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Lessons identified from the first UK Effects Based Planning Experiment[1]

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This paper is the 3rd in a set of 13 presented to the 9th ICCRTS by staff of the Defence Scientific and Technical Laboratory (Dstl) and QinetiQ plc, relating to 'command in the network enabled era', based on research undertaken for the United Kingdom Ministry of Defence's 'Network Enabled Capability' programme.

Abstract

This paper outlines the findings from the first UK Effects Based Planning Experiment, conducted in October 2003. The main aim of the experiment was to assess a candidate EBP process at the operational level of command and identify equipment capability requirements and issues for short- to medium-term exploitation. The EBP process was based on the development and assessment of a set of planning constructs including Network Analysis and Effects Rationale (Courses of Effect). A group of eight military players formed a UK National Contingent Headquarters and conducted the EBP process using prototype EBP software tools. The two main lessons identified from the experiment were (1) the requirement to manage the inherent complexity within an Effects Based Plan through a combination of rigorous staff processes and focused guidance from the Commander; and (2) the advantage of multi-disciplinary staff cells concerned with distinct Battlespace Actors (e.g. Red, Blue) over distinct Plans and Analysis teams. At a time when the UK military is developing its Effects Based Approach at the operational level of command, it is believed that these lessons can be used directly to inform best practice at the UK Joint Force Headquarters.

Introduction

This paper outlines the findings from the first UK Effects Based Planning Experiment, funded by DEC(CCII)[2] under the MOD Applied Research Programme and conducted in October 2003. The main aim of the experiment was to assess a candidate EBP process, developed for the operational level of command. The process was supported by a set of prototype EBP tools, developed by QinetiQ. A secondary aim of the experiment was to identify, based on the use of these tools within the EBP process, equipment capability requirements and issues for short- to medium-term exploitation.

Details of the Effects Based Planning concepts and process, and an introduction to the tools, are the subject of a companion paper '**Effects Based Planning - A UK Research Perspective'** [1].   This paper provides a high level view of the experimental design, highlights the key observations made during gameplay,

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2 Director Equipment Capability (Command, Control and Information Infrastructure)

describes some of the lessons learnt from the experiment and discusses some of the issues for EBP arising from this research.

Experimental design

At the time of the EBP experiment the EBP process, products and tools [1] were all novel, reflecting the paradigm shift in operational planning considered to be required for the successful adoption of the Effects Based Approach within the UK military. The EBP experiment was therefore designed as a discovery type of experiment [2]. A further justification for this approach is the inter-dependence of the EBP process, products and supporting capability – it is impossible to control variables, as would be required in a condition-based experiment, until some of the relationships between these enablers of EBP and the quality of the resultant Effects Based Plan have been discovered.

The experiment was conducted at the JCBM ARTD[3] at DSTL Portsdown West between 27th and 31st October 2003, with the execution phase covering the 29th – 31st October. It was a 'man-in-the-loop' experiment, characterised by a team of participants playing a UK National Contingent Headquarters (UKNCHQ) and supported by information systems capability (EBP tools).

The NCHQ team comprised a National Contingent Commander (NCC), Chief of Staff (COS), J2, J2 OA, J3, J5, J3/5 OA and Political Advisor (POLAD). J2 OA and J3/5 OA were new roles created for the experiment; they were Operational Analysts, with domain expertise in non-friendly and friendly Actors, respectively. The team was staffed by a mixture of current and retired military officers. The scenario was based on real-world data, developed by staff from DIS[4] and an external military consultancy, all of whom acted as EXCON during the experiment itself.

As indicated in [1], each EBP tool was associated with a generic product (essentially, an **EBP construct**). One issue with the form of these products was that they did not automatically map onto the kind of products that might be required within a planning cycle – in particular, they were not tailored to knowledge sharing (through briefings) at specific planning cycle breakpoints. To counter this an Effects Based Planning Cycle was developed, based on the current Joint Campaign Planning Cycle [3]. This both provided appropriate breakpoints and stated the requirement for each briefing.

