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Technical Memorandum:

Findings of the Test and Evaluation Proof of Concept Trial at the NCOT Facility

Trial Date: March 11-13, 2002

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Abstract

A proof of concept (POC) assessment was conducted on the NCOT facility to determine its ability to support Test and Evaluation requirements for real-time, human-system performance measurement. The goal was to look at the NCOT capability to develop, build and run scenarios and to capture a range of performance data from individuals and small teams. In general, it was concluded that for the most part the NCOT facility provided the means for building and running scenarios, however software modifications would be need to better support T&E data capture and analysis requirements.

Résumé

Le NCOT faisait l'objet d'une validation de principe (VP) pour déterminer sa capacité à soutenir les exigences d'essai et d'évaluation relatives à la mesure du rendement homme-machine en temps réel. Le but était de vérifier sa capacité à élaborer, à bâtir et à exécuter des scénarios ainsi qu'à recueillir des données sur le rendement de personnes et de petites équipes. Selon les constats, le NCOT permet surtout de bâtir et d'exécuter des scénarios, car, pour mieux recueillir et analyser des données, il faudrait modifier son logiciel.

Executive Summary

This report represents the next step in an ongoing process to provide systematic human factors support to the COMDAT program, in terms of developing a trial plan and detailed methods and measures to evaluate the impact and effectiveness of new decision support technologies to the Ops Room of the Halifax class ships.

In previous reports we have outlined potential data collection sites and have developed a detailed trial plan specifying what C2 processes to measure, and a number of methods to capture the required data for test and evaluation (T&E) purposes. The next step in the process has been to assess the capability of the NCOT facility to support real time data collection and analysis through a Proof of Concept (POC) trial.

The trial involved the development and building of a complex scenario that comprised background events in the air and on the surface from commercial and other traffic. Superimposed upon the background scenario were a number of potential threat events arising out of the specific geo-political circumstances.

The scenario was then run in real time in NCOT using a small team of Navy supplied SMEs to play the roles of the RT1, TrackSup, SWC and ORO. We then assessed the ability of NCOT to support a wide range of requirements in the actual running of the scenario. These included the ability (1) to deliver information to the team from within the scenario and from T&E personnel playing other Ops Room roles; (2) to capture ORO actions, team communications and CCS screen content (3) to time and log events of interest for T&E analysis and (4) to capture a video and audio record of team interaction. Subsequently, we then assessed the NCOT capability to playback the recorded scenario events for analysis for T&E purposes and to allow appropriate management of trial data.

We concluded that NCOT provides good support for scenario building, running and data capture. Although several suggestions for system improvements were made to make these processes more efficient, reliable and effective for future data collection trials. In terms of data management, playback and analysis, we identified a number of shortcomings with the NCOT system to support the unique and specific requirements for T&E purposes. This was not surprising since NCOT has been conceived and designed as a Navy training facility rather than a T&E test bed. A number of practical solutions, both hardware and software based, were suggested to overcome the existing limitations of the system for playback and analysis purposes.

It was concluded that if such solutions and improvements can be implemented, the NCOT facility will be a suitable environment for conducting T&E trials using small Ops Room teams, with a view to measuring and assessing key Ops Room C2 processes that may be impacted by COMDAT technology.

Sommaire

Grâce au présent rapport, nous franchissons une autre étape du processus permanent visant à fournir un soutien en matière de facteurs humains systématiques au programme COMDAT. Ce soutien porte essentiellement sur l'élaboration d'un plan d'essai ainsi que de méthodes et de mesures exhaustives pour évaluer les incidences et l'efficacité de la nouvelle technologie d'aide aux décisions du C Op des navires de la classe Halifax.

Dans les rapports précédents, nous avons relevé des sites potentiels de collecte de données et élaboré un plan d'essai détaillé, indiquant les processus de C2 à mesurer, et des méthodes pour recueillir les données nécessaires à l'essai et à l'évaluation (E et E). Nous devions ensuite évaluer, au moyen d'un essai de validation de principe (VP), la capacité du NCOT à soutenir la collecte et l'analyse de données en temps réel.

L'essai comprenait l'élaboration et l'édification d'un scénario complexe comportant, en toile de fond, des événements aériens et terrestres liés au trafic commercial et autres. S'y ajoutaient un certain nombre de menaces potentielles découlant de circonstances géopolitiques précises.

Nous avons exécuté le scénario en temps réel dans le NCOT avec quelques spécialistes en la matière, prêtés par la Marine, qui jouaient les rôles de RT1, de superviseur de piste, de CAD et d'O C Op. Nous avons évalué la capacité du NCOT à soutenir toute une gamme d'exigences, pendant l'exécution réelle du scénario, dont celles 1) de communiquer à l'équipe l'information tirée du scénario et provenant du personnel d'E et E dans le rôle d'autres C Op, 2) d'enregistrer les actions de l'O C Op, les communications de l'équipe et le contenu de l'écran du CCOS, 3) d'enregistrer les événements d'intérêt pour l'analyse d'E et E ainsi que l'heure à laquelle ils se sont produits et 4) d'enregistrer l'interaction de l'équipe (vidéo et audio). Puis, nous avons évalué la capacité du NCOT à reconstituer les événements enregistrés à des fins d'analyse dans le cadre de l'E et E et à permettre la gestion convenable des données d'essai.

Nous avons conclu que le NCOT soutient bien l'édification et l'exécution de scénarios ainsi que la collecte de données. Néanmoins, nous avons émis plusieurs suggestions pour améliorer le système ainsi que l'efficacité, la fiabilité et l'efficience des processus en vue des prochains essais de collecte de données. Quant à la gestion des données, à la reconstitution et à l'analyse, nous avons relevé des lacunes à l'égard des exigences uniques et précises d'E et E. Rien de surprenant, car le NCOT a été conçu en tant qu'équipement de formation de la Marine et non de banc d'essai pour l'E et E. Nous avons suggéré des solutions pratiques, matérielles et logicielles, pour repousser les limites actuelles du système en matière de reconstitution et d'analyse.

En mettant en œuvre ces solutions et ces améliorations, le NCOT constituera un environnement adéquat pour mener des E et E avec de petites équipes de C Op et ainsi mesurer et évaluer les principaux processus de C2 du C Op qui peuvent être touchés par la technologie COMDAT.

Table of Contents

1. Introduction

The work reported in this Technical Memorandum arises from a contract to Human*systems* Incorporated® (HSI®) from the Defence and Civil Institute of Environmental Medicine (DCIEM). The Scientific Authority (SA) for the work is Carol McCann. The work continues an ongoing program of test and evaluation (T&E) whose goal is to create reliable and valid measures of ORO performance in the Halifax class Ops Room, with a view to assessing the impact of future decision support technologies.

This Technical Memorandum summarises the outcome of the Test and Evaluation (T&E) Proof of Concept (POC) Trial at the NCOT facility that was conducted in accordance with the T&E trial plan outlined in reference 1. The POC was conducted by HSI ® team members during a visit to NCOT on March 11-13 2002.

This memorandum is organised into the following sections:

- Goals of the POC
- Method used
- Results of the assessment
- Conclusions
- Recommendations

2. Goals of the Proof of Concept

The overall objective was to assess the suitability of the NCOT facility to provide the required environment for future T&E trials to gather human-system performance data on small Ops Room teams. The intent of the trials would be to generate reliable performance data on a variety of C2 tasks using a simulation of the existing Ops Room equipment. A successful outcome would serve two goals. First, it would demonstrate that meaningful and reliable C2 MOPs could indeed be collected. Second, the data obtained would provide a basis for assessing the future impact of new COMDAT technologies.

