

SIMULATION AND DEFENCE CAPABILITY

References:

- A. *ADFP 4 – Preparedness and Mobilisation*, Chapter 1
- B. *Capability Systems Life Cycle Management Manual 2002*, Chapter 1

INTRODUCTION

1. The purpose of this document is to explain the contribution of simulation to capability. It draws heavily on extant Defence capability doctrine presented in the references. Pointers for accessing the references appear at the end of the document.

2. Simulation¹ has been important for Defence and recent developments show that its importance is increasing. Given the ever-present pressure to extract maximum benefit from resources, however, it is imperative that the contribution of all activities to the generation of Military Capability is clear. Only then can informed choices on the priorities for resourcing be made.

3. In order to defend Australia and its interests, Defence develops military capabilities which enable the Government to apply military power when required. The phrase ‘Military Capability’ will often invoke thoughts of heavy-weight hardware – strike aircraft, submarines and the like – followed by thoughts of enabling items – communications equipment for example. The mental association between equipment and capability may be so strong that other activities or systems may be seen to have little or no relevance. Yet items of equipment do not, of course, in themselves deliver Military Capability. This capability is the net result of a number of components working in unison as part of a system. Simulation provides essential, enabling support to a key range of such components.

MILITARY CAPABILITY AND ITS COMPONENTS²

4. The components of Military Capability are summarised in Figure 1.

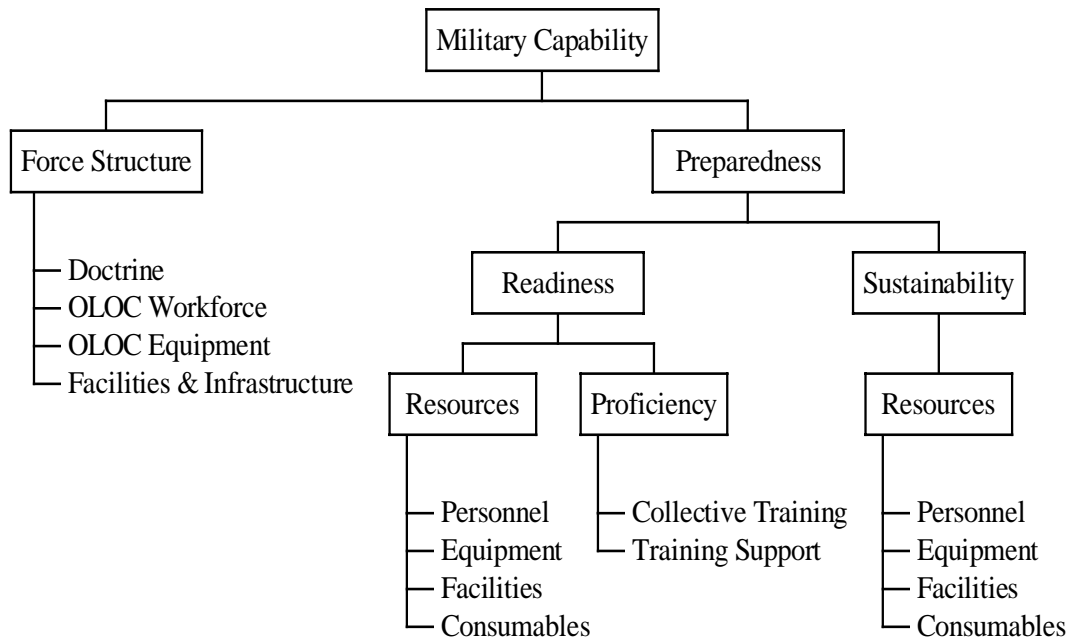


Figure 1 – components of Military Capability

1. A **model** is defined as a physical, mathematical or otherwise logical representation of a system, entity, phenomenon or process. A **simulation** is the implementation or exercise of a model over time. (DI(G) OPS 42-1)

2. This section is based on *ADFP 4 – Preparedness and Mobilisation*, Chap 1

5. Examination of the details of these components shows that capability depends on:
 - a. people who are trained and proficient (individually and collectively);
 - b. equipment which is available and serviceable; and
 - c. judgements about how both will be employed in times of conflict.
6. The fact that capability has a number of components introduces a further consideration: there is a significant requirement for analysis and decision making in the capability development process.

