all warfighters in the Kill Chain. MEC-based mission readiness can be assessed in high-fidelity exercises simulating wartime combat operations. In Mesa's DMO Testbed, warfighter

Mr. Mike Kretzer, Air Force Information Warfare Center Technical Director, learned about training research plans in the Information Operations and Intelligence, Surveillance, and Reconnaissance regimes during a visit to Mesa. Here, Maj Dave Malinowski described the Satellite Operations Simulator

teams recently completed the first run of a "MEC-focused" training research syllabus to compare warfighter performance with teams using the "mission rehearsal" syllabus.

Warfighter teams and IPs overwhelmingly endorse the MEC-focused approach, and ACC is closely monitoring the program as Mesa SMEs put the finishing touches on survey results. Tying mission scenario development to MEC knowledge, skills, and experiences will enable researchers to alter scenarios with specific MECs in mind. Scenarios could also be crafted to include complexity measurement modeling to help assess depth, as well as breadth, of mission readiness training for warfighters in the Kill Chain.

Team Mesa is tackling a myriad of "sensor-to-shooter" links in the Kill Chain and has formed the Joint Close Air Support (JCAS) and Information Operations/ Intelligence, Surveillance, and Reconnaissance (IO/ISR) training research teams. MRS scientists, engineers, and SMEs are developing enhanced simulation environments that replicate complexities of the JCAS mission and essential real-world IO/ISR characteristics. Initial efforts incorporate advanced technologies to leverage computer-generated force (CGF) capabilities with realistic C2, IO/ISR, and decision-making nodes in the Kill Chain.

At the request of the Joint Combat Identification & Evaluation Team at Eglin AFB FL, Team Mesa employed an A-10 Full Mission Trainer (FMT) to support the Military Operations in Urban Terrain (MOUT) Advanced Concept Technology Demonstration. This first-ever live, virtual, and constructive JCAS demonstration connected the A-10 "Hawg" at MRS with an AC-130U gunship Weapons Systems Trainer at Hurlburt Field FL, and "The Village" at the MOUT Training Center on the McKenna Range in Ft Benning GA.

The A-10 pilot at MRS engaged CGFs from the Mission Ready Operations Center (Hurlburt Field) with weapons effects visible in the "Hawg" FMT and the gunship. Through an astounding integration of DMO capabilities at McKenna Range, Terminal Attack Control (TAC) operators at "The Village" visually acquired targets and called for fires delivered by the virtual JCAS weapons systems. While the aircraft attacked surface targets in their synthetic environment, TAC operators witnessed pyrotechnic explosive effects emulating "real-world" weapons effects on "The Village" target sets. The TAC operators were able to provide vital visual confirmation of JCAS mission accomplishment during the two-day datalinked demonstration. TAC operators were also fitted with electronic Blue Force Trackers to help the "Hawg" pilot discern friendly forces through the heads-up display. The ability to identify "blue" forces amongst threat mechanized forces, dismounted infantry, surface-to-air weapons and helicopters, enabled the "Hawg" pilot to visually engage targets with bombs, missiles, and 30mm gun while flying through the 23cm database.

Through a proof-of-concept called "CASNET," this MOUT demonstration connected the A-10 FMT to a robust synthetic JCAS environment. When CASNET matures, "Hawg" pilots at distributed sites will be able to execute tailored multi-ship DMO scenarios from any FMT location. Certified encryptors will secure T-1 connections to allow each site to access the Internet. This will enable "Hawg" pilots to fly the spectrum of A-10 tactics while obviating the need to maintain dedicated high-bandwidth infrastructure linking each CASNET site. This low-cost connectivity allows "as needed" scheduling among world-wide A-10 units, including any operation where an FMT is deployed to support mission rehearsal training with a combat unit.

Through the "magic" of DMO, TAC operators on the ground in "The Village" at Ft Benning GA directed JCAS attacks by a "Hawg" pilot flying an A-10 FMT at Mesa AZ-- weapons effects were visible through integrated live, virtual, and constructive systems

Through site visits at various USAF operational nodes and sister-Service staff offices and laboratories, Team Mesa is collating requirements and building advocacy for a true JCAS training and rehearsal capability. Initial cooperative R&D agreements with the USMC have raised US Joint Forces Command interest in coordinating and consulting with the Division on mutually beneficial training research efforts. By convincing industry to provide a loaner JCAS trainer to the Air Ground Operations School (AGOS) at Nellis AFB, an initial Team Mesa schema spotlights how concerted synergy can deliver rapid results.

Training To Go Expeditionary

Visit Team Mesa in the Training Systems Product Group booth (#845) to observe Joint Service DMO demonstrations at the Interservice/Industry Training Simulation and Education Conference (I/ITSEC) 2003, Orlando, FL, 1-4 December

Army, Navy, Air Force, and Marine systems on the show floor will link to F-16 MTTs and the Weapons Control Station in the DMO Testbed in Mesa. The demonstrations will show how deployable simulators, supported by robust mission planning, briefing, and debriefing capabilities can enhance mission readiness for warfighters operating from austere locations.

Vignette 1: Terrorist Action Response and Attack Assessment
Vignette 2: Special Operations Rescue of Aircrew
Vignette 3: Joint Close Air Support
Vignette 4: Battlespace Maneuver and Integration of Firepower

(See schedule in booth for demonstration times.)

NAVY USMC AIR FORCE ARMY '03 INDUSTRY 25th Anniversary

Acting on a request from AGOS, Team Mesa energized industry to integrate a generic pilot station with visual presentation technologies for a prototype Indirect Forward Air Control Trainer (IFACT) and facilitated placement at AGOS. The prototype IFACT aids TAC communications training at AGOS, leading the JCAS team to marshal funding for prioritized deliveries of the first five IFACT R&D systems.