The specific goals of the POC were to investigate the suitability of NCOT to support T&E trials in the following areas.

Scenario

- Building the scenario
- Testing that the scenario unfolded in real-time in the manner intended
- Evaluating whether the foreground threat events were suitable
- Assessing the suitability of the scenario for producing the required level of ORO and team workload

General logistics for running the scenario

- Time required for set-up and preparation
- Personnel support: NCOT technical support, Navy SMEs, T&E team (HSI®).
- Robustness and reliability of the system hardware and software during the scenario
- Ability to record additional audio and video
- Suitability and adequacy of communications among scenario players
- Suitability and adequacy of data supplied to scenario players
- Personnel support requirements:

Ability to support specific T&E requirements

- Control of game entities in real time
- Communications from T&E/actors to Ops Room Team
- Consistency of scenario repetition across trials
- Recording of trial data
- Playback and analysis of NCOT data files

3. Method used

A scenario was prepared ahead of time, details of which are provided in Annex A. The scenario was designed to create a moderate level of workload for the team and comprised background surface and air traffic overlaid with surface and air threat events. The Ops Room team required to run the scenario comprised an RT1, Track Sup, SWC and ORO. HSI® staff (ex navy ORO SMEs) provided additional information to the team that would normally come from the CO, OOW, CANEWS and any other relevant sources. The NCOT facility manager provided full time support to the team in setting up, running and analysing the scenario.

The structure of the POC trial was as follows:

Day 1:

- Play and review scenario in real time and correct any problems
- Configure workstations for the Ops room team
- Set up T&E logistics for audio and video recording
- Rehearse roles and control of game entities
- Review and rehearse requirements from NCOT support staff

Day 2:

- Brief Navy SMEs participating as subjects on purpose of POC, project.
- Review mission background for scenario with Navy participants.
- Familiarise Navy participants with Workstations and Comms
- Create necessary scenario overlays by RT1 and Track Sup (e.g. fixed reference points, area of patrol etc).
- Brief watch handover
- First trial run with scenario with interruptions to assess data analysis methodology
- Second trial run
- Third trial run
- Debrief participants
- Review trial playback
- Analyse outcome

Day 3:

- Brief new Navy SME participants
- Create necessary scenario overlays by RT1 and Track Sup (e.g. fixed reference points, area of patrol etc).
- Conduct watch handover briefing
- First trial run with ASCACT air profile patterns
- Break
- Second trial run with ASCACT air profile patterns
- Debrief team/washup
- Analyse/review trial runs

4. Results[1]

4.1 Scenario

4.1.1 Scenario development

The scenario was created from scratch as there were no suitable, pre-existing NCOT scenarios available. The scenario was based on a CSTC training scenario (OP CRATER) and was prepared using the existing game entities that were in the NCOT database, modified, where necessary, for present requirements. The scenario was first planned on paper with an outline of the geographical, political and military contexts, to which was added a Master Scenario Events List (MSEL). The latter provided a time ordered description of all of the game entities that would be introduced during the scenario and their associated trajectories. The full scenario description, briefing notes, order of battle, ID criteria, ROE and MSEL are provided in Annex A. The scenario was created by HSI® staff (ex ORO and Sea Trainer) with assistance from the NCOT manager. The scenario was intended to play for approximately 2.5 hours. The resulting master scenario file was stored on the NCOT system for later playback during the POC trial.

4.1.2 Did the scenario unfold in real-time in the manner intended?

In general, the playback of the scenario in real time was found to be satisfactory. Entities moved in the manner planned and appeared to be realistic to the Ops Room team. Some dynamic entities became de-activated unexpectedly during the course of the playback but this did not appear to have any apparent consequences to the players. The reason for these de-activations was unclear. They could have been caused by operator error, but the nature of the de-activations suggests that they may have been caused by an error in the NCOT software. Some entities did not have appropriate characteristics, for example Mirage aircraft were inappropriately provided with IFF. However, such problems can be readily rectified by correcting the appropriate database entry.

4.1.3 Were the mission foreground threat events suitable?

Air and surface threat events moved in the scenario appropriately and appeared to produce the appropriate responses among the team. That is, they were distinguished from the background events and initiated the expected level of assessment and analysis.

4.1.4 Was the scenario suitable for producing the required level of workload?

The team seemed to be operating at a moderate level of workload. They were able to keep up with the rate of events and did not appear to be dropping tasks. It should be noted that there were no overlapping air and surface threat events. In order to increase the workload level, the

[1] In the subsequent text recommendations are highlighted with italics.

pace of air threats could be increased and overlapping temporal threats could be implemented. Further, there is a need to create some realistic level of background tasks that the ORO would normally face, such as managing the ship's Flex program or helo flying program and dealing with communications. This will ensure that the ORO will need to divide attention over the normal task range for an ORO rather than to able to focus only on selected aspects of the tactical picture.

4.2 General logistics for running the scenario

4.2.1 Time required for set-up and preparation

This can be broken down into the following components and excludes scenario preparation, which was covered earlier. Note that the first and second two items can be done in parallel

Initial training day for T&E SME actors

Although not required for the POC trial, for all subsequent trials there will be a need to set aside time for training the Navy SME's who will serve as actors/confederates while the scenario is played out. They will be given an introduction to the scenario and their roles, and will participate in a full rehearsal of the scenario at least once, and possibly twice. During the rehearsal they will be trained to follow certain scripted requirements demanded by the T&E trial plan. Suitable breaks were inserted at approximately 2 hour intervals.

Initial physical setup - 30 minutes

This involves configuring the hardware, installing microphones and video recorder.

Daily software setup - 30 minutes

This was performed by the NCOT manager but, potentially, could be done by any suitable trained staff member. The above time allows for some re-starts as some problems were observed in some workstations that failed to be initiated or went down.

Daily scenario setup - 30-60 minutes

This involved having two navy SMEs (during the POC these were the RT1 and Track Sup players) manually enter fixed geographical entities into the CCS. This procedure had to be repeated every time the system went down. This step could be eliminated *if a provision were available to create scenario overlays that could be brought up at each SSD station.* If this cannot be achieved, then two people would be required to do this. In this study, the Navy SMEs acting as RT1 and Track Sup would be available to do this – but HSI® staff could also be used.

Briefing participants - 30 minutes

This includes, in this order, a study briefing(15 minutes), mission briefing (15 minutes) to familiarise study ORO subjects with study data capture procedures, and to commence building their "picture" or mental model of the mission and operational context to the point at which it would have been at the end of the watch preceding the start of the "study" watch, discussion of ROE and ORBAT issues with ORO subjects.

Mini-watch-30 minutes. This provides an opportunity for participants to become familiar with the specific hardware and to start to build the picture under light background load conditions. After the mission briefing, participants (and actors) go through a mini-watch (say 20 minutes), which would comprise the following elements. Starting a watch; doing a comms check; some light picture building (no surprises – and told that before they start this mini-watch); settling in, becoming familiar with the "picture"; building their mental model about what is going on; learning the sound of the voices of the different team members, how they request and receive information from sources not physically present in the scenario; getting used to the little NCOT peculiarities and room layout, also any study specials (text message handouts, stateboard substitutes, pauses, SitReps, etc). In general the goal is to achieve the necessary familiarity so that they would not be experiencing these for the first time in the study watch proper. Also, during this period they get to ask any questions they want about the way things are going to work.

