FIGHT'S ON!

Quarterly Newsletter from the Warfighter Training Research Division (AFRL/HEA)
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US/UK Coalition Mission Training Research Exercise Condor Capture

By networking AFRL Mesa AZ simulation systems with UK systems at RAF Waddington, the Division's partnership with the UK's Defence Science & Technology Laboratory (DSTL) yielded another in a series of successful Coalition Mission Training Research trials. The latest five-day trial, Exercise Condor Capture, connected front-line warfighters employing virtual simulators representing the following Mission Design Series (MDS) and warfighting systems: four RAF GR4 Tornados, four RAF Typhoon Eurofighters, four USAF F-16 Vipers, two USAF F-16 Viper Forward Air Control-Airborne (FAC-A), Airborne Warning and Control System (AWACS), Joint Terminal Attack Control (JTAC), and an Air Support Operations Center (ASOC) function.

USAF and RAF warfighters finalize mission planning details prior to a Condor Capture mission

Participating warfighters received the Air Tasking Order (ATO), broke out the ATO "frag," mission planned, and conducted after-action reviews via distributed brief/debrief systems, and executed complex research scenarios over the Joint National Training Center (Ft Irwin CA) desert database. With collaboration of USAF and RAF warfighters, scientists and engineers in the US and UK are applying lessons learned during these international trials in preparation for further exercises with coalition partners in future high-fidelity Distributed Mission Operations (DMO) and Mission Training via Distributed Simulation events. Condor Capture warfighters hailed from the 107th Fighter Squadron, Selfridge MI ANG; the 56th Fighter Wing, Luke AFB AZ; number 8 & 23 Squadrons, RAF Waddington; the 11th & 712th Air Support Operations Squadrons, Ft Hood TX; and the 705th Combat Training Squadron, Kirtland AFB NM.

Starting with Day 1 of the war, Condor Capture met with excellent individual and team composite force training research results. The mass debriefs highlighted mission success, as 99% of the debriefs focused on tactical lessons learned and very minimal discussion of simulator or DMO network issues. These results were outstanding, considering this level of training research achievement is not often seen in complex DMO events.

Crews experienced the fog-of-war, with intermittent radar "spikes" from computer-generated Red Air adversaries as well as limited communication availability (only four radio frequencies were available) due to network constraints. Warfighters were forced, in real-time, to create alternate communication plans as well as build their Situational Awareness (SA) through

JTACs locate targets and call in air strikes in the immersive virtual environment of the prototype dome

use of their simulated MDS and warfighting equipment. This evolutionary type of training research environment promises to force warfighters to explore aspects of the current synthetic war and not the legacy of previous DMO events with their concomitant limitations.

The JTAC and ASOC warfighters were able to execute two troops in contact (TIC) events, as well as call in bombing strikes on armored convoys. Operating with the JTAC Training and Rehearsal System (TRS) during the exercise, the JTACs were able to call for bombs on their selected targets within realistic combat timelines. Now into the third year of research and development (R&D) of the prototype JTAC "dome" virtual simulator, the JTAC TRS successfully supported the third DMO exercise since becoming network capable. Of particular note for virtual aircrews was the first ever realistic laser designation of ground targets by using a fully functional Ground Laser Target Designator emulation system developed by Minerva Engineering.

Condor Capture training research activities included several other firsts in international simulation. Vipers 1 and 2 had full air-to-air tanker coordination, received "in-flight" refueling, and returned to the fight. Viper 4 flew into McCarran Airport (Las Vegas NV), where a simulated Integrated Combat Turn (ICT) readied the jet with a fuel pit stop and missile reload, allowing the pilot to re-launch and return to the fight. The most important aspect of these two events was that both the tanker and ICT activities were executed on a realistic timeline, supporting research objectives related to team coordination and mission prioritization skills.

Other firsts included integration of deployable training systems into a large force coalition exercise. In this case, one of the medium-fidelity Deployable Tactics Trainers (DTT) at AFRL Mesa flew in formation with the high-fidelity Multi-Task Trainers dubbed Vipers 1, 2, and 3. This opened the opportunity to employ one of the Vipers as a FAC-A platform, giving the pilot full 360 degree visual SA to execute precise skills required to conduct Close Air Support (CAS) missions, including TIC situations.