FUNDAMENTAL INPUTS TO CAPABILITY³

7. A complementary view is that capability is delivered by systems, and that those systems have fundamental inputs as shown in Figure 2.

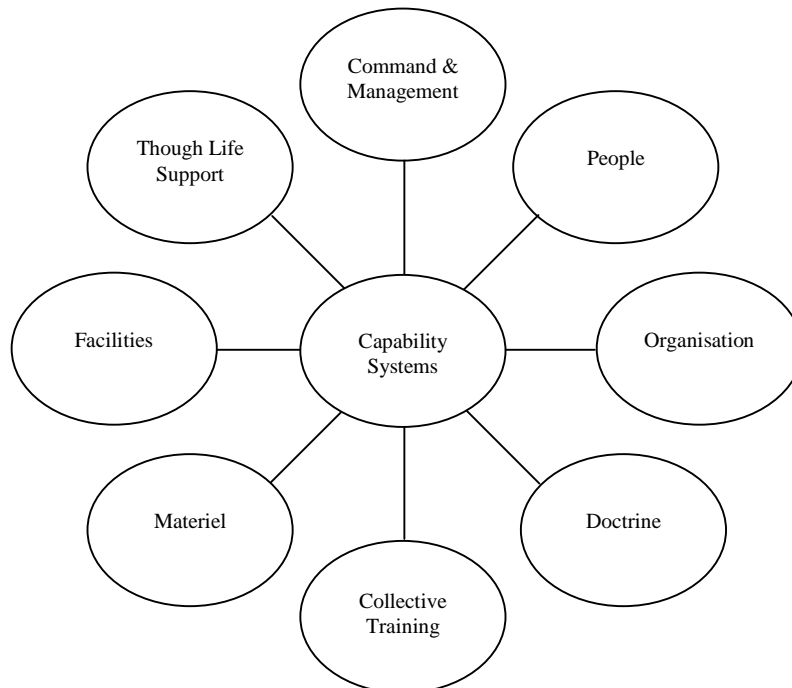


Figure 2 – fundamental inputs to capability

8. The diagram reinforces:
 - a. the fact that no single thing delivers capability;
 - b. the importance of people and their training, in addition to equipment; and
 - c. the importance of issues and processes which, in turn, involve analysis and decision making.

THE NATURE OF SIMULATION

9. The applications for simulation in Defence can be broadly divided into two categories, namely personnel training, and support to analysis and decision making. In both roles, simulations may be used either as discrete systems, as an adjunct to real-world systems, or indeed to stimulate real-world systems.

3. This section is based on the *Capability Systems Life Cycle Management Manual 2002*, Chap 1

10. **Training.** The training role for simulation in developing, maintaining and practicing skills is well established, as follows:

- a. **Individual Training.** Simulation is used for individual training, to develop and maintain core and operational skills.
- b. **Team Training.** Simulation is used for team training of functional groups of people with one simulation system supporting a number of trainees simultaneously.
- c. **Collective Training.** Simulation is used for the collective training of functional groups of people who need to work with each other and, in this application, can involve the linking of a number of simulations with each one supporting a number of trainees simultaneously.
- d. **Distributed Training.** Distributed simulation systems readily allow people to train together despite being geographically remote.
- e. **Mission Rehearsal.** Simulation provides ‘just-in-time’ training for individuals and teams, to practice essential skills specific to a real and imminent operation.

11. **Decision Making.** The relevance of simulation to decision making is as follows:

- a. **Problem Definition.** Simulation depends on the development of a model of real world systems or processes. Model development provides a vehicle by which the stakeholders to a problem or issue can gain and agree on a shared understanding of it.
- b. **Problem Exploration.** Simulation allows decision makers to understand the parameters relevant to a particular issue or problem, and to identify those parameters which have most significant impact on the end result.
- c. **Option Comparison.** Simulation allows decision makers to explore the likely outcome of a number of different courses of action or options, to select the one which gives the most suitable result, and to understand how fragile or robust that result is likely to be under changing circumstances.
- d. **Decision Justification.** Simulation can provide decision makers with an analysis process which is repeatable and statistically sound, and hence with robust answers which can survive scrutiny.
- e. **Experience Augmentation.** Simulation can provide decision makers with the means to extend their experiences, and hence inform future judgements, beyond those available from their ‘normal’ duties.
- f. **Assessment.** Simulation allows the proficiency of people and the status of equipment to be assessed as part of a decision process as well as post-mission analysis and problem-solving.