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[3] Joint Command & Battlespace Management Applied Research Technology Demonstrator
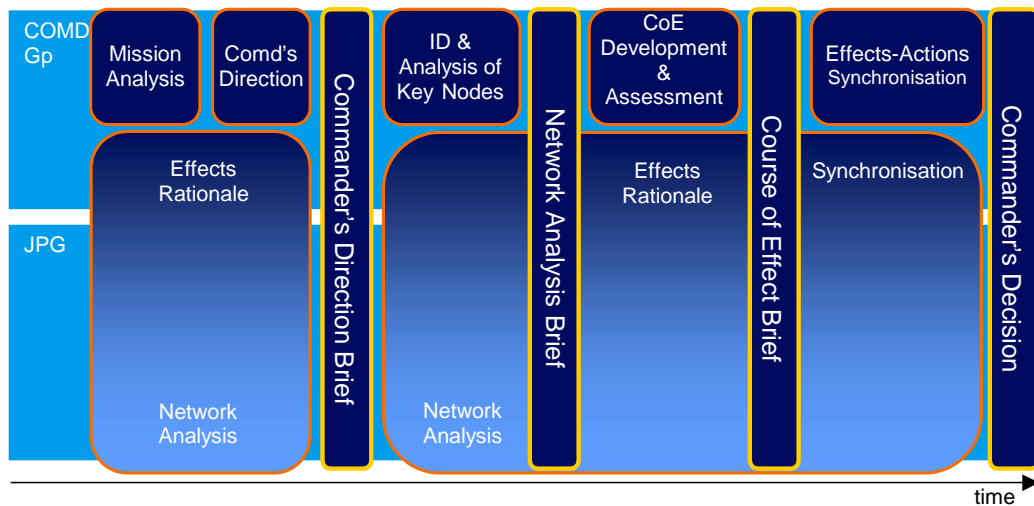[4] Defence Intelligence Service

Figure 1; Effects Based Planning Cycle

The EBP cycle, shown in Figure 1, indicates the order in which sub-processes (square orange boxes) should be conducted by which staff group (COMD Gp or JPG[5]). It also shows the breakpoints and associated briefings (vertically-aligned yellow boxes). The EBP cycle commences with the receipt of the Operational Effects Planning Directive (OEPD). This document, which was written for the experiment, is essentially the EBP equivalent of extant Strategic Directives (CDS/ CJO) and provides the Commander with his mission and guidance, precipitating Mission Analysis. Although the EBP cycle used within the experiment terminated with the Commander's Decision brief, it should be noted that this was an experimental artefact only and reflects the final product that the players were asked to work towards.

Certain aspects of the EBP cycle as used in the experiment were purposefully vague; since the experiment was of the discovery type, it was decided not to constrain the players by over-specifying the activity of the JPG. Thus JPG sub-processes are defined only in terms of the associated generic products. Further, the players were not assigned explicitly to either the COMD Gp or the JPG (although the NCC and COS were expected to form the core of the former). Descriptions of the COMD Gp sub-processes can be found in [1]. The form and content of each brief however, were well defined and were also devised to cover each of the three generic EBP products (constructs) separately. These briefs are described below:

- The **Commander's Direction Brief** is provided by the Commander to all HQ staff and encapsulates the output of Mission Analysis as prepared during the Commander's Direction sub-process.

- The **Network Analysis Backbrief** is provided by the COS and the staff to the Commander and serves to summarise the Network Analysis across all MELTPPS dimensions. It provides a formal breakpoint in Network Assessment so that it can be used to inform Effects/ Actions Assessment (through the Commander's guidance).

- The **Course of Effect (COE) Brief** is provided by the COS and the staff to the Commander. It describes the rationale behind all Actors' COEs with

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[5] The Command Group (COMD Gp) are effectively the 'executive' within the operational HQ. They include the Commander, his COS and key staff from each branch. The Joint Planning Group (JPG) are made up from the remainder of the staff and tend to undertake less directive roles.

> supporting and impeding Effects. This demands that causal links *across* COEs have been identified.

- – The **Commander's Decision brief** is provided by the Commander to HQ staff, includes his Concept of Operations and encapsulates his COE (i.e. Blue only) synchronised against time.