As a result, when they start the study watch, it will be more as if they are coming back on watch to something familiar, but just shifted forward in time.

Watch Handover (10 minutes) : Standard mission briefing. ORO provides SitRep at end to demonstrate understanding

4.2.2 Personnel support

NCOT technical support

Support was provided by the NCOT manager who is knowledgeable in matters relating to the running of the NCOT software and issues relating to hardware. No local software engineering support is available to deal with issues relating to the Unix operating environment. Such support is currently provided through telephone to Richmond, B.C. Some issues concerning software capabilities (such as the size of scenario log files and the over-writing of scenario log files) arose that could not be satisfactorily answered.

We recommend that system technical support be provided on site during the initial setup day for future trials.

Navy SMEs: technical support and role players

Technical support

Normally, NCOT is supported by Navy training personnel familiar with functions of the individual Ops Room team roles and the NCOT system. During the POC trial none of these were available, thus if problems occurred with a specialized aspect of the CCS functionality there was no one at hand to check out the problem and provide a solution. An example of such a problem that had impact on the fidelity of the simulation was our inability to flash up fire control radar as expected on a contact in order to get altitude information. Also, there was uncertainty about the provision of EW bearing lines in the absence of a CANEWS work station and operator.

We recommend that the appropriate NCOT Navy training specialists be made available on the set-up day of future trials to ensure that the NCOT system is providing the appropriate Ops Room functionality for all systems to be implemented in the trial.

Role players

For the POC trial, experienced RT1 and Track Sup operators from CFNOS were provided and met the requirements for the trial. The ORO position was filled by an ASWC who is currently taking the ORO course and the SWC position was played by someone who had not performed that role in 10 years and only had operational experience as a SWC with a ADLIPS display, not a HALIFAX SSD.

This experience highlights the fact that *future HSI® requests for Navy personnel must be precise and provide clear requirements for the experience level required for each team player and for the Navy to concur – or put the study at risk.* Failure to obtain personnel with the appropriate experience will clearly have the potential to render any ensuing data as unrepresentative of true operational performance. It should be acknowledged that not having individuals with the experience requested for the POC trial may have been due to the short 4 week lead time available to the Navy in the request for personnel. We need direction with respect to realistic lead times required, and a better understanding of likely sources of suitable navy personnel.

T&E support staff

The following positions were found to be required to support scenario implementation and data recording of the trial.

1. Trial Co-ordinator: watches closely the unfolding of the mission events on the CCS and provides real-time co-ordination and adjustment of the scenario events to the NCOT Instructor Stations and data capture among the three previous positions. Filled by HSI® staff with extended training. This position is also the overall trial co-ordinator and is responsible for managing all aspects of the trial on the day.

2. Data driver 1: This person controls the background air and surface tracks that must be inserted or manipulated in some way in real time. An NCOT Instructor Station would be used for this position. Can be filled by HSI® staff with minimal training.

3. Data driver 2: This person controls all of the air and surface threat tracks that must be inserted or manipulated in some way in real time. An NCOT Instructor Station would be used for this position. Can be filled by HSI® staff with extended training.

4. Information provider: This person responds to all communications from the team with respect to requests for information and simulates the following roles: TG, CO, CANEWS, ORS (and in the future ASWC and TAS Sup). An NCOT SSD station would be used for this position. Can be filled by HSI® staff with Navy Ops Room experience (e.g. ex navy ORO).

5. ORO observer: sits behind the ORO and observes/assesses ORO actions in real time. Requires SME with ORO training experience - be provided by HSI® team.

Comments.

Initially in the POC trial we tried to combine positions 3 (data driver) and 4 (information provider) into a single role. However, the workload proved to be too high for a single individual such that communications to and from the team were subject to operationally unrealistic delays or unintentionally inaccurate responses. Much of this workload resulted from EWS traffic – particularly related to the absence of automatic EW bearing lines from CANEWS.

Positions 1 and 2 are only required because of limitations in the existing NCOT software that currently require entities with changes in their trajectories to be entered into the scenario manually. Ideally, we would like to pre-script all events and have all entities enter into the scenario and follow their scripted trajectories automatically. Such a script is simple for background air and surface contacts that move more or less on a single trajectory across the area of interest. In the case of threat and other similar entities, whose trajectories may involve frequent changes in course, altitude or speed, the script could include all of these desired characteristics, such that the entities always move in a known prescribed pattern. Therefore, one major software improvement that would obviously reduce T&E personnel support would be to *provide additional software functionality that would allow entities to automatically enter the scenario and have their trajectories controlled by the NCOT software following a time-ordered script.* This requirement corresponds to the existing NCOT function of "**Predetermined Tracks**" which allows the creation of pre-determined waypoints for an entity to follow. The preparation work for the scenario revealed that this function was not operating in the expected manner. This is an important NCOT function for the support of the T&E program since it allows the creation of tracks that can also follow a prescribed path such as zigzag, ellipse and sinuation as well as formation flying in which cohort entities automatically follow the pattern of the formation leader. The actual availability of this function needs to be checked as soon as possible.

4.2.3 Robustness & reliability of system hardware & software during play

The system malfunctioned several times during the course of the POC trial. The most frequent type of failure was a freezing of the scenario and workstation, which then required a re-boot of the entire system (i.e. all work stations). The malfunctions appeared to be mostly software induced, although in one case there was a hardware failure. Further, each workstation had a "sleep" function, such that in the absence of any keyboard or mouse activity for a period of time (the exact period was not known and differed for each workstation) the workstation would shut down and the entire network would require re-booting. This resulted in a time-out of approximately 10-15 minutes while the scenario was restarted. A further 10-20 minutes was also required to allow the RT1 and Track Sup to re-enter CCS data such as geographical points etc. Yet more time was required, since the scenario could not fast forward to the point of stoppage without the re-creation in real time of the threat and background tracks. This means having to replay parts of the scenario that the team will already have been through. *It is recommended that the "sleep" function either be switched off or adjusted to a much longer time-out interval.*

A possible work-around for this problem would be to save the scenario file in sequential fragments of 30 minute duration. Using the appropriate file segment following a stoppage would mean a worst case situation where 15 minutes of scenario would be repeated. The downside of this would be the time required to rebuild the scenario overlays and a loss of operational realism.

A second type of failure appeared to be related to the specific functionality of some of the simulated Halifax class systems. Such failures were noted as follows:

- SG150 radar: failed to auto-initiate and auto-track surface tracks, even when manually generated tracks were assigned to the radar

- STIR fire control radars: failed to respond to primary designation by SWC, thereby not providing altitude and fire control information on the contact

A third, and possibly less important problem, was found with the NCOT landmass database in the area of operations. Small islands north of the patrol area were not depicted and there was a westward exaggeration of about 6 miles of the Yemen coastline. While causing some reduction in operational realism, we believe that this problem is manageable

Our preliminary assessment is that such failures give rise to some concerns about whether the NCOT facility can provide the required level of reliability to support the T&E effort. A final judgment of this should probably be suspended until after the pilot trial has been conducted since some problems may simply require better insight into existing system functionality.

