EXPLOITING HIGH FIDELITY SIMULATION FOR AIRCREW COALITION MISSION TRAINING

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ABSRACT

In November 2001, DSTL, QinetiQ and the U.S Air Force Research Laboratory (AFRL) completed the first synthetic Composite Air Operation (COMAO) experiment to assess the potential of networked simulation for providing Coalition Mission Training (CMT) for the front-line. The exercise, named trial VirtEgo (the Virt stands for Virtual and Ego stands for a conscious, thinking subject) was designed to satisfy both training and research objectives in a tactically relevant and instructionally valid environment. The operational goal was to prepare RAF pilots for the Combined Qualified Weapons Instructors (CQWI) Operational Phase two weeks later in Scotland. The CQWI is the RAF s fighter weapons school. The training research goal was to leverage current US and UK simulation-based training initiatives in a CMT exercise. This effort examined the coalition training potential of linking the simulation facilities at Bedford (where the UK aircrew and expert White Force were co-located) with the USAF Research Laboratory, Warfighter Training Research Division (AFRL/HEA), Mesa, US where an experienced F-16 4-ship team participated as part of overall combat package. The UK portion was sponsored by Strike Command to provide synthetic COMAO training for students on the CQWI course, (namely 2 RAF Jaguar pilots and 2 Tornado F3 RAF crews). Key instructional features included specifying training objectives based on Mission Essential Competencies (MECs); applying and evaluating distributed planning, briefing and debriefing processes and technologies; and using common training and field evaluation measures with all participants. This paper provides an overview of the design, rationale and data from the experiment. It will also establish the way ahead for future coalition training research.

AUTHORS' BIOGRAPHIES

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Ms Ebb Smith is a Research Psychologist for DSTL, Bedford, UK. In 1996 she received her BSc (Hons) in Psychology from the University of Durham and joined DERA to pursue a career as a research psychologist. She has been the lead for the design, co-ordination and analysis of networked simulation trials involving front-line aircrew, development of performance metrics and production of User Requirement Documents for QinetiQ s MoD sponsored synthetic collective training experiments. Ms Smith has also conducted research into simulation assessment for ground crew training and Naval Flight Deck Officer training.

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BACKGROUND

This paper describes work, sponsored by the UK Ministry of Defence as part of its Applied Research Programme, which is investigating the use of synthetic environments (SE) to improve aircrew operational effectiveness. Since 1999 the research has focused on the application of SE technology to support collective mission training.

To date three major synthetic exercises have been conducted. The first of these, Ebb & Flow took place in Feb 2000, (McIntyre & Smith 2000), followed by Sycoe in Jan 2001, (Smith & McIntyre 2001), and most recently VirtEgo, the subject of this paper, in November 2001. In each case a synthetic environment was established, in which front-line, Combat-Ready (C-R) aircrew could participate in a complex, high threat, realistic, mission scenario, created over a secure network, as part of a Composite Air Operations (COMAO) exercise. A COMAO is defined as air actions, inter-related in both timescale and space, where units differing in type and/or role are put under the control of a single commander to achieve a common specific objective (ATP-33(B) NATO Tactical Air Doctrine).

A key element of VirtEgo was the inclusion of front line aircrew from different roles, Air-to-Ground (A-G) and Air-to-Air (A-A) plus an AWACS fighter controller, working together in a common virtual battle-space. This made the focus very much on collective training which has been defined, for the air domain, as 2 or more teams with different roles training to interoperate in an environment defined by a common set of training objectives (NATO SAS-013 Study group).

Trial VirtEgo was designed with both research and training aims, to provide training for candidates on the UK s Combined Qualified Weapons Instructors (CQWI) course and to provide a first opportunity to look at coalition training using networked simulation.

A Wide Area Network (WAN) link was configured to connect the QinetiQ simulation facilities at Bedford, UK with the simulation facilities at the US Air Force Research Laboratories (AFRL), Mesa, AZ. AFRL were simultaneously linked to the Canadian Defence & Civil Institute of Environmental Medicine (DCIEM)[1], Toronto. A long-term UK/US/CA collaborative project is being developed to take this research forward under the auspices of two groups of the Technical Co-operation Panel (TTCP); the Human Resources and Performance Group, Technical Panel 2 (HUM TP-2, Training Technology) and the Aerospace Systems Group, Technical Panel 1 (AER TP-1 Aerospace Operational Analysis and Simulation).