An F-16 pilot from Luke AFB prepares to fly FAC-A missions in a DTT simulator at AFRL Mesa

The DMO Testbed video wall shows the Viper 4-ship out-the-window views and cockpit displays

AFRL Mesa also showcased the first use of a new DTT cockpit Graphical Display, projected on the large DMO Testbed displays and recorded for mission debriefs. This is a major advance for the deployable DMO R&D program, and will serve as a means of recording and debriefing precision guided munition instrumentation and targeting. The AFRL Mesa goal is to follow the current F-16 Common Configuration Implementation Program (CCIP) and eventually simulate the new capabilities afforded by the CCIP conversion.

Condor Capture featured network technical innovations, as US and UK engineers were able to use the UK's data logger, dubbed "NuNu," to record all Distributed Interactive Simulation (DIS) packets. This allowed the UK node to have full playback control of all DIS data files representing the 300 to 400 air and ground entities in the exercise, and warfighters in the US and UK could debrief collectively from recordings of DIS traffic at the end of each day's scenario. Crews in the US were able to collaborate, view, and speak to specific points throughout the briefs and debriefs. Additionally, engineers in the US synched debrief rooms 1 and 2 at AFRL Mesa, enabling researchers in the adjacent rooms to view the same exercise slides, Video Teleconference (VTC) feeds, and mission screens to facilitate research data collection by the training research audience.

RAF mission commander in the UK briefs USAF and RAF warfighters at AFRL Mesa via VTC using shared mission data files

As Condor Capture gained momentum, there proved to be excellent training R&D days for individuals as well as team performance and collaboration amongst the warfighters and scientists and engineers of AFRL Mesa and DSTL. The UK developed an excellent scenario which was executed well by all warfighters.

AFRL Mesa and DSTL researchers observed close integration and collaboration between teams, and all warfighters commented on excellent coordination and

AFRL Mesa and DSTL experts conduct Condor Capture data collection from adjacent brief/debrief room

support from all MDS systems and warfighting functions. There was still some fog-of-war present with uncorrelated Red Air spikes and comm limitations; however, it provided realistic real-time training opportunities.

When a Blue Air asset "died" early in the mission, the remaining assets had to cover a wider area and change Blue airspace allocation priorities. In real-time, the US mission commander coordinated and shifted priorities from air interdiction to time sensitive targeting (TST). All players exercised excellent air-to-ground discipline as the FAC-A and JTACs orchestrated CAS and TST events. The mission briefs and after-action debriefs went well, and the R&D teams highlighted multiple lessons learned to be applied before the next day's ATO drop. There were considerable challenges to the US and UK warfighters, as the complexity of each day's ATO was met with excellent mission planning, brainstorming, and briefings by all participants. The mission and package commanders devised very complex plans with several pushes to promote broader team decision making, prioritization, and allocation of assets. There were significant potential opportunities for pop-up targets and warfighters demonstrated the best integration of JTAC targeting, designation, and coordination with the ASOC ever seen in a distributed simulation event.

The F-16, FAC-A, ASOC, JTAC, and AWACS teams performed superbly, showing outstanding professionalism and focus on the fight to enhance realism of this DMO opportunity. In the UK, an Air Commodore, supported by two RAF lawyers, served as the Joint Forces Air Component Commander. Concluding the mass debrief with his own assessment based on recent real-world experience, the Air Commodore touched on a few items such as risk taking (who owns it and what level of risk is it), training opportunities, and overall mission success.

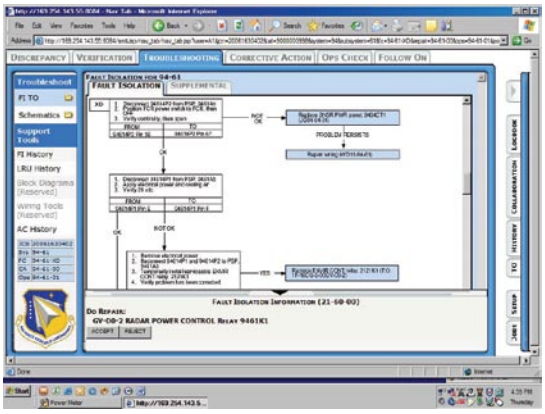
After many Coalition Mission Training Research trials, the collaborative R&D program has transitioned to the operational Air Force. Recently, the USAF Deputy Chief of Staff for Operations, Plans, and Requirements endorsed the US and UK Air Forces arrangement to maintain long-term interoperability of the US DMO and the UK Distributed Simulation systems to provide a capability to conduct warfighter combat readiness preparation and training. AFRL Mesa will support development of the coalition network and participate in the first scheduled exercise in January 2008, tentatively called "Avenging Eagle."