4.2.4 Ability to record additional audio and video

A video camera was mounted towards the rear of the team and appeared to adequately capture the movements of the team (e.g. head position, body movements, face to face interaction). Microphones were mounted between the ORO and SWC and between the RT1 and Track Sup; and these appeared to be adequate for capturing off-net verbal communications and verbal input to radio microphones from those positions.

4.2.5 Suitability and adequacy of communications among scenario players

The NCOT communication facility appeared to be adequate in providing the requisite network communications among the team, although some of the circuits were not able to be assigned their usual SHINCOMS reference. For example, the internal Above Water Warfare coordination net was assigned to the ASW button instead of the AWW button. The quality and speed of communications appeared to adequately mimic normal Ops Room circumstances. Recording quality was marred by noise from alarms, which blotted out some recordings. There was also a background hum from the ventilation system that made softly spoken communications difficult to hear.

4.2.6 Ability to support specific T&E requirements

4.2.6.1 Control of game entities in real time

Game entities are described in detail in Annex A. Once introduced into the scenario, game entities generally moved in an operationally realistic manner. There were three types of entity patterns that needed to be controlled - single trajectory tracks, tracks that had several legs and multiple trajectories and tracks that may need to respond or react in an appropriate manner in real time to actions taken by the Ops Room team.

Single trajectory entities are brought into the game at a known time and reference point and follow a ballistic pattern across the area of operations. Examples include, commercial air traffic taking off and landing , helicopter traffic between the coast and oil-rigs and surface vessels sailing from ports. The T&E team controlled these entities by taking them from a "parked" area that was outside the area of operations and moving them to a waypoint and activating them. At this point the scenario software then took over their movement. This manual control process was required because the current version of software does not support the timed entry of entities into the scenario following a pre-scripted schedule.

The second type of tracks involved multiple trajectories, that is entities that might change course, altitude or speed while in the area of operations. For example, Yemeni aircraft taking off from Hays airbase could follow a variety of patterns that might provide different levels of threat and interest. Each individual change of pattern required dynamic real-time control by a member of the T&E team.

This proved to be a manageable task, but was subject to a number of limitations. First, as the number of entities in a complex scenario that require real-time control increases, the ability of the entity controller to manage all of these becomes compromised. Second, there is some imprecision in following the required trajectory script exactly and to repeat that pattern in the same manner on successive trials. This results from small lags in initiating events and latencies in aircraft flight dynamics, as well as the skill level of the operator. Approximate patterns can be repeated with ease; however, this will result in some imprecision in collecting MOP response time data where the start time is initiated by a track that is supposed to be at an exact geographical location, relative to the ship. We were not able to establish the magnitude of such potential errors because of problems with scenario playback (see below).

The requirement for precise repeatability of tracks is particularly relevant to the generation of tracks that are designed to produce some radar confusion, as exemplified by the patterns used in ASCACT trial. Three of the ASCAT patterns were evaluated. Pattern 1: two aircraft at same altitude and speed, on converging tracks, converge and fly close together directly over the AOI before diverging. Pattern 2: two aircraft at the same altitude and speed have trajectories that cross backwards and forwards with each other across the AOI. Pattern 3: two A/C on same heading and speed approach AOI, one A/C changes altitude lower, and maintains lower altitude while holding same direction as other A/C.

In general, it was found difficult to generate tracks involving two A/C doing such close manoeuvring with exact repeatable precision, although, with practice, a reasonable approximation to the required patterns could be produced. Further, some difficulty was encountered in getting entities to make fast turns in the manner that accurately simulates combat manoeuvres.

One important observation was that the NCOT simulated radar seemed to experience no difficulty in maintaining separate and correct track identities for the ASCACT tracks that we were able to reproduce, such as two A/C coming together from different vectors. Therefore, it remains a moot point whether to continue to use such tracks to simulate existing radar tracking problems that MSDF technology is designed to solve. Therefore, *we recommend an early discussion with DREA and LM to further elaborate upon the development of track requirements that will suitably address existing radar technology problems and MSDF improvements. We further recommend that DCIEM put in place the necessary contractual arrangement to* allow HSI® *to interact and work closely with LM to ensure rapid and timely interchange of technical information concerning the progress of COMDAT support work.*

The third type of track, which requires the game entity to move in an operationally realistic manner in response to the appropriate circumstances in real time, would require real-time manual control by the T&E team in any case.

Our assessment is that in order to reduce T&E overhead for manual control of entities and to ensure precision in the execution of track trajectories *the software be enhanced to allow pre-scripted tracks to enter and move within the scenario under game software control.*[2]

4.2.6.2 Communications from T&E/actors to Ops Room Team

One member of the T&E team played multiple roles to provide contextual communication and information to the Ops Room team by way of one of the radio nets in response to requests for information from the CO, OOW, CANEWS etc. This appeared to work effectively and in a timely manner. The exception, noted earlier, was when this same member of the T&E team was concentrating on the control of game entities, which resulted in a lag in the communication response.

In future trials, it would appear possible and desirable to pass paper text messages to the ORO using the ORO observer position. These would make the ORO task more realistic, and include a requirement to select and forward relevant information to others in the Ops room team.

4.2.6.3 Consistency of scenario repetition across trials

Although we were not able to assess this formally because of playback problems, we were able to conclude that background air and surface events could be repeated with the required precision across trials. However, there were problems in maintaining the required consistency of both the timing and spatial precision of dynamically controlled tracks, as outlined in 4.2.6.1.

4.2.6.4 Support for collecting specific MOPs

The detailed MOPs provided in reference 1 were reviewed and a generic list of requirements to support the delivery or required scenario events and data collection was constructed. The generic capability was derived by examining all of the individual scenario input, monitoring and recording elements, and then grouping them into more generic categories. This information is shown in the Tables 1-5 below, together with an indication of the ability to support these requirements within NCOT and by the T&E team.

Table 1 provides a summary assessment from the POC of the capability of NCOT to provide information that must be provided to the ORO other than through the specific scenario events. This information could be text messages by hand or via the CCS, or voice messages through the various nets or face to face. The meaning of the various columns is as follows:

Info to ORO: describes the type of message and medium

Feasible: indicates our assessment of whether it can be done in NCOT

[2] We have been told that this was supposed to be achievable through the "Pre-Determined Track" function of the Scenario Builder software, however, we have not had any success in making this work correctly

Timing sent: means if the time of the message transmission can be recorded and how this is accomplished.

Timing recd: means if the time of the message reception by the ORO can be recorded and how this is accomplished.

T&E-who does: indicates who in the T&E team would be responsible for delivering the message.

If not T&E, ID source: If the message does not originate with the T&E team, can the message source be identified and how.

Capture Response Action: If the message results in an ORO action (response) can this event be captured and how.

Capture Response Content: If the message results in an ORO action (response) can the content be captured and how.

ID target of response: If the message results in a response by the ORO can the target (recipient) of the response be identified.

Time of response: If the message results in a response by the ORO can the time of the response be captured.

Assess response: If the message results in a response by the ORO can the content of the response be analysed and how.

In Table 2 , we assess the outcome of the POC in terms of the capabilities of NCOT to provide support for the following input events

- Background air/surface commercial
- Background air/surface hostile
- Significant A/C actions (changes course to TG, altitude, speed, radar, previous pattern, assumes attack profile
- ASCACT aircraft patterns thought to generate radar confusion.

