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Adapting C2 to the 21st Century

Using THE HTA TOOL for Agile Mission Planning

Track: Organizational Issues (C2 Metrics and Assessment, C2 Concepts, Theory and Policy)

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Using THE HTA TOOL for Mission Planning

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The software application known as THE HTA TOOL was developed, non-commercially, under the auspices of the Human Factors Integration - Defence Technology Centre (HFI-DTC). This is an MOD initiative. The original driver was a growing demand for the computerisation of Hierarchical Task Analysis (HTA), a well recognised, if 40 year old, methodology. HTA is used predominantly in the training domain, but more recently has been used for air mission planning (for Euro-Fighter). The nature of most missions is changing (e.g. from attrition to effects-based) and while new technology can facilitate changes after the start of an operation, there is a shortage of planning tools to enable agility in the planning process. This paper will argue that THE HTA TOOL can be utilised for mission analysis and rapid modification, and that it has potential as an agile planning tool for ground combat. The paper will discuss the benefits of using a computerised application, look at examples of mission planning and how these can benefit from the numerous features of the tool (which can be freely distributed under the aegis of NATO, the TTCP, and other programs).

Using THE HTA TOOL for Agile Mission Planning

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The nature of Command and Control (C2) is constantly changing. The world order has evolved significantly over the last decade and the military are required to be increasingly agile and adaptable (DSTL, 2003). This is a fundamental concept of Network Enabled Capability (NEC). In the 21st century our lives revolve around technology and computers. Computerised systems have endless power to offer if properly combined with human knowledge and expertise. Software can then help people do their jobs, quicker and more efficiently.

THE HTA TOOL was first developed in response to a growing need for the computerisation of Hierarchical Task Analysis (HTA). It was developed non-commercially under the auspices of the Human Factors Integration-Defence Technology Centre (HFI-DTC), an MOD initiative, and is widely (and freely) available through a number of channels.

The original aim of the research was to produce a prototype tool which could support the range of HTA applications, and notably to create a tool to assist a user in analysing and decomposing a task for training purposes. HTA has been applied in a number of domains, including the process control, and power generation industries (Annett 2004), emergency services (Baber et al, 2004), civil aviation (Marshall et al, 2003), driving (Walker 2002) public technology (Stanton and Stevenage 1998), retail (Shepherd 2001), as well as military applications (Kirwan and Ainsworth, 1992; Ainsworth and Marshall, 1998/2000).

THE HTA TOOL was engineered following the Rapid Application Development model at Cranfield University (at the Defence Academy campus), distributed to the MOD for critique in 2005, before being made available for public release, both in the UK, and Internationally. It has been used by a number of multi-national corporations, for many applications beyond its original intentions, and with great success. One major defence contractor, BAE Systems, is currently using it for air mission planning for the Euro-Fighter. This paper will seek to show that it can also be used as a rapid mission planning tool for ground combat.

With any type of mission planner there is a need for flexibility (Sakamoto 2006). A mission planner in the Command and Control system should account for the uncertainty inherent in the operational execution of the missions. At this point an application like THE HTA TOOL becomes very powerful. It has an easy to use, intuitive interface, and changes can be made on-the-fly and, with the right network, disseminated around the chain of command in seconds.

The tool also facilitates a degree of uncertainty in the initial design phase by the construction of task plans. A plan can be described for any “parent” task in a hierarchy and expresses the order, timing and pre-conditions of “child” operations. There are built-in functions to produce plans automatically, or to highlight where a plan has not been included. Additionally, the plans system allows a considerable amount of customisation, including a simple-to-follow plan builder using common

order styles, such as linear and parallel, and provision for an analyst to provide a textual description for particularly complex situations.

Figure 1 shows a screenshot of THE HTA TOOL in use as a mission planner for a Quick Attack. This example shows the differing degrees of complexity of plan and at different levels of the decomposition. It also highlights the fact that some parts of an analysis are potentially re-usable and, using the tool, can be integrated directly into another analysis or mission plan.