Prior to the experiment, all players were provided with full training on the EBP concept, process/ cycle and tools; they also played a paper-based EBP scenario so that they could familiarise themselves with the EBP concepts and develop team relationships. The experimental scenario was conveyed to the players in standard exercise format by EXCON; the players were also provided with a sufficient amount of read-in material to allow them to become immersed in the scenario. For the experiment itself the players were each furnished with a full suite of EBP tools; through these tools they had access to a pre-populated Network Analysis, which represented the baseline ONA that an operational HQ staff might expect to pick up during the earliest phase of an operation. The players were given a short amount of time to immerse themselves in the scenario and continue free training with the tools. The NCC was then issued with the Operational Effects Planning Directive (OEPD) and gameplay began. During this period, which spanned two days and a total of approximately 12 hours, each a team of observers sat with the HQ staff. The observation team also asked ad hoc questions of the players following each briefing.

Since the experiment was of the discovery type, and given the novel aspect of the process, products and tools, it was expected that the experiment would need to be refocused and rescoped on a number of occasions. As well as multiple breakpoints with question-and-answer sessions, two of the players (the NCC and COS) actually formed part of EXCON and provided feedback to the experiment controller on experimental progress. The experimental controller was therefore constantly aware of the requirements to modify the gameplay objectives, or alter the timetable, and authorised such changes accordingly.

Key observations from the experiment

At the beginning of gameplay, the players were provided with the OEPD and access to the EBP tools, including the extant Network Analysis. Mission Analysis was conducted over a protracted period of time because the players took the opportunity to interrogate the data and familiarise themselves with the concepts and tools. For example, J2 OA, J3/5 OA and POLAD formed an 'Analysis team' and proceeded to draw a Network Analysis of their own on a white board based on information provided in the read-in material, thus reinforcing their understanding of the Network Analysis concept and situating themselves in the data before looking at the database within the tools. J2, J3 and J5 formed a 'Plans team' and began to sketch out, on paper, Strategic Aims and Objectives for all Actors they perceived in the battlespace, thus reinforcing their understanding of the Course of Effect construct. The NCC and COS formed their own team and undertook the same task in isolation from the Plans team. Apart from the players' obvious requirements to continue to immerse themselves in the scenario and familiarise themselves with new concepts and tools, a key early observation was the reliance that an 'Effects Based HQ' has on the Effects Based Approach being adopted at the superior level of command. The OEPD, although discussing Strategic Objectives and Effects, was simply a slightly expanded version of the standard CJO's Directive – it contained neither an expression of the Strategic Course of Effect, nor was it specific in its guidance concerning the degree to

which the UKNCHQ needed to consider and consult the other Instruments of Power. In the absence of Effects Based Planning products passed down from PJHQ, the team took a while to understand and scope their own Effects Based Planning activity.

Having been provided with interim planning guidance from the NCC, the Plans team began to develop a number of Objectives, each of which described an end-state, across the MELTPPS dimensions wherever possible, for different Actors. The planners then began to generate Effects in a creative fashion, and enter them using the ERT, deciding to assess them at a later time. Key observations here were the ease with which Effects and Actions became confused (leading to numerous discussions about the definition of an Effect and references to the example Lexicon of Effects) and the ease with which a large number of Effects could be created. The Analysis team continued with its white board-based Network Assessment and then translated this into the NAT/ NAV, modifying existing Nodes accordingly. A key observation across the two teams was the number of assumptions each was required to make in the absence of input from the other – for example, the Plans team was developing Effects against Nodes without fully understanding their capabilities or semantic relationships with other Nodes. Consequently, when the teams began to use the tools they were forced to complete database fields about which they had little knowledge, and at this point the separation between the teams was recognised. The NCC and COS were essentially conducting Mission Analysis on their own, and writing the Commander's Guidance. Unlike the Plans team, however, they were assessing Effects as they conceived them and worked within the context of the OEPD. This may be explained by these two players' relative familiarity with the EBP process.

During the subsequent Commander's Direction Brief, the NCC provided valuable focus to the team by outlining his Objectives, in terms of MELTPPS dimensions, for each Node group (essentially Actor). He also described the types of Effect he believed would be required to contribute to these Objectives, outlined which Instruments of Power may best be employed and highlighted his Main Effort.