12. **Benefits.** The benefits of simulation in the training and decision support roles can be characterised as follows:

- a. **Effectiveness.** Simulation increases the effectiveness of training and decision activities. For example, simulation:
 - (1) provides access to scenarios and experiences more readily than alternative means;

- (2) in some instances, provides the only practicable way to access particular scenarios or experiences;
 - (3) provides a safe and controlled environment for the development of skills and processes;
 - (4) is typically accessible for 24 hours per day and 7 days per week, without constraint from weather and similar factors;
 - (5) reduces the need to use operational systems or equipment for non-operational activities;
 - (6) provides rigour when dealing with complexity;
 - (7) enables the clear and supportable representation of the dynamics and interdependencies of battlespace phenomena
 - (8) portrays the impact of uncertainty in key events.
- b. **Economy.** Simulation also brings direct and indirect economic benefits. For example:
- (1) the cost of simulation is often less than alternative methods for achieving the same result;
 - (2) the direct operating costs of simulations are typically much less than for the equivalent real equipment or activities, particularly over extended operating periods;
 - (3) simulation reduces the financial implications of exposure to hazardous situations;
 - (4) simulation improves the quality, and hence reduces the adverse financial implications, of decisions.

IMPLICATIONS FOR CAPABILITY

13. The role of simulation in training and decision support, and its benefits in terms of effectiveness and economy, are directly relevant to Military Capability. Generic examples of this relevance to the key components of capability are as follows, while specific examples are tabulated in Annex A:

- a. **Force structure.** Simulation augments force structure by:
- (1) providing a tool for the development and testing of doctrine;
 - (2) providing practicable, economical and task specific training and assessment opportunities when achieving and sustaining OLOC; and
 - (3) reducing the training load on real equipment, thereby either releasing it for operational duties or preserving it through reduced rate of effort.
- b. **Personnel Readiness.** Effective simulation increases personnel readiness:
- (1) through more regular exposure to wider experiences than are otherwise available, particularly in times of budgetary constraint;
 - (2) by providing a readily accessible means to refresh highly perishable skills, and to rehearse for imminent operations;

- (3) by providing additional preparation so that greater benefit can be extracted from training opportunities in the real equipment; and
 - (4) by allowing geographically distributed people to practice working together prior to live exercises or real operations.
- c. **Equipment Readiness.** Simulation enhances equipment readiness:
- (1) through increased serviceability as a result of removing the more punishing training tasks from the real equipment;
 - (2) through increased equipment availability, since a reduced rate of effort leads to greater intervals between maintenance or failure; and
 - (3) by providing a means to assess the functional status of weapon systems prior to deployment.
- d. **Sustainability.** Simulation increases the readiness of rotation forces by providing training opportunities while the real equipment is operationally deployed.

14. **Capability Development Process.** Considering the capability development process overall, the decision support role for simulation has significant application:

- a. in establishing the composition of, and balance between, the various components; and
- b. in assessing the effectiveness of current and future components of Military Capability.

CONCLUSION

15. It is clear that simulation has a significant place in the generation of Military Capability. The contribution of simulation can be described in terms of enhancement to capability, saving of resources, and reduction of risk, as follows:

- a. Simulation enhances capability directly by contributing to the individual components of capability, and to the overall capability development process.
- b. Simulation saves resources both directly through savings in operating costs, and indirectly by improving the quality of decision making. These savings are available for reinvestment into capability systems.
- c. Simulation reduces risk by reducing exposure to hazardous situations, and by allowing the likely implications of decisions and changing circumstances to be assessed in advance. Risk reduction, in turn, promotes the preservation and effective employment of capability.

16. The relative contribution of simulation to capability depends on the particular circumstances and the relevant measures of effectiveness. The key message is that, by providing essential, enabling support to a key range of capability components, simulation is already a strong contributor to Military Capability. It will assume greater importance as Defence continues to advance its exploitation of simulation.

Annex:

A. Simulation and Capability – Examples

The references may be accessed on DEFWEB as follows:

ADFP 4: <http://defweb.cbr.defence.gov.au/home/documents/data/ADFPUBS/JSPADFP/ADFP4/01.pdf>

CSLCM: <http://defweb.cbr.defence.gov.au/home/documents/data/DEFPUBS/DEPTMAN/CSLCM/01.PDF>