Networked Command and Control Training, Mission Planning, Course of Action Analysis and Mission Rehearsal

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ABSTRACT

This paper is one of a coordinated set prepared for a NATO Modelling and Simulation Group Lecture Series in Command and Control – Simulation Interoperability (C2SIM). This paper provides insights into the utility of C2SIM (C-BML and MSDL) standards as they have developed to support the military in training for, and conducting military operations using networked C2 and simulation systems.

1.0 INTRODUCTION

This paper examines the utility of C2SIM interoperability standards, C-BML and MSDL, to support the military in training for and conducting military operations. The specific areas covered in this paper include the following:

- Force Readiness (Training);
  - Use of simulation to stimulate a training audience (TA) using networked C2 systems, e.g. to train different echelon commanders and staffs;
  - To train people how to use C2 systems – by the provision realistic report and request streams generated by a simulation system;
- Coupling C2 systems with simulation systems to help develop and evaluate operational plans;
  - Prepare a plan using an operational planning tool;
  - Run simulation in Faster-Than-Real-Time (FTRT) mode;
  - Collect and process the simulation results to help support COA analysis (COAA);
- The use of simulation to wargame in COAA;
- Coupling C2 systems with simulation systems to conduct Mission Rehearsal (MR) for commanders and their staff;
- UK FTRT experimentation.

2.0 BACKGROUND

It has long been recognised that simulation can contribute to supporting key military areas of interest:

- Force readiness; everything required to prepare a force in peace time (i.e. training);
- Support for operations; COAA, (back)briefing, war-gaming (for planning and mission) and MR; and

- Future capabilities development; Concept Development and Experimentation (CD&E).

National and multi-national initiatives over the last twenty years have identified where simulation support can be enhanced further by the application of standards that enable C2 systems to be interoperable with the simulation systems. As a result of these initiatives the following benefits have been identified:

- Increased effectiveness and efficiency;
- Decreased cost; and
- Decreased preparation and response times.

Within the NATO Modelling and Simulation Group (MSG), both MSG 48 and the follow-on technical activity, MSG-085, reiterated the potential benefits from implementing the current standards C-BML and MSDL that could be realised in the areas of force readiness, and support to operations.

MSG-048 (2006-2010) performed preliminary analyses and performed a series experiments and thus was able to provide an initial set of requirements and recommendations for subsequent BML standardization efforts and also considered the use of the Military Scenario Definition Language (MSDL) for scenario initialization. [1]

MSG-085 initiated in 2010, and thanks largely to significant involvement from the operational community, established a clearer scope and refined set of operational and technical requirements for C2SIM interoperability. Interoperation among C2 and simulation systems is a common and significant theme in the transformation of modern military forces. This requirement implies the ability to seamlessly integrate C2 systems and simulation systems and to provide the means for a meaningful and unambiguous information exchange. C2SIM interoperation applies to systems of systems functioning toward a common goal at different levels: (1) within services, (2) across services (i.e. joint) and (3) across nations in a multinational or coalition context. [2]

In both technical activities final events took place to demonstrate the potential that using C2SIM standards could provide to the military user.

In a more recent presentation by staff in the British Army in describing a new concept Defence Operational Training Capability (Land) (DOTC(L) which itself form part of wider UK defence capability it was stated that army simulation had to:

- Meet the future operational requirement;
    - Realism;
    - Utility;
    - Evidence;
    - Interoperability.
- Embrace technological opportunity;
- Deliver more cost effective solutions;
    - Maximising the benefits of simulation;
    - Expertise and employment training.
- Generate evidence to inform Force Development (FD) and operational planning.

MSG-048 and MSG-085 have proved that the use of standards will support this British Army concept.

3.0 FORCE READINESS AND TRAINING

'It cannot be too often repeated that in modern war … the chief factor in achieving triumph is what has been done in the way of preparation and training before the beginning of the war.'

Theodore Roosevelt, 1902

All military forces have to train in order to prepare forces for potential operations. The readiness of those forces is determined by governments and is subject to resource constraints. A priority within this is to train commanders and their staffs at all echelons of command.

3.1 Training of Commanders and Staff

Training of formation and to a lesser extent the battlegroup staff was in the past quite time consuming. The early mechanisms for training staff were either on Field Training Exercises (FTX) and Command Post Exercises (CPX). The former were expensive to run, not environmentally friendly and the latter to some extent although fun they were not always realistically run and their success was very much dependent on the level of effort, imagination, drive and experience of a commander and their staff.

The ability of the exercising control (EXCON) to analyse each situation was often ad-hoc and debriefing often subjective as there were no After Action Review (AAR) mechanisms to play back the exercise nor if desirable could they stop and restart the exercise at a particular point. A document issued for Exercise PURPLE LINK 97 – a Computer Assisted Exercise (CAX) which the UK undertook with the USA stated that in essence the CPX relied *heavily for stimulation on scripted inputs, large numbers of men and equipment deployed into the field and man power intensive response cells and it is not possible to exercise fully all elements of a HQ without a disproportionately large number of control staff.* [4]

In the UK and other nations the development of a Command and Staff Trainer (CAST) provided a means of addressing some of the challenges. For example in The Netherlands they developed the Netherlands Command & Staff Trainer (NL-CST), in the UK it was initially a Battle Group Trainer (BGT), which subsequently was renamed as BBGT with the addition of Brigade training and finally became CAST with three systems deployed, two in the UK and one in Germany with the ability to train a divisional headquarters (HQ).