DESIGN RATIONALE

The scenario for VirtEgo was based on a real-world operational theatre, with a daily timetable modelled on live training exercises such as the NATO Tactical Leadership Programme (TLP), and the UK s Tactical Leadership Training programme (TLT). A synthetic coalition mission package was constituted and consisted of: a manned US 4-ship of F-16Cs; a manned UK 4-ship of A-G assets; a manned UK 4-ship of A-A assets and computer generated Suppression of Enemy Air Defence (SEAD) assets. A manned AWACS fighter controller station was also included as part of the coalition assets. Aircrew participants were provided with authentic rules of engagement and Special Instructions (SPINS). A military Intelligence Officer (INTO) set the scene by giving an introductory theatre intelligence brief, based on the scenario. He also gave daily intelligence briefing, thus providing evolving information throughout the exercise. Other coalition assets were represented by computer-generated forces (CGF). A comprehensive threat environment in the form of a dynamic integrated air-defence system was also provided, with a Sector Operations Centre (SOC) Director who had 2 manned red-air simulators, computer generated air threats, ground-based anti-

[1] DCIEM is now known as DRDC

artillery and surface-to-air missile (SAM) threats under his command.

Each morning the mission commander was given a full air tasking order (ATO) to break out. The aircrew participants brainstormed, planned, and briefed the mission to achieve the taskings laid down in the ATO. A complete mission was then flown: startup; taxi and take off; push; ingress to target; egress and recovery back to aircrews own airfields. The training philosophy was that mission training isn t just about the flying. All mission phases are important, including planning, briefing and debriefing. The synthetic environment therefore had to support the aircrew s training needs throughout the complete mission cycle.

The aircrew had one familiarization day followed by two full end-to—end COMAO mission days. During these two days the mission tempo was increased, presenting the aircrew with a wide range of operationally realistic challenges to overcome. The limited 2-day period was a constraint imposed by the requirements of the UK CQWI course.

The technology was managed by a technical team who had responsibility for maintaining the integrity of the synthetic COMAO environment for the duration of the exercise. The training elements of the exercise were managed by an established RAF team of tactical and training experts; these are military specialists from different roles who run the UK live collective air training exercises. They provided a White Force who worked co-operatively with the technical team.

Use of a White Force in Trial VirtEgo

The term White Force may have slightly different meanings in different contexts. In the UK it is commonly applied to the team of military experts who organise and run large-scale live training exercises such as the UK s annual Tactical Leadership Training exercise. This White Force will normally include an Exercise Director, a Combined Air Operations Centre (CAOC) element, Red Air experts, Air-to-Ground experts, Air-to-Air experts, Intelligence experts etc. In VirtEgo the exercise was run very much like a live exercise with the White Force there to oversee the planning, briefing, execution and debriefing of the mission, and to ensure that safety was not compromised.

The VirtEgo White Force had an A-G expert and an A-A expert who closely observed and assessed the planning process. These experts did not intervene in any way but they could report back to the rest of the White Force on the plan as it developed. The White Force, as a group could see which trigger events could be inserted into the mission to promote collective training and to test inter-formation co-ordination. A second A-A expert devised a red air game plan with full knowledge of the coalition plan, so as to maximise the training benefit of likely encounters between the two sides. Other members of the White Force acted as role-players for coalition members that would be represented by CGF, for example the SEAD, providing the voice at the end of a telephone line for essential pre-mission co-ordination.

During mission execution these role players made appropriate radio transmissions, thus enabling the aircrew to communicate, co-ordinate and co-operate effectively with all elements of the coalition package whether represented by man-in-the-loop simulations or CGF. The White Force were stationed in the exercise control room whilst the mission was being flown, equipped with role-player stations and an interactive communications network with access to 2D tactical views, stealth views and the AWACS tactical picture. Remote view cameras were also placed within the simulator cockpits. They had the ability to monitor aircrew performance, orchestrate the performance of the hostile forces, both manned and CGF, and to act as role-players as mission events dictated. They were thus able to increase or decrease the mission tempo to enhance the training experience, with the caveat that the assets available and their behaviours were bounded by what was credible for the theatre in question and remained in-line with the intelligence briefings given to crews. The White Force were also able to initiate certain trigger events designed to promote inter-formation interactions. With their god s eye view of what was happening and their knowledge of what the aircrew had planned they could manipulate conditions for maximum training value, something which is not possible in a live exercise. This is why a skilled operational team (or White Force) are needed as training managers for a complex collective training exercise.

