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The Conflict Analysis Tool:
a framework for the study of Operations Other Than War

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Abstract

Since the ending of the Cold War, the focus of military planners has moved away from all-out conflict towards smaller-scale engagements and other roles such as peacekeeping and diplomacy. This range of tasks comes under the term Operations Other Than War (OOTW). This paper describes a framework that has been developed to support the analysis of OOTW situations – the Conflict Analysis Tool.

The framework operates by breaking down OOTW scenarios into two elements: a relatively slowly evolving background of circumstances; and a sequence of significant episodic events that occur against this background. The functionality incorporates:

- The decision making process, whereby each party makes choices and initiates the episodic events according to their perception of the scenario status and the options available to them;
- The impact of decisions, where the outcomes are assigned according to the actual scenario status. These outcomes may be derived from feeder models or through military judgement;
- The flexibility of the framework permits the representation of the complex features of OOTW scenarios;
- The framework also includes an event tree representation of the developing scenario.

The primary role of the framework is to allow the investigation of the cumulative impact of different parameters throughout a scenario. These features could include the capabilities of platforms or equipment, or may be parameters such as the overall objectives or the Rules of Engagement that are in place.

Other potential uses for the framework are being examined. They include:

- Use as a high-level organisational tool;
- Development of tactics;
- A training aid.

The generic nature of the tool also means that it has the potential to be applied to the analysis of many situations outside the field of OOTW – military and non-military.

The framework has been successfully piloted in a peacekeeping scenario, and is currently undergoing further refinement with the impending prospect of use in OA studies.

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Background

Since the ending of the Cold War, the focus of military thinking has moved away from facing the prospect of all-out conflict towards dealing with a class of operations that comes under the term Operations Other Than War or OOTW. Covering a range of smaller-scale engagements and other roles such as peacekeeping and diplomacy, they are difficult to characterise except for the fact that, as the name OOTW indicates, they do not involve sustained military combat. Examples in which UK forces have been involved since the mid-1990s include patrolling the no-fly zones over Iraq, peace support operations in the Balkans, evacuating civilians from West Africa and providing humanitarian support in the Caribbean.

The investigation of OOTW provides a whole host of new challenges for the military analyst. Traditionally, the analysis of many of the issues faced in a major conflict is carried out by using one-on-one combat simulations with a fixed set of initial variables. However, this approach is insufficient here, as OOTW typically take place within the context of evolving military, political and social backgrounds involving a number of parties – with the disintegration of Yugoslavia providing a number of obvious illustrations. In particular, it has proved difficult to evaluate the benefits that new equipment would bring within OOTW scenarios, especially in terms of measuring the effectiveness of achieving overall objectives.

Traditional methods work well in modelling the effectiveness of equipment in single engagements within the overall setting. For example, it may be possible to model how well different air defence systems perform against an air attack. The problem then is assessing the impact of this engagement (or vignette) on the overall situation – why does this particular vignette matter and how does it affect our overall objectives?

A requirement therefore exists to integrate the more detailed engagement modelling into the wider context of the developing situation. This paper sets out the approach taken with the development of the Conflict Analysis Tool (CAT), an application that integrates a sequence of episodic vignettes within the evolving background of a scenario.

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Model Concept

The CAT provides a framework for the integration of a sequence of events into the development of an overall OOTW scenario. It encapsulates the following characteristics of Operations Other Than War:

a) Their **episodic nature**. A sequence of discrete events occur, where each action may have a profound effect on the circumstances in which later events take place;

b) An **evolving background**. There is a context within which the vignettes take place. This may itself change over time, but need not be explicitly modelled;

c) **Escalation**. Each involved party can exercise a degree of control over how events develop, for example what action is chosen at a decision point;

d) **Outcomes**. Each vignette may have a range of outcomes, depending on the action taken and the scenario status;

e) **Complexity**. Unlike traditional military analysis, there are few restraints on the number of participants or the variety of different ways in which the scenario can evolve.

The conceptual approach for the model draws on the insights of soft OR techniques, such as game theory[1]. A background of evolving circumstances runs throughout the scenario (Figure 1), which defines matters such as the objectives of the parties, their current strategy and force levels. The tool itself is based around an event tree that branches out at each vignette, according to the options available to the parties and the possible outcomes.
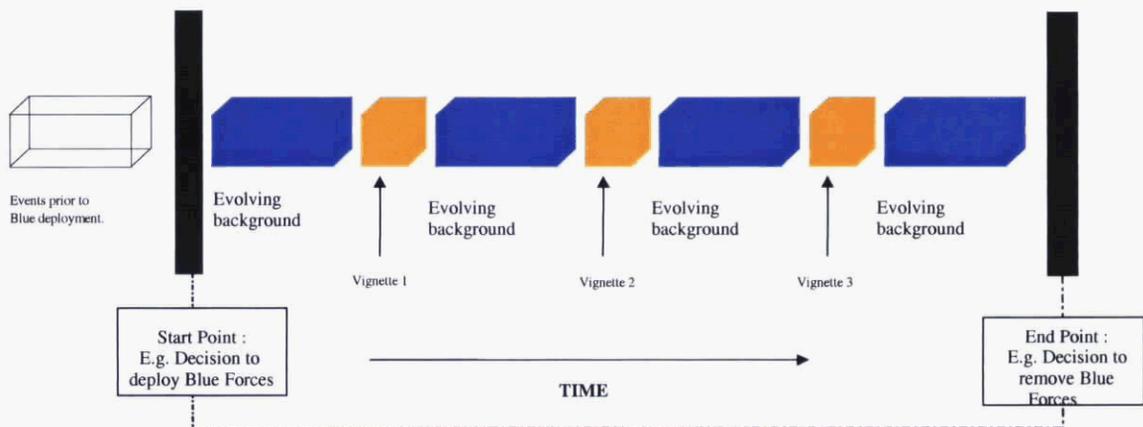

