Lessons Learnt In The Range Of Team Training Experienced In The UK Mission Training Through Distributed Simulation Demonstrator Programme

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Abstract. The UK MOD has a vision of providing Mission Training through Distributed Simulation (MTDS). The MTDS Capability Concept Demonstrator (CCD) programme developed a facility comprising of 4 Tornado GR4 and 4 Typhoon simulators, a 7-seat AWACS mission crew training system, and an extensive exercise management capability (including virtual role players and Computer Generated Forces (CGF)). In a series of nine events, training participants were involved in a series of air battlespace missions involving joint and multi-national assets. Each event provided evidence to address key issues associated with the UK MTDS vision. This paper provides an overview of the range of training experienced at the collective, joint (air, land and maritime) and combined training (multinational fast jet, AWACS and forward air controller) levels. Participants were quick to articulate that UK MTDS had utility for a wide range of training from small team, through collective to joint and multinational. A key lesson was that a single training event could support training objectives simultaneously on a number of levels, e.g. benefiting from the ability to lead a force package as well as being exposed to a collective training environment. Further, it was observed that aspects of individual and team training were being delivered as a natural ‘by-product’ of collective training.

1. INTRODUCTION
The UK Mission Training through Distributed Simulation (MTDS) programme seeks to use synthetic training environments (STEs) to deliver operational team, collective, joint and combined training for the air component of the Joint Battlespace. A Capability Concept Demonstrator (CCD) was funded by UK MOD to de-risk UK MTDS and define user requirements. The MTDS CCD programme background, including details of the five training exercises undertaken within the programme, have been presented elsewhere [1], [2]. The focus of this paper is the range of training achieved by participants in the MTDS CCD programme.

1.1 MTDS CCD FACILITY
The MTDS CCD facility consisted of eight fast jet simulators, four Typhoon and four Tornado GR4 aircraft, a seven seat E-3 Airborne Warning and Control System (AWACS) capability, and a comprehensive exercise management and control suite. A 40-seat briefing and de-briefing room and a selection of smaller planning rooms were provided. These incorporated standard in-service planning aids and video conferencing, telephone and shared whiteboard technology so that the participants could undertake a condensed cycle of planning, briefing, execution and debriefing (PBED). A classified networking hub allowed for connecting securely with training facilities elsewhere in the UK, US and Canada as shown in Figure 1.

2. RANGE OF TRAINING
The five main training events undertaken as part of the MTDS CCD programme demonstrated a wide spectrum of training scenarios, involving a correspondingly broad range of warfighters.

The range of training demonstrated during the programme included:

• Team training: Where multiple platforms of the same type or multiple individuals within the same platform trained together. This
included 2 and 4-ship fast jet training, and AWACS mission crew training;
• Collective training: Where two or more teams train together, in which each team fulfils a different military role;
• Joint training: Where individuals and/or teams train together across service boundaries; and
• Combined training: Where individuals and/or teams train together across national boundaries.

Data collected from these events and outside of the MTDS CCD facility in liaison with stakeholders have demonstrated a widespread appreciation of the potential of UK MTDS to meet a broad range of training objectives. This paper describes the range of training that could be provided within UK MTDS ranging from team to collective, joint and combined training based on evidence gathered throughout the programme.

Five major training exercises are listed that form the evidence base for the MTDS CCD outcomes [1]. The first phase consisted of three trials of team, collective and joint training using the MTDS CCD. At the end of this phase, distributed training interoperability with Aviation Training International Limited (ATIL) rotary simulators, Air Force Research Laboratories (AFRL), the Distributed Mission Operations Centre (DMOC) STE and Defence R&D Canada (DRDC) was demonstrated, and a trials environment provided in order to answer key questions. Furthermore, Typhoon and AWACS STE were introduced. The exercises were:
- 1 - EXERCISE BATTLE BUZZARD
- 2 - EXERCISE CONDOR CAPTURE
- 3 - EXERCISE NORTHERN GOSHAWK

Building upon this, two further events were conducted to analyse, evaluate and determine a robust exercise management approach and measure training output. Technology was tested to understand multi-level security issues, including linkage to the Distributed Mission Operations Network (DMON) and UK maritime/rotary-wing legacy STE, and best practice was captured. Typhoon and AWACS training audiences were involved in UK dispersed and US dispersed multinational, joint collective training events.