SIMULATORS

The UK participants were collocated at Bedford, flying research simulation systems (see Figure 1a) connected via a Local Area Network (LAN). Each of the simulators had a 2-radio fit , with 8 channels to provide a realistic communications capability. Two 2.5 metre^2 immersive tents were configured for the A-G role. Each tent had a generic, single seat, fixed base, cockpit with representative head down displays (HDDs). An outside world view, with superimposed head-up display (HUD), was provided using four projectors which gave a back projected 180^o vertical x 270^o horizontal field of

view on four semi-rigid screens (front, top and two sides). These cockpits were used by 2 A-G CQWI candidates. To make up the rest of a tactical 4-ship formation, two A-G instructors used lower fidelity mission stations, each with a single screen providing a field of view of 90° vertical x 50° horizontal. The use of mission stations for the instructors was not ideal because it meant that each 4-ship was made up of heterogeneous entities. This configuration was necessary due to limitations in the number of available research simulators.

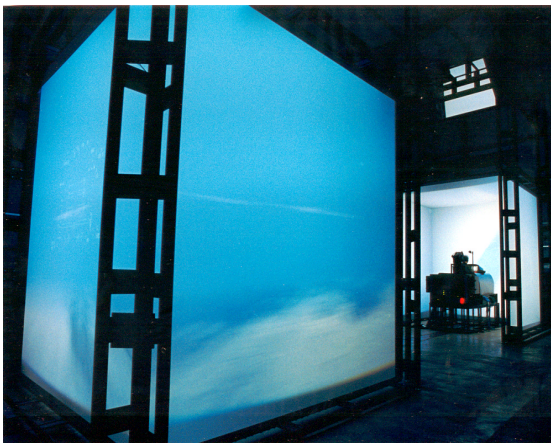

Figure 1a. Two immersive tent simulators

Figure Two 4 metre^2 immersive tents were configured to enable A-A aircrew to operate them. In this case each tent had a generic two-seat, fixed-base cockpit providing tandem seating for pilot and navigator as in the real aircraft. These cockpits were used by the A-A CQWI candidates (two pilots and two navigators). To make up the rest of a tactical 4-ship two of the A-A squadron instructors used mission stations, operating in single seat mode.

In addition, a secure, long-haul WAN link between Bedford and AFRL enabled a manned F-16C 4-ship to participate in the same mission as the UK crews. AFRL have been closely involved in the development of networked simulations in the USAF Distributed Mission Training (DMT-A) initiative (See Figure 1b).

Figure 1b. Two-ship and Mission Desk at AFRL

Their 4-ship comprised four F-16C block 30, type specific, single-seat cockpits immersed within Modular-Mobile Display for Advanced Research and Training (M2 DART) systems, each of which is a rear projection, dome-display with a 360° horizontal field of view. It is important to note that the focus of this trial was on collective training to support the CQWI candidates. Therefore, the AFRL F-16C team was not a team undergoing training, but was a training support team to the trial. By having the AFRL team set up in this way, a more significant level of control could be provided for the overall evaluation. In future trials, training objectives and training effectiveness evaluations will be conducted across all the teams.

Industry standard protocols were used to support interoperability over the WAN link, specifically a commercial dial-up rate ISDN was used. It was used for DIS data including voice whilst missions were being flown. This link was also used for video and data conferencing during planning, briefing and debriefing phases. A link from the US to Canada, was also in place; specifically to the Canadian Defence & Civil Institute of Environmental Medicine (DCIEM), Toronto (now DRDC). This allowed the Canadians to receive some of the DIS data in real-time, and was intended to prove that the infrastructure would work between the three sites. It is anticipated that there will be greater Canadian involvement in future trials which may take place under the auspices of TTCP. Networks were accredited by national authorities to US/UK/CAN SECRET.

CREW CO-ORDINATION SYSTEM

Crew co-ordination facilities were set up to support the distributed aspects of the trial. These included a number of tele-working tools, including electronic whiteboards. The link between Bedford and AFRL enabled video and voice to flow across the network. A standards based

approach was adopted so that dissimilar video equipment could be used at each site.