Figure 1: OOTW Model Concept

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[1] See *'Confrontation Analysis: How to Win Operations Other Than War'* by Nigel Howard, published by the C4ISR Cooperative Research Program, 1999, for further details on applying Game Theory and Drama Theory to the analysis of OOTW

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Model Details

The Conflict Analysis Tool is centred on an event tree as shown in Figure 2. This enables the analyst to quickly navigate around the different options for the development of the scenario. The development of events moving down branches of the event tree comprises successive triplets of:

a) Development of the evolving background;

b) Branching of the tree to represent the selection of the different vignette options;

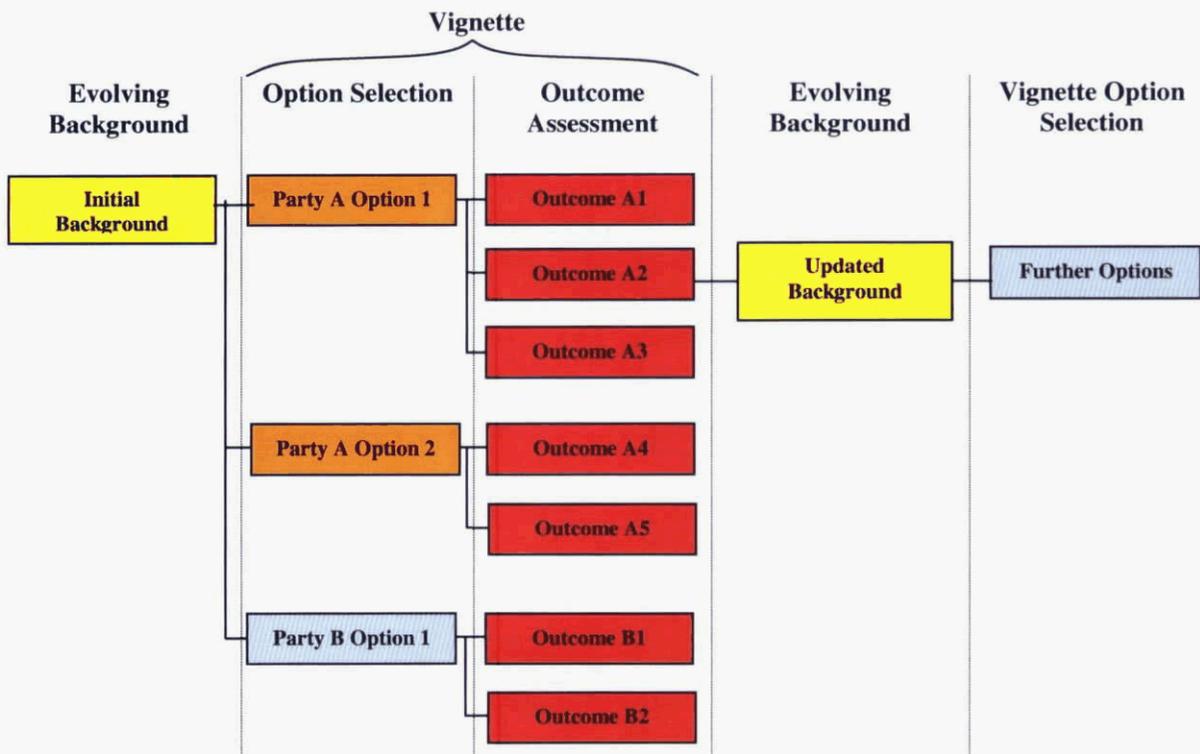c) Branching of each vignette to present their possible outcomes.

Figure 2: Generic Event Tree Representation

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Participants

It has traditionally been the case that conflict scenarios have incorporated two opponents. However, in the case of OOTW the situation may be more complex. As well as belligerents (of which there may be more than two), the scenario may involve peacekeeping forces, neutral countries and non-governmental organisations, to name but a few. The CAT allows for the inclusion of as many parties as is required by the user, although it only permits one party to decide upon and carry out an action at any one time (although there is no reason why any responses cannot be immediate).

Measurement criteria

As the scenario progresses, a number of criteria are maintained that indicate how well each party is proceeding with regard to their final objectives. These *measures of effectiveness* can take a variety of forms, such as the assets available and collateral damage, and are defined by the model user.