The two exercises were:
- 4 - EXERCISE ARCTIC OWL
- 5 - EXERCISE AVENGING EAGLE

In order to support the training objectives of the warfighters, a central White Force (WF) team led by an exercise director managed collocated and dispersed assets.

A day in the life of the MTDS CCD facility followed the cycle of PBED. The day began with a series of briefings setting the context and overall intent for the day’s mission. Led by a Mission Commander, the warfighters would then begin their planning, both within their formations and co-ordinating between formations (including across national boundaries), as required. This was followed by the mission execution phase where warfighters at the collocated and dispersed sites carried out their ‘blue’ plan with the facilitation of

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1 Teams training together across service boundaries can be considered to be ‘joint collective’ training.
the white force. Following the completion of the mission execution, warfighters would lead a series of debriefings, beginning with a formation level debriefing. The final activity was a mass debriefing in which all participants ran through a facilitated After Action Review (AAR) including timed mission replay, to capture the critical lessons identified.

3. RESULTS

3.1 Team training

The initial focus of the MTDS CCD, reflecting the outcomes of prior research [3], was on the provision of collective training. However, earlier studies had also identified that UK MTDS had the potential to provide training at the team level, specifically fast jet 4-ship work up training. This would serve to prepare teams at this level to 'what if' scenarios (such as adverse weather) that they could not easily experience in the live environment.

These earlier conclusions were reinforced during the MTDS CCD programme, with Typhoon participants noting that UK MTDS could provide a good environment for a team 'work up' to a collective training scenario. Here, the scenario could be envisaged where a UK MTDS system provides a short 'work up' period prior to a full-scale collective training event.

The E-3D AWACS community were another component that identified the potential for team training within UK MTDS. The UK E-3D community looks to conduct 10-person mission crew training wherever possible, and noted that a UK MTDS E-3D trainer could be used to deliver stand-alone team training when not utilised for collective events. Further, a lower priority requirement was identified to train at the sub-team (e.g. weapons and surveillance team) level. This would not require the wider E-3D crew (e.g. the flight crew and Communications Operator) to be present where a satisfactory Instructor Operator Station (IOS) was provided.

In broad terms, the provision of elements of team level training within UK MTDS may lead to the need for higher fidelity STE, due to the increased emphasis on procedures. This and other fidelity requirements are discussed in detail in [1] and [4].

In general, the MTDS CCD programme confirmed the findings of prior studies by demonstrating that elements of team training could be delivered within UK MTDS.

3.2 Collective training

The MTDS CCD programme adopted a model of collective air battlespace training developed under prior UK MOD synthetic training research [3]. In this model, synthetic Composite Air Operation (COMAO) missions were constructed to emulate the PBED cycle used on live training events (e.g. Elements of Tactical Leadership Training and Combined Qualified Weapon Instructor courses). At the start of this programme, the packages constructed to prosecute these missions were fast jet focussed, but as the programme progressed the model was expanded with wider warfighter participation, including rotary wing and land assets.

The collective training model demonstrated during the MTDS CCD was refined further from prior research to include this wider audience. The final model delivered training benefit and positive comments were received from both air-air and air-surface aircrew and those in the Command and Control (C2)/Air Battle Management roles.

During the exercises, a wide variety of mission types were explored, including those rarely conducted in existing training (e.g. Combat Search and Rescue).