Figure 2 below shows SmartBoard™ and video in use in the UK s Plan/Brief/Debrief Centre during trial VirtEgo. Outputs could be displayed on any one of three large screens, via a projection system. The US planning room can be seen on one of these screens in the background of Figure 2. The planning map used by aircrew can be seen on the SmartBoard™. The SmartBoards™ provide a touch sensitive screen, of relatively large physical area, which is convenient for multiple users. These could be used simply as an electronic White Board; alternatively the screens support applications such as PowerPoint or electronic web based applications. The screen could operate in stand-alone mode or the contents of the screen could be shared across the link, using Microsoft net meeting.

Figure 2. SmartBoard™ in use during mission planning

For trial, VirtEgo the debrief was led from the UK with US participation. Figure 3a shows the UK debrief facility in use providing a comprehensive mission replay capability which was synchronised at both ends of the link.

Figure 3a. Debrief screens in use during trial VirtEgo

Figure 3b shows the Debrief system at AFRL with full digital data, four F-16 cockpits, plasma displays plus SmartBoard“ overlay on planview display.

Figure 3b. Debrief system at AFRL

OBJECTIVES

Trial VirtEgo was designed to satisfy both operational and training research objectives in a tactically relevant and instructionally valid environment.
The training research focus was on the use of distributed simulation for coalition mission training. The UK A-G and A-A assets were collocated at the Bedford site. The assigned tasking necessitated co-operative planning and co-ordination between the UK and US based aircrew. Two missions were flown and, in order to explore the maximum number of integration possibilities, the F-16Cs flew in an A-G role on the first mission, swinging to an A-A role following weapons delivery. For the second mission they adopted an A-A role throughout. There were therefore different co-ordination needs between the crews during the planning phase of each mission.

Specific research objectives for the trial included:

- assessment of the potential of distributed simulation to provide an effective coalition mission training environment;
- investigation of Exercise Management requirements for distributed collective training across remote sites;
- assessment of the ability of a secure WAN to support the participation of manned players in a distributed training exercise;
- assessment of the efficacy of distributed tools for mission planning, briefing and debriefing and the impact of the tools on overall event success;
- elaboration of mission essential tasks and competencies for coalition training and rehearsal.

VirtEgo was also designed to provide refresher COMAO training for UK crews undertaking the CQWI Course. This is a 5-month course which turns experienced front-line aircrew into Qualified Weapons

Instructors (QWIs). Although this is described as a combined course, the potential weapons instructors are located at separate air bases, according to their aircraft type, for most of the 5 months period and only come together for the culmination of the course in a 2-week live flying Operational Phase (Ops Phase). The objectives of the Ops Phase are:

- to practise daytime COMAO procedures, employing fighter escort/sweep, Air-to-Air Refuelling (AAR), SEAD, Recce and Airborne Early Warning (AEW) in a hostile Electronic Warfare (EW) environment;
- to practice, develop and refine COMAO tactics;
- to learn by comprehensive mission debriefs, incorporating feedback from opposing forces;
- to gain exposure to EW threats.

It is highly likely that the high level cognitive skills, which are essential to successful COMAOs are prone to skill fade. These would include the ability to build and maintain situation awareness (SA) or to make tactical decisions in a complex and highly dynamic environment. VirtEgo was designed to refresh such high level COMAO skills by enabling the aircrew to practice their role-specific mission tasks **collectively** and to plan, brief and debrief comprehensive COMAO missions. The value of this refresher training would be confirmed if performance of the CQWI candidates in the initial stages of the Ops Phase was enhanced.

ASSESSMENTS

The WAN link successfully allowed the coalition package to work together during all mission phases.

Previous trials (McIntyre & Smith, Smith & McIntyre Op Cit) have shown that synthetic COMAOs provide good opportunities for crews to train and practice their mission essential tasks and exercise their competencies (MET/Cs). These findings were confirmed in VirtEgo, with aircrew of the opinion that 60% of their role-specific MET/Cs could be trained or practiced in the synthetic training exercise as well as they could be in regular live training exercises. 28% of these MET/C were rated as being better trained in the synthetic COMAO.

There was also an average 20% improvement seen in the aircrews collective performance over the two mission days. Collective performance was assessed according to criteria such as; ability to balance risks , level of situational awareness of tactical situation and between role communication and co-ordination.

