Chapter 4: Capability-Based Planning and the Royal Canadian Air Force

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IMPORTANT INFORMATIVE STATEMENTS

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CH04

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John A. Steele

CH04 Table of Contents

Introduction

Of the set of enterprise resource management (ERM) challenges facing the Royal Canadian Air Force (RCAF), arguably the most complex and surely the one most fraught with uncertainty is ensuring that the RCAF is able to do what Canada will require of it in the future. Part of the challenge is that the RCAF is only one of the Canadian military services[1] that, in combination and jointly, provide the military capability by which the Canadian Armed Forces (CAF) undertakes to meet its commitment to be strategically relevant, operationally responsive and tactically decisive.[2] Beyond this, the CAF operates successfully only with comprehensive support from the Department of National Defence (DND) institution, which faces its own operational and capability challenges, while complying with federal administrative policy and implementing the Government of Canada's (GC's) horizontal initiatives, i.e., those cutting across many federal departments. In developing what it likes to call air power, the RCAF must also make best use of evolving technology, anticipate adaptive military threats, accommodate changes in operational environments around the world, act in accordance with changing political realities, and deliver within imposed resource constraints.

The purpose of this chapter is to provide a convenient reference to publications[3] that reflect Canadian capability-based planning and RCAF force development (FD), along with interactions between them, and some implications. The intent is to develop a better understanding of the opportunities and challenges associated with developing a fully integrated force development system as part of sound ERM.

The chapter begins with a brief summary of the defence organization, followed by an introduction to FD, and then discusses the concept of capability-based planning (CBP) as an approach to whole-of-force development, along with the basic rationale for CBP. The chapter then outlines Canada's experience using CBP and the current state of CBP, including some of the lessons observed and ERM activity developed in response. Further on, a short summary is provided of work done within the RCAF to develop complementary processes for identifying, planning and ultimately delivering the air force that Canada will need in the coming decades. Subsequently, the state of linkages between CBP and the RCAF is explored, and a brief assessment is provided. At the end of the chapter, the current situation is reviewed from the perspective of more fully integrating the CBP process with RCAF FD processes and those of Canada's other military services.

To clarify the terminology for readers outside DND, Figure 1 shows how the senior levels of the Department are organized. The highest level of professional leadership is provided by the Deputy Minister (DM) and the Chief of the Defence Staff (CDS), who is Canada's only equivalent to an American four-star general, and is said to lead at Level Zero or L0. Green blocks indicate military-led organizations reporting to the CDS; blue blocks indicate civilian organizations reporting to the DM; and the white blocks in between indicate organizations reporting to both, with each leading a Level One (L1) organization. The senior L1 is the Vice Chief of the Defence Staff (VCDS), who is considered DND's resource manager.
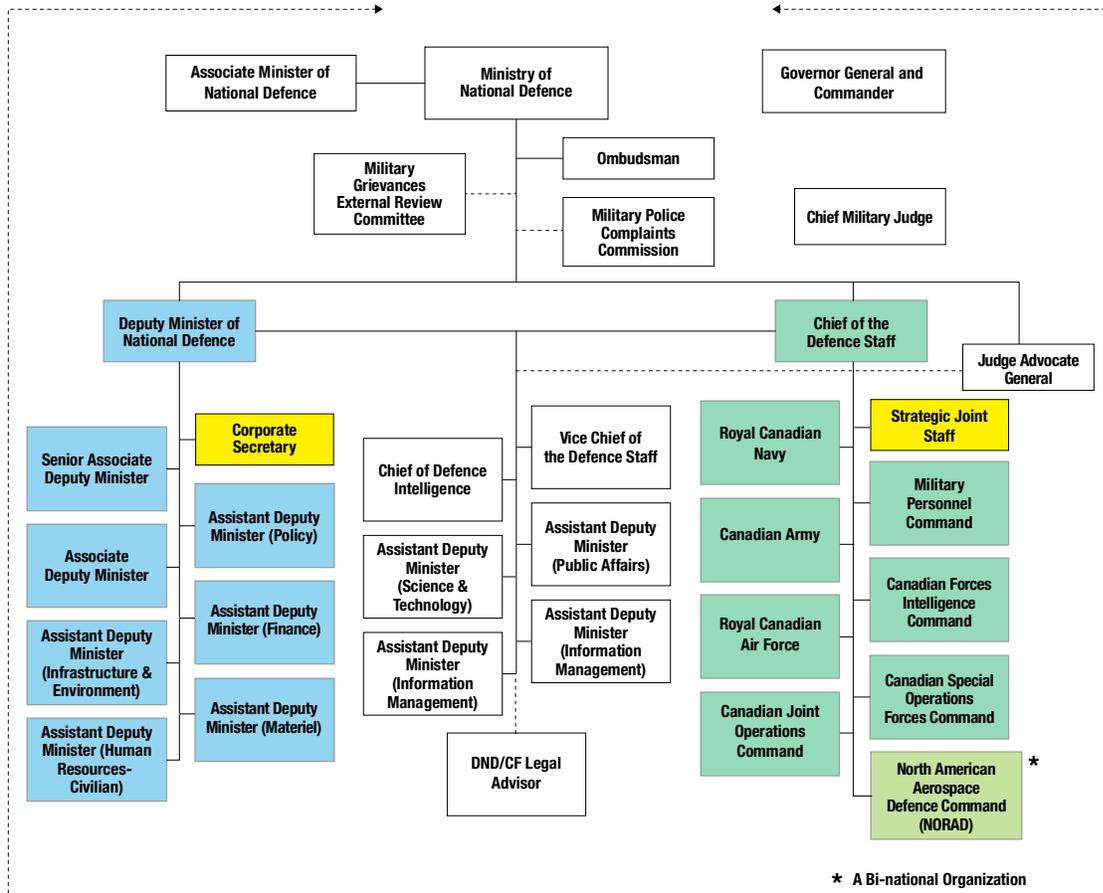
Figure 1. Senior DND organization chart [4]