Figure 1- Initial method of moving units at Command and Staff Trainer in the UK prior to introduction of simulation.

Systems were initially manual and personnel who acted as Lower Controllers (LOCON) moved symbolic blocks representing units on a large scale set of map tiles as depicted in Figure 1. The introduction of simulations that could have military orders of battle (ORBAT) manually input and tasks given to representative forces within the simulation provided a capability to stimulate commanders and their staffs with the output. However this still required the staff (LOCON) responsible for interacting with the TA to provide data verbally via simulated Combat Net Radio (CNR).

3.2 The Swivel Chair Interface and Digitization of C2 Systems

Although this was a step-change the reliance on a 'swivel-chair' interface to enable LOCON to communicate with the TA meant that input errors into the simulation were more likely.[1] The process was also manpower intensive. In the USA this interface was described *"as cumbersome, limited, one way, sluggish, very manpower intensive, and often introduced errors."* [5]

The development of digitised C2 systems also meant that they required location information for units to be input into the system to provide situational awareness. This led to the development of one-way feeds to the C2 system from the simulation.

The US Army conducted a number of experiments to investigate how the situation could be improved. However, to exchange all C4I digital,[2] voice, and video data that would be passed in a tactical situation with future modern simulations, a more robust digital interface was considered to be necessary. Some of the reasons the US Army gave are listed below: [6]

- Stove-piped C4I systems required unique input of common information – the same information was required to be input multiple times into each C4I system and the simulation.
- The majority of automated data flow was one-way, from the simulation to the C4I device for updating of unit locations, status, etc.
- There was no direct control of the simulation from the C4I device.
- There was no reduction in the size of the workstation controller contingent that were still required to translate and input commands into the simulation and therefore no change on the training requirement in order to serve as controllers.
- In addition each stovepipe C4I device required its own black box to translate information between it and the simulation.

In 1998 the British Army Simulation Strategy stated that:

"The central place of Digitization in the Equipment Programme implies that simulation will have to: take into account the architectures and data standards prescribed for operational CIS (OpCIS); replicate systems used in the digitized joint battlespace sufficiently well to allow ***comprehensive and realistic training; and be configured in such a way as to allow direct interaction with OpCIS.****"* [3]

MSG-085 developed an Operational Concept Document (OCD) to support the requirement for using C2SIM standards to provide a more enhanced capability. The OCD was developed by an Operational Sub-Group (OSG) within MSG-85 with military membership. The OSG based the OCD on the experience of using NL-CST. The system like many other national systems relied on the 'swivel chair' interface as shown in the diagram at Figure 2.

[1] A swivel-chair interface can be defined as where a LOCON having received instructions via the simulated Combat Net Radio (CNR) then has to populate the simulation in order for it to be initialised. Messages that are received from the simulation as a series of alerts are then interpreted because they do not conform to military message formats and the controller uses the simulated CNR to inform the TA of the message.

[2] The term C4I was an acronym in use at the time this report was produced. It was Command, Control, Communications, Computers and Intelligence.

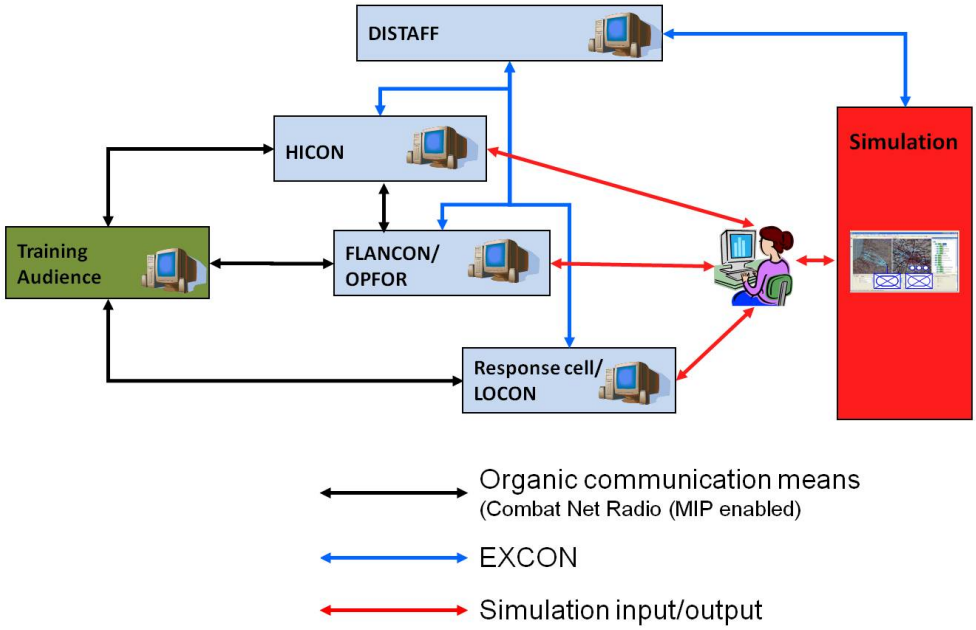

Figure 2 – Command Post Training: The Manual 'Swivel-Chair' Interface

3.3 Future Command Post Training Capability

The OSG envisaged that a future capability would use the C2SIM standards, C-BML and MSDL, to eliminate the 'swivel-chair' interface and provide automated input/output of data from both the C2 and simulation systems as illustrated in Figure 3.