Of particular interest in VirtEgo was an initial assessment of the reaction of coalition forces flying a mission together, , using distributed technology. A questionnaire was therefore developed, to be completed by all participants in the exercise whether UK or US based. In each case assessments were of contributions made by the assessors own team and each of the other participants, including; UK A-G, UK A-A. F-16Cs, AWACS and SEAD. The questionnaire asked for assessments to be made in a number of areas, including:

- confidence that package plan was fully understood by all coalition forces;
- confidence that own formation s objectives were understood by others;
- confidence that you understood other formations objectives;
- level of communication during the planning phase and during the mission;
- pre-mission confidence in ability of all to help package achieve mission success;
- post-mission confidence in ability of all to help package achieve mission success;
- effect of participating in this mission on level of trust between the teams.

Figure 4 presents some of the findings from an A-A perspective, in which a rating of 3 indicates Average , 4 indicates High Average and 5 indicates Above Average .

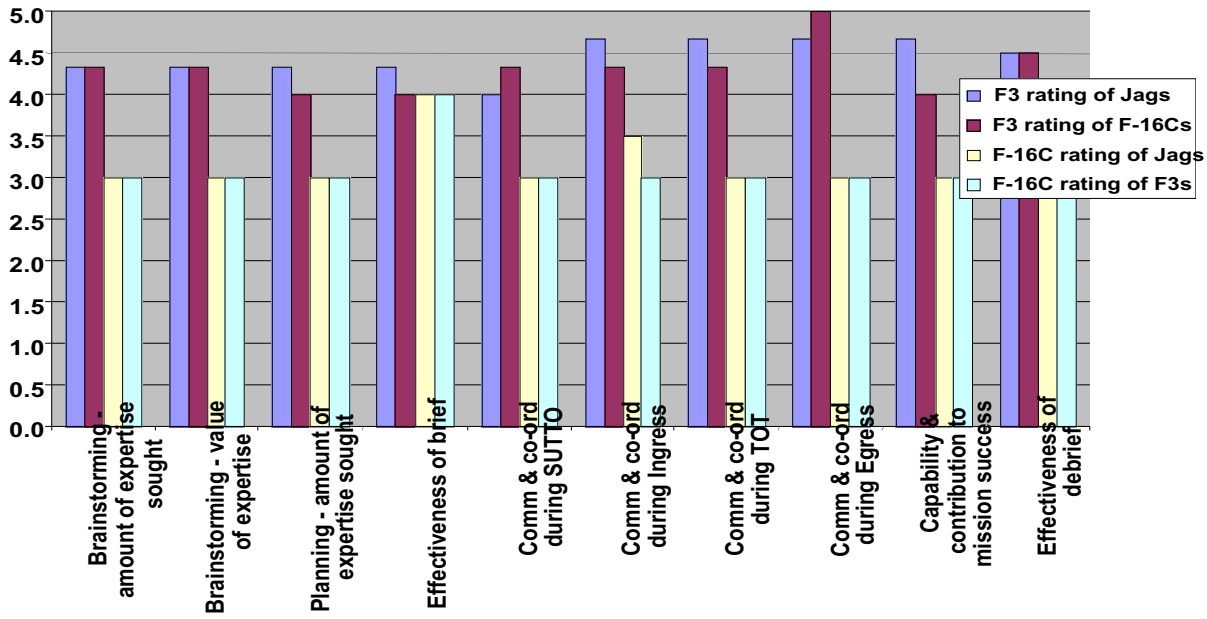

Figure 4. Comparison of UK and US ratings of other participants contribution to mission success

In general the UK formations rated the contribution of the F-16Cs higher than the F-16Cs rated the UK package elements. This may be due to a variety of reasons, not least that there were technological limitations which impinged upon the F-16Cs ability to integrate with the UK package elements during the planning, briefing and debriefing phases.

OPERATIONAL TRAINING

A number of performance assessments made during trial VirtEgo were repeated during the subsequent live training at the CQWI Ops Phase.

Assessments was made of overall collective performance, with CQWI instructors and the White Force team being asked to assess how well participants were seen to be working together as a collective force. Ratings were made using a percentage scale, where 0% indicates very poor - could not be worse , 100 % indicates optimum - could not be improved . A rating of 50% or more indicates an acceptable level has been demonstrated .

As can be seen in Figure 5 the crews performance was generally acceptable during mission 1 of VirtEgo. This is unsurprising as all were experienced aircrew. Only three areas came close to the 50 % level, one actually dipping slightly below it, into an unacceptable performance. These were Ability to balance risks Ability to cope with fog of war and Level of awareness of the tactical situation . These are aspects of collective performance which are amongst the most difficult to practice during peace-time training. In general, an improvement could be seen during the second mission of trial VirtEgo, as might be expected. Mission 1 of the Ops Phase showed maintenance of this improvement, which appeared to have transferred well.