Force Development

Force Development is the current term used for the process whereby services and the CAF draw up and execute plans to develop their military capability set. According to the Defence Terminology Bank, FD "is a system of integrated and interdependent processes used to identify, conceptualize and implement necessary changes to existing capabilities or to develop new capabilities."[5]

The term is not broadly used in this sense outside of the CAF, except within the United States (US) Army. It came into usage around the time when futures methodologies began to inform how the CAF should develop. In the Canadian context, the term Force Development supplements older related terms, such as Force Generation (production of military force elements) and Force Employment (military operations delivering command, sense and act effects), and more recently Force Support (military operations delivering shield and sustain effects, more or less) and Force Management (institutional support, in a broad sense), to make up what is known in Canada as the 5F model, provided by the Canadian Forces (CF) Transformation Team and reported in Lieutenant-General (LGen) Andrew Leslie's *Report*

on Transformation 2011.[6] Although it had been developed further by 2013, the 5F model was still not well suited to supporting holistic analysis of the defence team. Its design consistently failed to track either the creation of value for defence, or specific process interdependencies. While its headings appeal to a military-centric mindset, it shed no light on the comprehensive dependence of military capacity and operations on defence institutions. The 5F model has since been further developed and used by the Royal Canadian Navy (RCN) to manage its activities, although the author has no information on the nature of this extended development and use.

For the most part, capability management and changes within the CAF are embodied in projects initiated and advanced by the service that naturally owns the capability, i.e., that owns the force elements logically delivering the corresponding capability effects. Since such advances routinely require capital investments for new or improved military equipment, and because capital procurement processes are assigned to stages and are quite elaborate, the centrally imposed process requirements are incorporated into the project approval gates set out in the Project Approval Directive (PAD).[7] This Project Approval Process (PAP), in its most generic form, goes through five phases with approval gates at each phase transition point, as shown below in Figure 2. First, access to capital spending authority normally occurs when a project enters the Definition phase, during which capital funding approval is required at different levels, depending on the total cost of procurement. Service commanders can allocate funds for projects with a value of up to $1M; the Deputy Minister can approve funding up to $5M; larger procurements require the approval of the Minister of National Defence or of the Treasury Board.

The approximate number of projects put through the PAP within a given service at any given time tends to be 100 or more, although this will also include investments to improve non-operational processes such as flight-training simulators and more institutional processes.

