Value-Based Force Structure Design

John O'Neill

DSTO Fern Hill
Department of Defence
Canberra, ACT, 2600
AUSTRALIA
Email:
John.ONeill@dsto.defence.gov.au

Fergus O'Brien

Software Engineering Research Centre
Level 5, 255 Bourke Street
Melbourne, Victoria, 3000
AUSTRALIA
Email: fob@serc.rmit.edu.au

Ed Kruzins

DSTO Fernhill
Department of Defence
Canberra, ACT, 2600
AUSTRALIA
Email:
Ed.Kruzins@dsto.defence.gov.au

Abstract

A value chain analysis approach is used to explore the NCW implications for a 2015 force structure design for Australia. Key insights are that we are currently conceiving NCW solutions for different strategic military tasks at different boundaries of analysis; and that while a packages of platforms approach (Alberts, 1995) is appealing for interoperability with the US, an information-centric approach that addresses dependency issues may address the broader force structure design issues.

1. Introduction

Australia faces a major block obsolescence issue in the next decade. Thinking about a 2015 force structure reveals a major opportunity to move from a platform-centric approach to a network-centric approach to conducting warfare.

There are three fundamental issues to be resolved about moving to a network-centric force structure design. First, Australia's defence strategy is shifting from defending Australia (Defence White Paper, 2000) to defending Australia's national interests, recognising that these interests may involve off-shore operations either in the region or in the wider environment (Australian Strategic Review, 2003), and that these interests may be threatened by both state and non-state actors.

Second, that the concept of network-centric warfare (NCW) is an evolving construct and that what we are seeing in the Iraq war of 2003 with the focus on agility for the Decide-Act part of the OODA loop and mobile targeting is very different to the Gulf War in 1991 where the focus was on the Observe-Orient part of the OODA loop with static target lists and air tasking orders.

US NCW	**Australian NCW**
Global sensor space, generally focused engagement space (300*300km grid)	Broad mainland sensor space, potentially large engagement space (up to 10% of Earth's surface)
Many types of assets, many assets in grid	Small number of multi-roled assets
Global, secure comms	Patchy comms
High-emitting force	Low-emitting force
Power of network = N*N, must plug-in to participate in ops	Plugging-in is optional and enables mass/info tradeoff

Table 1. US NCW versus Australian NCW

Third, that the force structure design attributes for NCW for Defending Australia and Contributing to the Security of our Region

may be quite different to the US. Some of these dilemmas are shown in Table 1. What are the tradeoffs in acquiring capabilities designed to operate in a US NCW context for Australia, and are there other dependency issues Australian should be thinking about?

The 2000 White Paper has defined Australia's military strategic tasks as Defence of Australia, Support for Wider Interests (UN and US Coalitions), Contributing to the Security of our Immediate Neighbourhood (Regional Coalitions) and Peacetime National Tasks. The 2003 Australian Strategic Review added the emerging transnational threat and elevated the priority of offshore operations equal to Defence of Australia.

The aim is to design an adaptable and flexible force structure for Australia for 2015, employing network-centric approaches that are capable of being employed across Australia's military strategic tasks.

This paper aims to identify some of the NCW implications for 2015 force structure design for Australia's strategic military tasks. Section 2 employs a value chain analysis approach to explore some of the NCW implications. Section 3 situates these implications in terms of Australia's strategic military tasks and shows why the force structure design issue is complicated. Section 4 presents some preliminary design themes.

2. A Value Chain Analysis

Value chains define the set of dependencies required to achieve an end-state or effect. A value chain can be considered as a thread through different networks at a contextual level. A thread may span platforms, agencies and nations to show how an effect or end-state is achieved.

Value chain analysis is used extensively by the business community to improve the effectiveness of business models (Porter, 1985). A value chain analysis approach will be employed to investigate the implications of NCW for force structure design on a number of issues. These issues include peacetime versus wartime mobile targets and then rethinking the strike value chain. The functional dependency requirements of mission capability packages (MCPs) will be identified enabling a comparison between packages of platforms and information-centric approaches. Finally, the value chain approach raises questions about what to include/exclude from the value chain, raising issues about the warfighting boundary of analysis.

