Canada's New Joint Experimentation Centre: An Experimentation Approach to Analysis for Compliance and Peace Building

Kendall Wheaton, Ph.D.

Canadian Forces Experimentation Centre
Shirley's Bay Campus
Ottawa, Ontario, Canada.
e-mail: wheatonkr@forces.ca

Dr. Wheaton is a Senior Operational Research Analyst in the Department of National Defence in Canada. He has been on the staff of the Operational Research Division for fifteen years and has experience in the Air, Maritime, and Joint environments. He is presently the leader of the Experiment Design and Evaluation Section of the Canadian Forces Experimentation Centre (CFEC). Dr. Wheaton's activities in the CFEC involve studies on command and control as well as analyses to support the equipment of a joint experimentation capability in Canada.

INTRODUCTION

This paper describes the recent evolution of a joint experimentation capability in the Department of National Defence in Canada and then presents a proposed approach to the application of experimentation to the development of analysis for compliance and peace building. Concept development and experimentation (CD&E) centers are being established in the defence departments of many countries at the moment as well as in NATO. These centers are developing plans for experimentation and methods for their conduct. In many cases gaming (wargames and games for operations other than war (OOTW)) will be used as well as seminars, brainstorming, constructive simulations, and exercises (both live and virtual).

The Department of National Defence in Canada established a project to develop a joint experimentation capability in September of 2000. A project definition team composed of officers, scientists and support personnel was formed in June 2001 at the Shirley's Bay Campus in Ottawa. This team's mandate is to develop the plans for an experimentation campaign and a new centre including facilities to host a wide range of experiments. The paper will describe the plans for this new joint experimentation centre, the relationships to environmental experimentation activities, the facilities for seminars, brainstorming and gaming, and the development a network to link centres across Canada and link into the Combined Federated Battle Lab (CFBL) Network.

The paper will then describe a proposal for the application of experimentation to developing methods for the analysis of compliance and peace building. Operational research methods are seen, in Canada at least, as making a significant contribution to the spectrum of experimentation methods and tools. Seminar games and wargames are tools long used by the

operational research community that are already identified as key experimentation tools. One of the challenges in the development of analysis for compliance and peace building is to validate analysis methods. Too often the analysts have no alternative except to use real operations. The creation of these new centres provides the opportunity and resources to test analysis tools in experimental or exercise scenarios. These centres are resourced to host a variety of military and civilian specialists in order to pursue an experimentation objective. The paper will discuss the experimentation that could occur using personnel with appropriate expertise and/or field experience to explore the validation of new analysis tools.

THE CANADIAN FORCES EXPERIMENTATION CENTRE

Concept Development and Experimentation (CD&E) is relatively new in the Department of National Defence in Canada. The Canadian Army established the Army Experimentation Centre (AEC) within their Army Simulation Centre in 1998. The Navy is in the process of creating an experimentation staff at the Canadian Forces Maritime Warfare Centre and the Air Force is seeking approval to develop experimentation facilities within a new Air Force Warfare Centre. A joint experimentation capability is being established in Ottawa at the Canadian Forces Experimentation Centre (CFEC) as part of the Joint Force Development Branch under the Deputy Chief of Defence Staff (DCDS).

The programs at the Army, Navy, and Air Force experimentation centres focus on service oriented issues and are most often at the operational and tactical levels. The role of CFEC is to focus on joint issues, primarily the issues facing the Vice Chief of Defence Staff (VCDS) who manages the long-range strategic development program for future capabilities in the Department and the DCDS who is the force employer in Canada. These relationships are depicted in Figure 1, as they pertain to experimentation.

As the force employer, the DCDS is responsible for strategic and operational planning for all national and international missions in the Department of National Defence. The DCDS is also responsible for providing advice and guidance to the Government of Canada on developing situations for which Canada may be asked to provide military assistance. Consequently, the key capability areas in the strategic development program for the CFEC to address are Command and Control, Information, and Intelligence.

The primary objectives for the CFEC, listed below from the unit's Concept of Operations, describe the CFEC's role within the Department of National Defence:

- Contribute to the realization of *Strategy 2020*.
- Solicit and explore innovative warfare concepts.
- Identify options and provide advice to DND/CF leadership.
- Coordinate Pan-DND/CF experimentation activities.
- Coordinate CDE collaboration with allies, public and private institutions.

- Coordinate and standardize M&S activities and models and promote re-use of models and components pan-DND and across Allies.