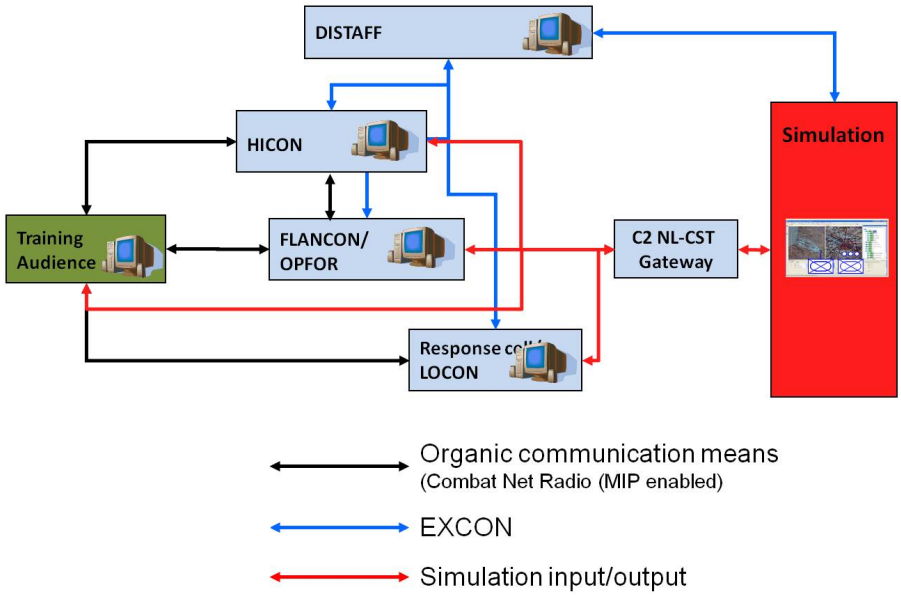

Figure 3 – Future Command Post Training

The OSG also provided a requirements matrix with the rationale for a requirement as necessary. The matrix is at Table 1.

Table 1 – Requirements Matrix for Future Command Post Training Capability

REQT ID	DESCRIPTION	CATEGORY	SUB CATEGORY
REQT-OCD-TR-01	It should be possible to initialize C2 systems and the simulation from a common source given by the training organization.	System Initialization	General
REQT-OCD-TR-02	The merging of subordinate plans should be automated and result in a comprehensive machine understandable plan that can be executed by a simulation.	Tasking	General
REQT-OCD-TR-03	Communication of orders should be possible from all the C2IS that are involved for all levels of the training organization (HICON, LOCON, OPFOR, FLANCON).	Tasking	General
REQT-OCD-TR-04	A simplified format and structure should be available for specifying and communicating OPFOR tasking. Rationale: Given the fact that most C2ISs can't handle the ordering process of the enemy very well for OPFOR either the C2ISs have to be adapted for this or dedicated OPFOR ordering systems should be used.	Tasking	OPFOR
REQT-OCD-TR-05	HICON must be able to directly order his own simulated units through his C2IS.	Tasking	General
REQT-OCD-TR-06	The simulator must be able to automatically send reports from simulated subordinates to the TA and the TA should be able to inform the simulator at which aggregate level it expects the reports. By default subordinates of the TA should be one echelon lower than the TA itself.	Reporting	Information Exchange
REQT-OCD-TR-07	The TA should be able to send a request for reports to the simulated lower command, whether this is simulated by a LOCON or by the simulator.	Reporting	Information Exchange
REQT-OCD-TR-08	There should be a component that allows for easy adaptation of existing C2IS such that they can send and receive automated formal messages such as C-BML and MSDL.	System Interfaces	Interface Adapter
REQT-OCD-TR-09	System should be able to store the automated formal messages (e.g. MSDL/C-BML) for subsequent retrieval. Rationale: This will be required to support AAR activities.	Persistence	Storage
REQT-OCD-TR-10	Automated information retrieval services should support information access consistent with exercise control functionalities. Rationale: Need to support STRT/RT/FTRT playback, rewind, fast forward, jump to functionalities of stored data for AAR purposes.	Persistence	Retrieval

REQT ID	DESCRIPTION	CATEGORY	SUB CATEGORY
REQT-OCD-TR-11	Data required for simulator initialization or re-initialization should be able to be stored in a machine-readable format (e.g. MSDL and C-BML) at any given time during scenario execution. Rationale: This will allow for examining or restarting an exercise at different times of a previous scenario execution.	Persistence	Scenario Snapshot

4.0 MILITARY PLANNING

Mission planning has always been the major function of a headquarters in the military decision-making process and has not always been carried out as efficiently as they should as is implied by this British Army annual report, 'Observations from Training Report 2002', which stated that:

"The decision making process must be conducted in a focused and methodical manner, including wargaming, the median for refining the plan, and rehearsal, the means of confirming the plan. Once units cross the Line of Departure the function of the headquarters is to continue to hone the commanders plan and respond as required, but if the initial plan is flawed little can be done to resurrect success." [8]

However as Major General J I Bashall CBE, GOC 1 (UK) Armoured Division, 2012 stated in an introduction to the British Army Staff Officers' Handbook (SOHB) 2014:

"Warfare is not simple. Our business is increasingly and at times inconceivably complex. The planning process used by the Army has evolved over the years to allow for this increased complexity but at its core it is a system to help commanders understand a problem, and then derive an executable solution. The plans we create by the end of the process will not necessarily be simple, and indeed they may run to pages of complex coordination to sequence several lines of activity. But the problem will have been understood, and a plan created which is simplified for execution."