For each of these we determined that each of the following required pieces of data for measurement purposes could be obtained from the scenario or playback:

- time into scenario
- time painted on radar display
- time into area of interest
- time out of area of interest
- time of change ins status of contact
- time at own ship's weapons range
- time at A/C weapons range
- time EWS emitted
- time EWS detected.

While the majority of these input events can be easily implemented in NCOT and the required data captured, some technical difficulties in simulating ASCACT tracks to the required degree of precision was encountered (as mentioned earlier in section 4.2.6.1).

In Table 3 we show how in NCOT we can capture data relevant to ORO actions on the CCS, and interactions with other information sources. Tables 4 and 5 show how we can record ORO and other communications and assess ORO knowledge, respectively. This capability is assessed in terms of how we would specifically capture information content, the time of the action and the identity of the recipient of ORO communications. The ability to add T&E embedded probes into the scenario is also assessed using approaches such as a SITREP to the CO, a "bogus" request for information as well as the means for determining the associated response time to such embedded probes.

In general, NCOT appears to be capable of supporting the range of techniques that will be necessary to capture MOPs. Having said that however, it should be noted that at this time we have not had the opportunity to actually calculate sample MOPs from the POC data rec(rd. This arose because of a number of problems relating to the lack of reliability in the system functioning and especially in playback (see below). Clearly, the pilot trial will provide the most opportune time for assessing the feasibility of capturing and analysing the data in the manner intended.

4.2.6.5 Recording of trial data

For each workstation the screen content and all net based communications are continuously recorded on the hard drive of the individual workstation. This information is stored in a proprietary file format and is not amenable to being read using standard data analysis or statistical software, . The entire scenario session may be recorded as a single file, or recording can be started and stopped under real-time control to yield smaller, sequential data files. This may have some advantages given limitations in data playback outlined below.

However, file management functionality appeared rudimentary, and could be improved. For instance, we were not able to access information concerning the length of the resulting file. Whether this is a result of a software limitation or lack of knowledge on our part on how to retrieve such information is not known. We also learned that once a hard drive becomes full the system starts to overwrite existing files; again how this actually happens and the consequences for stored data from trials is unknown. At present files cannot be copied or removed from the hard drive onto secondary mass storage media.

These issues raise some concerns for the future management and access of T&E data. Hence, *we recommend that a capability be added to store data files on an external medium.* This may require a DVD format given that the length of the file may exceed CD-ROM capacity. A further advantage of storage on such a medium is outlined in the following section concerning playback of stored data. Whatever medium is chosen, this requirement is considered essential for the retention of critical trial data for the production of which has been the result of considerable logistical effort, which, obviously, cannot afford to be wasted.

4.2.6.6 Playback and analysis of NCOT data files

Playback

Some serious limitations to the playback of NCOT data were discovered and are outlined below.

1. Data files are currently 'owned' and located on each individual workstation, as a consequence, they can only be played back on that station. The playback may be monitored on a separate workstation that is temporarily configured for this purpose on the NCOT network. The NCOT system does not produce a single data record integrated across all of the workstations that comprise a small team configuration for a particular trial. This lack of capability may have significant consequences for trial analysis. Using the NCOT playback, the simultaneous review and analysis of the T&E trial data across all team workstations would require a co-ordinated manual start of the replay on each of the individual workstations and an observer/analyst at each workstation. While, with some minimal practice, any error in ensuring a common start of the replay would probably be acceptable, we have not been able to ascertain whether the playback at each workstation will remain synchronised over what could be the course of a 2 hour trial.

2. Data files can only be played back in real time. Further, there are no capabilities to fast forward, slow forward, reverse, pause or stop/restart. In fact, once the replay has been stopped when it is re-started the playback reverts to the beginning of the file! Clearly, such limitations severely compromise the ability of the T&E team to perform the required fine grain analysis of the trial data in anything approaching an efficient manner, if at all. What is already likely to be a labour intensive activity is only made worse by this apparent lack of a rudimentary capability.

Two solutions to this problem are suggested. First, that the necessary software could be developed to provide the functionality to support analysis of trial data (outlined in detail later). This approach is likely to be time consuming and costly. *The second, and our preferred, solution is to provide a capability to capture the video and audio output of the workstation playback and convert into a format that will allow recording on standard digital video media.* The added advantage of such an approach is that trial data could then be taken off-site for analysis at HSI® premises, with significant savings in travel overhead, or the need for the purchase of an NCOT compatible workstation for data playback. Such capture could be accomplished through the purchase of a high quality video converter that would transform the native NCOT RGB video output into an NTSC video compatible format. The technical requirements and cost of such a solution are currently being investigated.

3. Several system freezes were encountered during the playback of recorded data from the DCIEM POC sessions.[3] This may have been the result of trying to playback several files simultaneously on different workstations in order to accommodate our needs. On the final afternoon, the system crashed during playback and could not be re-started to allow further playback. Telephone enquiries to MDA headquarters in Richmond did not result in an immediate solution being found to the problem of playback freezing.

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[3] This did not happen as much with the earlier recorded DREA POC data that was stored as a single file The DCIEM data were stored in a sequential series of smaller files in order to avoid having to go back to the very start of the scenario, each time the playback was stopped

4. Playback of audio traffic captured from the comm nets was somewhat degraded by the intrusion of noise from background fans of the heating/ventilation system. Further, communications became almost unintelligible when a CCS alarm had been captured on the audio track. Our tentative conclusion is that the audio playback is of marginal quality for T&E analysis. Further investigation of this is required to determine whether there are ways to improve the signal to noise ratio.

On the positive side, the quality of the video playback, whether on a workstation monitor, or displayed on a large, front-surface projection screen through a high-resolution video projector, was sharp and provided clear detail of all symbology, alpha-numerics and QAB strokes. However, a separate video record, that was captured from a workstation monitor or the projected image by the T&E team digital video camera, showed poor image quality. Thus, it was concluded that this would not be a satisfactory workaround to the problem of creating a video record that would be more amenable for T&E analysis than the NCOT data file.

Analysis

Notwithstanding the above comments concerning limitations, the data files do provide the necessary information to allow detailed analysis to allow the extraction and calculation of performance data. The workstation clock is visible at all times and would allow timing of events (accurate to the nearest second) to be extracted. The effect of the operator's actions are clearly seen on the screen in terms of the information provided in the radar area as well as in the various numerical and tabular data areas. We were able to see which track was currently hooked, the track data, the range selected and all other information that provides the tactical picture. Thus, it would appear feasible to determine from the video and comms records the ongoing tactical focus of the ORO and also allow some response time measures to be collected, such as the time between the appearance of new information and the subsequent ORO response. It should be noted that because of the lack of access to the playback files in the final session, we were not able to actually attempt to extract MOP data examples as had been planned

