



System Performance Requirements Established from a Taxonomy for Command and Control

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Authors

Daniel Jenkins	Brunel university
Neville Stanton	Brunel University
Guy Walker	Brunel University
Paul Salmon	Brunel University
Mark Young	Brunel University

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1 Executive Summary

This document details the requirements elicited from the taxonomy of command and control developed by Stanton et al (in press). These requirements are focused on a goal based analysis of the steps a commander would need to take in carrying out a mission.

The purpose of these requirements is to aid the development of the reconfigurable Human Factors test bed currently under investigation at Brunel University. Key system requirements elicited from the report include:

- Mission Window
- Time planning window
- Time based function
- DSOM
- Resources window
- Walk through
- DSOM link to orders window
- Intelligence history window when new overlays arrive (sat image) maybe added in tree structure
- Risk assessment tool

These requirements will be used to develop the Silver Command Specification.

2 Requirements Established from a Generic Taxonomy of Command and Control

The taxonomy of generic command and control by Stanton et al (in press) was used to establish some of the requirements for the software.

The diagram has been annotated to show where the tool requirements were found. Also annotated on the document are notes showing where the generic model corresponds to the seven questions in the combat estimate. Analysing the taxonomy identified that additional tools were required

- Mission Window
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Table 2-1 - Explanation of abbreviations

MW	Mission Window
SO	Situation Overlay
HL	History Log
RW	Resources window
TBW	Time based window
WT	Walk through