After this brief (approximately 2 hours into the gameplay) the two teams began to consult each other with greater regularity, and worked exclusively with their tools. The Plans team divided into 'Blue plans' and 'Red plans'. A key observation here is that the planning and analysis tasks were still disjointed and consultations were too infrequent. Physically, the teams were sat at separate desks and were using separate tools (ERT and NAT/ NAV, respectively) with scant use of the NET tool, which provided the cross-references between Nodes and Effects. A secondary observation is that the Plans team had not yet considered COEs for any Green (non-aligned) Actors.

By the Network Analysis Backbrief, approximately 6 hours into the gameplay, the Analysis team believed that it had exhausted most of its work. The Plans team had now divided into 3 sub-teams, with 'Green plans' being staffed by J5; they were now also generating and maintaining a graphical version of the ERT, which they continued to do so for the remainder of the experiment. A key observation at this stage is that the Plans team had not begun to assess any Effects or Actions and were therefore not consulting the Analysis team about Nodes – this might also have explained why the Analysts felt under-utilised at this stage. Although Effects and Actions Assessment did begin in earnest after this point, and there was increased collaboration between the teams, it was still insufficient.

Near the beginning of the second day of experimentation, approximately 8 hours into the gameplay, the players made the decision to modify their Ways of Working by forming Actor-based cells, each containing a planner and an analyst. Thus J2 and J2 OA focused on Red, J3 and J3/5 OA on Blue and POLAD joined J5 in looking at

Green. This had an immediate impact on the progress of the staff, since Effects and Actions could be more rapidly and effectively assessed. Two other observations were subsequently made:

1. Planning deadlines would not be met due to the large number of Effects and Actions that had been created but required assessment;

2. The improved Ways of Working across the 6 staff actually hindered the NCC's/ COS's awareness of planning progress.

Consequently, it was decided to build extra breakpoints into the experiment so that the NCC and COS could remain continually aware of staff progress, continually direct and, in required, refocus staff effort. Over the final 4 hours of gameplay, however, the NCC and COS still had reduced awareness of the progress of the plan despite the extra breakpoints; the main aim of the planning activity became the management of the Effects already in the COEs, rather than the completion of the task itself.

There was some limited wargaming during the latter stages (final two hours) of gameplay, notably between the Red and Blue teams, but the number of cross-COE links identified was relatively low. All Effects-Actions Synchronisation activity was shifted to a third day, where it was conducted in a workshop.

Lessons identified from the experiment

In addition to the observations (summarised in the previous section), experimental data was collected from group discussions, conducted at the end of each day of experimentation, and from questionnaires administered at the end of the experiment. Seven themes emerged from the data. These are depicted in Figure 2, below; the links show interrelationships between the themes.
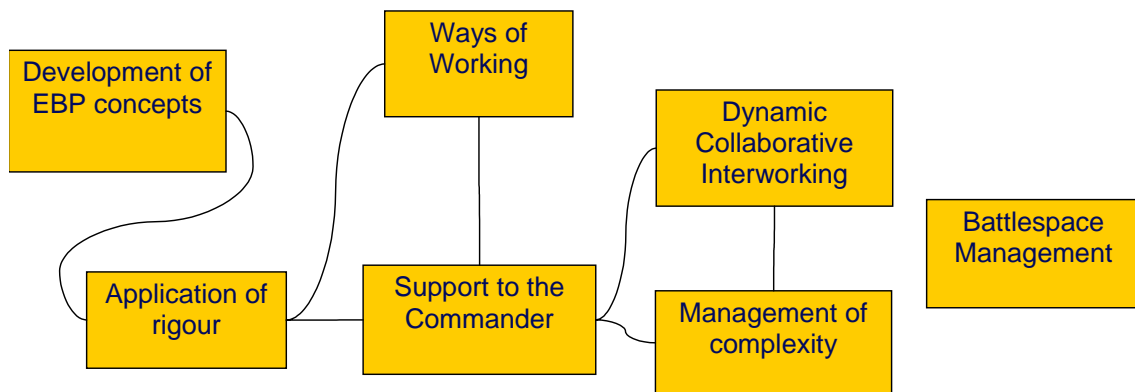

Figure 2; Lessons identified - seven themes

Development of EBP concepts

The definition of an **Effect**, as conceived before the experiment, was "a (change in) the state of a Node". The players quite rightly pointed out, however, that one may wish to cause a change in the relationship *between* Nodes, i.e. changing the degree to which a Node can influence others, rather than affecting (attributes of) the Node itself.