4.1 Military Planning Process

In outline the military planning process follows the steps outlined below, although this may vary across nations.

- Receipt of mission and mission analysis
  - Briefing
  - Back Brief
- COA development, analysis, comparison and approval
  - Wargaming for COA development
  - COAA and comparison
  - Wargaming for Order enhancement
- Orders production
- MR
- Execution
  - Assessment
  - Re-planning

At the heart of any planning and execution process is the need to Plan, Refine, Execute and Evaluate

(PREE)[3] at both operational and tactical levels. NATO and nations have developed their military planning processes to support decision making at all levels of command. For example the UK the army have developed three processes to support decision making and called referred to as 'Estimates', the US Army have one used at both the operational and tactical levels, and France has three that are used by their land forces . The national processes are either at the operational or tactical level whereas the NATO process is used from strategic to operational levels of command. These are described in Table 2 below.

Table 2 – UK and Allied Military Decision Making Processes

Estimate	Nation	Utility
Operation Level		
Operational Estimate (OE)	UK	Operational (Campaign) Planning incorporating CJIIM
Comprehensive Operations Planning Directive (COPD)	NATO	Complex operational planning level incorporating CJIIM
Military Decision Making Process (MDMP)	US	Operation and Tactical planning process
Operational Planning Process (OPP)	FR	Land Component Command with CJIIM context
Method for Planning Operations (MPO)	FR	Operational planning for national (unilateral) operations
Tactical Level		
Tactical Estimate (TE)	UK	Planning for complex tactical problems, e.g. a brigade preparing for an intervention operation
Combat Estimate (CE)	UK	Short term tactical planning where the context of the mission is broadly understood and there is an emphasis on tempo of decision and action.
MDMP	US	Operation and Tactical planning process
Methode D'Elaboration D'Unde Decision Operationelle (MEDO)	FR	Tactical level used by divisions, TFs and BGs

An example of the French Methode D'Elaboration D'Unde Decision Operationelle (MEDO) used at the tactical level is illustrated at Figure 4.

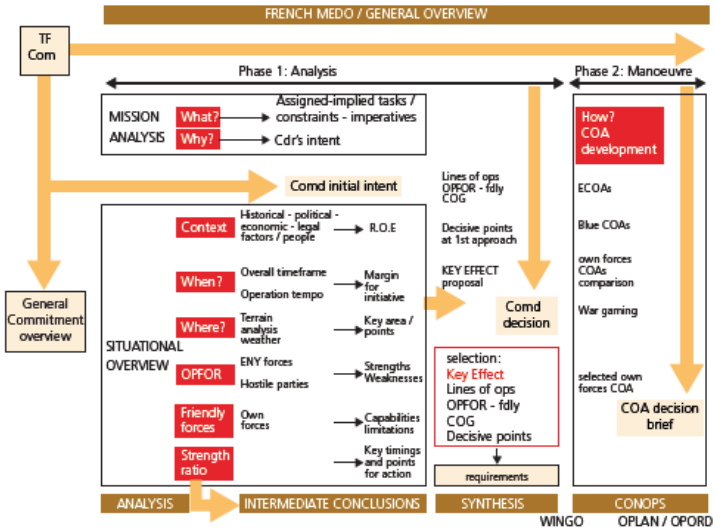

Figure 4 – French Methode D'Elaboration D'Unde Decision Operationelle (MEDO)

[3] Some nations use the cyclic process of Assess, Plan, Refine, Execute (APRE)

4.2 Use of Simulation to support MDMP

The military decision making process is complex, information intensive and time critical. The success of future C2 systems is measured by their ability to improve commander's speed and agility in decision-making. There are many potential applications for C2SIM interoperability in the military decision making process during an operation. As an example, opportunities for simulation driven support are for planning and MR. And there would be more and more simulations developed in the future, with useful technological advances that can translate into an advantage on the battlefield. Those simulations may be executed locally within the HQ, or can be executed at distance within server farms, depending on the resources required by each simulator.

MSG-085 OSG developed an OCD [9] for the COA aspects of mission planning based on the French experience using SICF and APLET. SICF (Système d'Information pour le Commandement des Forces) is a Land Forces C2 Information System (C2IS) deployed for French Division and Brigade Command Post. In addition, SICF is also used by the CRR-FR (Rapid Reaction Corps France) and the EuroCorps. APLET (Aide a la Planification d'Engagement Tactique) provides the simulation that supports COAA. The OSG made a number of recommendations in the OCD based on the use of these two systems which would be applicable to any C2 or simulation system.

4.3 NATO Comprehensive Operational Planning Directive (COPD)

The Alliance Command Operations COPD provides guidance for the conduct of military planning on operations. It provides:

- an overview of NATO crisis management and planning;
- procedures on developing situational awareness;
- the planning process at the NATO strategic level;
- the planning process at the operational level;
- operations assessment; and
- all relevant formats.

