

# Cost-effective capacity testing in the Australian Army

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**Abstract:** The Australian Army's ability to undertake new or existing contingencies is dependent on its capabilities and the capacity it holds of each capability to conduct multiple contingencies simultaneously. Capacity is determined not only by the number of assets that are available, but also the way in which they are organized. Armies must therefore review their current and future force structures against their anticipated tasking in order to ensure they have adequate capacity. However, full-scale reviews or tests can be expensive and time-consuming.

In this paper we present a cost-effective largely qualitative methodology for testing an Army's capacity based largely around structured planning and assessment processes. This was demonstrated in an experimental environment comparing the Australian Army's current organizational structure to two hypothetical future structures. These were: Centralized, where assets were managed in a single Headquarters; and Decentralized, where assets were managed by a number of distributed Headquarters.

Each structure was evaluated on its ability to meet the requirements of concurrent military operations, drawn from future operational planning guidance. Three syndicates, comprising military and civilian Subject Matter Experts, were each assigned one structure, and worked through a systematic process of allocating assets to tasks. Structures were graded by the syndicates and by independent experts on their ability to meet the tasking requirements.

The methodology was able to identify weaknesses and deficiencies in each of the structures. Some limitations of the methodology and recommendations for future use will be discussed.

**Keywords:** *Methodology, capability, organizational structure*

## 1. INTRODUCTION

Successful organisations around the world often look at their current and planned capability to determine their requirements for the future. Defence organisations are no different in this respect. This is normally done through the application of processes such as Strategy to Task Technique (Bathe & Smith, 2002), Capability Based Planning (TTCP, 2004), the Missions and Means Framework (Tanenbaum & Britt, 2005) and Capability Options Development and Analysis (Boey *et al.*, 2003 and Gaidow *et al.*, 2006). The one thing these processes have in common is that they focus on capabilities required. That is, they try and understand if their organisation has the capabilities to deal with possible events in the future. From a Defence perspective the question is, can the future force generate the required effects? The problem with this approach is that is binary; it only considers whether or not the effect is generated. It does not consider the number of times the effect is required, particularly the number of concurrent effects required. That is, they overlook the capacity required. In the design of a full force structure, such as the design of the future Army, capacity plays an important role.

In order to more comprehensively test the Australian Army's capacity, in 2008 the Defence Science and Technology Organisation (DSTO) in collaboration with the Land Warfare Development Centre conducted a Limited Objective Experiment (LOE). The LOE tested the Australian Army's capacity<sup>1</sup> to conduct multiple operations occurring concurrently and in sequence. The aim of the analysis was to determine the break point of three possible future force structures, that is, the Feasible Scenario Space (Williams and Bowden, 2013). The LOE was part of an ongoing program of work in DSTO looking at future force options (Department of Defence, 2010).

The three structures were a future representation of the Current structure, a Centralised structure and a De-Centralised structure. As an additional layer of complexity, the extent of different basis of provisioning<sup>2</sup> (BOP) of a new major systems capability was considered for each force structure. Three different BOP options were considered (full BOP, and two partial BOPs). This meant that there were nine possible combinations of force structure and BOP. The BOP was considered as major capability acquisitions projects may not always be fully funded, which has an impact on capacity.

There is much work that has been done looking at the problem of Force Generation Modelling that links this to capacity requirements such as that by Gauthier *et al.* (2008) and Filinkov *et al.* (2010). These approaches are generally high fidelity models with large data requirements and require a lot of time to set up a study. In the study reported here, the structures being considered did not have the fidelity of data required to allow this type of approach. In addition to this access to military subject matter experts (SMEs) was limited to a one week activity.

In order to overcome some of the challenges associated with the use of high fidelity models, we developed a cost-effective capacity testing program. In this paper, we discuss how it was applied to the Australian Army; however we believe that the methods and principles are more broadly applicable. This includes the other Services within the Australian Defence Force, Joint Forces, and other complex organisations.

## 2. FUTURE LAND OPERATING CONCEPT

A key aspect of the evaluation related to the application of the Australian Army's future land operating concept. This is known as Adaptive Campaigning 09: Army's Future Land Operating Concept (AC-FLOC) (Australian Army, 2009). This is the Army's concept of how the Army will operate in the future so the ability to fulfil the principles of this concept is key in determining success in the future. In brief there are two key aspects to this concept; the tenets for success and the Lines of Operation (LOO).

