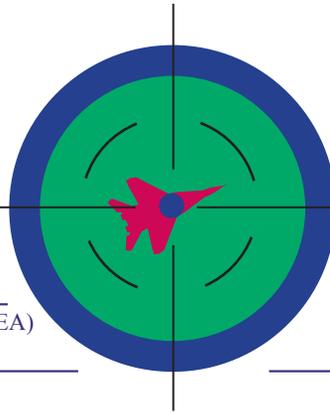


FIGHT'S ON!



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

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"I was *downtown* at the start of activities and got to launch the first HARM of *Operation Iraqi Freedom*...the location of my flight and the tactics employed were EXACTLY like we were practicing in the F-16 MTC at Shaw before we left...talk about *Mission Rehearsal!*" This quote is from a USAF Weapons School graduate who flew his first realistic training scenarios in the Distributed Mission Operations (DMO) Testbed at Mesa Research Site AZ, September 2001.



AIM-9 missile fired from F-16 in a DMO scenario at Mesa

AFRL/HEA first demonstrated high-fidelity four-ship simulation training technologies in April 1997 and has proven standards for multi-ship and distributed training systems. Mesa is proud to have developed, advanced, and transitioned training technologies and methods found in current Mission Training Center (MTC) configurations fielded in the Combat Air Force (CAF)!

Training Research Focuses on Kill Chain: The Speed of Combat Ops Drives Applied Research

AFRL/HEA leads research initiatives that address warfighter training needs to enable seamless "sensor-to-shooter" execution of the Kill Chain (KC) to Find, Fix, Track, Target, Engage, and Assess (F2T2EA). The vicissitudes of operating in a hostile environment require highly skilled mission-ready warfighters to execute timely and accurate decisions throughout the F2T2EA chain, always with less than decision-quality information under dynamic, stressful, and sometimes austere conditions, as evidenced by Southwest Asia (SWA) combat operations.

To ensure all warfighters in the KC are trained to higher-order individual, team, and inter-team Mission Essential Competencies (MEC), Air Combat Command (ACC) plans to apply MEC-based training to major defense systems (MDS) and mission areas. Team Mesa developed MEC-driven multi-ship combat training scenarios for the air-to-air role, and ACC is applying this methodology template for the MDS migration. Supporting competencies, and associated knowledge, skills, and experiences, are subsumed in

the MEC structure. By analyzing CAF training gaps, AFRL/HEA is helping determine how best to fill these gaps and compress the KC, which is vital to time critical targeting.



Command and Control Binds KC

Major KC decisions are made in the Air Operations Center (AOC). AFRL/HEA is analyzing how AOC command and control (C2) decision-makers process information from numerous sources, spanning space-based to ground-based operations. The Division is working with C2 operators on Airborne Warning and

Control System (AWACS) aircraft (and by extension, the Ground Theater Air Control System) to develop MECs for this dynamic environment and to apply corresponding methodologies to develop MECs for the AOC. This revolutionary approach is a training research "force multiplier," designed to ensure warfighters across the KC spectrum are fully prepared for combat operations against formidable threats in any weather, and at any time.

An outgrowth of C2 MEC development is a collaborative effort with the Group for Organizational Excellence and Aptima, Inc. to analyze warfighter interactions in AOC divisions. The first phase of AOC MEC development addressed two out of four AOC divisions, Combat Operations and Combat plans, with the next phase to include the Combat Strategy and Combat Intelligence, Surveillance, and Reconnaissance Divisions.

During DMO training research weeks at Mesa, F-16C and C2 warfighters engage in scenarios focused at the operational level of war against a multitude of robust



Lt Col John "Soak" Dolan, Commander, 16th Weapons Squadron, Nellis AFB NV, flew into Williams Gateway Airport (above) and joined IPs and students of WIC Class 03A. Following a syllabus mission in Mesa's DMO testbed, Soak emphasized air-to-air tactics with Maj Jeff "Ace" Wiegand and Maj Shawn "Haggis" McGrath

applicable training and technology efforts, and developing synergies to address Joint CAS (JCAS)/JTAC mission commonalities. For this training research effort, Team Mesa forged an alliance with JCAS/JTAC



threats over the Nellis Test and Training Range database. In the DMO environment, warfighters can operate without peacetime live-fly restrictions and artificialities of daily training. Since warfighter training is designed to stress operators throughout the KC, in some cases realistic DMO scenarios and Red Flag exercises are more difficult than real-world situations. During Operation *Iraqi Freedom*, a Viper pilot noted "Red Flag is a lot more intense than this... the adversaries were a heck of a lot better." A major goal of CSAF's DMO vision is to elicit the same perspective from every warfighter!