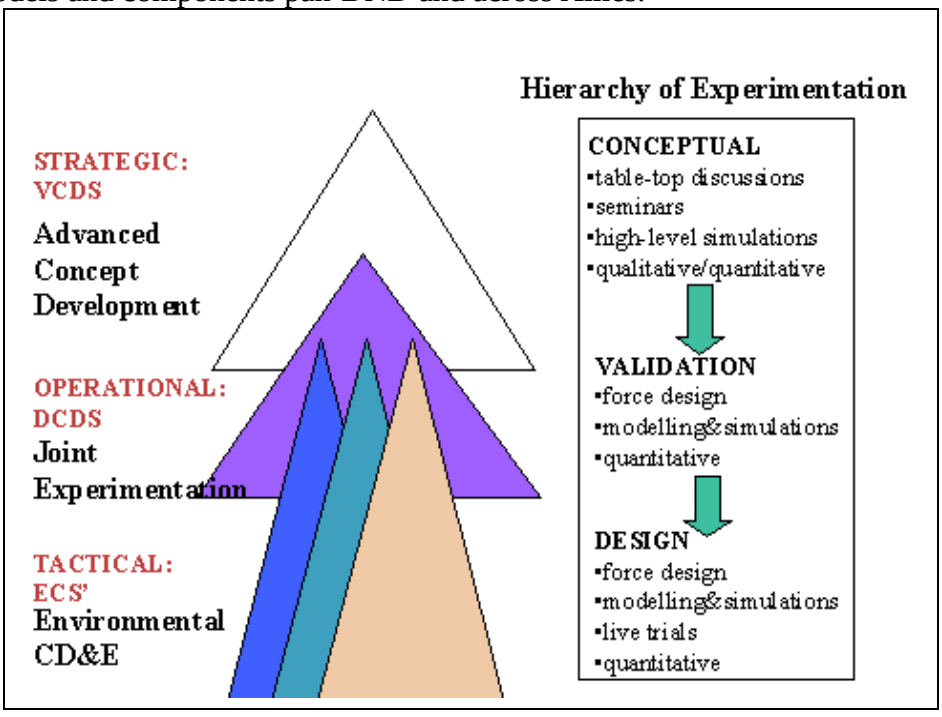

Figure 1: Canadian Experimentation: a Three Tiered Approach.

The CFEC is located on the Shirley's Bay Campus in Ottawa within the Communication Research Centre (CRC) adjacent to the Defence Research and Development Canada (DRDC) Ottawa laboratory. This site is close to the Department's National Defence Headquarters providing easy access for DCDS and VCDS staff to the joint experimentation facilities. In addition, CFEC staff benefit from the being on-site with DRDC Ottawa and CRC that have scientific and technical staffs involved in R&D in defence and communication systems, models and simulations. Furthermore, DRDC Ottawa has a suitable laboratory with connections to the Combined Federated Battle Lab (CFBL) network. This facility is the interim site for the CFEC Battle Lab. By 2004 a purpose-built facility will be in place to provide both office space and a Battle Lab for the CFEC.

CD&E is conducted at the CFEC by multi-disciplinary teams of military officers and defence scientists. The Advanced Concept Development team, a part of the VCDS staff, develops long-range concepts in accordance with the department's capability planning objectives. Three experimentation teams from the DCDS staff develop the centre's campaign plan and perform experiments to validate concepts. The department's Synthetic Environment Coordination Office (SECO) is also located at CFEC and provides guidance to the department on best practices and standards for M&S activities, especially as they pertain to experimentation, analysis and R&D.

Canada's commitment to experimentation, like a number of other nations, is significant. In addition to four centers and the associated staff, there is a significant investment in battle labs and networking facilities. Each experimentation center is developing seminar and/or war-gaming capabilities combined with connections to the CFBL network. These facilities are establishing the tools (computer based war-games), scenarios, and databases required to simulate operations. The networks create the capabilities to link the tools and conduct

distributed war-games. Consequently, larger groups of experts can pool their skills and create broader simulated environments for experimentation.

In addition to the traditional sensor and weapon simulations for war-games, algorithms are now being developed to simulate human decision-making and human behaviors, both individual and collective. Distributed simulations are being facilitated through new developments like the High Level Architecture (HLA) that enables the federation of applications across networks. With the CFBL network, the CFEC can link a Canadian simulation to simulations at CD&E and research centers in the United States, United Kingdom, Australia, New Zealand and NATO.