There are five LOO defined within AC-FLOC:

- Joint Land Combat - actions to secure the environment and remove organised resistance, and set conditions for the other LOOs;
- Population Protection - actions to provide protection and security to threatened populations in order to set the conditions for the re-establishment of law and order;

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<sup>1</sup> In this paper capacity refers to the amount of capability required to conduct the required operation within acceptable risk.

<sup>2</sup> The BOP is a determination of the quantity of an asset that the Army is required to hold in order to support preparedness and mobilisation objectives. A BOP takes into consideration unit entitlements, operating stocks required to support the in-service fleet, reserve stocks and attrition stocks.

- Information Actions - actions that inform and shape the perceptions, attitudes, behaviour and understanding of target population groups;
- Population Support - actions to establish/restore or temporarily replace the necessary essential services in affected communities; and
- Indigenous Capacity Building - actions to nurture the establishment of civilian governance, which may include local and central government, security, police, legal, financial and administrative systems.

AC-FLOC stresses the interdependence of the all five LOO and their ability to reinforce each other<sup>3</sup>.

There are four tenets of success defined in AC-FLOC:

- Flexibility - the ability to maintain effectiveness within given LOO;
- Agility - the ability to dynamically shift balance and weight of effort between different LOO;
- Resilience - the capacity to sustain loss, damage and setbacks and still maintain essential levels of capability across core functions; and
- Responsiveness - the ability to rapidly identify then appropriately respond to new threats and opportunities within a line of operation.

### 3. METHOD

This section provides an overview of the method used to determine Army's capacity requirements. It begins by providing an overview of the LOE and then describes how the data was captured and the assessment process used. It should be noted that prior to the experiment being conducted ethics approval was sought and granted.

#### 3.1. Experimental Structure

The LOE was a vignette-based single-sided planning wargame using syndicates of SMEs. Each syndicate contained current serving Australian Army personnel from a range of key Corps having extensive experience in Army capabilities and planning. Each syndicate was led by an Army officer at the rank of Lieutenant Colonel (LTCOL) and observed by a DSTO Operations Analyst. The DSTO Operations Analyst oversaw and recorded significant events or areas of interest that occur within each syndicate.

The LOE ran over a week involving a series of planning and assessment processes with three syndicates. Each syndicate was asked to consider a different force structure option; Centralised, De-Centralised and Current Structure. Each force structure option was configured differently within barracks but had the same capabilities available to deploy on operations.

The vignettes at the LOE were based on the Australian Capability Context Scenarios (Department of Defence, 2010), and included traditional Army tasks such as domestic security, humanitarian aid, peace keeping and peace making. Combinations of these vignettes made up the tests for each force structure with each test building on the previous one by adding additional vignettes. Each syndicate received the same tests during the LOE to ensure a comparison could be made between the three Force structures. A total of four tests were run. There were also enduring requirements throughout the process such as domestic security, humanitarian aid to a natural disaster, an act of war or a peace making mission.

Once the syndicates were issued with a vignette they undertook an extensive planning phase. Included in this planning phase they had to address issues such as a rotation plan for the troops. Rotation plans required them to be aware of issues such as raising a replacement force, training them, and the longer term sustainment.

An additional capacity test was introduced through the Major Capability Lens. This step entailed each syndicate looking at the impact of variations in major capabilities. For this LOE this focused around a future capability and the impact of BOP on the ability to meet each test. The three options considered were one-third, two-thirds and three-thirds (full) BOP. To reduce the number of tests that needed to be conducted, the first test used the lowest BOP. If this passed the given tests, the greater BOPs were also assumed to have passed. For example, if the one-third BOP passed a test then both the two-thirds and three-thirds were assumed to pass without being tested. However, if the one-third BOP failed the test, the two-thirds basis was tested. If that also failed, then the three-thirds BOP was tested.