It specifies simulation support should be used in a number of key functional areas. The use of C2SIM permits exchange of digital orders for development, review and testing; between planners at different echelons and between planners and operations staff.

Figure 5 (COPD Interim Version 1.0) below shows the complex relationships between the different echelons during the different phases and the types of information which may be generated and transferred.

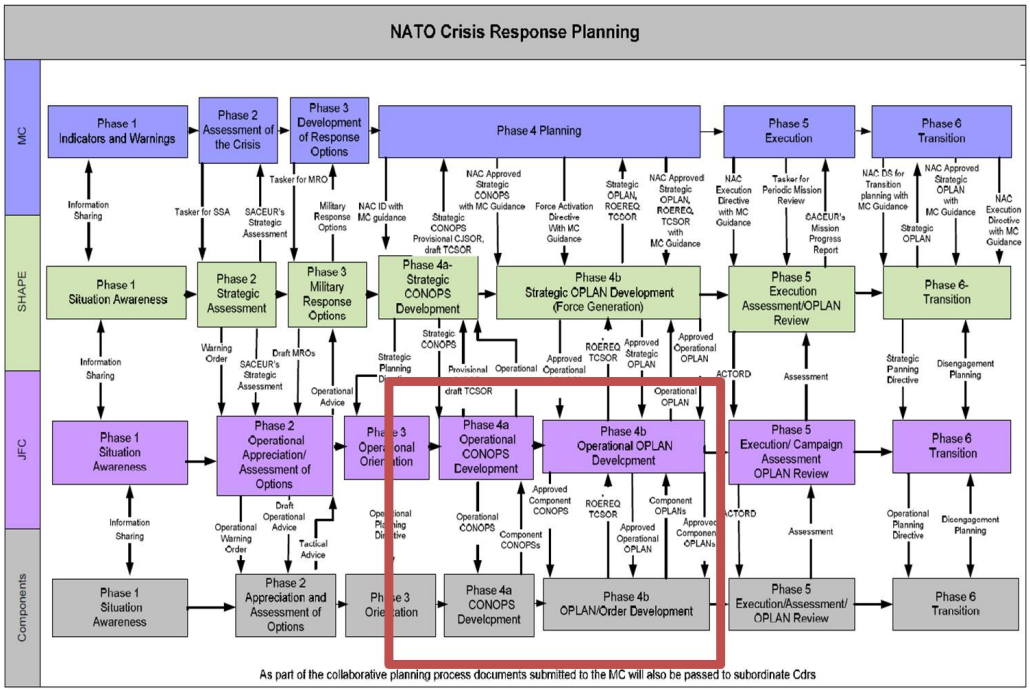

Figure 5 – NATO COPD Planning Process (Interim Version 1.0)

Analysis identified that FTRT simulation-based mission planning has the potential to support Phases 3, 4a and 4b, development of an OPLAN from the Concept of Operation (CONOP). Any set of plans may require input from or affect planners in forty-one defined Functional Areas which are shown in Table 3.

Table 3 – Functional Areas

Functional Area		Functional Area		Functional Area		Functional Area	
A	Concept of Operations	L	Psychological Operations	W	Civil-Military Cooperation	HH	Rear Area Operations
B	Task Organisation	M	Arms Control	X	Public Information	II	Joint Fires
C	Forces and Tasks	N	Nuclear Operations	Y	Conflict Termination	JJ	NATO Crisis Response System
D	Intelligence	O	Information Operations	Z	Spare	KK	Operational Analysis Support
E	Rules of Engagement	P	Electronic Warfare	AA	Legal	LL	Lessons Learned
F	Maritime Operations	Q	CIS	BB	Training and Rehearsals	MM	Military Police
G	Land Operations	R	Logistics	CC	Command Information	NN to	Spare

Functional Area		Functional Area		Functional Area		Functional Area	
H	Air Operations	S	Movements	DD	Space Operations	XX	
I	Amphibious Operations	T	Environmental Support	EE	Engineer Support		
J	Force Protection	U	NBC Defence	FF	Financial Support	YY	Miscellaneous
K	Special Operations	V	Search, Rescue and Recovery	GG	Non-NATO Force Procedures	ZZ	Distribution

In the final demonstration of MSG-085 was conducted using the NATO COPD Interim Version 1.0 Subsequently NATO released Version 2.0 [10]. Figure 6 is the diagram that has replaced Figure 5.