In the first of a three-phase spiral development series, Team Mesa advanced initial IFACT development to get tools in the hands of JCAS operators to train now, while also facilitating training R&D through shared performance data. One IFACT will go to Camp Lejeune NC, where the USMC's Training & Education Command will oversee East Coast TAC training for Marines, and one will be placed with USAF's 12th Combat Training Squadron at the Army's National Training Center, Ft Irwin CA. To enhance coalition and NATO training, a third IFACT will be placed with USAF's 2nd Air Support Operations Squadron, collocated with the 1st Infantry Division, Wurzburg, Germany. AGOS will get an IFACT to replace their loaner, and in conjunction with the fifth system at MRS, will establish a training R&D relationship for ensuing spiral development phases with the JCAS team. With five IFACT "testbeds" in place, a CAF initiative will deliver follow-on production systems to as many as 23 units in ACC and up to 12 units in USAF Europe for JCAS upgrade and continuation training. As a technology transition catalyst, the Division helped JCAS operators take a quantum leap forward in pilot and TAC operational readiness training, at half the cost of current design configurations.

By analyzing lessons learned in combat, Team Mesa continues to "lead turn" mission readiness needs for all warfighters in the Kill Chain.

MRS Tour Complements Annual IMAGE Conference

The MRS authors of "An Overview of Networked Simulation Technology from the Warfighter Training Research Division Perspective" guided IMAGE Conference attendees on a tour of MRS to show how simulation technology progressed at MRS in the last year. IMAGE Conference attendees include representatives from USAF, Army, and Navy training system R&D and acquisition communities and image generator (IG), simulation database, and display vendors.

The tour highlight was the DMO Testbed, which houses the networked four-ship of F-16 MTT "Vipers" and the Weapons Control Station, where each system serves as a "testbed within the Testbed." Vipers 1 and 2 use SGI Onyx II IGs with Aechelon Technology's runtime software and perfectly correlated visual and sensor databases. For the IMAGE tour, Viper 2 was configured to fly with the MRS-developed Night Vision Training System (NVTS) simulating Night Vision Goggles (NVGs). Viper 3 was configured with Aechelon's PC Nova IG, runtime software, and database correlated with Vipers 1 (day) and 2 (night). Viper 4 demonstrated an SDS International PC IG hardware and runtime software solution using a visual database correlated with the other three Vipers.

All testbed IGs ran at a rock-solid 60-hertz (real time) update rate throughout the DMO scenarios, and smoothly showed 360 degree visuals in the Mobile

Maj "Simple" Symons explains the Division's training technologies and research methods while guiding a local news reporter through the synthetic skies over Nellis AFB NV in an F-16 MTT during Media Day at Mesa Research Site

Modular Display for Advanced Research and Training (M2DART). An on-site A-10 FMT destined for Osan Air Base Korea was in a standalone configuration. A-10 FMTs delivered to CAF units use MetaVR PC IG hardware, runtime software, and database, also running at the 60-hertz update rate.

BRIEFS & DEBRIEFS

Hosted by Dr. Henk Ruck, MRS opened its doors for Media Day representatives from local area television, radio, and newspaper outlets. Footnoting the day's events over several days of coverage, the media ran numerous features and articles produced around Team Mesa interviews.

Marking the initial evaluation on the two-year cycle to assess R&D programs, MRS hosted a sub-set of the USAF Scientific Advisory Board (SAB) for a full day of briefings and demonstrations. Mesa's on-site evaluation will be included in the overall SAB report covering all AFRL/HE programs, which is expected early next year.

The lead visual scientist from Defence R&D Canada (DRDC)-Toronto confirmed development and delivery status of the CF-18 MTT technology demonstrator with MRS program managers. Since the program is on track, DRDC-Toronto and MRS confirmed plans for extended visual research activities under the US/Canadian Project Arrangement (PA) concerning Distributed Mission Training Technologies. A PA amendment to formalize these extended activities, coordinated through the Secretary of the Air Force International Affairs office, is currently being reviewed at the Canadian International Affairs office.

Anticipating the CF-18 MTT delivery, an MRS-designed M2DART visual display system was previously delivered to DRDC-Toronto. The DRDC-Toronto project manager agreed to help support Mesa's ultra-high resolution database development, potentially freeing resources for continued MRS and DRDC-Toronto collaboration.

TARGETS OF OPPORTUNITY

The "Fly by Night" R&D team developed and integrated key control-interface NVTS functions for the SensorHost Version 2.0 software. These upgrades increase training opportunities for NVG users as additions include moon setup interface (for position, azimuth, elevation, and phase), noise setup interface for photocathode and ion noise parameters, and command interface to control moon, sun, and planets settings.

The "Fly by Night" R&D team will also transition NVTS technology to the F-16 two-ship in the Network Training Center at Luke AFB AZ. Team Mesa previously blazed this transition trail with USN and USMC customers, and will provide technical assistance to place this NVG simulation-based training capability with the first USAF user.

As of 1 November, AFRL/HE reorganization added two branches to AFRL/HEA. Watch for activity updates as the branch programs expand training research opportunities for the Division.

Scientific Advisory Board members Dr. Debbie Boehm-Davis, Dr. Dexter Fletcher (team lead), and Maj Gen George Harrison (USAF-Ret) received hand's-on orientation of NVG and NVTS development programs from Mr. Deke Joralman of Mesa's "Fly by Night" R&D team

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
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

AFRL/HEA UPAR Case File No. HEA-03-089
©2003 by the Air Force Research Laboratory Mesa Research Site.