The Canadian domain of the CFBL network is called the Canadian Forces Experimentation Network or CFXNet. It will connect all of the department's defence laboratories to all of the military experimentation sites. Per capita, Canada has a very large number of sites compared to other countries using the CFBL network. The Canadian philosophy, however, is to overcome the challenge of a small community dispersed over a large geography through a significant investment in communications. The CFXNet will provide a means for distributed virtual experimentation up to and including combined Joint/Tactical level games serving Air Force, Army, Navy and Joint objectives. The vision of the designers is to be able to support distributed activities on a broad scale and link to Allies for events like the U.S. Joint Forces Command's Millennium Challenge 02 experiment.

The other key element to realizing this vision is the Battle Lab at each experimentation centre. The CFEC Battle Lab will host:

- Seminar and brainstorming facilities; and
- Joint wargaming facilities that will also employ constructive and virtual simulations.

The facility will be large enough to support large games with 40 to 50 players with an additional surge capacity of up 75 players. The Army's AEC has excellent tactical wargaming capabilities and can host 30 to 40 players. The Navy and Air Force are still developing plans for their facilities.

The CFEC experimentation activities are planned through an annual campaign plan called the Canadian Forces Joint CD&E Plan. This plan is approved by the Joint Capability Review Board (JCRB) which is composed of the senior staff of the department; the Vice and Deputy Chiefs of Staff, the Chiefs of the Air Force, Army and Navy and so on. The CFEC's joint experimentation plan is endorsed at a senior level to facilitate coordination between the service experimentation centres and the CFEC.

The campaign plan is linked closely to the department's Strategy 2020 document, which provides the objectives for transformation and the associated metrics. The vision statement from this document (quoted from the VCDS web page) clearly identifies the requirement for transformation:

> *"The Defence Team will generate, employ and sustain high-quality, combat-capable, inter-operable and rapidly deployable task-tailored forces. We will exploit leading-edge doctrine and technologies to accomplish our domestic and international roles in the battle space of the 21st century and be*

> *recognized, both at home and abroad, as an innovative, relevant knowledge-based institution. With transformational leadership and coherent management, we will build upon our proud heritage in pursuit of clear strategic objectives."*

The CFEC's role will be to develop concepts for experimentation that support the transformation of the Canadian Forces of 2002 to those envisioned in 2020. To this end, the CFEC has adapted a hierarchical concept architecture based upon the construct used by the U.S. Joint Forces Command's Joint Experimentation Centre. The Canadian hierarchy has four levels:

1. Capstone Concept: A capstone concept is the overarching concept, in this case the core of Strategy 2020.

2. Integrating Concept: An integrating concept combines multiple subordinate (functional) concepts into a common theme. (The eight capability areas of the Canadian Joint Task List become the integrating concepts.)

3. Functional Concept: A functional concept describes a major component of an integrating concept in greater detail, typically focusing on a generic mission or specific type of operation.

4. Employment Concept: An employment concept describes how to employ a specific system to conduct a specific task. It also identifies capabilities required by the 2020 Forces.

The process begins with the Joint Capability Assessment Teams (JCATs) that provide for consultation with strategic planners and internal brainstorming. This leads to the development of draft concepts that are vetted through symposia and workshops in consultation with subject experts from across the department. The process is shown in Figure 2 with ideas starting at a JCAT and then moving to the CFEC for concept development and experimentation and finally back to the JCRB and the "Level Ones," the senior executives in the department, who are the "agents for change".

In the first year of operation, CFEC assessed the current strategic direction on force development for the Canadian Forces in consultation within the Department, and with a view to the priorities of our Allies. Bearing in mind that this was the CFEC's first campaign plan and still a learning experience, a capstone concept and two integrating concepts were identified along with associated functional concepts. The level of activity and resources to address these concepts was considered within the capability of the unit.

The campaign plan is predicated on the core premise of *Strategy 2020.* Therefore the Capstone Concept is,

> "*to position the force structure of the CF to provide Canada with modern, task-tailored, and globally deployable combat-capable forces that can respond quickly to crises at home and abroad, in joint or combined operations."*

The two integrating concepts are Command and Control (C2) and Information and Intelligence (I2).