The **semantic network** approach already provides for the aggregation and decomposition of Nodes within a Network Analysis; this is done by specifying semantic links that characterise organisational or structural hierarchy (e.g. Node A "is

part of" Node B). The resulting representation, however, can be visually difficult to comprehend and organise. In particular, the players came across the case whereby they wished to create an Effect against a group of Nodes but had no 'aggregate Node' within their Network Analysis to represent this group. Moreover, even when this was created, Effects were not then inherited against each of the Nodes within that group. The consequent requirements are for both a more natural means of depicting Nodes (e.g. collapsible/ expandable Nodes hierarchies) and some means of Effect inheritance for 'child Nodes', where this is valid.

The **Course of Effect** concept was well received by the players, perhaps because it is a natural progression of the Course of Action concept currently used at all levels of military planning. The option to depict COEs graphically was practised by the team and became the main Effects Rationale 'product'.

The sub-division of planning activity by 'colour' according to allegiance (and hence unified Course of Effect/ Action) is not a new idea. Although the main focus for planning activity in the current Operational Estimate is the blue COA, an appreciation of at least the possible Red COA is generated through the IPB process, with or without a member of the planning team explicitly role-playing the 'Red Commander'. The COE concept reinforced the requirement to both plan for Blue *and* provide a Blue view on the plans of *all other* Actors. (See below for an account of how this impacted upon *Ways of Working*.)

In fact, the experiment scenario included multiple forces, organisations and factions who, although collected together under the three colours Red, Green and Blue, did not necessarily share common Strategic Aims, Strategic Objectives or Effects.   The players rightly argued that since each of these individual groups would have their own distinct COE, the Effects Rationale construct should reflect this fact.   The players stated that the Effects Rationale construct reinforced the requirement for the team to plan *across* COEs (including the development of contributing and impeding causal links) because it underlines the need to consider all Actors' COEs in parallel. Finally, the Effects Rationale construct also provided a visual basis for wargaming during the later stages of the experiment, since the secondary effects of a particular Effect or Action being realised could be visually inspected and validated using the tool. This also led the requirement for this construct to underpin *Battlespace Management* (see separate lesson below).

Ways of Working

As described in the previous section, the HQ staff initially formed up into an Analysis team and a Plans team, yet completed the experiment working in cross-disciplinary **Actor-based cells** (Red, Blue and Green). The concept of a 'Red Commander' within military HQs is well established yet practised to differing degrees. This is a member of the planning team who role-plays the adversary and develops the 'Blue view of Red', initially independently of the remainder of the team so that Blue intent and plans to not situate his thinking. The experiment both underlined the requirement for a Red Commander and introduced the requirement for 'Green Commander.'   The players saw this second role as novel. Finally, the first lesson above highlights the requirement to develop one COE *per Actor*, even if there is more than one per colour (Blue, Red or Green). Where there are multiple Blue Actors, for example, this might suggest distinct groups of Blue staff, each generating a COE independently of other Blue groups. It is expected, however, that manning levels will preclude the mapping of distinct staff to each Actor if the number of Actors is not small.

Each of the Actor-based cells conducted *both* Network Assessment and Course of Effect Development/ Assessment for their own coloured Actors. The players reported that this approach served them better. A perceived disadvantage of this approach, however, is that Analysis and Planning cease to exist as distinct functions, and no single member of staff has awareness of the entire analysis or the entire plan. When the players reorganised themselves into Actor-based cells, it was noted that the NCC and COS were less aware of planning progress, and therefore less able to manage planning activity, than before. Hence this lesson is associated with *Support to the Commander*.