Firepower Coordination Vital to KC

Critical to rapidly getting "bombs on target" in the KC are the Joint Terminal Attack Control (JTAC) and Special Tactics Combat Control teams charged with orchestrating Close Air Support (CAS) strikes in close proximity to friendly forces. AFRL/HEA is correlating



WIC instructor pilots (IPs) discuss mission briefing techniques and training objectives with WIC students prior to engagements in Mesa's DMO training research testbed

stakeholders. Among them are C2 offices in the Pentagon and Langley AFB, as well as the Air Ground Operations School (AGOS) at Nellis AFB and 720th Special Tactics Group at Hurlburt Field FL.

All TACs train at AGOS, and the Theater Air Ground System (TAGS) melds JCAS/JTAC training needs to address urgent and compelling shortfalls identified in the 2003 *JCAS Action Plan* and *Capstone Requirements Document for CAS*, endorsed by CSAF. AFRL leads research and integration efforts to identify training solutions for the TAGS community and streamline KC operations.

CAF leaders recognize the value of dedicated CAS training, and endorse AFRL/HEA's convergent research approach. During Operation *Iraqi Freedom*, a Viper pilot observed a classic CAS frustration -- the JTAC's view of a target area from the ground is different than the view from 20,000 feet. Noting each pilot must positively identify an enemy target before releasing weapons, he stated "the last thing you want to do is not be sure and drop -- and kill Marines or soldiers on the ground." One obvious application of simulation technology will give these ground TACs the ability to view their battlespace from ground level and 20,000 feet simultaneously. With focused, tactically relevant training and rehearsal, JTAC target descriptions and resulting mission successes will dramatically improve.

Mission Readiness Key to 24-hour KC

Modern combat relies on the ability to fight at night, and AFRL/HEA's leadership in Night Vision Goggle (NVG) training research helps warfighters train to execute the KC in this environment. Team Mesa developed the Night Vision Training System (NVTS) as a prototype for multi-ship NVG simulation training, and is poised to include two-ship NVG scenarios in a DMO research syllabus. Demonstrated NVTS capabilities induced the US Navy to incorporate the technology into their nascent distributed training program. Dr. Robert Walker, head of Defense Research and Development, Canada (DRDC) noted NVTS could enhance the CF-18 prototype simulator being developed at Mesa. This Canadian-funded collaborative project is crucial to creating a DMO node at DRDC-Toronto, and will enhance realism of US-UK-Canadian Coalition Mission Training Research (CMTR) trials.

Coalition KC Execution in Ops

US forces routinely work with coalition partners to execute KC operations (such as Operation *Iraqi Freedom*). A recent CMTR trial featured aircrew and controllers operating over a common SWA database from networked simulation sites in DRDC's facility in Toronto and the UK's Defense Science and Technology Laboratory (DSTL) affiliate in Bedford, England. A package of 26 aircraft from three nations executed composite SWA air operations while opposed by constructive integrated air defense systems.

At the UK sites, RAF aircrew flew simulators representing a four-ship each of F-3 Tornados and AV-8 Harriers, while Canadian pilots manned a representative four-ship of CF-18 Hornets--all this while 310th Fighter Squadron "Top Hats" pilots flew Mesa's four F-16 simulators. The overseas simulators were networked to Mesa's high-fidelity Vipers and Weapons Control Station simulators, enabling warfighter participants to conduct time sensitive KC actions. This research supports training transformation as envisioned by the Office of the Secretary of Defense!



Lt Col Mike "Odie" Park, AFRL/HEA Research Operations Officer, describes events to Maj Dan Constable, A3 Ops-Winnipeg, during a DMO demonstration while Dr. Walker (seated), DRDC Director, observes

Using approved encryption systems and leased Integrated Services Digital Network lines AFRL/HEA, DRDC, and DSTL scientists and engineers optimized the DMO network to support interconnected real-time video, voice, file-transfer, and drawings of mission depictions. Each CMTR site was linked via video-teleconferencing and interactive data equipment, permitting geographically-separated warfighters to conduct detailed mission planning, briefing, execution, and debriefing



"Rainman" and "Freddy", pilots of the 310th FS confirm mission planning details prior to CMTR mass briefing. Mission Commander and flight leads in UK and Mesa interacted in real-time for mission planning, briefing, and debriefing

commensurate with collocated forces (such as during Red Flags). A British AOC generated the Air Tasking Order (ATO) for each day's mission, and weapons directors in the UK and Mesa performed primary controller duties as part of the designated mission commander package. Once AFRL/HEA experts refined the ATO and mission

planning tools, aircrew in the UK led activities on days the ATO fraged the RAF for mission commander duties. The "Top Hats" flight lead and Canadian controller deployed to Mesa picked up duties on the last CMTR flying day.

This process can be completely duplicated today at the SECRET level using commercial-off-the-shelf (COTS) technology. Dr. Ron Sega, Director, Defense Research and Engineering noted the digital brief/debrief capability could be applied to current SWA combat operations and charged AFRL/HEA to accelerate transition of this innovative use of COTS equipment to support front-line warfighters.