FD includes both the activities conducted within the military services as they determine and develop the force they want to become, and the central decisionmaking processes by Chief of Force Development (CFD) staff under the VCDS that prioritize capital investments and other resourcing decisions that support and enable the delivery of these future forces.
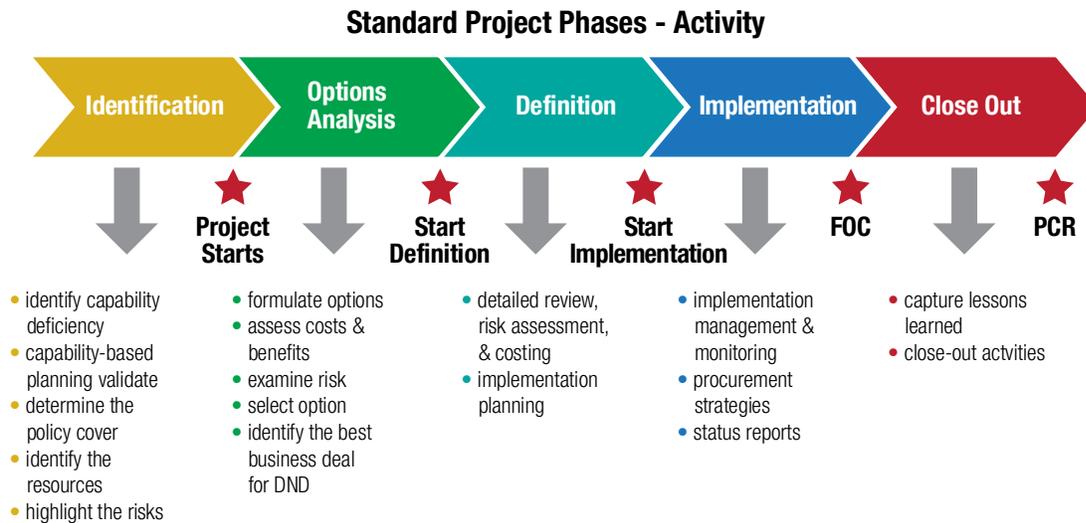
Standard Project Phases - Activity

Identification → Options Analysis → Definition → Implementation → Close Out

★ Project Starts ★ Start Definition ★ Start Implementation ★ FOC ★ PCR

- identify capability deficiency
- capability-based planning validate
- determine the policy cover
- identify the resources
- highlight the risks

- formulate options
- assess costs & benefits
- examine risk
- select option
- identify the best business deal for DND

- detailed review, risk assessment, & costing
- implementation planning

- implementation management & monitoring
- procurement strategies
- status reports

- capture lessons learned
- close-out actvities

Figure 2. DND project approval process[8]

Capability-Based Planning

To quote from the CBP Handbook, a capability is

> the ability to achieve a desired end result. "Capability" is a description of the military operational output or outcome that a unit, force or organization is able (and usually constituted or organized) to deliver. Within the context of CBP "capability" is further defined as the ability to contribute to the achievement of a desired effect in a given environment within a specified time and the sustainment of that effect for a designated period.[9]

Thus, capabilities are intrinsically hierarchical constructs that can be broken down into contributing component capabilities that achieve intermediate outcomes. When defined in this way, each of the temporally sequenced and geographically separated assigned tasks that culminate in the achievement of large-scale military objectives and ultimate campaign objectives can be mapped to the employment of capabilities able to carry out the component tasks. Often, different force elements are able to carry out the same tasks in various ways and with different costs, risks, degrees of responsiveness, and logistical support burdens.[10] By focusing on operational tasks defined in terms of the resulting effects delivered in theatre, it becomes possible to achieve a very useful modular understanding of military forces that brings clarity to the trade-space in strategic resource allocation.