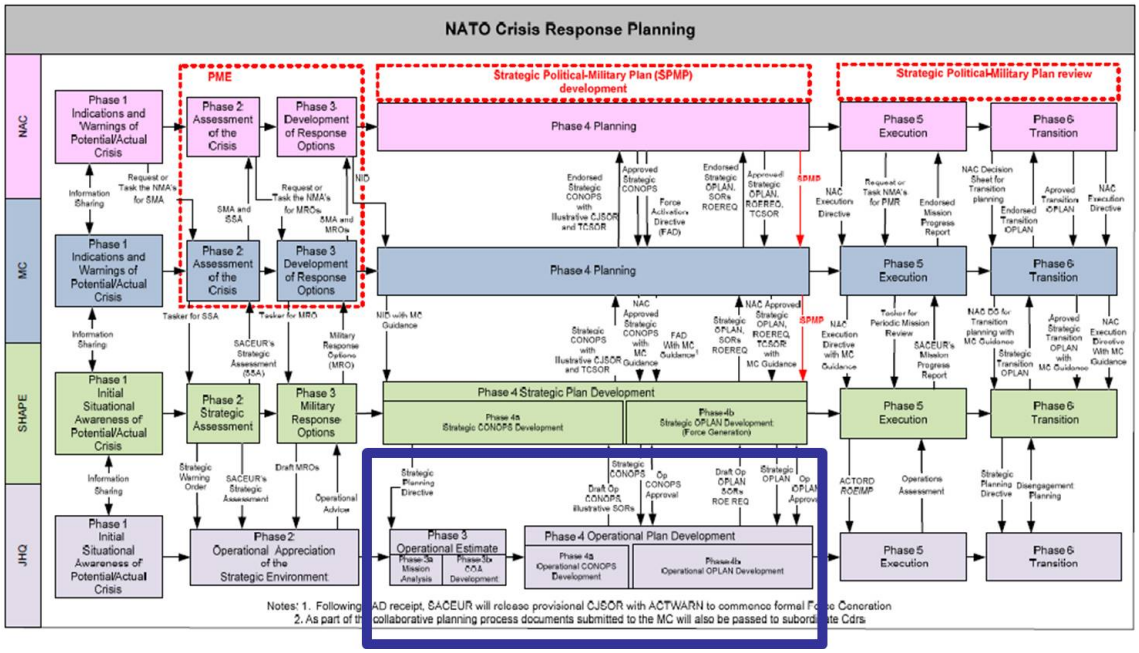

Figure 6 – NATO COPD Planning Process (Interim Version 2.0)

The change from version 1 is that it does not include the lower component commands shown in the Figure 5. In Joint Mission Planning we are principally interested in the JHQ level of command and the component commanders. Therefore it is not envisaged that this changes proposals to use C2SIM standards to enable simulations systems to support COAA development, Wargaming and MR.

MSG-085 also established a number of Common Interest Groups (CIG) to examine a number of functional areas, one of which was Joint Mission Planning (JMP). The JMP CIG investigated how C-BML plans and orders can be used in support of military mission planning, how planning tools can be used to evolve orders (COAA) which can be evaluated quickly using fast-running simulations. Chosen plans would then be implemented in a training environment using real-time simulations. Although the output of this CIG was only a paper study a number of simulations that could run FTRT were examined and a number of planning tools identified. Simulations included OneSAF, Joint Forces SAF (JSAF) and Joint Theatre

Level Simulation (JTLS). Planning systems included Tools for Operations Planning Functional Area Service (TOPFAS) and Integrated Gaming System (IGS). Both were potentially feasible for use.

The UK has adopted NATO Operational Planning Processes and AJP-5.0 subject to national caveats where necessary.

5.0 WARGAMING

5.1 Historical Background

The use of simulation in wargaming is not new for example in China as early as 3000 BC they had a game called *'Wei-Hai'* (Encirclement). In India a game called *'Chaturanga'* was developed from which chess in its various forms came about. The modern genesis of wargaming was in the 17th century when games of a sort were used in Europe. One such design known as 'The King's Game' was created by Christopher Weikmann in 1644.

It was the Prussian army that exploited the use of wargames to great effect after the introduction of a game developed by Lieutenant von Reisswitz called *'Anleitung zur Darstelling militarische manuver mit dem apparat des Kriegsspiels'* (Instructions for the Representation of Tactical Manoeuvres under the Guise of a Wargame). This game had a number of innovations that included the use of actual topographical maps to enable the visualisation of the battlefield and a set of rules that quantified the effects of combat. [11]

5.2 COA Wargaming

The application of Operational Analysis (OA) and wargaming as long been recognised as this statement from UK Army Doctrine in 1995 makes clear.

In conjunction with OA, wargaming can be employed to determine enemy courses of action and to identify, and quantify objectively, possible responses. Given friendly force strengths and dispositions, enemy capabilities and deduced possible courses of action in a set area of operations, proposed own courses of action can be tested. In this way, wargaming can assist in the commander's decision-making and in the development of subsequent plans." [12]

Wargaming can be used for a number of decision making processes, but 'COA Wargaming' and 'Wargaming' however are not synonymous terms, COA Wargaming is just one form of wargaming and used normally towards to end of the planning process. It is considered essential to evaluate the potential of the COA to achieve the mission against an OPFOR foreseen in the different opposing COAs and to identify and correct deficiencies. The real value of wargaming however is in allowing the commander and staff to synchronize actions and visualise the conduct of operation, while gaining insight into implications of opposing capabilities/actions and conditions in the operational environment. Figure 7 illustrates the traditional approach to wargaming with no simulation support.

Figure 7 – Traditional Approach to Wargaming

The opportunity to wargame a COA is shown in Figure 8 which was published in the British Army SOHB in 2014. The SOHB provides a comprehensive set of instructions to support a staff officer in conducting wargaming. Other nations undoubtedly have similar documentation.