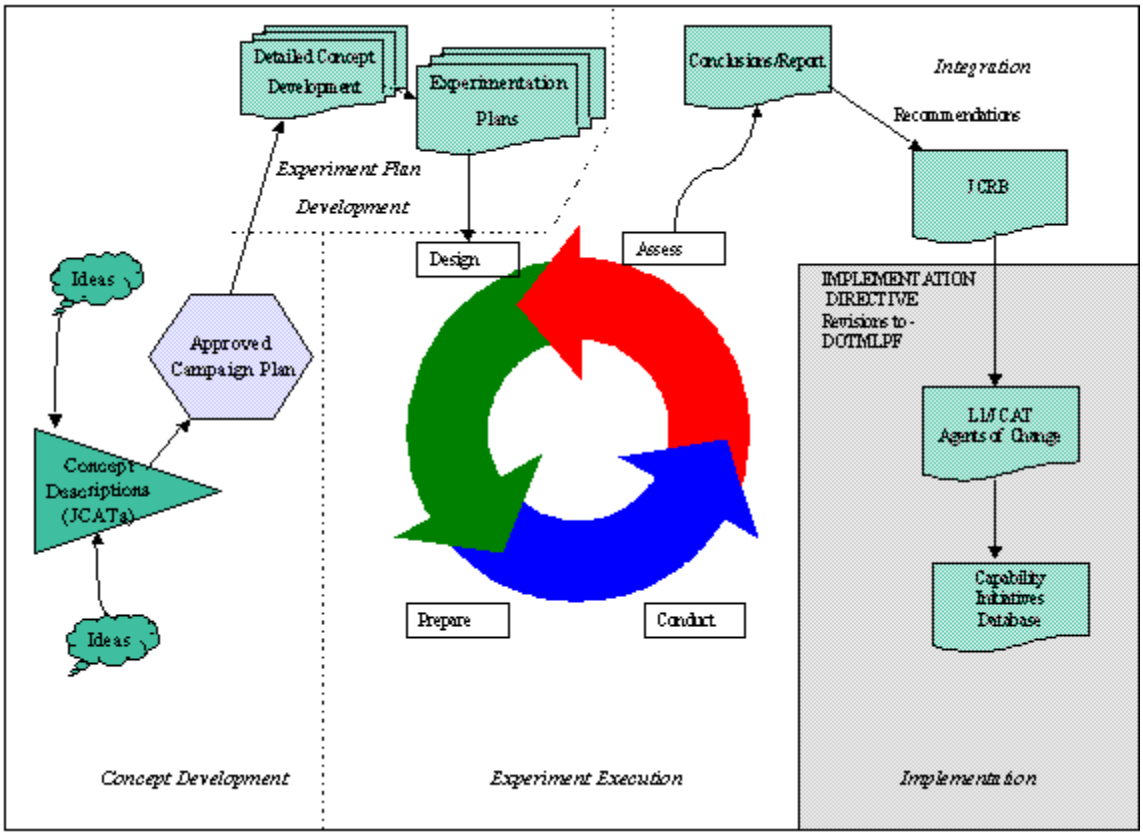

Figure 2: The Concept Development and Experimentation Process.

The functional concepts identified under C2 are Effects Based Operations (EBO) and Common Operational Picture (COP). EBO is such a broad concept for C2 that it is essentially an overarching concept to all the other concepts in the campaign plan. When applied to strategic C2, it impacts the current force structure and doctrine dramatically for headquarters at the strategic and operational levels. It is also significant that this concept is on the transformation agenda of some of Canada's Allies. The COP concept is focused on the information required to provide situational awareness at all levels of activity from tactical to strategic.

The functional concepts identified under I2 are Operational Net Assessment (ONA) and Integrated ISR Architecture. The ONA concept is based upon the US Joint Forces Command ONA concept that uses information from a broader base of sources than traditionally used for military intelligence to assess the situation in a region. ONA in the US context is closely linked to EBO and is considered an essential step in effects based planning. The Integrated ISR Architecture concept is the investigation of the future ISR architecture required to support seamless and nearly automatic tasking and transmission of ISR assets and products respectively a the future military environment that is seen to be global, coalition and responsive.

In summary, in an era of reductions, the recognition of the Revolution in Military Affairs (RMA) and the need for transformation has resulted in an unprecedented allocation of

resources to analysis activities in the form of CD&E. With EBO at the top of several nations' programmes, there is an opportunity to use experimentation instead of fieldwork to develop methods for the analysis of compliance and peace building. The remainder of this paper explores this possibility.

DEVELOPMENT OF ANALYSIS METHODS

Operational research methods are often seen as making a significant contribution to the spectrum of experimentation methods and tools. Seminars games and wargames are tools long used by the operational research community that are already identified as key experimentation tools. One of the challenges in the development of analysis for compliance and peace building is to validate the methods. Too often the analysts have no alternative except to use real operations. The creation of experimentation centres provides the opportunity and resources to test analysis tools in experiment or exercise scenarios. This discussion focuses on the experimentation that could occur using personnel with appropriate expertise and/or field experience to explore the validation of new analysis tools or methods.

Fieldwork will always be the most realistic environment for the development of analysis tools and methods, especially for the very complex issues like the recovery of a region after a conflict. The work, however, is iterative. Methods and tools need to be tested and validated in different situations and the opportunities for this will be constrained by real world events. A further complication is access. An organization pursuing a certain line of development may not be invited or be able to support all of the operations suited their research.