Info to ORO (other than T&E software)	Feasible	Timing Sent	Timing Recd	T&E - who does?	If not T&E, ID source	Capture Response Action	Capture Response Content	ID target of response	Time of response	Assess Response
Text message via CCS	NO								.	
Text message by hand	YES. via ORO observer.	YES ORO obs notes WS clock	YES Trial coord notes appropriate WS clock	ORO obs Trial coord	Known to team	YES· NCOT video/audio record of ORO WS or ORO obs.	YES· NCOT video/audio record of ORO WS or ORO obs	YES. NCOT video/audio record of ORO WS or ORO obs.	YES from playback clock or observer record.	Post event analysis by SME
Voice message from net	YES	YES. video/ audio playback	YES. playback clock	NA	YES video/audio playback	YES· NCOT video/audio record of ORO WS or ORO obs	YES· NCOT video/audio record of ORO WS or ORO obs	YES. NCOT video/audio record of ORO WS or ORO obs.	YES. from playback clock or observer record	Post event analysis by SME
Voice message face to face	YES. from T&E video/ audio record	YES need to add clock to T&E video record	YES·	NA	YES· from T&E video/audio record	YES· NCOT video/audio record of ORO WS or ORO obs.	YES. NCOT video/audio record of ORO WS or ORO obs	YES. NCOT video/audio record of ORO WS or ORO obs.	YES: from playback clock or observer record.	Post event analysis by SME

Table 1: Feasibility and methods for providing information to ORO and for capturing MOPs

Input events from scenario	Time into scenario	Time painted	Time into AOI	Time symbology	Time Out of AOI	Time change in status	Time at own ship weapons range	Time at A/C weapons range	Time EWS emitted	Time EWS detected
Background air/surface-commercial Background surface Hostile air Hostile surface A/C changes course to TG A/C changes speed A/C changes alt A/C radar A/C changes previous pattern A/C assumes attack profile Neutral-changes profile ASCACT patterns	YES. from ground truth playback of scenario	YES: from ground truth playback of scenario	YES: from ground truth playback of scenario	YES: from playback of trial scenario	YES. from ground truth playback of scenario	YES. from ground truth playback of scenario	YES: from ground truth playback of scenario	YES. from ground truth playback of scenario	YES: from ground truth playback of scenario	YES. from ground truth playback of scenario

Table 2: Feasibility and method of implementing and recording scenario events

ORO actions	Capture screen	Capture/ timestamp action	Assess action
ORO action on CCS	YES NCOT playback	YES NCOT playback Accurate to nearest second.	ORO obs in real time commentary through headset. Post trial analysis by SME on NCOT/T&E playback
ORO consults other sources	ORO use of ancillary information (e g manuals, plot, simulated stateboards, tacpacs) captured by T&E video and analysed post event. May also be captured by ORO obs		

Table 3: Feasibility and methods for capturing ORO actions

ORO Communications	Capture message content	Capture/ timestamp action	ID recipient	Assess content
ORO speaks directly to team/member (not on net)	YES. T&E audio capture	YES. T&E audio file playback Will need to add functionality to provide visual time base indicator.	YES. T&E audio file playback	SME analysis of T&E audio file
ORO uses net	YES: NCOT audio capture	YES: NCOT audio playback plus CCS clock (video record)	YES: NCOT audio playback	SME analysis of T&E audio file

Table 4: Feasibility and methods for capturing ORO communications

Assessing ORO knowledge	Real time SITREP to CO	ORO CCS Display	T&E Bogus request for info	Response time to embedded probe
Picture content at start of scenario	YES		YES	NA
Change in picture content	YES		YES	NCOT playback
Indiv threat comprehension	YES		YES	NA
Change in threat status	YES	YES	YES	NCOT playback
Relative threat priorities	YES	YES	YES	
Tactical situation	YES		YES	
Time to CPA	YES	YES	YES	
Own engagement envelope: earliest/latest point to shoot -		YES		
Enemy engagement range – contact		YES		

Table 5: Feasibility and methods for assessing ORO knowledge.

5. Conclusions

The NCOT environment provides *adequate support for the development and running of scenarios* to support T&E testing and for the collection of required data. This assessment is based upon the assumption that problems with the fidelity of simulation of some system functions (see 4.2.3) may be readily corrected.

With respect to *the playback and analysis of T&E data we believe that there are some serious limitations of the NCOT system*. This conclusion is based upon the way we expect that the data will have to be analysed after the trial conclusion. We anticipate that we will need to have a high level of control over the scenario playback process in order to extract the required data; such control will include an ability to pause, rewind, slow forward and fast forward. Further, there may be a need to provide a time-synchronised playback between two or more workstations. In order to achieve such control, significant software changes would need to be made or alternate approaches should be considered (as outlined below).

A second concern relates to the ability to manage archived scenario files. At present we have been advised that there is no capability to determine the length of files or how much space is available on the drive to accommodate new files or to ensure that they are not overwritten. There is also no ability to copy data files to external devices at individual workstations.

A third concern is that, even assuming that the above two problem areas can be corrected, all analysis would have to be done at the NCOT facility. Given that one might expect each hour of recording to require 3-4 hours of analysis, this would mean the T&E analysts would have to spend several days at NCOT. This could not only raise issues of accessibility, but also add overhead costs to the project associated with travel and accommodation. Again, some solutions to this issue are outlined below.

6. Recommendations

6.1 Software and system improvements
(in approximate order of priority)

Some of these improvements may indeed exist, but were not apparent or could not be made to function during the POC.

1. Provide a capability in the master scenario file to allow entities to follow a pre-scripted trajectory. This could be readily accomplished by fixing the problems in implementing the NCOT Scenario Builder function of "**Pre-determined tracks**". (NCOT Manual Section 6-27).
2. Allow entities to automatically enter into the scenario at pre-specified times and follow a constant track and speed.
3. Allow entities to automatically enter into the scenario at pre-specified times and follow a pre-scripted trajectory.
4. Provide a capability for a time-stamped flag to be entered from an instructor workstation into the scenario record. This could be achieved by capturing function key presses and logging the time of the press and saving to a file. The resulting data file should comprise a time-ordered list of the key presses and time (scenario time) when pressed. This file should be in an ASCII text/tab delimited format to allow for export to a spreadsheet.
5. Provide a capability to capture specific key presses at the ORO and other team workstations. These are to be time stamped and recorded to a data file in the manner described under item 4. Specific actions required to be captured include: quick action buttons (QABs), numeric keys, "enter" key, F2 and the alarm button.
6. Develop a capability for control over playback files to include: slow motion, pause/re-start, rewind, fast rewind/fast forward and go to flags (as in#4).
7. Provide an ability to download data files to external media.
8. Provide an ability to replay multiple files simultaneously on different workstations (preferably in synchrony)
9. Provide data file management capabilities
10. Provide an override of the workstation "sleep" function or allow it be adjusted to a much longer time out.
11. On SSD enable dimming of symbology so that can operator can examine radar paint alone (as occurs on the actual CCS)
12. Provide a capability for the creation of CCS overlays ahead of time and to allow them to be integrated into the Tactical Situation Area of the SSD when the scenario is run.

13. Enable instructor to draw "lines" and save for later use e.g. patrol areas (e.g. like Word Draw options plus text insertions)
14. Provide a means of distinguishing between active tracks and stationary or parked tracks in the instructor screen i.e. to rapidly identify all tracks in play at the moment
15. Allow audio playback on any workstation
16. Improve signal to noise ratio (sound quality) of audio playback.