The CQWI instructors were particularly interested in the performance of the CQWI candidates during the planning phase. A questionnaire was therefore developed, to be completed by the CQWI Instructors for each mission they observed. They were asked to rate performance on the following 10 categories: Leadership; Followership; Use of information; Use of resources; Communication; Integration; Time management; Thinking about the big picture; Decision making; Attitude. Assessors were asked to give each rating as a percentage; where 0% = Fail; 1% to 19% = Below Average; 20% to 39% = Low Average; 40% to 59% = Average; 60% — 79% = High Average; 80% to 100% = Above Average.

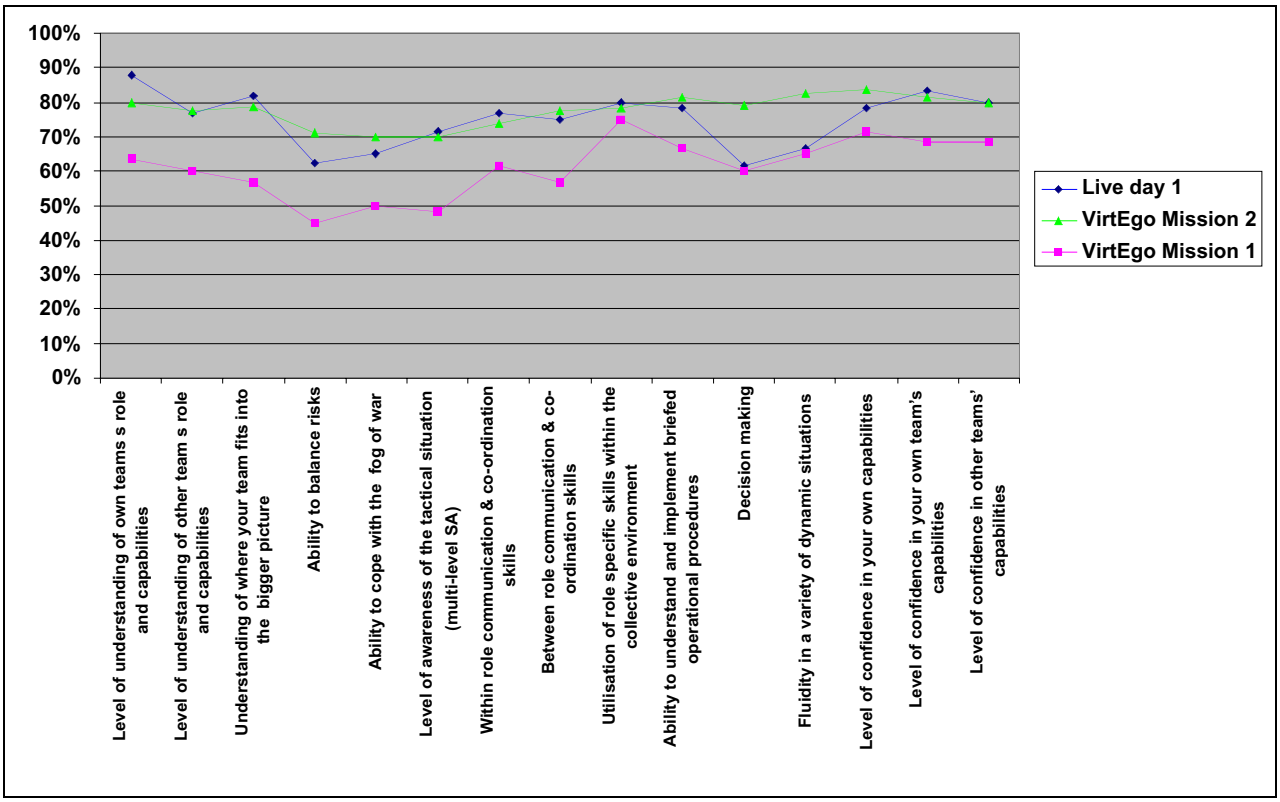

Figure 5. Collective performance assessment

The results indicate that there was a significant improvement in the planning performance of the QWI candidates over the two days of the trial, (see Figure 6), with a leveling out of planning capabilities across all ten categories, to a very high level of proficiency. This effect is not surprising as these were experienced aircrew who were out of practice and the refresher effects of a day s practice were being observed.