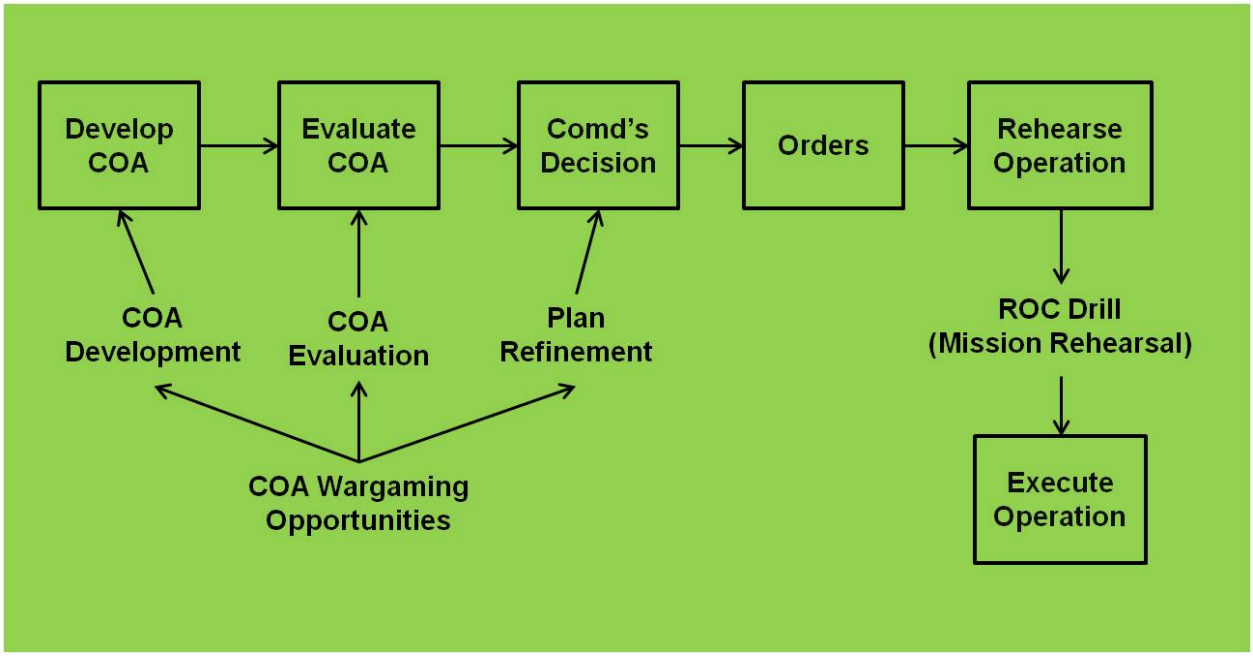

Figure 8 – COA Wargaming Opportunities

COA Development: Can help to visualise an embryonic COA, indicating the art of the possible and enabling impractical COAs to be discarded at an early stage. Early wargaming should yield a better understanding of a proposed COA. Finally it also helps to ensure that that COAs are distinct and not merely a variant on the same scheme of manoeuvre.

COA Evaluation: Can be used to compare each friendly COA with appropriate opponent COAs and any other relevant factors to determine the likelihood of success. Wargaming at this stage provides information on the relative strengths and weaknesses of each individual COA for evaluation against a commander's COA selection criteria.

Plan Refinement: Wargaming can contribute significantly to its refinement of a selected plan, including identifying risks, areas of weakness. In addition, wargaming assists in the production of coordinating instructions, indicates specific requirements for battlespace management and highlights potential tasks and associated readiness for reserves.

The use of C2 and simulation systems that are interoperable through the application of C2SIM standards can enhance COA Wargaming beyond what traditional methods of wargaming can achieve.

6.0 MISSION REHEARSAL

C2SIM interoperability requirements for MR are similar to those associated with training events, discussed above in section 3.0, and often involves the same systems. However, the following distinction could be made: training generally focuses on acquiring skills and achieving operator proficiency, whereas MR focuses on achieving a high level of preparedness with respect to a specific mission and context, often, involving forces that will be deployed.

The same flexibility and advantages discussed above with respect to training also could have advantages for MR. However the focus of MR would probably be on risk mitigation and team-building rather than on operator proficiency and reducing the required number of interactors. [1]

7.0 UK FASTER THAN REAL TIME EXPERIMENT

In order to support activities such as COAA in a timely manner (e.g. in support of decision-support systems) it is necessary to run the simulation at rates that largely exceed real-time – otherwise it likely not to be possible to analyse a sufficient number of own COA and enemy COA fast enough to satisfy the commander's planning or decision-support needs.

In 2014 the UK through its C2SIM research programme examined the feasibility of using a simulation running in a FTRT mode to support military planning with the aim of demonstrating to interested parties the capability to conduct campaign planning that conforms to the NATO COPD processes using C2 systems that are interoperable with an appropriate simulation. The main objectives were:

- To show the utility of using C2SIM standards;
- Ease of use;
- Benefits to the planning and operational cycle in key functional areas by;
    - Reducing the time taken to conduct planning;
    - The ability to work concurrently with subordinate and superior organisations;
    - The ability to compare multiple COA faster;
    - To better visualise the options that are investigated;
    - To provide the basis of an audit;
    - To conduct distributed campaign planning with the dissemination of a superior headquarters plan to allow subordinates access/input.
    - Helping choose the best or optimum COA.

7.1 FTRT Scenario

The scenario for the demonstration was constrained by the limited number of behaviours initially available for tasking OneSAF using C-BML standards, namely: Advance, Attack and Engage. No specific UK equipment or units were used, simply rebadged and truncated formations extant in OneSAF. Since this

was a first demonstration, the scenario used the US Army Joint Readiness Training Centre (JRTC) terrain database, one of the standard terrain areas supplied with OneSAF.