2.1 Peacetime versus Wartime Mobile Targets

The Peacetime National Tasks (PNT) are Australia's military support to wider community needs such as coastal surveillance and emergency management. Australia's region of interest for PNT is characterised by a large space to surveil (10% of the Earth's surface), different agencies responsible for different types of surveillance and operations, small numbers of assets owned by different agencies, and a centralised tasking and information coordination structure for each agency based on a *see-plan-respond* value chain.

For example, a track detected by a surveillance asset may be passed back to Canberra where a number of agencies coordinate a response. Coastwatch may be tasked to identify and monitor the track, the Police and Customs may be alerted to drug smuggling, the Navy may be tasked to intercept the track. The planning may be coordinated, then each agency would conduct it's own task. The time from initial detection to response may be many hours.

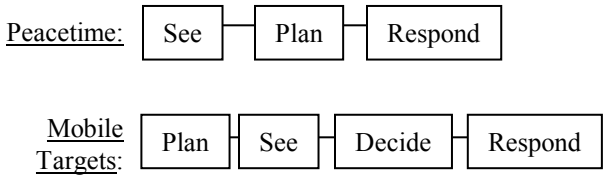

Figure 1. Peacetime versus Wartime Mobile Target value chains

Wartime Mobile Targets have very different characteristics due to the time constraints caused by the mobile nature of the targets making the See-Plan-Respond value chain unworkable. Figure 1 shows an alternative value chain based on *Plan-See-Decide-Respond*. The key to this value chain is to have the planning done before detection (type of response, area of operation, decision chain, assets on station sustained over a period of time), resources in place to respond quickly to any detection (eg an aircraft on station and weaponed-up), and authorised decision-makers who can quickly decide on the legitimacy of a target and order a response before the target has moved out of detection range.

Implications of peacetime versus wartime mobile targeting:

- The See-Plan-Respond value chain is designed to maximise the utilisation of scarce resources.
- The Plan-See-Decide-Respond value chain is designed to maximise achieving the effect by enabling the warfighter to take the initiative in the battlespace.
- The trade-off for the Plan-See-Decide-Respond value chain is that it is resource intensive and expensive (the need to have a respond asset on station and waiting for a detection).

2.2 Rethinking the Strike Value Chain

The strike value chain has traditionally been optimised for static targets allowing efficient use of resources. This section examines how the strike value chain may be reconceived to support wartime mobile targeting.

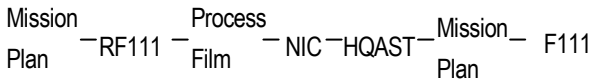

Figure 2. Strike Value Chain

The strike mission can be represented as a See-Plan-Respond value chain as shown in Figure 2. An RF111 does the seeing, the film is processed and analysed, HQAST prioritises the target, the mission is planned and the F111 conducts the strike. This value chain takes 10+ hours end-to-end which if applied to wartime mobile targeting would be arguably ineffective.

How could we rethink the strike value chain to enable mobile targeting? The key heuristic is to *replace "x" by information*, where "x" is a physical object that needs to be moved. Applying this heuristic to the strike value chain reveals several opportunities to change the value chain performance to better enable mobile targeting:

- The need to physically move film can be replaced by a data transmission
- Rethinking the cognitive structures and knowledge flows from mission planning that enables imagery analysis, interpretation and target identification in real-time
- Identifying who needs to make which type of decisions for wartime mobile targets, the timeframe in which decisions must be made, and getting the information directly to the decision-maker to ensure timely decision-making
- Handling the response by either: a) having a shooter on station ready to go, for example, an F111 weaponed-up on station; b) having weapons on the sensor or "see" platform, for example, weapons on the RF111

- A fast response eliminates the need to keep the target under surveillance for long periods of time reducing the endurance issues of the seeing platform (and the need to rotate the seeing platform)

The key force structure design elements are:

- Identify the effect to be achieved and the time to achieve the effect
- Identify the decision-maker, simplify the decision chain and get the information directly to the decision-maker
- Move the planning and knowledge requirements to the start of the value chain enabling all the actors to perform their role in context with a minimum of additional negotiation and coordination
- Changing focus from optimising the use of scarce resources to optimising the achievement of an effect (and the side-effect is smarter utilisation of resources by leveraging NCW)

The value chain analysis approach facilitates understanding of how sensors, situation awareness, decision-making and shooting are coupled together to achieve an effect. Based on this understanding, the value chain can then be reanalysed to understand how to couple the sensors, situation awareness, decision-makers and shooters in new ways to meet new requirements, for example, moving to a mobile targeting strike value chain from a static target strike value chain.

2.3 Functional Dependencies

The need to design coordination between sensors and shooters in an NCW environment raises the issue of the functional dependencies in Mission Capability Packages (MCPs). For example, consider the functional dependencies for a US JSF MCP shown in Figure 3 and how many of the functions are off-board the JSF platform.

Figure 3. JSF US MCP

The functional dependencies in an MCP are designed to achieve an effect against a particular threat structure.

A key issue for Australia is that if we procure the JSF, we will be buying the aircraft but not the MCP. The questions that Australia needs to ask when buying platforms in this way are:

- What functional dependencies are not being acquired with the platform?
- What is the Australian threat structure versus the threat structure for the MCP design?
- Is there a gap in the dependencies required to counter the Australian threat and if so how will Australia address them?

2.4 Packages of Platforms versus an Information-Centric Approach

Understanding the functional dependency gaps raised in acquiring platforms designed to work in MCPs raises the issue of what to do about them. For example, Australia is planning to acquire an Air Warfare Destroyer (AWD). The aim is to acquire an AWD from the US ensuring high-level interoperability with US carrier task-force battle groups in US coalition operations. The problem for Australia is if an adversary acquires a third party targeting capability. In this case, the AWD will have a radar that can see to the horizon (30km) and a SM-2 missile that can shoot 150km, however, the threat can use third party targeting to launch from over the horizon denying the AWD the opportunity to

engage the launch platform as shown in Figure 4.

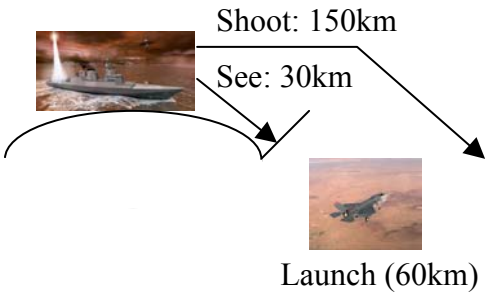

Figure 4. AWD and third-party targeting

Third-party targeting is not currently a problem for the US because the aircraft carrier provides an AEW&C providing beyond the horizon radar coverage, so Australia needs to design it's own solution.

One solution is a **package of platforms** in the form of AEW&C and JSF providing a Combat Air Patrol (CAP) for the AWD and surface-action group. This solution will solve the third-party targeting problem if we can maintain the CAP for an extended period of time. The CAP solution then expands to require air-to-air refuellers, appropriate bases, and sustainability issues. Most importantly, the CAP solution ties up a significant portion of Australia's small number of high technology assets.

An alternative solution is to leverage Australia's information competitive advantage in the form of the Jindalee Over-the-horizon Radar Network (JORN), our wide-area surveillance network, and coupling JORN to the AWD in the following ways. First, upgrade JORN to achieve target quality data. Second, create a mechanism to distribute the JORN data to the AWD in real-time as a tactical information flow (rather than the current strategic information flow). Third, ensure that a version of the SM-2 missile was purchased that had an active-seeker, enabling the missile to vector onto the threat. With an **information-centric** approach centred on JORN, the third party targeting problem can be addressed without employing significant numbers of assets as shown in Figure 5.