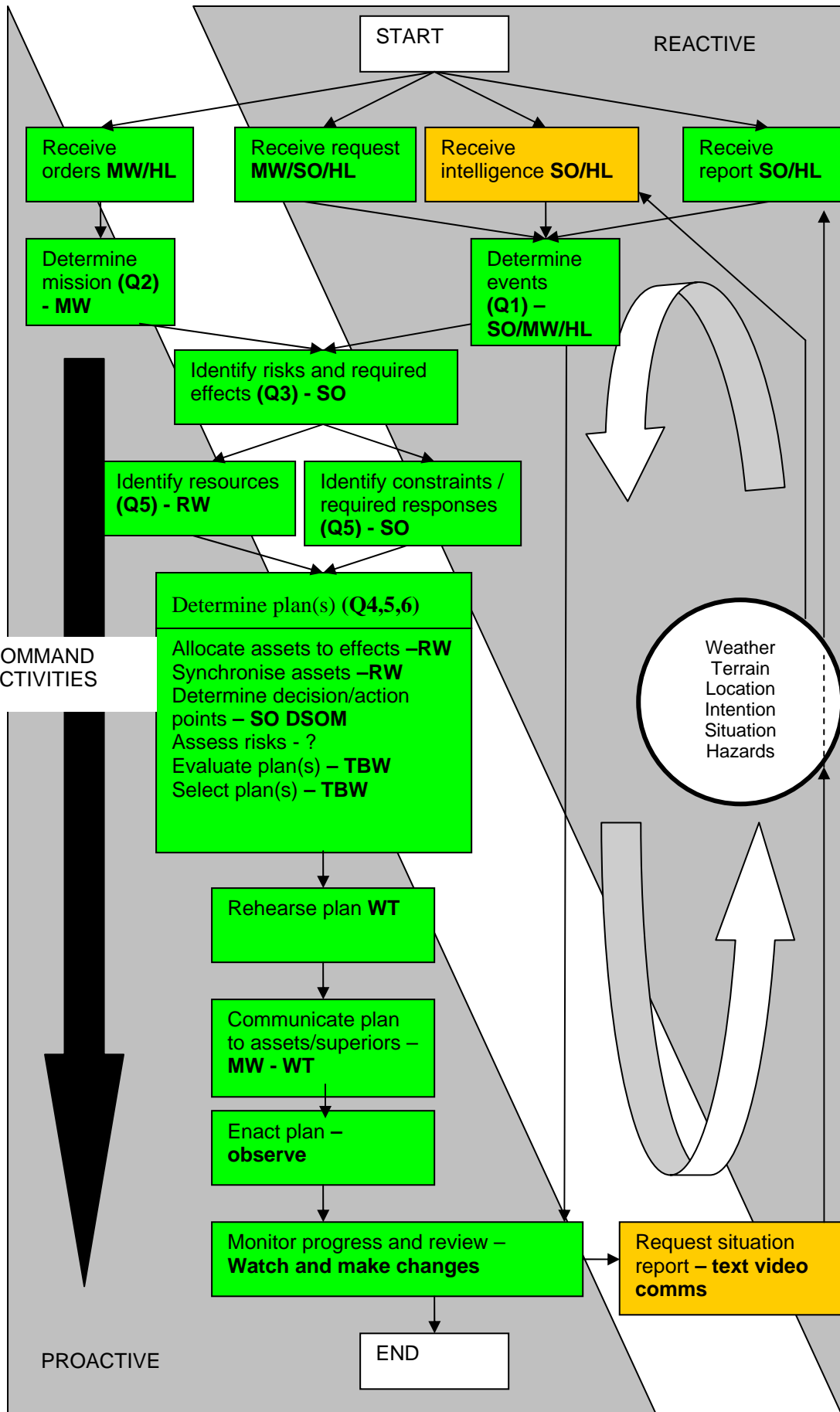


Table 2-2 gives further details of why the tools were required. More comprehensive descriptions of the tools can be found in section 2.1.

Table 2-2 - Details of tool requirements

Item	Description	Tool
Receive orders	Orders can be sent directly from superiors to the commander. The orders should be displayed in a dedicated mission window that allows the user to see the orders and details about them. All key events such as incoming orders would also be recorded as a line item in a History log.	Mission Window. History Log
Receive request	Requests can either be sent directly to the mission window or sent as a situation overlay which the user can then choose to add to the mission window. The fundamental difference between orders and requests is that they are compulsory and optional respectively.	Mission Window Situation Overlay History Log
Receive intelligence	Intelligence will be received as either text or via a graphical enhancement to the representation of the domain. Some kind of warning needs to be given to alert the user to the new information as well as time stamping its arrival for later retrieval.	Situation Overlay History Log
Receive report	Reports will be received as either text or via a graphical enhancement to the representation of the domain. Some kind of warning needs to be given to alert the user to the new information as well as time stamping its arrival for later retrieval.	Situation Overlay History Log
Determine mission	The act of determining the mission will be based on orders received in the mission window. This window should have the functionality to decompose the order into smaller sub-purposes	Mission Window
Determine Events	The act of determining events will be based on the determined missions in the mission window. This window should have the functionality to decompose the sub-purposes into a list of Goals and tasks. The events will be planned out in a new situation overlay.	Situation Overlay Mission Window History Log

Identify risks and required effects	Based on the information shown in the representation of the domain risks and effects can be marked up on a new situation overlay	Situation Overlay
Identify resources	The resources available in terms of units will be displayed in the representation of the domain. They should also be tracked in a tabular form showing additional information	Resources window
Identify constraints / required responses	This should be shown in the representation of the domain showing no go areas and no fire regions.	Situation Overlay
Determine plan(s)		
Allocate assets to effects	This should be done in the representation of the domain and tracked in the resources window	Resources window
Synchronise assets	Assets can be synchronised within the resources window	Resources window
Determine decision/action points	Within the situation overlay decision and action points can be mapped to their geographical position. The can then be added directly to the DSOM	Situation Overlay DSOM
Assess risks		
Evaluate plan(s)	Plans will be explored at different future times by modifying the existing representation of the domain so that it represents future states. This should be controlled temporally and by a number of alternative courses of actions.	Time based window
Select plan(s)	By evaluation of the plans a final most effective plan that is within the constraints of the system should be selected	Time based window
Rehearse plan	The plan can be rehearsed by scrolling through the selected course of action temporally. The use of a first person walk through would also aid this process.	Walk through

Communicate plan to assets/superiors	This communication can be demonstrated in the same way as the rehearsal	Mission Window Walk through
Enact plan	Whilst the plan is enacted the commander observes and initiates the required changes	Observe
Monitor progress and review	Whilst the plan is enacted the commander observes and initiates the required changes	Watch and make changes
Request situation report	Situation reports will be generated automatically by units feeding back their geographical position. This can also be supplemented with additional text, video and audio data.	text video communications

2.1 Explanation of required functionality

2.1.1 Mission Window

The mission window should be a small repositionable window. The content of this window should be dynamic and editable. The highest level of this should be orders from above along with details to this. It should then also be possible to decompose this high level order into smaller subtasks that could be listed in the level below.

One possible way of representing this would be very similar to a HTA or the tree structure already used within Google Earth. The mission window should be capable of allowing the commander to send and receive both completed as well as partial orders. This has the potential to dramatically speed up the process by allowing subordinates access to orders earlier.