Experimentation is an alternative to real world operations. It has both advantages and disadvantages. The big advantage is that events can be planned and scheduled. If the development of certain tools and methods is the objective, goals and timelines can be set. Development can proceed at a controlled and relatively predictable pace. The main potential disadvantage is realism. The experiment will rely heavily on the quality and experience of the developers and players. Even then, when it comes to problems like compliance and peace building, it will be very challenging to create the recovery of a region and the behaviors of all the factions that live there.

EBO: AN OVERARCHING CONCEPT FOR OPERATIONS

EBO as an overarching concept for operations creates several new requirements for planning, data collection and analysis in real world operations. In a typical mission-planning environment, Commander's intent is translated into objectives and then options are examined to select the most appropriate military action to achieve the objective. EBO goes one step beyond this requiring that planners examine causal linkages and effects to the action proposed in the current situation. Essential to this examination is the development of a comprehensive picture of the opponent and the environment in which the operation will be conducted. This may be described as a "systems of systems" approach to understanding the region and the people.

EBO analysis should indicate the direct effects resulting from proposed actions as well as second and possibly even third order effects. This will provide planners with a broader appreciation of the consequences of potential actions and may show instances where there will be un-welcomed or counter-productive side effects. The EBO concept proposed by US Joint Forces Command, reference 1, also describes the application of non-military capabilities to achieve desired effects and the examination of own forces capabilities in the assessment of effects and the development of an effects based plan.

Consider a Peacekeeping mission. After the initial planning and deployment, planning continues on a regular basis as the situation evolves and new forces are brought into the region. Analysts are may employed in or near the region to assess data collected on compliance and the return to normalcy. They, in turn, advise military planners who select the actions to enhance peacekeeping efforts. Military planners employing EBO would employ a broader range of information sources than they do traditionally. They would require analysts (or fellow military staff) to perform a broader range of analyses that in turn will generate a requirement for a very broad range of data to be collected. Certainly for any peacekeeping mission, information pertaining to compliance and peace building would be a part of this collection.

EBO EXPERIMENTATION AND THE DEVELOPMENT OF ANALYSIS METHODS

Now consider the experimentation to test this EBO concept. Given the importance of the EBO concept and the scale of resources being allocated to experimentation, it should be possible to set up events of considerable size and fidelity. EBO experiments will be needed that examine the primary missions to which this concept may be applied. Peacekeeping will be high on that list. So, consider an experiment with a peacekeeping scenario, staffed with military and subject matter experts with experience in real world missions. With a mature EBO concept and realistic mission data, experimenters would need to develop the capability to simulate or model the recovery of a nation.

The data collection and analysis required to validate the EBO concept will create a requirement to develop Measures of Effectiveness (MOEs) and Measures of Performance (MOPs) related to the response of the region to the operation. The experimentation will also create a requirement for models of political, economic and social stability. Since the objective of EBO is to choose courses of action that have the best effects, EBO in a peace operation should lead to choices that promote recovery. Models that support EBO in these operations should, therefore, also be relevant to the analysis of compliance and peace building.

If the preceding assumptions in this section are correct, then EBO experiments employing peacekeeping scenarios can also be used to test analysis methods for compliance and peace building. In fact, the new models needed to support EBO should contribute directly to analysis for compliance and peace building. The process should begin with the development of appropriate scenarios. Realistic scenarios will only be developed through a significant investment and with the assistance of experts with a wide variety of skills. A systematic understanding of the environment is also essential. During the Cornwallis VI conference, the need to model the recovery or failure of the political, social and/or economic systems of a

country to better understand the key factors in these processes and design indicators for field work was presented by S. Hansch (reference 2). Other discussions from Cornwallis VI, reinforced the need for such models and the need for new equations for operational research on OOTW and on Peace Operations.

CONCLUSION

As the EBO concept challenges military planners to expand their activities into new areas, perhaps so should OR practitioners. To support the EBO concept, OR analysts should look at beyond the normal disciplines to economics, behavioral science, and political science, for example, in order to develop OR models for future operations. The OR community should seek out experts that can provide insights into these subjects as they relate to a region of potential interest.

The development of experimentation capabilities is providing a new avenue for the development of analysis methods, models, and simulations. The international and collaborative nature of this new activity provides opportunities for partnerships to address common analysis challenges. The example discussed in this paper shows such an opportunity, where the experimentation community has a challenge to which resources will be applied that can serve other purposes at the same time.

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