The friendly order of battle consisted of a UK Mechanised Infantry Brigade conducting contingency operations. In turn the brigade consists of three Infantry Battalions supported by artillery, logistics and reconnaissance elements (730 vehicles, 953 soldiers). The Opposing Forces (OPFOR) comprised three BMP companies (48 vehicles, 216 soldiers).

7.2 FTRT Architecture

The initial proposal for the FTRT demonstration architecture was to use an Open BML GUI, an appropriate web server such as the CBMS WS and the OneSAF simulation as shown at Figure 9.

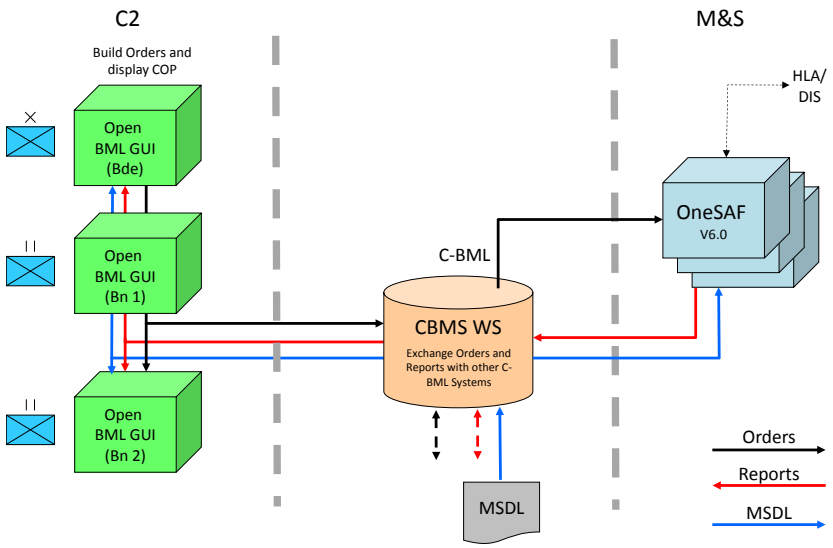

Figure 9 – UK FTRT Architecture

7.3 BML GUI

An Open BML GUI was chosen as a surrogate C2 system because the UK's current Land C2 application, ComBAT (Common Battlefield Application Toolset), was a closed system and could not be used without considerable engineering effort, although it remains the aspiration to use this application in the future.

There are a number of BML GUIs that have been developed by academia and industry such as the C2LG GUI. A BML GUI needs to:

- Be able to manipulate MSDL Initialisation data:
  - Create, edit, save, load, merge, publish, subscribe
- Be able to manipulate C-BML Orders:
  - Create, edit, save, load, queue, publish, subscribe
- Be able to monitor the simulation through C-BML location and event reports
- Be a component of an integrated military planning tool
- Be easy to use – Map editor, ORBAT editor, etc

- Hence, these requirements should apply to a C2 Planning Application/Tool

For the purpose of the experiment it was decided to use a GUI that had been developed by Thales and is depicted in Figure 10. A number of enhancements are planned to provide more functionality.

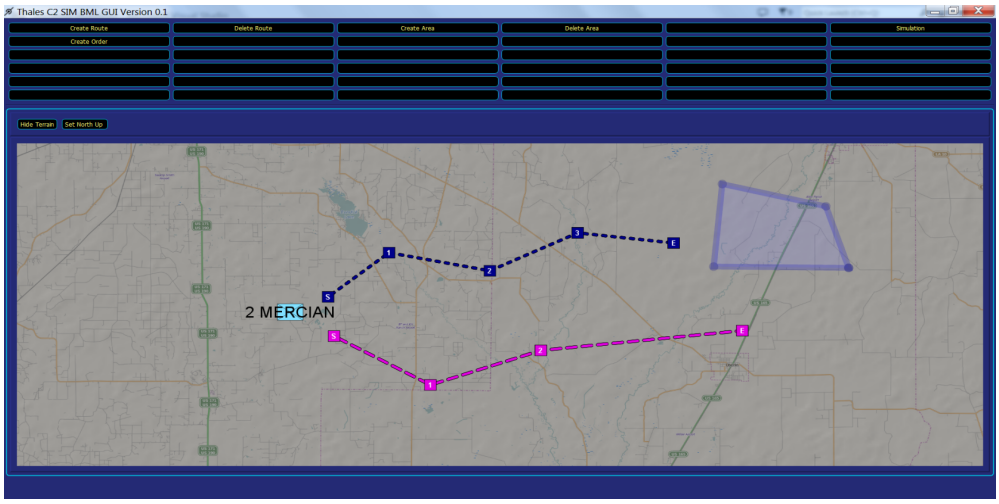

Figure 10 – Thales C2SIM BML GUI

An initial demonstration was conducted in 2014 and further experiments will be conducted in November 2015 and early 2016.

8.0 CONCLUSION

From the national and MSG-48 and MSG-085 experience gained over a period of 20 years it is clear that the application of C2SIM standards can; enhance networked C2 training for commanders and their staffs at all levels of command; stimulate C2 systems with automated reports and returns; enable the use of simulation for military planning including wargaming and support MR. Work is still required however to operationalise C2SIM.

9.0 REFERENCES

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