The specific benefits, as articulated by warfighters are included in a selection of comments below:

- “Liaison: was good to be able to liaise with jets (aircrew) and look/see what they can do” E-3D fighter controller, TRIAL FALCON FLIGHT;
- “Good COMAO planning exercise for a full operational mission” Tornado GR4 pilot, EXERCISE NORTHERN GOSHAWK; and
- “Discussing ops/tactics with operators from other fields” Tornado GR4 navigator, EXERCISE NORTHERN GOSHAWK.

As reflected by reactions to multinational events, one theme to the responses was that aircrew felt the environment provided by the MTDS CCD provided an effective learning environment for more junior aircrew. Responses included:

- “The system is an excellent learning tool – a chance to participate in a COMAO environment with a little less pressure and the chance for younger aircrew to lead a COMAO.” Tornado GR4 navigator, EXERCISE CONDOR CAPTURE; and
- “I would loved to have done this when I was young.” Tornado GR4 pilot, EXERCISE CONDOR CAPTURE

In a progression from earlier demonstrations, wider participants from the command and control (C2) and Intelligence, Surveillance Target Acquisition and Reconnaissance (ISTAR) domains were introduced into this model, with general overall success. This suggests that the model of training employed could be expanded to include wider participants during UK MTDS. Potential variations on this theme could include C2 centred training events where an operational element (e.g. a combat ops team) is the training audience; and an ISTAR focussed event where wider elements of the ISTAR capability (e.g. Nimrod R1 and ASTOR) are represented. However, caution should be exercised in overloading training events with too many participants as this may increase the risk of ‘training fodder’. Here,
the size of the training audience is increased to such an extent that some participants serve only to support the training objectives of others, rather than gaining benefit themselves.

Overall, the MTDS CCD programme refined and developed the model of collective tactical mission training and wider components such as the ISTAR community were also integrated.

Collective training has been the most thoroughly de-risked training type investigated during the MTDS CCD programme and remains the most likely ‘core business’ of UK MTDS.

3.3 Joint training

The UK has conducted joint training for some time via a series of Permanent Joint Headquarters (PJHQ) led exercises; these largely service the training requirements of the operational level joint components. Increasing tactical level joint working on operations, particularly between air and land domains in operational theatres, has led to a desire to support and resource dedicated joint tactical training. A number of programmes are currently underway to produce the technical infrastructure (e.g. networking) required to conduct distributed joint tactical training, driven by policy. In parallel are a small number of programmes defining the training requirements for joint tactical training.

Within the MTDS CCD programme, EXERCISE ARCTIC OWL provided a demonstration of distributed joint tactical training, linking ATIL AH-64 Apache simulators and maritime fighter controllers (FC) within a Type 42 destroyer training system to the MTDS CCD. EXERCISE ARCTIC OWL was well received; as it was on a limited scale, further exploration of the utility of UK MTDS for joint training was undertaken with wider stakeholders.

In general, support for using UK MTDS for joint training was high amongst participants in the MTDS CCD programme. The majority of participants were at the tactical level, hence most responses relate to this level of training. With UK MTDS as the ‘hub’ for air battlespace training, the majority of near term opportunities are for dual service air-land and air-maritime training rather than integrated tri-service training.

Post the MTDS CCD programme, the facility is being used for Air-land Integration (ALI) training that is of critical importance on current operations and is likely to be an enduring requirement. Air-land integration falls into three broad areas: Fires, ISTAR and Combat Service Support underpinned by the wider activity of battlespace management. During ALI training events, the facility provides a representative 3-D training environment for management of the battlespace and delivery of joint fires. A selection of comments from participants during EXERCISE ARCTIC OWL is included below:

- “Another good insight into COMAOS - especially air land integration” Tornado GR4 aircrew
- “Good co-ordination work between ASOC/UAV/CAOC/FAC provides good effects in scenario” Tornado GR4 aircrew

The model adopted for this type of training exercise could be expanded to include wider ISTAR assets and elements of Land HQs, such as the Battlespace Management cell. Other potential areas for integration with the land component include the Support Helicopter component.