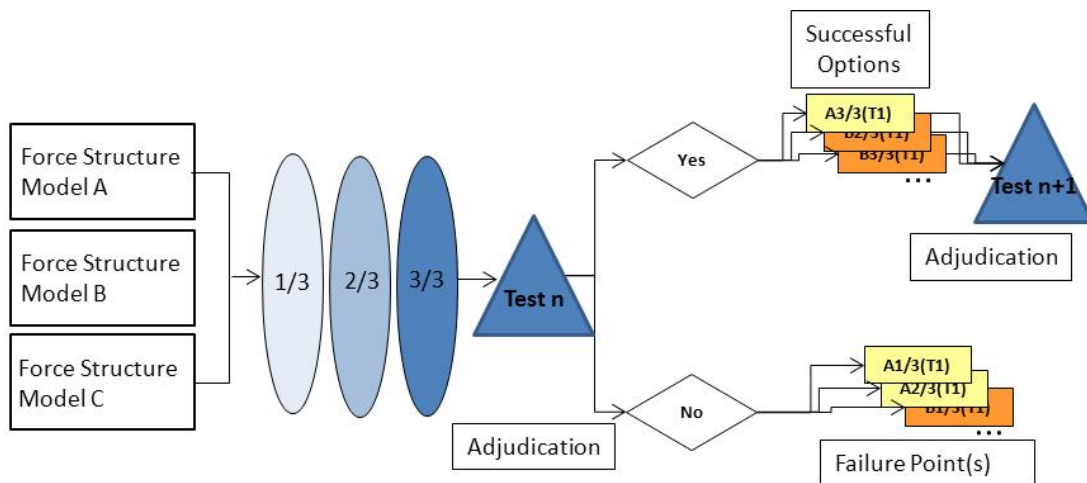
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<sup>3</sup> Bilusich *et al.* (2012) provides analysis of the interactions between the LOO as defined in AC-FLOC.

Figure 1 shows the basic LOE process. Each force structure and capability lens combination is taken into the test. Successful options move onto the next test, which added additional vignettes, while failed options have their points of failure identified for further analysis. At the end of the series of tests each force structure and capability lens combination was reported on in terms of where it failed or it's identified friction points if it successfully passed the final test.

In looking at each test the syndicates were asked to undertake planning for the vignettes it contained. They were required to produce products which were used in the test process. The key products were;

1. Preferred courses of action and alternate courses of action for each vignette.
2. Force generation and rotation model. This includes the assignment of capabilities which are synchronised across all ongoing operations / vignettes.
3. Identification of friction<sup>4</sup> and failure points.
4. Identification of strengths, weaknesses, costs and risks.
5. Can the syndicate achieve the tasking's that they have been set including the existing enduring tasks.



**Figure 1:** LOE Process

### 3.2. Test Phase

The test phase involved the evaluation of the syndicate's plan based on the key products they produced. This evaluation was done by the syndicate lead and Adjudication Cell. The Adjudication Cell was a committee comprising SMEs and analysts with an in depth knowledge of Army. The sole purpose of the Adjudication Cell was to conduct a syndicate independent evaluation of each Force Structure's performance. This evaluation was on the ability of the Force Structure to achieve the requirements of the vignettes balanced against the adaptive campaigning tenets and LOO requirements. This cell also provided a degree of impartiality in the assessment process as there was not sufficient time for each of the syndicates to consider more than one Force Structure options.

The syndicate LTCOL and DSTO Analyst presented the syndicate's ability to complete the test based on the plan, options and issues identified to the Adjudication Cell members. The Adjudication Cell members then conducted their independent evaluation of the force structures, based on these products.

Experimental control and the lead analyst conducted the final assessment to determine if a given option (combination of Force Structure and Major Capability Lens) passed the test and was subsequently able to move on and receive the next test. In making this determination three different data collection methods were used.

The first data collection method was the use of force structure scorecards. Two scorecards were used; one from the syndicate and those from the members of the Adjudication Cell were compared. The final scorecard assessment was then determined from these independent assessments. Of particular focus in this were the following three factors:

1. Force generation and rotation plan synchronised across all enduring operations

<sup>4</sup> A friction point is where the option being tested was considered to be able to pass the test, however, there was significant risk of failure if things did not progress according to plan.