6.2 Data capture and analysis

Notwithstanding items 3,4 and 5 above, our preferred solution for data analysis is to allow data files to be captured in a manner that will allow their removal from site and analysis to be conducted at an HSI® site. To achieve this we propose the following solutions:

> Capture the NCOT workstation video output to the CCS display in real time and convert it to NTSC video using a scan converter. This will be required for each workstation of interest (which for present purposes is 4). The subsequent video signal can then be captured on digital videotape with a single record for each source. Possibly, if we can maintain signal quality, the four records could be multiplexed onto a single tape. For audio records, NCOT maintains a separate digital audio file for each workstation, and these could be subsequently transferred to a removable media to allow integration with the video record when the analysis is performed. We are also exploring a new technology that will simultaneously capture the output of four workstations and integrate them into a single digital (non-video) record for subsequent payback.

An alternative approach would be to purchase and configure an NCOT compatible workstation for local playback/review purposes. The major disadvantage of such an approach is that the playback would be limited to a single data record at a time. Hence, the co-ordinated analysis of information across team players at different workstations could not be achieved.

6.3 Personnel requirements to support T&E

1. On the set-up day prior to data capture, NCOT Navy trainers be made available to ensure that all of the Ops Room simulated functionality is working in the operationally correct manner.
2. This day will also serve as a training day for T&E SME actors. They will be given an introduction to the scenario and their roles, and will participate in a full rehearsal of the scenario at least once, and possibly twice. During the rehearsal they will be trained to follow certain scripted requirements demanded by the T&E trial plan.
3. On the same day, a systems software specialist should be on hand to ensure that the system is functioning appropriately and that there is space to store data records.
4. *Navy provided SMEs.*
   Actors: 1 RT1, 1 Track Sup, 1 SWC. All need to have some experience, preferably

including working together as a single team. Thus, our ideal would be to draw an intact team from one watch on one ship to stay over both days. Recognizing that this is unlikely, then we need SMEs that have relevant qualifications and relevant experience in their recent past, e.g. QL5 NCIOP for the TS. A QL4/5 NCIOP (or a QL3 NCIOP, with significant experience) for the RT1. Equivalent needs apply to the SWC SME. Whoever is provided, they need to stay for the duration of the trial (two days for the pilot, five days for the study) so that we don't have to repeat the start up briefing / learning time on subsequent days.
Subjects: For the pilot study, two OROs will be needed for a half day each. For the actual study, a further eight OROs (each for half a day) must have completed the ORO course and have had at least one year as an ORO in a HALIFAX class frigate, as recently as possible, but certainly within the last four years.

5. *HSI® personnel*: The make-up of the T&E team for the Pilot Trial is largely dependent on whether software fixes 6.1.1 and 6.1.2 are in place. The following table outlines the team required, depending whether such fixes are done or not.

T&E function	Personnel Required	Software fixed	Software not fixed
Entity controller-background	HSI® staff - trained	NO	YES
Entity controller-threat	HSI® staff - trained	NO	YES
Information provider	HSI® - Navy SME	YES	YES
ORO Observer	HSI® -Navy SME	YES	YES
Trial co-ordinator (also controls some dynamic entities	HSI® senior staff	YES (also controls some dynamic entities)	YES
TOTAL		3	5

6.4 Scenario modification

To ensure appropriate distribution of ORO attention, some additional tasks will need to be provided. We are working out details of these and how they may be practically implemented.

6.5 Other issues

We recommend an early discussion with DREA and LMC to further elaborate upon the specific requirements for the development of "test" tracks that will address existing radar technology problems in track detection and maintenance and other track contexts that are likely to be benefited by MSDF improvements.

7. References

Matthews, M.L., Webb R.D.G and Keeble, A. R. Assessing the Impact of Multi-Sensor Data Fusion on Command and Control Operations in the HALIFAX Class Frigate: Recommendations for Measures of Performance and Detailed Test Plan. DCIEM Report #. February 2002.

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Annex A: Scenario Description

General Situation

As a result of Yemen's continued refusal to take decisive action against Al Qaeda cells operating within its borders, President Bush has included Yemen as an element in the Axis of Evil. The USS George Washington Battle Group has been positioned in the Gulf of Aden and carrier based aircraft have been conducting overt operations to demonstrate air superiority in the Gulf up to the territorial air space of Yemen. President Bush has been working to build international support for military action against Yemen but has met with resistance, particularly from the Arab nations, Russia and China.

While coalition-building efforts continue naval forces from the United States, Canada, the United Kingdom and Australia have begun to monitor shipping in the Gulf of Aden and the Red Sea in anticipation of a UN resolution establishing a Maritime Interdiction Operation in the region. The main focus of the monitoring effort is in the Gulf of Aden as concerns mount that ships from Iran may be transporting Al Qaeda supplies and personnel to Yemen ports. HALIFAX is the only ship in the southern portion of the Red Sea. HALIFAX's role for the time being is to become familiar with the maritime environment in the area. If a MIO is authorized by the UN, HALIFAX will participate.

Yemen has claimed that its forces have been preparing for strikes against the Al Qaeda cells but there appears to be little resolve for action. Al Qaeda members are believed to be relatively free to travel within Yemen, and are known to cross borders into southern Saudi Arabia, Eritrea and Ethiopia. Refusing to be intimidated, Yemen military aircraft have on occasion intercepted US Navy aircraft in international airspace and have approached the George Washington to within 20 miles. They have also routinely approached HAL to within 5 miles. To date the Yemen aircraft have carried only air-to-air missiles; they have not carried bombs or anti-ship missiles. Yemen aircraft include Fitters (FBA), Fishbeds (intercept) and Mirage (anti-ship). The Fitters carry two 500lb iron bombs and the Mirage carry two Exocet ASMs. Yemen Tarantual patrol boats have routinely operated within territorial waters in the Gulf of Aden and Red Sea. The Tarantuals carry SSN-2C anti-ship missiles. There are two operational coastal missile batteries on the Red Sea coast and their associated Puff Ball radars are routinely active for extended periods of time. Tension between Yemen and the US has been relatively high since the attack on the USS COLE in Aden, with the September 11th attacks serving to heighten emotions even more. Although the Yemen government has made no threats, Al Qaeda elements within Yemen have made unspecified threats against American interests in the area.

To further complicate the situation, Yemen and Eritrea have begun a war of words over oil rights in the southern Red Sea. American oil companies based in Eritrea operate four oil rigs in international water just off of the Yemen island of Kubra. Yemen claims that the oil rigs are within their territorial waters but the international community recognizes the area as international waters. Yemen maintains a naval presence in the vicinity of the oil rigs, usually consisting of one or two Tarantual patrol boats. Yemen aircraft on occasion approach Eriteran airspace to exert pressure and probe defences.

HALIFAX is operating near the major shipping lane between the Suez Canal and the Gulf region. Large ships including oil tankers regularly pass through the Bab el Mandeb, the strait between

Yemen and Eritrea/Djibouti. Other maritime traffic in the area consists of some small wooden fishermen and pleasure craft, supply boats going to and from the oil rigs from Aseb, Eritrea, and small, fast cigarette boat-like smuggler traffic between Yemen and Eritrea. These smugglers trade primarily in cigarettes and liquor, but intelligence indicated that they may also be transporting Al Qaeda personnel. The waters in the area are very polluted, with floating animal carcasses and other debris being commonplace.

Apart from the routine commercial air traffic in the region, helicopters fly between Aseb, Eritrea and the oil rigs, and numerous small private planes transit between Eritrea, Yemen and Saudi Arabia. Many of these planes are flown by rich Saudi's , the same demographic that sails recreational boats in the area.