Shooters Engage KC Targets

Team Mesa supported the ten current F-16 Weapons Instructor Course (WIC) Class 03A students and their instructors from the 16th Weapons Squadron, USAF Weapons School, for a week of advanced DMO scenarios. The pace of operations at Mesa during "WIC week" was analogous to WIC training at Nellis AFB, and participating scientists and subject-matter experts confirmed the Division's training research programs are attuned to enhance critical KC competencies for warfighter shooters. Lessons learned from Operation Iraqi Freedom will provide fertile ground for AFRL/HEA experts to proactively fine-tune warfighter training research programs to meet CAF readiness needs.



Dr. Ron Sega, DDR&E, debriefs "Top Hats" IPs during the latest US-UK-CA Coalition Mission Training Research exercise



Successful Demo --Distributed Training Network Guard--

The USAF has embarked on a major effort to develop full-mission training and rehearsal opportunities for warfighters operating at different classification levels. By interfacing approximately 33 geographically-separated MTCs into a realistic synthetic environment, warfighters will have on-demand "train the way we fight" capability. Partnered with AFRL/IF, Rome NY, AFRL/HEA hosted a Distributed Training Network Guard (DTNG) capabilities demonstration at Mesa. Team Mesa experts, with support from the primary developer, Trusted Computer Solutions, successfully demonstrated DTNG to more than 90 attendees from the DoD, Army, Navy, and key System Program Offices.

There are no current network capabilities to enable data transfer between simulation systems operating at different security levels, but DTNG will support two-level connectivity and enable networked simulations to interoperate at different security levels within a common synthetic environment. The DTNG is comprised of a two-way data transfer device installed between simulation networks, and a stand-alone interactive graphical user interface software tool to define security classification rules for the system to operate. The DTNG program is now focused on technology transition, classification rule set development, and system certification and accreditation.



Mr. Lance Call, software engineer, describes key events while four Team Mesa pilots fly mission vignettes in the DMO testbed during DTNG demonstrations for modeling and simulation experts from USAF, sister-Services, and industry



BRIEFS AND DEBRIEFS

Team Mesa is condensing the recently completed 300-page **AETC Advanced Flying Training Technologies Report** as a concise presentation to help develop a roadmap for inserting advanced technologies into training. The report gives the AETC staff a picture of training areas students currently find difficult to learn, while pointing out inadequate allotted syllabus time and inadequacies of current simulator technology. Based on data collected from AETC IPs and site visits by researchers and engineers, AFRL/HEA highlights data showing which simulator technologies are good choices to insert and/or replace what's currently in the field. AETC's Studies and Analysis office provided feedback on the report, and endorsed all AFRL/HEA conclusions, for the briefing to AETC/DO and XP set for May 2003.

Progress continues on the **Ultra-High Resolution** laser projector effort with Evans and Sutherland (E&S). E&S plans to place interim blue lasers and a

red prototype in the Mesa "laser lab" development area in late spring, with prototype green and blue lasers arriving by year's end. E&S demonstrations to AFRL/HEA's program experts confirmed lasers now generate red, green, and blue wavelengths; packaging, testing, and reliability studies are next.

TARGETS OF OPPORTUNITY

The Division's **DMO-Force Protection training research** program got a boost when the 96th Ground Combat Training Squadron, a Security Forces schoolhouse, agreed to support field evaluations of simulation technology. An initial contract effort with McDonald Research Associates delivered two draft Force Protection training scenarios and completed the test plan for upcoming technology evalua-

tions. Preliminary evaluations with Team Mesa members are helping scientists estimate simulation learning times.

In collaboration with the Iowa ANG's 133rd Test Squadron, AFRL/HEA is helping develop an **experimental Battle Control Center**. Designed to be a modernized Control and Reporting Center, the system can accept, process, correlate, and fuse data from any radar in the US inventory, and share it throughout the DMO battlespace to improve C2 warfighter battle management and situational awareness.

In preparation for the March 2003 **Applied Technology Council (ATC)** with AETC/CC, Brig Gen Steve Sargeant (AETC/XP) held the 1-Star ATC dry run at Mesa. AETC identified several Advanced Technology Demonstrations and Critical Experiments and may leverage AFRL research to develop a Generalized Operations Simulation Environment (GOSE). GOSE is conceptualized as a scaleable, modular approach to virtual reality training using common PC-based hardware and software.

Gen Lester Lyles, AFMC/CC, exchanges unit "coins" with Col Curtis Papke, Commander, Mesa Research Site, after making laudatory comments following lunch with Team Mesa (right)



Gen Lyles reviewed the Performance Evaluation and Tracking System, designed to digitally extract key mission data during four-ship DMO training research scenarios at Mesa (left)



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