Application of rigour

Rigour should be applied from the start of the EBP process. The **Commander's Direction** (as the product of Mission Analysis) must shape subsequent staff work by setting bounds for **Effects and Actions Development**, whilst describing the criteria for **Effects and Actions Assessment** (e.g. ROE). **Network Assessment** could also be shaped through the early identification of Key Nodes to focus subsequent effort; exploration of the network would begin at these points. The responsibility for the application of rigour lies with all HQ staff, not simply the Commander and COS. The experiment demonstrated how easily planning activity could lose focus if assessment processes are relaxed in favour of the simple enumeration of Effects and Actions.

Support to the Commander

The current Joint Campaign Planning Cycle is command-led and it is recommended that EBP should be conducted under the same paradigm. However, management of complexity (highlighted as a lesson it its own right, later) is a big issue within EBP. In the experiment the Commander and COS had a difficult task in keeping the staff focused on the Commander's Direction since it was too easy for the staff to become embroiled in generating Effects/ Actions without assessing them. This was not aided by the Commander and COS's lack of awareness of staff progress. As stated above, this may have been due, in part, to the shift in Ways of Working to Actor-based cells (leaving no member of staff with an overview on all analysis or planning activity).

Further, the EBP tools used in the experiment supported the staff in generating staff products rather than **briefings to the Commander**. For example, briefings using EBP tool output in the experiment suffered through lack of focus on the important aspects of the analysis and planning. Although there are clearly lessons for tool development, support to the commander can only be effectively provided through the adherence to effective EBP staff procedures.

Dynamic Collaborative Interworking

As one of the NEC themes, **Dynamic Collaborative Interworking** will require "all entities (including non-frontline MOD bodies, OGDs[6], industry, academia and public service as well as military) to work together dynamically to meet changing mission needs and tempo, removing the boundary between collaborative planning and synchronised execution" [4]. The experiment helped to identify some requirements for Dynamic Collaborative Interworking between an Operational-level HQ and all other stakeholders in the operational Effects Based Plan. For example, Mission Analysis was hindered because CJO's Directive was the output of a non-Effects Based Planning Process at PJHQ and, although it contained some of the language of Effects, EBP artefacts (Strategic Aim, Strategic Objectives, Effects etc.) had to be

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[6] Other Government Departments

extracted by the HQ team. It should be noted that although the requirement to plan across the Instruments of Power (diplomatic, military and economic) was recognised by the team, it was not pursued in depth only because the staff were deeply involved in managing their own Effects (see *Management of Complexity*); it is expected that a longer experiment would have seen a greater degree of **collaborative EBP** between HQ staff and other organisations (e.g. NGOs[7]).

Management of complexity

Perhaps the strongest theme that emerged from the experiment was that of the complexity of producing an Effects Based Plan given the requirements for planning for Effects (rather than simply Actions); considering all MELTPPS dimensions and DME Instruments of Power; and constructing COEs with interactions between Actors. Most such lessons are closely associated with those under the themes *Application of Rigour* and *Support to the Commander*. Rigour in the process, supported by the tools, will help the staff to manage complexity through the application of assessment criteria to planning artefacts as they are developed; enhanced support to the Commander will him to remain aware of the complexity in the plan and subsequently manage it through the refocusing of planning effort.

The players stated, on more than one occasion, that it was feasible to link most Nodes to most other Nodes. This was because they were free to use links to represent semantic relationships as they saw fit, and frequently any pair of Nodes would have *some* form of relationship between them. In the extreme case, this would lead to a completely connected network of Nodes. When it is considered that the number of links in a completely connected network varies with the square of the number of Nodes, it is not difficult to conceive how the complexity of the network easily becomes unmanageable. The same observations were also made about cause-and-effect links within the Effects Rationale construct. To counter this, it is recommended that a **link assessment** process is developed to both maintain focus on key relationships whilst ensuring some level of consistency across different staff.

It is recognised that the management of complexity is a skill that must be applied, rather than a process that can be guaranteed to succeed through adherence to procedures. This is because the choice as to what is important and what is superfluous is highly subjective and context dependent. The management of complexity must also be countered by the risk of excluding a key piece of analysis, or key planning fragment, from the plan.