The key question for proving the value of the synthetic experience was whether the training received in the synthetic environment at Bedford would transfer to the Ops Phase, leading to an improvement in the performance of the candidates during its first few days. There was indeed a distinct improvement in planning performance compared to the first mission day of trial VirtEgo suggesting that transfer of training had been achieved.

The CQWI Instructors confirmed that they could see an improvement in all aspects of the planning cycle compared to what is usually seen during the first mission day of the Ops Phase. In particular the instructors noted; better ATO analysis, students were more on the ball , better use of leadership skills, better communication and organization. The instructors also reported a better rapport, and more effective inter team co-ordination, between the A-A and A-G aircrew than had been seen during previous CQWI Ops Phases. The two squadrons had had the chance to get to know each other and work together at Bedford and so needed less time to overcome initial uncertainties about the other role.

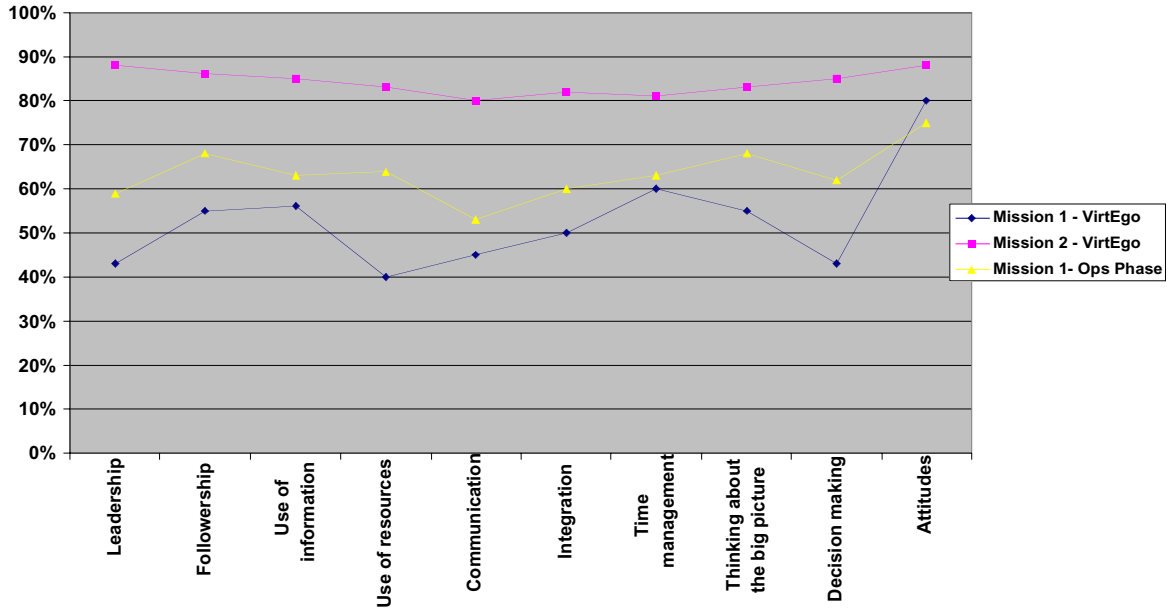

Figure 6. Comparison of planning phases - VirtEgo vs Live Ops Phase

There are of course a number of reasons why an even greater improvement was not seen. Only two full mission days were flown during trial VirtEgo which may not have provided sufficient opportunity to maximize the COMAO training potential. The consensus was that a minimum of three days would be needed in future. There was also a two-week break between VirtEgo and the Ops Phase because of the pressures of the CQWI course; some of the lessons learnt at VirtEgo may have been forgotten. It would be beneficial if the synthetic training could take place immediately prior to the Ops Phase.

DISCUSSION AND CONCLUSIONS

There was generally a positive feeling amongst participants in VirtEgo that there was considerable potential for coalition synthetic training. A number of confounding factors are recognised, which make it difficult to draw any definite conclusions from this exercise about how well distributed teams could potentially work together. The US F-16Cs agreed to participate in a UK trial that had been set up to provide training to the CQWI students and was tailored to their specific requirements. As mentioned earlier, the US participants did not have specific Training Objectives (TOs) of their own and so assessment of whether or not training was achieved for them was not appropriate and expanding the focus of the trial and the objectives to the other individuals and teams will be addressed in future trials. It is also planned to develop competency- and construct-oriented objective measures to assess how the different elements worked together. These objective measures, which can be derived from the actual data packet information transmitted over the WAN can be linked to more subjective assessments of the quality of such constructs as communication, situational awareness, picture management and battle management. The linked data can be made available not only to researchers examining training impacts, but also to the instructor pilot and the tactical team for use in the debriefing portion of the exercise. AFRL has developed a suite of competency-based and automated objective and subjective measurement tools which were used in this trial for usability and functional evaluation and which will be available for future trials as a means to actually collect training research data.