2. Identification of failure points
3. Identification of strengths and weaknesses, costs and risks with each of the syndicates.

As the second data collection method, the analysts observed military deliberations, taking note of any friction or failure points, key decisions, or assumptions. Observations were categorised according to Fundamental Inputs to Capability (FIC) (DMO, 2008), Battlefield Operating System (BOS) (ABCA (2004)), Adaptive Campaigning Lines Of Operation (LOO) (Australian Army, 2009), and phase of operation. These observations, along with inputs from the syndicate members were recorded in observer record sheets. This data source was used to provide future context and justification for those options that were seen as failing.

As the third data collection method, to aid in the planning and to provide additional information for the post LOE analysis, each syndicate was also provided with a Microsoft Project operator. This person built the rotation plan, allowing the syndicate to understand unit allocations while planning as well as collecting data for post LOE analysis. This was primarily used as a mechanism to check rotation planning.

### **3.3. Scorecards**

The score card evaluations were based around 3 broad areas; mission success, adaptive campaigning tenets and adaptive campaigning LOO. The definition of each grading was as follows:

- Green: Fully effective- progress to next test
- Amber: Partially effective – progress with significant costs and risks
- Red: Systemic failure – unworkable for progression

If a score of amber or red was given then a detail justification needed to be provided.

#### ***Mission success***

The first broad area of the evaluation scorecard was mission success. Under this the evaluators were asked to rate the success of the mission in terms of the first rotation, second rotation and subsequent follow on rotations. Within each rotation a score was given for each BOS, Special Operations and Joint Enablers. In doing this evaluators were asked to consider:

1. The capacity to raise and train the designed force to meet operational requirements, particularly the impact, cost and risk of the force structure being considered,
2. The ability to prepare, rotate and reconstitute the force during operations, including the following questions:
  - Can the force sustain enduring contingencies?
  - At what point does the rotation model fail?
  - What is the impact and cost of sustained operations?
3. The extent to which the structure could provide sufficient capacity to maintain effectiveness across the test, and the risk of commitment, and
4. The ability of the structure to provide sufficient capacity to maintain effectiveness across the contingencies and the risk of commitment. If the appropriate capability could not be identified then alternative capabilities were to be considered along with the risks of these.

#### ***Ability to implement tenets of adaptive campaigning***

The second broad area looked at the four key tenets to success of adaptive campaigning; Flexibility, Agility, Resilience and Responsiveness. Each of these tenets was considered both in relation to a single operational theatre and across multiple operations theatres separately. That is, while a particular force option may have had flexibility within one operational theatre, if a given test had more than one operational theatre, the force structure may have lacked flexibility across multiple theatres.

Flexibility was defined as the ability to maintain effectiveness within given LOO. For example, did the tested structure and capability have the ability to be reconfigured in different ways undertake different tasking under differing sets of conditions?

Agility was defined as the ability of the force to dynamically shift balance and weight of effort between different LOO. That is, was the deployed force capable of reconfiguring to take into account changes in the mission by adapting a morphing situation without drawing on additional capability? Indicators included levels of concurrency, size of reserve units and time deployed.

Resilience was defined as the capacity to sustain loss, damage and setbacks and still maintain essential levels of capability across core functions. To look at this the evaluators considered the maximum length of enduring tasks. To look at this, consideration was given to the percentage by BOS across the total force of redundant capability available to replace loss or damage while maintaining the mission and the number of rotations by

BOS of discreet capabilities before those capabilities are consumed and cannot be reconstituted. Failure was considered to occur at the point when there was no residual capability available to replace loss or damage and setbacks to maintain enduring contingencies.

Responsiveness was defined as the ability to rapidly identify then appropriately respond to new threats and opportunities within a line of operation. In particular, consideration was given to defined possible changes in missions and the time it took to adapt to such changes.

***Ability to conduct the five lines of operation***

The final broad area was that of the five LOO as defined in AC-FLOC. A key aspect of AC-FLOC is the ability of Army to operate simultaneously across all lines of operations, in particular through the conduct of sustained close combat in order to “win the battle”. Army must be capable of planning, integrating, balancing and executing actions across all five lines of operation at the individual, combined arms team, battle group and joint interagency task force level.

