



THE COARSE ART OF AIR FORCE EXPERIMENTATION

In recent times a new term has entered the ADF's lexicon—Experimentation. Like most new terms it is often misunderstood and misused and therefore, there is a perceivable need to de-mystify it by explaining what it means from a RAAF perspective.

Viewed in a very generic manner, experimentation can be used to support almost every phase of a concept-led or -informed force development process, from the initial formulation of conceptual ideas through to the development of detailed descriptions of the processes, organisations, systems and equipment needed for their application.

Because of its extreme utility, Military Experimentation is rapidly becoming entrenched as a vital part of the ADF's concept-led capability development process. Military experimentation can be defined as, *'the application of the principles of experimental science to the process of exploring innovative methods of operation, especially to assess their feasibility, evaluate their utility and determine their limits'*.

CDF's 'Force 2020' vision statement makes it clear that experimentation will be crucial in 'turning the vision into reality', and that single-Service experimentation has a key role to play in that process. Within the ADF, experimentation is used to support concept and capability development by using methods that integrate professional judgement, mathematical modelling and historical experience. It is a means of gathering evidence when situations, organisations and technology to support a concept do not yet exist and provides an independent test and audit process.

In practise, experimentation is used in conjunction with a number of other tools and information sources to develop a consolidated picture of future capability requirements. Some of the tools and information sources, which compliment experimentation, include project-related studies, Rapid Prototype Development and Evaluation (RPDE), Concept Technology Demonstrators (CTDs), technology reviews and intelligence assessments.

In keeping with 'Force 2020', the role of experimentation is also highlighted in the *Air Force Plan 2005*, where

it is described as a 'key factor' in 'building a seamless, integrated and networked air and space force to fight and win'. The Plan goes on to assert that 'Air Force will continually aim to reshape the future force through actions such as experimentation, concept development and strategic planning'.

RAAF experimentation contributes to the concept-led force development process in two main ways. Firstly, it forms part of Air Force's internal concept development process, where it is used to inform, test and evaluate air and space power concepts emanating from the Air Power Development Centre (APDC). Once 'validated' through experimentation, these concepts can be used to provide context and guidance to the capability developers. Secondly, Air Force experiments can provide a means of assessing the suitability of planned force structures and organisations, thereby identifying possible capability gaps and further opportunities for exploitation.



To achieve these aims, Air Force experiments are always conducted in a Joint Force context, generally set 10 to 15 years into the future. These experiments can take many forms, with their exact nature being governed by the issue(s) being examined and the questions being posed. However, there are a number of basic principles that should be adhered to and limitations that must be carefully considered in the design and conduct of any experiment.

An experiment is generally designed to establish cause-and-effect relationships between the 'inputs' and 'outputs' of a process. This is achieved by *systematically* varying selected inputs and observing changes in the

outputs. However, the nature of military experimentation demands some relaxation in the strict principles of classical experimental science.

Military operations are essentially human endeavours that take place in a chaotic and constantly changing environment. The number of variables that may have a significant effect on outcomes is innumerable, and many will be uncontrollable. The situation is further complicated by the fact that many of the variables could be interdependent. While it is possible to introduce plausible simplifying assumptions to bring some of these factors under control, there is a limit to which this can be done without undermining the validity and credibility of the experiment. In addition, many of the observations and performance measurements will be subjective in nature, thus affecting the replication of the experiment and confounding attempts to produce statistically significant samples.



These limitations must be borne in mind throughout all phases of the experiment, from initial problem definition through to the way in which the results are interpreted and used. The aim of Air Force experimentation is therefore not to produce scientific certainty, but to reduce uncertainty when making force development decisions. Under these circumstances, a more pragmatic approach to experimentation becomes acceptable.

Of necessity, the nature of most RAAF experiments will be either be exploratory or hypothesis-based. An exploratory approach is employed when the process being examined is not well understood and the likely outcome cannot be predicted. It is used to answer questions of the form ‘what happens if...?’. Observations and data collection from this type of experiment have to

be broad based, and assessment of the outcomes will be generic in nature. The technique has particular utility in military experimentation, which is characterised by having to contend with highly complex situations that are influenced by a vast range of possible variables.

An exploratory experiment can be used to gain a better appreciation of the *main* factors and influences, which govern the outcome of a particular process. Follow-on work will then be able to concentrate on examining the precise influence of these factors. For this reason, an exploratory experiment will normally be conducted as a pre-cursor to hypothesis-based activities.

Most issues to be examined through experimentation will be too large and complex to be adequately addressed through a single experiment. The general philosophy in the RAAF therefore is to develop experimentation campaigns comprising an integrated set of experiments, with each activity designed to provide part of the overall answer.

The current focus for RAAF experimentation is a four-year campaign with the theme of ‘Networking the Air Force’. The main aim is to examine the Planned Force to assess its suitability for NCW under representative operational conditions. This in turn will assist in identifying any capability gaps and also in the development of appropriate Air Force concepts for exploiting the capabilities provided by the networked force.

Over the coming weeks, follow-on Pathfinders will describe some of the insights that have been gained through the Air Force experimentation process.

Over the last century, military experimentation—in the form of war games, simulations and especially field exercises—has proven to be a key and often essential element of innovation and transformation. Properly undertaken, military experimentation is a source of great competitive advantage.

— Andrew Krepinevich, 2000.



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