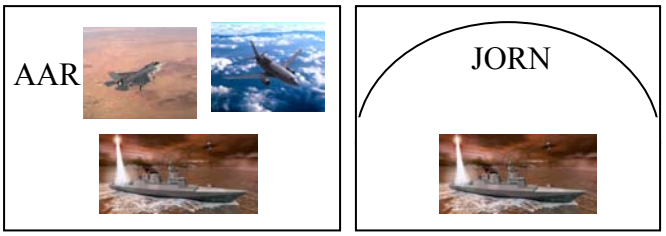

Figure 5. Package of platforms versus an Information-centric approach

The trade-off is that the information-centric solution only works in Australia's sensor region. Beyond that, Australia must rely on other sensor approaches such as integrating into allied capabilities. However, if we operate outside Australia's region our current strategic guidance indicates that it is likely we will do so as part of a US coalition, negating the third party targeting problem.

The key force structure design issue is: where to focus forces to achieve an effect, where do we need visible presence and where do we need mobility, and where can we trade platform mass for information.

2.5 Warfighting Boundary of Analysis

NCW coupled with Effects-Based Operations (EBO) is forcing the warfighter to rethink their boundary of analysis and what to include/exclude from the system. For example, we could say that NCW is just about the sensor-shooter relationship, but equally it is about mission-planning to weapons on target and ultimately infrastructure and sustainability issues through to weapons on target as shown in Figure 6.

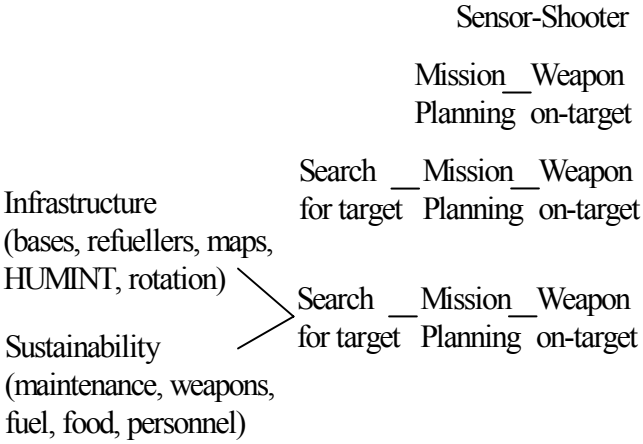

Figure 6. Strike value chains

Similarly, in analysing the East Timor peacekeeping operation we find some very different insights as we move the boundary of analysis as shown in Figure 7. The peacekeeping operation could be viewed as a set of short-notice land operations value chains. However, if we build in the contingency planning, acquisition decisions and the role of Department of Foreign Affairs and Trade (DFAT) and the US, then the land operations value chains are seen in a very different context.

The context changes due to the need to integrate the multi-national and multi-agency perspectives in-theatre as well as at the operational planning level, and to build-in the knowledge accumulated in the contingency planning and acquisition decisions.

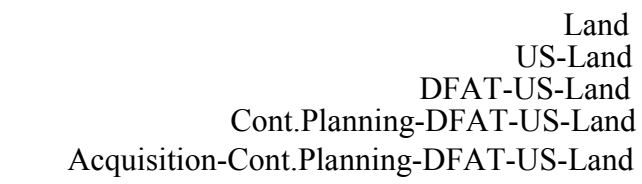

Figure 7. Possible value chains for analysing the East Timor peacekeeping operation

While NCW is asking the warfighter how to do the warfighting more effectively, EBO is asking the warfighter to ensure that they are achieving the right national strategic effect.

The force structure design insight is that deliberate planning and experimentation have a key role if this knowledge can be applied at the start of a value chain and carried through the entire value chain (as shown in Section 2.2).