The OCU QWI Instructors were unanimous in their belief that the synthetic COMAO training undertaken during trial VirtEgo had been of great benefit and had better prepared the QWI candidates for the Live Ops Phase.

There are a number of factors which appear, from the UK experience to date, to contribute towards the success of a synthetic collective training exercise. Collocation is perceived by the UK crews to be of great benefit during a collective training exercise. However, collocation is not always possible and certainly for

multi-national, coalition training there will probably need to be a geographical distribution of training sites. It is therefore important to look at how best to use the available technology to overcome the barriers to interaction that are associated with non collocation. Future trials will address this question. Another important factor has been the expertise of the exercise management team, they have been a critical component of collective missions to date, particularly as CGF role-players both during mission planning and during execution. The role of a White Force has yet to be defined for coalition training. Again this will be a topic for future collaborative research.

From the U.S. Air Force perspective benefits from this trial can be summarized as follows: Running a joint research and training exercise was a tremendous step forward in joint- and coalition force training capabilities. Moreover, it serves as an exemplar of how future events must be structured to provide the type of training that is required for coalition operations. Some aspects of the distributed mission planning and debriefing capabilities did not perform as expected. Since part of the research was on determining the compatibility and function of a host of local and of distributed technologies themselves, these problems were expected and are being addressed for future events. While it is feasible to conduct joint training/research activities where the research is more human performance-based, in the future the underpinning technology should be robust and proven — i.e. the technology should not be the focus of any research when formal training is being provided (and paid for). It is also important to emphasize that this event underscored our need to understand how the UK and US work and where the UK and US do things differently from one another. The researchers had similar strategies (UK, US), but different implementations. US DMT research focused on 4-ship mission effectiveness and tactical employment for air-to-air and air-to-ground engagements mission while Trial VirtEgo focused on composite force mission.

It is also important to create a total training experience and consider the training needs of participants during all the mission phases, particularly brainstorming and planning. Valuable operational training was accomplished for the UK crews during VirtEgo. This was undoubtedly attributable to the rich COMAO environment which kept the aircrew fully immersed in each days mission and created an experience which was so realistic that they forgot they were involved in a synthetic training exercise.

The ultimate goal is to understand what is required to turn a network of simulators into an effective collective training system. Interoperability is the key and does not just apply to platforms, but to roles and personnel, policy, procedures and doctrine. Interoperability requires understanding, co-operation, communication and trust.

LIST OF ACRONYMS

A-A	Air-to-Air
AAR	Air-to-Air Refuelling
AEW	Airborne Early Warning
AFRL	Air Force Research Laboratory
A-G	Air-to-Ground
ATO	Air Tasking Order
AWACS	Airborne Warning and Control System
CGF	Computer Generated Forces
COMAO	Composite Air Operation
CQWI	Combined Qualified Weapons Instructor
C-R	Combat Ready
DCIEM	Defence & Civil Institute of Environmental Medicine
DIS	Distributed Interactive Simulation
DMT	Distributed Mission Training
DRDC	Defence Research & Development Canada
EW	Electronic Warfare
HDD	Head Down Display
HUD	Head Up Display
INTO	Intelligence Officer
ISDN	Integrated Services Digital Network
LAN	Local Area Network
MET/Cs	Mission Essential Tasks/Competencies
M2DART	Modular-Mobile Display for Advanced Research and Training
QWI	Qualified Weapons Instructor
RAF	Royal Air Force
SA	Situation Awareness
SAM	Surface to Air Missile
SE	Synthetic Environment
SEAD	Suppression of Enemy Air Defences
SOC	Sector Operations Centre
SPINS	Special Instructions
TLP	Tactical Leadership Programme
TLT	Tactical Leadership Training
TOs	Training Objectives
TTCP	The Technical Cooperation Panel
WAN	Wide Area Network

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