The areas of interest for each LOO were:

1. Joint Land Combat:
  - a. Required survivability to absorb predicted threat levels in the Area of Operation,
  - b. Sufficient overmatch in combat power to overcome predicted threat, and
  - c. Sufficient battlefield mobility to decisively apply principles of Recon Strike, Recon Fires and Swarming.
2. Population protection:
  - a. Sufficient forces to establish control of the population,
  - b. Ability to provide law and order and security functions, and
  - c. Ability to provide environmental hazard management.
3. Public information:
  - a. Ability to effectively disseminate messages and information to the population in a timely manner,
  - b. Measure and assess the perceptions of key targeted population groups, and
  - c. Minimize adverse effects of the operation on the population (appropriate force for mission requirements).
4. Population support
  - a. Ability to assess immediate requirements,
  - b. The capacity to respond promptly and effectively, and
  - c. The capacity to transition and support.
5. Indigenous capacity building
  - a. Ability to assess long term requirements,
  - b. The capabilities and capacity to initially lead, and
  - c. The capabilities and capacity to effectively transition and support.

The scorecard evaluations were done independently by the syndicate and the Adjudication Cell and were later compared. When the ratings varied, points of clarification were made first with the syndicate, then with the Adjudication Cell. The final assessment was given after consideration of all the comments made and assessments by the syndicate and the Adjudication Cell as well as those made in other tests. The Adjudication Cell assessment was given preference when the justification for the assessment was Order Of Battle (ORBAT) related. The syndicate assessment was given preference when the justification was plan based. At no point in the process where the individual ratings aggregated to give an overall ratings.

#### **4. DISCUSSION AND RECOMMENDATIONS**

This paper has presented a method for examining the break point of possible future forces and structures. The process allowed a quick analysis of different force structures and capabilities. Although the method has been applied in an Army context it can be extended, with some modification to the detail, to other aspects of defence as well as the organisations outside defence. However the following should be taken into account:

1. The number of syndicates. While three syndicates were used in this study the number of syndicates required may be different depending on the number of options under consideration.
2. The composition of the syndicates. It is a key aspect of the philosophical validity of the activity that the syndicate has personnel representing all of the required skills (Bowden & Williams, 2013).
3. Structuring the vignettes to test all required options. This should include items such as daily routine functions, regular non routine functions, and any other issues of relevance or interest. Required options may be generated through doctrine, strategic plans, business development plans, or similar.

4. Aligning the vignettes and assessments to specific system requirements. In this study, Army's future operating concept (AC-FLOC) formed the basis of two out of three broad areas of score card evaluation. This needs to be replaced by specific requirements of the system being considered. For a company that has measures of performance and functions that are expected to be met then these should be used. Examples of this might be, if you are in the manufacturing industry you may wish to have all of your staff trained to a level that they are able to operate any equipment, your staffing levels are such that you can cater for a surge in orders and be able to meet tight deadlines, you may not operate on the just in time stores process and have stock on hand which alleviates problems with other companies supplying you. These points are essential as they are used within the scorecards as measures of performance and success or failure.
5. The use of additional lenses. In this study, a capability lens was used to test differential BOP. This could be replaced by any Future capability options that are to be tested. For example, if a trucking company was looking at alternative methods of moving freight, one of the lenses could be moving freight by train or rail, a second could be by air freight, a third could be increasing the number of trucks in the company and a fourth option could be improving the carry capacity of the current fleet to include road trains.
6. The role of external assessors. While it is important that syndicates are able to assess their option's performance, to add internal validity (Bowden & Williams, 2013) it is important to have independent SMEs who can provide a secondary assessment as was done by the contextual prism. This group can be made up of anyone who has the appropriate background.
7. The requirement for a break point. It is important to have sufficient tests and sufficiently complex scenarios to reach a break point. This ensures robust definition of the Feasible Friendly Scenario Space and differentiation between options.

The methodology we described was successfully applied during the LOE. It enabled clear differentiation between the three different force structures, and between the different capability options. The results formed a key part of the argument Army took to White Paper 2009 and the results can be seen is the favourable direction to Army from government following the White Paper process.

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