3. Military Strategic Tasks

	Defence of Australia	US Coalition	Regional Coalition	Transnational threats
Warfighting value chains	Dependency Structure + Info-centric?	Package of platforms		
Multi-agency, multi-nation value chains			Social network for planning and in-theatre coordination	Fast info feeds to establish presence and conduct strikes

Table 2. NCW Implications for Australia's Military Strategic Tasks

Section 1 defined Australia's military strategic tasks. The force structure design implications of NCW for these military strategic tasks are shown in Table 2. The table reveals different boundaries of analysis across the tasks as the defence organisation focuses on different problems to solve:

- Defence of Australia is focused on warfighting, identifying the most appropriate platforms for a 2015 force structure and the most appropriate dependency structures for achieving end-states and effects. The information-centric approach described in Section 2.4 may be one way to retain a competitive advantage.
- US Coalitions is focused on how we would maintain high-levels of interoperability with the US, plug-in to their MCPs designed for warfighting, and add value in coalition operations. Australia's contribution to the Iraq War in

2003 was an order of magnitude greater than our contribution to the Gulf War in 1991 both in materiel and warfighting terms.

- Regional Coalitions focuses our attention on the multi-agency, multi-national value chains. How do we integrate situation awareness across agencies and across nations, how do we do coalition planning, how do we handle in-theatre coordination across agencies and across nations. In particular, how do we generate and stretch our tactical networks to be inclusive and how do we stretch our strategic networks.
- Transnational threats present an interesting multi-agency, multi-national value chain problem. The threat is characterised by shifting areas of operation possibly crossing national boundaries. The campaign phases may involve React (clean-up after attack)-Proact (establish presence to prevent attack)-Preempt (remove capability for attack). Some of these phases are led by non-military agencies with the military in support, some are military led. A transnational campaign requires good integrated ISR that spans agencies and nations, the ability to respond in a timely, coordinated manner, and the ability to generate inclusive tactical networks quickly.

These problem descriptions are not exclusive to each task. The transnational threat description could also be a description of the Defence of Australia widespread raiding threat. Indeed, Defence of Australia by its very nature has to be multi-agency. We can learn a lot about our Defence of Australia force structure options by thinking about how to respond to transnational threats.

Instead of being exclusive, Table 2 aims to highlight that for different tasks we are focused on solving network problems at different boundaries of analysis due to the different evolution in thinking about NCW solutions for each task. It is these different boundaries of analysis and different NCW solutions that are complicating our ability to design an integrated, flexible, adaptable 2015 force structure.

By focusing on the platforms and communications between platforms, the US Coalition solution is at odds with the requirements of the other tasks. However, if we understand the dependencies required to achieve an effect or end-state and examine information-centric options, we may be able to construct solutions that maintain interoperability with the US and can be customised to Defence of Australia, Regional Coalition and Transnational threats.

4. Design Themes

The key design themes for a 2015 force structure include:

- Know where to focus your force – where do you need presence to achieve an effect, where do you need mobility to achieve an effect
- Trade mass for information to enable you to focus your force – not packages of platforms, instead an information-centric approach
- Know your national interests – since some national interests are situational, the minimum response is to know your region and adapt as the situation requires
- Deliberate planning – conducting deliberate planning enables the identification, setup, and practice of the networks required to operate in different situations
- Alliances – not just in terms of responding, but ensuring ISR flows in peace, particularly for tracking emerging transnational threats
- Ability to generate and stretch – operating offshore or conducting Defence of Australia requires the ability to generate

new tactical networks and stretch both the tactical and strategic networks

- Mobile targeting – don't get stuck in the peacetime see-plan-respond value chain. However, the plan-see-decide-respond value chain is expensive to operate so choose the most appropriate situations and have the flexibility to move between value chains as the situation requires
- Understand the functional dependencies – both at acquisition time and when conducting operations. Don't assume that a functional dependency must be met by a platform, sometimes information can tradeoff the requirement for another platform.
- Know whether you are optimising your force structure to maximise the ability to achieve an effect or maximise the utilisation of scarce resources

5. Conclusions

This paper has examined aspects of the NCW implications for Australia's military strategic tasks using a value chain approach with the aim of informing a 2015 force structure design. Nine design themes were identified for designing force structures for NCW.

The key issues that emerged are that different military strategic tasks may require different boundaries of analysis to explore the NCW implications. This will complicate the force structure design in relatively predictable ways.

While a packages of platforms force structure design approach is appealing for interoperability with the US, an information-centric approach that addresses dependency issues may address the broader force structure design issues for Australia.

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