Battlespace management

The EBP concept emphasises the use of Measures of Effectiveness to maintain awareness of which Effects have been achieved and which have not. Further, the development of MOEs that can actually be measured, either directly or through the identification of key indicators, is a criterion of the Effects Assessment process. The rationale behind this is that immeasurable Effects will give rise to a more unpredictable Battlespace, leading to reduced Situational Awareness. Hence well-defined MOEs may provide a framework for maintaining Battlespace awareness and therefore will support Battlespace Management. Since the Network Analysis construct is essentially a representation of the Battlespace as a system of Nodes, it may also be used as a construct within which Battlespace changes may be recorded and monitored. Certainly this construct would not replace traditional GIS systems,

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[7] Non-Governmental Organisations

but it has the benefit over such systems of being able to represent non-spatial aspects of the Battlespace, such as organisational relationships and allegiances.

Summary

A number of key lessons were learnt from the UK Effects Based Planning Experiment that helped to assess the candidate EBP process and tools. It should be noted, initially, that the experiment served to validate most of the underlying EBP concepts (with modifications recommended to a few, e.g. the definition of an Effect).

The *novel* staff requirements of Effects Based Planning may be summarised as follows:

– Analysis of the Battlespace across MELTPPS;

– Planning for Effects rather than simply for Actions;

– Planning across all Instruments of Power;

– The provision of more equal consideration to all Actors;

Perhaps the most important lesson for the EBP process was that, given these requirements, the process can potentially involve a great deal of extra staff work that needs to be managed effectively, both by the Commander and the staff themselves. The level of **complexity** within an Effects Based Plan can quickly become unmanageable and it is only through the application of rigour by the staff and the maintenance of the Commander's and COS's awareness of planning progress, coupled with their continual refocusing of staff effort, that a good Effects Based Plan can be produced. During the experiment the Commander and COS refocused effort at least three times, yet following each associated breakpoint the staff became too involved in the creation of Effects/ Nodes and links, rather than their assessment and management. Given the broad requirements of EBP, coupled with the scope in the EBP concepts to represent a wide variety of planning artefacts and relationships between them, it was perhaps tempting for the staff to attempt to model both the entire Battlespace (Network Analysis) and to counter the almost infinite set of secondary Effects that might occur given the achievement of any single effect in that Battlespace (Effects Rationale). As alluded to in **Lessons identified from the experiment**, the effective management of complexity is a skill that must be learnt, rather than a procedure that can automatically be applied. It is believed that the experiment provided an insight into the challenge of coping with complexity faced by operational HQs in conducting Effects Based Planning.

The other major lesson from the experiment concerned effective **Ways of Working** for an HQ team conducting Effects Based Planning. The initial staff breakdown into an Analysis team and a Plans team was perceived to be failing due to the lack of shared awareness across the teams. This was characterised by the situation in which the Plans team were associating Effects against nodes within the EBP tools without any knowledge of the relationships that Nodes shared with other Battlespace Nodes. It is not difficult to imagine that this would have led to unpredicted and undesired secondary Effects. The reorganisation of staff in Actor-based cells improved the efficiency of the staff work at the expense of the Commander and COS's awareness of planning progress – as well as the awareness of each Actor-based cell of the COE and progress of the other cells. This gave rise to problems with wargaming later on, since each Actor-based cell was too involved in developing its own COE. It is recognised, however, that had the experiment been slightly longer, there would have been time for

a distinct wargaming phase. It is believed that there actually exists a requirement for **continuous wargaming** (to refine each COE and manage complexity across COEs); a question that remains, therefore, is whether Actor-based cells are the most effective staff structure to support this approach.

Certainly the EBP concepts, process and tools will require many development iterations before they can be considered to be mature. The first UK Effects Based Planning Experiment was successful in its aims of assessing the candidate EBP process and identifying requirements for capability (i.e. software tools) to support that process. At a time when the UK military is developing its Effects Based Approach at the operational level of command, it is believed that the lessons identified from the experiment can be used to directly inform best practice at the UK Joint Force Headquarters.

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