A crucial factor that may change over time are the *Rules of Engagement* (RoEs) under which a party operates. These are a set of regulations that limit what actions a military force can undertake. They can have a significant influence over which options are available – for example, the firing of weapons may only be allowed in self-defence. Within the CAT, the extant RoEs are specific to each participant, and the model user may define their format or alternatively draw upon standard RoEs, such as those used by UK or NATO forces.

A key feature of the model is a parameter known as the *operational status*. It is defined as a measure of how well a particular party is proceeding with regard to its overall objectives (which may change over time). It is effectively an overall measure of effectiveness, and within the model the user defines the range of values that it may take.

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Vignettes

As shown in Figure 2, each vignette can be broken down into the following sequence:

a)   Vignette option evaluation and selection.

As the timeline of the scenario progresses, each of the parties will come across points at which they have the option to initiate actions. The actions possible will be constrained by a number of parameters such as the assets available and any rules of engagement under which the party is operating.

Each party assesses the possible outcomes of the available courses of action before any is initiated. A crucial aspect to note is that the parties will use their *perception* of the current circumstances and the likely outcomes from any action, which may or may not relate to the actual state of affairs. A feature of the CAT is that as a scenario is developed, the perception of events by each party as well as the underlying reality of the situation can be documented.

A key part of the evaluation stage is the determination by the party of a *preference level* for each of the vignette options available. This is typically represented as a numerical score based on the party's perception of how circumstances will change as a result of their action, taking into account the perceived probability of each result occurring. The scale of preference levels is not fixed and is left to the judgement of the individual model user. The rationale for any choice made can also be recorded within the model at this point.

A feature under development is to redefine preference levels and relate them to the probability that a particular option is chosen. It is anticipated that this will be based on the ability of the party to correctly choose the option that results in the highest operational status, which in turn will be related to the level of sophistication that the party has with regards to its picture compilation and decision-making process.

b)   Outcome determination

For each option that is selected, a number of outcomes may be possible. These outcomes relate to what will actually happen, which may be significantly different from the expectations of the party initiating the action. The outcomes may be determined by one of two methods:

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i. Feeder models: Results may be fed in from the running of external models and simulations, either as quantitative or qualitative data;

ii. Military Judgement: Expert judgement may be used to assess both the probability of outcomes occurring and the consequences of each possible outcome.

The justification of the outcome, whether it is derived from feeder models or military judgement can be recorded within the model.

c) *Updating of the evolving background*

Following each outcome, it may be necessary to update the evolving background. In addition to changing the cumulative measures of effectiveness, this could involve changes to the rules of engagement and the mission objectives.

Audit Trail

There is a facility within the CAT for providing an audit trail through the sequential development of the episodic vignettes within the evolving background. This audit trail includes the rationale for parties initiating particular vignettes and reference to the assessment and/or calculations underpinning the outcomes of vignettes.

Reports

CAT generates reports in MS Word 97. Within the current version of the model, the reports display the following parameters:

a) the stage of the scenario;

b) event details;

c) type of event (whether the node is an evolving background, an option selection point or an outcome);

d) preference value (for an option selection);

e) probability value (for an event outcome);

f) operational status value.

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Evaluation

The model was initially piloted in a sanctions and embargo scenario, where a number of issues regarding the ease with which the model could be tailored to different scenarios were identified. More recently the framework has been evaluated in the context of a multi-sided confrontation setting and an evacuation scenario.

Software

The model is implemented in MS Visual Basic 6 interfacing with an MS Jet database, running under MS Windows NT4 or higher.

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Model Utility

The CAT has the potential to support several areas of OOTW analysis including peacekeeping, humanitarian aid, forward presence and sanctions and embargo operations. Within the analysis of these scenarios, its role could include:

a) Scenario structuring

A methodology could be provided within which an initial assessment of the possible development and outcomes of a scenario could be undertaken. This could then be used to focus more detailed analysis onto key issues that the overall outcome is dependent upon.

b) Accumulation of vignette outcomes

In the context of scenario structuring, the tool provides a framework for investigating the cumulative effects of a series of vignettes within a scenario. This is of particular value when the aim is to evaluate the overall effectiveness of equipment, the benefit of which is only directly apparent at vignette level.

c) Aid to Planning and Tactics Development

The tool could be used to support the elaboration, investigation and assessment of possible strategies and tactics, in terms of the effects of employing different mission options available to the parties involved in a scenario.

d) Assessment of RoEs

The CAT could be used to enable an assessment of the effect of different RoEs, particularly in terms of decisions involving casualty risk.

e) Training Aid

The ability of the tool to record and revisit the sequence of decisions and events occurring during a scenario may be of benefit as a training aid for those who will be required to plan similar operations.

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Conclusions

The modelling framework described in this paper provides a powerful and flexible method for the integration of discrete events into the development of an overall OOTW scenario. In addition, it offers an auditable process whereby the impact of different decisions can be seen within the context of an ongoing situation.

Nevertheless, it should be stated that there is no single solution to the problem of finding easy analysis of the varied and complex domain of Operations Other Than War. However, it is hoped that the approach taken in developing the Conflict Analysis Tool can help the military analyst in bringing together the details and the strategy of conflict.

Acknowledgements

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