To illustrate how capabilities can be usefully defined, Table 1 shows the top level of the capability taxonomy used to support the analysis underpinning the Strategic Capability Roadmap (SCR) in the first whole-of-force round of CBP conducted under the CFD.[11] Notice that each capability name directly implies or even states the nature of the effects created. Aerospace Effects Production (AEP) refers to the production of operational effects that influence what happens in the aerospace

environment. Also, there are no platforms or specific force packages mentioned. Capabilities are delivered by force elements, which can be thought of as personnel, equipment, and sometimes real property that, working together, make one or more capabilities available to a theatre of operations. The distinction between force elements and capabilities is an important one in Canadian CBP, although their definitions may vary between nations and even between communities within the CAF, and this can easily lead to confusion. Major platforms serve as a natural basis for defining many force elements, and each element will make available capabilities as numerous as the separate tasks it is able to complete. This is not to imply that there are no dependencies on capabilities delivered by other force elements in the course of delivery of a force element's own capabilities. While a fighter aircraft provides many different capabilities in the CBP sense, only some of which are unique to that platform, other force elements set some of the conditions for the fighter aircraft's success.

Domain	Capability
Command	Command Support
	Communications
	Joint Effects Targeting
Sense	Intelligence
	Surveillance and Reconnaissance
Act	Aerospace Effects Production
	Land Effects Production
	Maritime Effects Production
	Special Operations Effects Production
	Non-Kinetic Effects Production
Shield	Force Protection
Sustain	Sustainment
	Support Services
	Movements
	Theatre Activation and Deactivation
Generate	Force Generation

Table 1. Top level of the capability taxonomy used in the SCR[12]

Each capability listed in Table 1 was further broken down into a hierarchy of functions, then activities, and finally, examples of activities. The specific breakdown of AEP is shown in Table 2. In aggregation, the breakdowns of each item in Table 1 came later to be called the Joint Capability Framework (JCF) for the cycle. Note that the way the items under Functions and Activities are defined adheres closely to the principle that capabilities should be defined according to the tasks they are able to accomplish or the end state they achieve. Again, no identifiable force elements are named in the table, but only

things that may need to be done. Furthermore, Examples of Activities include some that are not owned and provided by force elements belonging to the RCAF, such as Ground-Based Air Defence and Covert Operations. Conversely, there are RCAF capabilities that do not fall under AEP, such as Strategic Lift (Movements) and Close Air Support (Land Effects Production). CBP is most powerful when applied across an enterprise.

Capability	Functions	Activities	Examples of Activities
Aerospace Effects Production	Deny aerospace to the opposing force (OPFOR)	Defend friendly aerospace	Conduct air intercept
			Conduct defensive counter-air
		Defeat OPFOR aerospace assets	Conduct ground-based air defence
			Conduct anti-air warfare
			Conduct fighter sweep
	Provide freedom of manoeuvre in the aerospace	Combine forces for operations (ops)	Provide aerospace control
			Conduct combined air operations
		Destroy or suppress OPFOR aerospace assets on the ground or at sea	Conduct suppression of enemy air defence
			Conduct covert operations
			Conduct suppression of surface-to-air and surface-to-air missile threats
			Conduct offensive counter- air
		Protect own aerospace assets	Conduct air escort
			Conduct combat air patrol
			Monitor aerospace

Table 2. SCR decomposition of aerospace effects production[13]

It is worth noting that the power of the capability concept is now a well-accepted part of private-sector strategic analysis and plays a central role in the business architecture discipline.[14] It should not be surprising that the need to generate the right kinds of value efficiently and consistently as part of an enterprise strategy for success in a specific market context parallels, in most ways, the need to develop a military force for successful long-term national defence and security. Since capability concepts are as relevant in the private sector as they are in the defence sector, this report will single out the defence use of these concepts by referring to military CBP.

To further broaden the capability concept, while the CAF conducts operations around the world and maintains a sufficient number of prepared but undeployed forces to ensure near-term responsiveness, the DND institution is continually delivering its own operational outputs to achieve specific outcomes. The civilian (or predominantly civilian) portions of DND carry out a myriad of separate tasks that

produce desired effects within specific organizational contexts within specified time frames, and are able to sustain those effects for designated periods, and sometimes permanently. These tasks include more generic forms of training, the management of real property, materiel, information systems, communications, finances and procurement, as well as the coordination required for any organization that is part of a large complex enterprise. These parts of the defence team must adapt to corresponding changes in their own environments. Thus, the concept of an institutional capability is every bit as relevant to DND as military capability concepts are to the CAF. However, the CBP concept does not yet play a visible role in civilian workforce development.