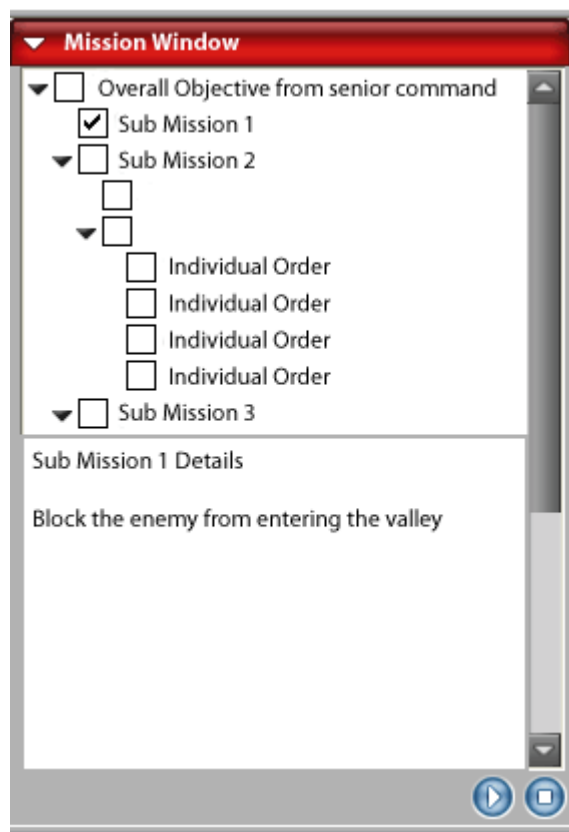


Figure 2-1 - Example layout for mission window

2.1.2 Time planning window

The time planning window should be linked in with the mission window. The purpose of the window is to represent key points in time that decisions need to be made by. Here tasks can be planned out and alarms set that prompt the commander as to when they should have completed a certain section of the planning process.

Novices can be guided through the system step by step, 'signing off' tasks as they are completed. This method would alert the novice commander to any tasks not addressed. This functionality could be realised in a small text window stepping the user through what needs to be done next. The list should have the option to select 'done' or select 'skip'. A summary window could show skipped things in red so that the user can go back over it.

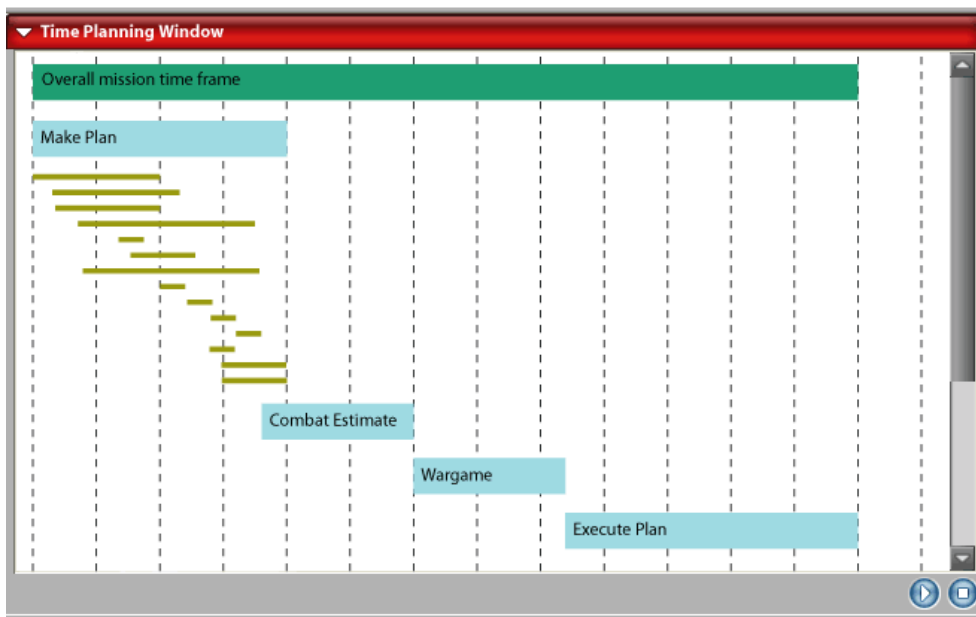


Figure 2-2 - Example layout for time planning window

2.1.3 Time based function (Exploring Courses of Action)

The purpose of the time based functionality is to allow the commander to step forward or backwards in time and reposition the units to there anticipated positions. Because the system is digital, there is also the possibility of constraining the commander from moving a unit further than it could physically travel in that time space.

This functionality could be incorporated in a tool bar with controls similar to that of windows media player allowing the commander to step forward or backwards or to play in some kind of animation. It is very important that the commander is not allowed to confuse future positions with current positions.