Linkage between air and maritime training also offers the potential for mutual benefit, as demonstrated to a limited degree during EXERCISE ARCTIC OWL. Extremely positive feedback from the maritime Fighter Controller (FC) community was received with one controller noting that the last time he had been able to interact with such a complex air picture, he was on operations. Other comments were recorded by maritime Type 42 FC participants during EXERCISE ARCTIC OWL included:

- “This was exceptional training”;
- “[A highlight was] being thrown in at the deep end. Being a naval FC I struggle to keep skill fade at a bay as the opportunities to control at sea seem to dwindle. Therefore professionally it was great for me to control so much.”; and
- “Good to be included in brief. Huge advantage to be part of brief with ALL players ahead of exercise.”

This suggests that, in future, tactical air-maritime events could focus on maritime air defence scenarios and involve wider elements of a destroyer ops room, such as the Air Warfare Officer and picture building team. This would align with the introduction of Type 45 destroyers into service. In the wider context, UK MTDS air-maritime links could be expanded to facilitate joint Future Carrier, Anti Submarine Warfare, and Airborne Surveillance vignettes. Generally the feedback from the naval community was extremely positive, providing strong evidence for linkage between UK MTDS and the Maritime collective training.

The potential for joint training across the three services is illustrated in Figure 3.

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2 Although, for example, a littoral scenario involving all three services could prove beneficial.

3 EXERCISE ARCTIC OWL, as a small scale joint air battlespace training demonstration, did not allow wider maritime tasks to be practiced such as Naval Gunfire Support.
Figure 3: Potential types of joint training within UK MTDS at the tactical, operational and strategic levels

3.4 Combined Training

The history of UK-US exercises under the Coalition Mission Training Research (CMTR) Programme Agreement extends to pre-MTDS CCD MOD research; hence the distributed combined training model was well understood prior to the start of the programme.

That said, data gathered throughout MTDS CCD exercises through links to AFRL, DRDC, and later the DMON, reinforced prior research in that there is significant mutual benefit in UK and coalition aircrew training together in a synthetic environment. In particular, the MTDS CCD programme demonstrated successful integration of UK warfighters with a range of US platforms at their respective Mission Training Centers, including air-air, air-surface and ISTAR assets.

Aircrew from across all the participating UK platforms commented that the process of PBED with their international equivalents increased their understanding of multinational procedures. Junior aircrew, who may not have had the experience of live combined exercises, such as RED FLAG, found the exposure to multinational platforms and personnel particularly useful. Specific comments included the following:

- “Highlights included briefing with the Americans on the live-link: this is the first time I have been involved in a COMAO plan and brief” (Tornado GR4 aircrew during EXERCISE BATTLE BUZZARD); and
- “Good to do coalition integration in mission integration” (E-3D fighter controller during EXERCISE CONDOR CAPTURE).

Such comments demonstrated the value of distributed synthetic coalition training exercises. While such events cannot completely replace face-to-face interaction with coalition partners, they can provide an extremely valuable experience in improving understanding of other nations’ platforms and processes.

4. DISCUSSION

The MTDS CCD programme demonstrated successfully a wide range of training events and mission types. These ranged from small scale team training scenarios to multi-site distributed events (Figure 4). The model of distributed collective training was expanded into the joint and multinational domain with success and these types of training should form a central part of UK MTDS. Further, a wide range of mission scenarios were employed, including those that are difficult or impossible to achieve in the live domain. Providing a wide range of potential scenarios within UK MTDS was welcomed by participants.

Figure 4: Summary of potential range of training available within UK MTDS with examples

In summary, evidence was collected during the MTDS CCD that indicates that the range of training achievable within UK MTDS is potentially extremely broad; an initial focus on collective training is justified as it would allow elements of team training to be conducted in parallel.

REFERENCES

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