RAF warfighters manned AWACS Block 30/35 consoles and the Tactical Display Framework C2 interface at AFRL Mesa

Aircraft Maintenance Intuitive Troubleshooting (AMIT) Research

The Director of Maintenance, Deputy Chief of Staff for Logistics, Installations and Mission Support, Headquarters USAF, directed the Automatic Identification Technology Program Management Office to take management responsibility for continued development of the AMIT tool for flight line-maintenance. AMIT was a 36-month advanced R&D critical experiment that started in December 2003 to enhance human performance of flight line maintenance technicians in troubleshooting complex aircraft discrepancies by capturing strategic knowledge for reuse.

The job performance aiding research culminated in a 14-week/72-subject Field Demonstration Test at Luke AFB, and results demonstrated the AMIT Job Performance Aid provided an average time savings of 45-55 minutes per repair task while eliminating critical errors. The demonstrated savings in task time of 47,158 clock hours on the F-16 Block 40/42 alone, translates to roughly 5.4 more aircraft being mission capable annually. The experimental design and test results from the AMIT Field Demonstration Test were recently presented to the DoD Human Factors Engineering Technical Advisory Group Meeting 57 in Portsmouth VA, and the AMIT program was selected as AFRL's #1 nomination to AFMC for an International Test and Evaluation Association Professional Award.



AMIT screen shot showing the Fault Isolation tree within the technical data in the Troubleshooting section

TARGETS OF OPPORTUNITY

The Division initiated an Air Battle Manager (ABM) training research program in collaboration with the 552nd Air Control Wing, Tinker AFB OK, to create ABM specific Mission Essential Competency (MEC) scenarios. Division researchers and ABM subject-matter experts are developing the first-ever MEC-focused ABM benchmark scenarios designed to specifically measure and assess the performance and skills of an Air Weapons Officer assigned to the AWACS. A future goal is to combine research scenarios and syllabi for ABMs with established F-16 research scenarios and syllabi presently used during DMO events at AFRL Mesa.

The Division sponsored development of a command and control (C2) team training and performance lab at the USAF Academy with the Department of Behavioral Sciences and Leadership. The lab, created as a result of funding from the Human Effectiveness Directorate's "No Strings" initiative, is being used to explore research questions related to decision making, ways to improve teamwork and collaboration, and human systems integration in Air and Space Operations Centers and other C2 teams and organizations. Academy cadets will have the opportunity to learn various Air Force C2 functions as well as the science behind decision-making knowledge and skill acquisition in this domain. The lab and the studies to be undertaken support the Division's University Consortium Research Partnership, which includes USAFA along with a number of other university laboratories and researchers around the country.

BRIEFS AND DEBRIEFS

AFRL Mesa engineers recently finished upgrades on the 20/20 Immersive Visual Display System in support of Defence Research and Development Canada's demonstration of advanced technologies to Canadian Government Officials and members of the Canadian Forces College. This collaboration, an integral portion of Canada's Advanced Deployable Day/Night Simulation program, involves the advanced laser display system, which will provide high-fidelity visuals for flight simulators. This capability will bring bright, eye-limited (or 20/20 acuity) imagery to flight simulators and is capable of displaying over 10 times the number of pixels currently displayed by commercial High-Definition TV projectors.

The JTAC Training and Rehearsal System (TRS) R&D program achieved deliverables for the prototype JTAC TRS or "JTAC Dome" Virtual Trainer simulator. With the R&D efforts of Dynamic Automation Systems, the majority of these enhancements are on the Instructor Operator Station (IOS). JTAC IOS operators are now able to move JTAC trainees through databases freely and on-the-fly, to trainee-selected locations or attached to simulated mobile vehicles. Additionally, IOS operators can observe laser target marking in the IOS display, expeditiously process Joint CAS requests for aircraft and artillery support with the aid of "JTAC friendly" templates, and integrate weather and other environmental changes into immersive Joint CAS training scenarios.

The Air Mobility Battlelab funded the Division's Night Vision Center of Excellence to develop and demonstrate an effective, low-cost, quickly-installable Night Vision Imaging System (NVIS)-friendly and covert external lighting system modification for KC-135 tanker aircraft, as well as NVIS-compatible boom operator refueling station lighting. The system uses a novel means of controlling output modes from light fixtures, and although the current design is KC-135 specific, the principle applies to any aircraft.

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