Figure 2-3 - Example of media player controls

It should be possible to explore a number of different Courses of Action (COA).

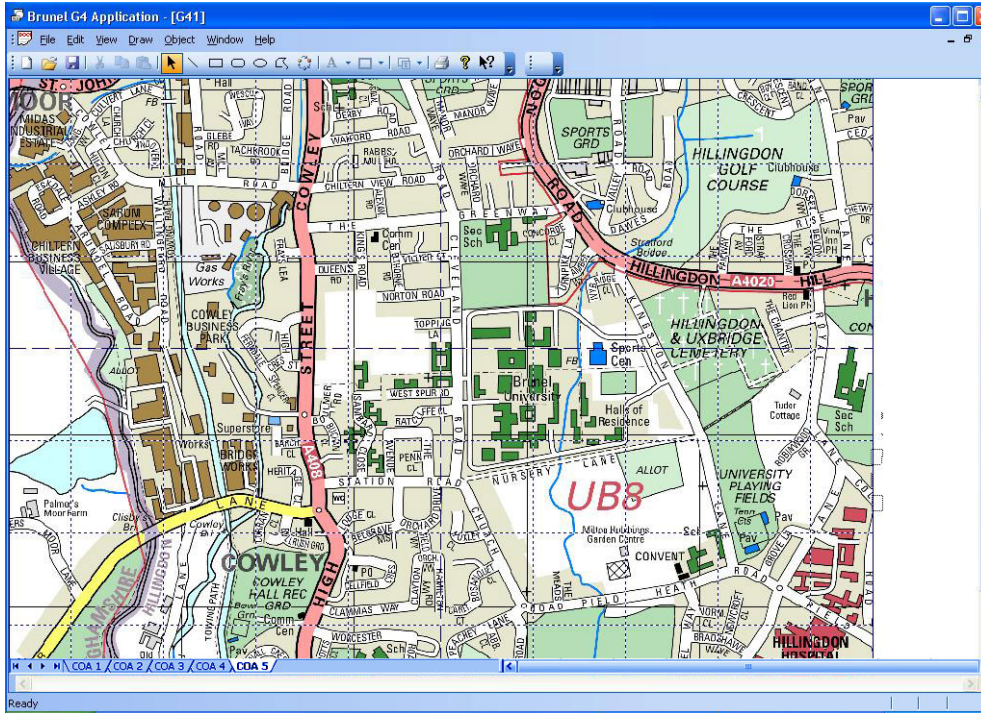


Figure 2-4 - Example of toggle bar to jump between COA's

By adding in an MS Excel style tab system it would be possible to quickly jump between many COA.

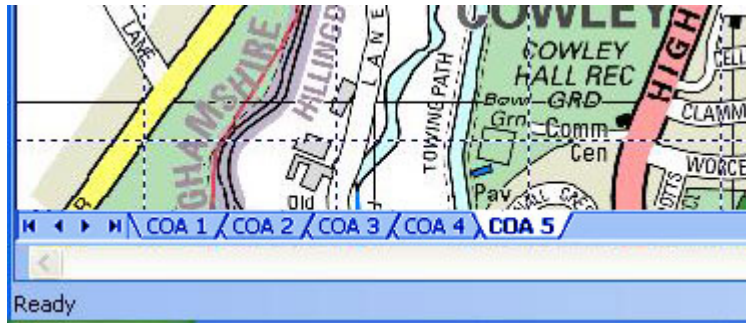


Figure 2-5 - Example of toggle bar to jump between COA's

2.1.4 DSOM

The Decisions Support Overlay Matrix should be included in digital form. The DSOM should also contain automatic links to the orders window.

2.1.7 History log

The purpose of the history log is to add a time stamp and a description as items are added to the environment. This would become a valuable asset in after action review as well as being beneficial for the commander to use while enacting the plan.

2.1.8 Risk assessment tool

The risk assessment tool would be a facility to record decisions made about risk assessment.

3 Conclusions

This report has documented the process to add additional requirements to the system specification. The foundation of how these requirements were elicited has been explained as well as a detailed description of the requirements of the following tools to be generated.

- Mission Window
- Time planning window
- Time based function
- DSOM
- Resources window
- Walk through
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- Risk assessment tool

The tools identified will form an important part of the Silver Command Specification.

4 References

N. A. Stanton, C. Baber, G. H. Walker, R. J. Houghton, R. McMaster, R. Stewart, D. Harris, D. Jenkins, M. S. Young and D. Green (In Press). Development of a Generic Activities Model of Command and Control

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