HMCS HALIFAX is carrying one Sea King helicopter and has a full operational weapons load. The ship is manned at Remar and has no major operational defects. The ship completed a full RSP, including Workups, three weeks prior to deploying from Halifax. The ship has been on patrol for eight days and expects to remain another 12 prior to being relieved. HALIFAX will continue to rotate into the patrol area for the foreseeable future. HALIFAX is operating under national OPCON and is using Canadian OPTASKS and ROE. ROE include the authority to warn off aircraft up to and including Warning 5. HALIFAX is in the Second Degree of Readiness, with CCS is in Semi-Auto, STIRS in Hot Standby, and all missiles tuned.

T time is 1230 local. Port watch is just coming on watch for the afternoon. Skies are clear and visibility is good. The captain is on the bridge. The XO is in her cabin.

Rules of Engagement:

Self defence only. Use of FC radars for height finding is authorized.

Identification Criteria:

AIR:

Hostile:
In process of conducting a hostile act

Suspect:
Contact that has previously committed a hostile act but is no longer on an attack profile
Contact that displays suspicious or potentially threatening behaviour
Any Yemen military aircraft

Neutral
Any non-military aircraft acting in a non-threatening manner
Military aircraft belonging to a neutral nation

Assumed Friend
Single contact that correlates within 5 degrees of an ESM bearing of a friendly electronic emission.
Contact on same bearing as another showing mode 4

Friend
Visually sighted and recognized as a friendly military aircraft
Contact displaying a valid mode 4 IFF reply and is the only contact on that bearing

Unknown
Evaluated track that cannot be identified

SURFACE:

Hostile
In process of conducting a hostile act

Suspect
Contact that has previously committed a hostile act but is no longer on an attack profile
Contact that displays suspicious or potentially threatening behaviour
Any Yemen military vessel

Neutral
Any non-military vessel acting in a non-threatening manner
Military vessel belonging to a neutral nation

Friend
Contact correlates with friendly ESM
Contact visually identified as friend
Contact with proper mode 4 response

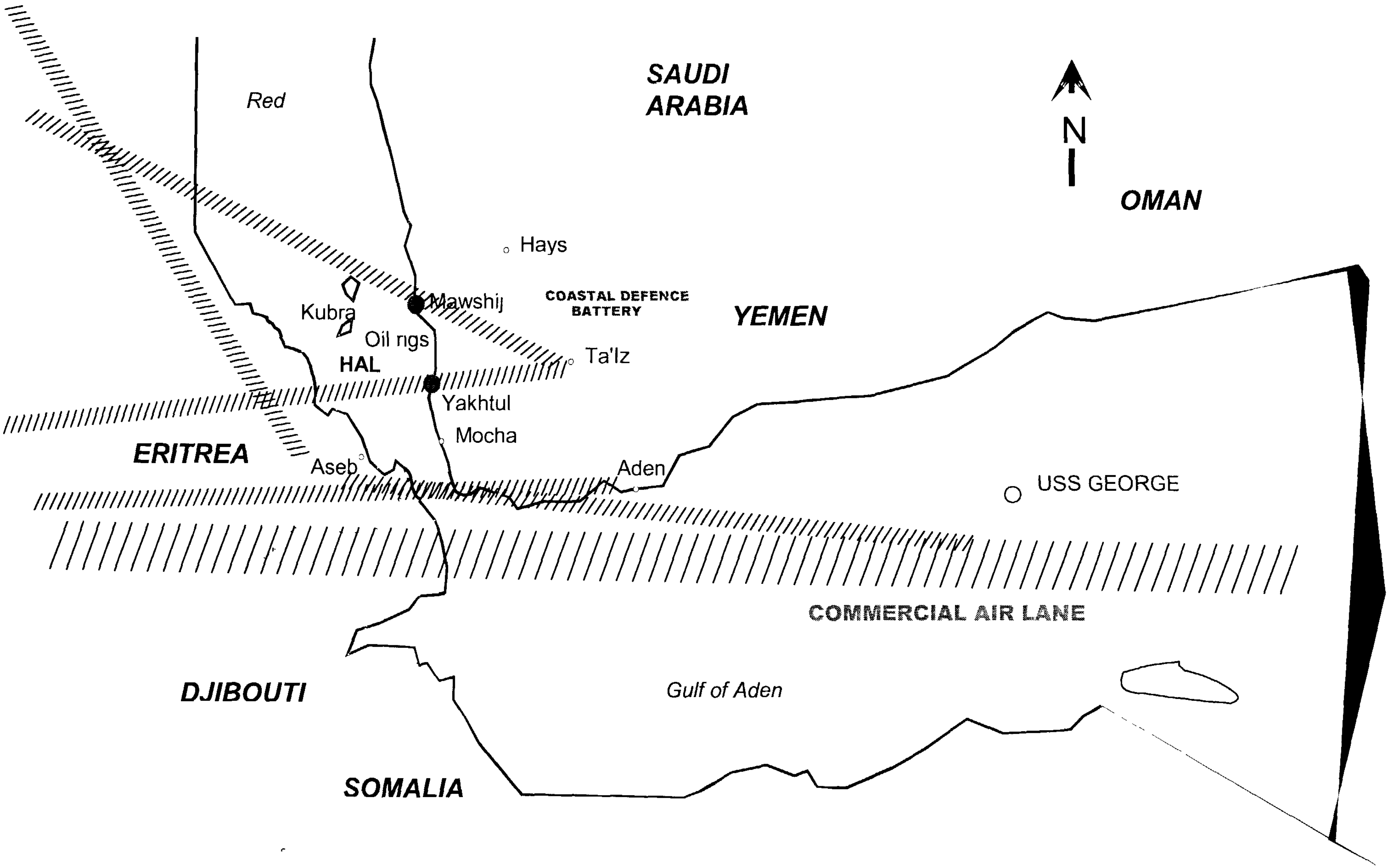
Unknown
Evaluated track that cannot be identified

Yemen Order of Battle

Platform	Weapons	Emitters
Surface:		
3 X Tarantul	4 X SSN-2C 1 X 76mm 2 X 30mm CIWS	Search - Plank Shave Fire Control - Bass Tilt
2 X Coastal Missile Batteries	8 X SSN-2C each	Puff Ball
AIR		
12 X Mirage	Exocet	Cyrano
22 X Fitter (FBA)	2 X 500lb bombs	High Fix
8 X Fishbed (Intercept)	Air to air	Jay Bird

Eritrea Order of Battle

Platform	Weapons	Emitters
AIR		
22 X Fitter (FBA)	2 X 500lb bombs	High Fix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N
OMAN
Hays
Mawshij
COASTAL DEFENCE BATTERY
YEMEN
Kubra
Oil rigs
HAL
Ta'Iz
Yakhtul
Mocha
ERITREA
Aseb
Aden
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14. ABSTRACT

(U) A proof of concept (POC) assessment was conducted on the NCOT facility to determine its ability to support Test and Evaluation requirements for real-time, human-system performance measurement. The goal was to look at the NCOT capability to develop, build and run scenarios and to capture a range of performance data from individuals and small teams. In general, it was concluded that for the most part the NCOT facility provided the means for building and running scenarios, however software modifications would be need to better support T&E data capture and analysis requirements

15 KEYWORDS, DESCRIPTORS or IDENTIFIERS

(U) proof of concept; NCOT; decison support technologies; trial plan