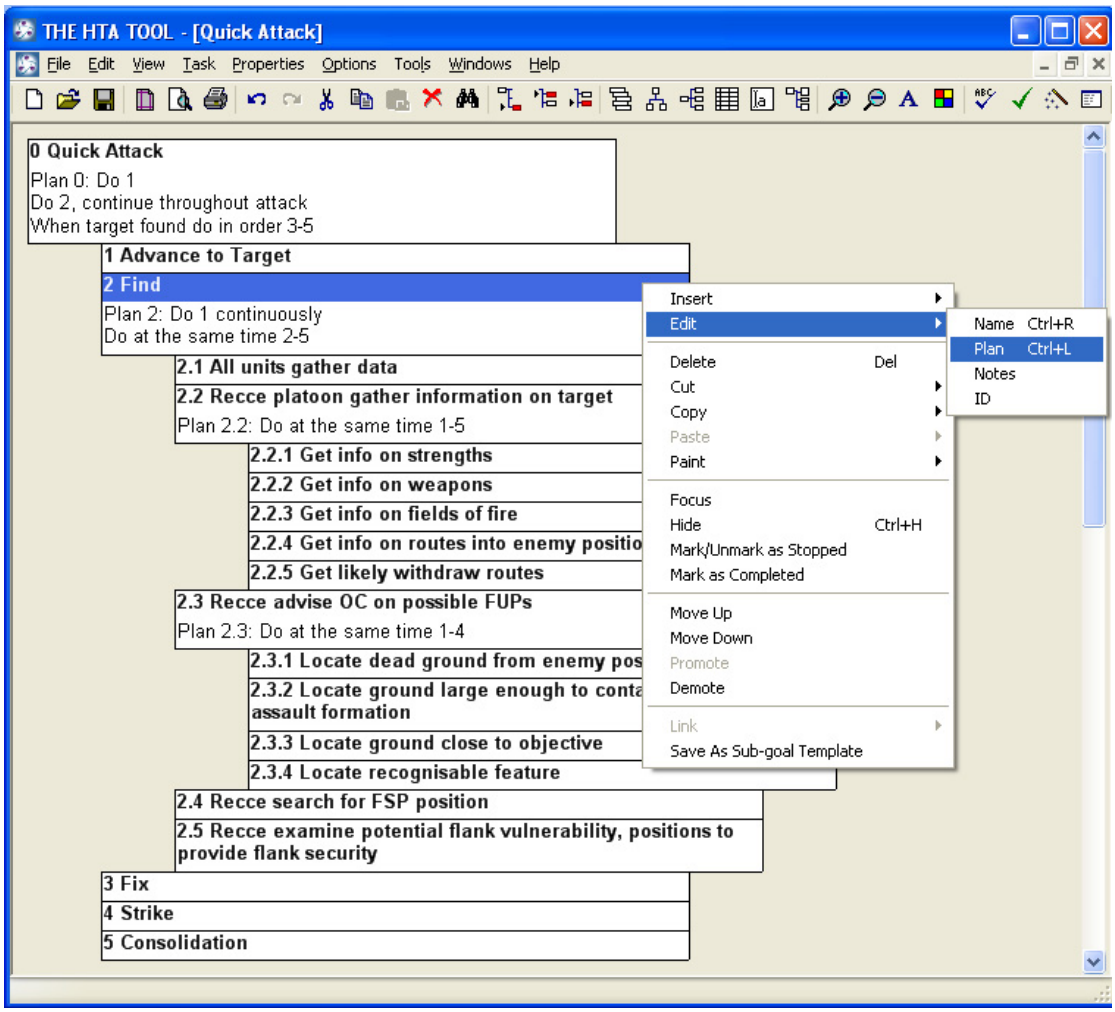

Figure 1 – Screenshot of THE HTA TOOL

There is a demonstrable need for a more agile and fluid command style of leadership in mission planning (Lutz 2005) from the traditionally constrained approach to C2. This does not just mean agility in the sense of having a group of troops who can assume a number of roles, for example, but an ability to move and adapt, quickly, to a changing situation.

The nature of missions is changing (e.g. from attrition to effects-based), and while new technology can enable changes after the start of an operation, there is a shortage of planning tools to assist such agility. THE HTA TOOL can support the changing mission challenges from a maintenance perspective (past missions can be easily modified) and in facilitating a decentralised command approach (Stewart 2006; Stevens 1998). Mission planners currently utilise whiteboards and documented results in spreadsheets and presentations to support decision making with limited automated tool support. It is argued that analysis capabilities must be developed for mission planners to leverage emerging mission planning concepts (Gilmour et al 2006), and to manage complex interdependencies (Allen 2006). THE HTA TOOL has the potential to help put this requirement into practice.

The tool boasts a number of advantages over traditional non-computerised methods. Initial analysis creation is simplified by the use of an Analysis Wizard which prompts the user for increasing levels of decomposition, one step at a time, as well as allowing quick selection of plans and an ability to load previously created sub-goal templates.

Any changes to the analysis result in an automatic update to the numbering system (in particular, and where appropriate, to the plans). The tool is designed to recognised graphical user interface (GUI) standards and has a familiar Microsoft Windows look and feel, including shortcut keys and menus, and toolbar buttons. This enables a user to learn the tool's basic functions in a few hours. The analysis tree is easily modifiable, with the ability to insert, cut, copy and paste tasks at any level (with undo and redo options).

There are also a number of visual representations of the decomposition, including indented list (as figure 1), vertical and horizontal hierarchies, and tabular list. Using the latter an analysis can be extended using custom or recommended techniques including DIF (Difficulty, Importance, Frequency) analysis. It is also possible to attach other information to tasks such as images, particularly useful for identification or clarification. When an agreed stopping point has been reached the analysis can be printed, with appropriate classification, or exported to a number of formats including XML (Extensible Markup Language), Vector Graphics metafile or Microsoft Excel.

This paper will discus some further advantages of using a computerised planning application, and consider examples of ground combat mission planning and how features of such a tool can be used.