A succinct and highly influential definition of CBP[15] is provided in Paul Davis' distillation of a decade of contributing work from the RAND Corporation: "Capabilities-based planning (CBP) is planning under uncertainty, to provide capabilities suitable for a wide range of modern-day challenges and circumstances while working within an economic framework that necessitates choice. It contrasts with developing forces based on a specific threat or scenario."[16]

The emphasis of Western military planning in recent decades has shifted between designing in order to respond to a small number of apparent threats (as was the case during the Cold War) and designing for a broader range of less certain threats requiring a wide variety of types of military response. Influencing this shift is the apparent predictability of future military roles. During the latter stages of the Cold War, when global power hostility dominated strategic thought, the West perceived a clear existential threat and trained and equipped its forces to address the principal military challenge,[17] which was fully circumscribed in detailed computer simulations. Military planning was dominated by a single threat spanning a single scenario with well-developed variations. With the collapse of the Soviet Union, a vast corpus of strategic planning analysis lost most of its near-term relevance, and the realization emerged that the new top problem to solve was military planning under uncertainty. This brought into sharp focus the importance of managing force versatility and refining the breaking down of various military problems into their component parts, so that a modular approach to military tasks could fully enable the development of national forces that are robust in the face of uncertainty.[18]

Military CBP in Canada

Early exploration

Land forces have long embraced capability concepts in their force planning to deal with what is arguably the most complex of the three operational environments.[19] As early as 1995, the RCAF used CBP at Fighter Group HQ in North Bay, Ontario, in response to budget reductions, and, in order to develop the 1994 Defence White Paper,[20] used a Strategies-to-Tasks procedure[21] in a task-based analysis to rationalize the CF18 fleet size.[22] Between 1996 and 1998, Phase II of the Canadian Maritime Forces 2015 Study included modelling of the ability of various fleet options to meet the requirements of stochastically generated sets of taskings requiring distinct capabilities.[23] In 1997, the Directorate of Defence Analysis organized a workshop with participants from across DND to develop a set of force planning scenarios spanning the range of tasks that might be given to the CAF, anchored in the 1994 Defence White Paper as amplified by the 1997 Defence Planning Guidance.[24] The event generated

31 tasks[25] aggregated into 12 scenarios.[26] Shortly thereafter, an approach was proposed that consisted in linking a central CBP process based on initial risk assessments to drive capital planning.[27] By 2001, the CBP idea was well enough known and regarded for DND planning guidance to formally adopt it, along with a new Canadian Joint Task List (CJTL) developed to align with allied task lists. The CJTL would provide a menu of operational tasks to anchor capability definitions in order to bring clarity to the CBP dialogue.[28]

As other western nations began developing and implementing their own whole-of-force CBP, the impetus grew for international collaborations to compare experiences and develop best practice guidelines. Separate and contemporary studies were assigned within the NATO Research and Technology Organization (NATO RTO)[29] and under The Technical Cooperation Program (TTCP).[30]

Full CBP cycles

In 2005, the new CDS General Rick Hillier, on reviewing the recommendations of CDS Action Team 3 (CAT 3),[31] made it a requirement that CBP be institutionalized as part of a centrally driven, top-down approach to FD within DND.[32] This led to the development of a set of scenarios that would bracket the variety of anticipated future threats,[33] and to the development, validation and use of procedures and analysis in order to use force planning scenarios to identify capability deficiencies. By October 2007, four scenarios had already been analyzed for capability shortfalls when the task was assigned to go from there to a set of prioritized investments based on completed scenario analyses. The task of completing the scenario analysis, developing a way to complete the task and the needed supporting tools, and then execution was successfully accomplished in ten months by a fully integrated team of military officers and defence scientists.[34] The result was a departmentally endorsed list of capital projects called the SCR that informed the 2009 DND Investment Plan (IP).

From 2010 through 2012, a second full round of the CBP process was implemented by the Director Capability Integration (DCI), reporting to the CFD's Director General Capability and Structure Integration (DGCSI), with support provided by the Strategic Planning Operational Research Team (SPORT) of Defence Research & Development Canada's Centre for Operational Research and Analysis (DRDC CORA), as requested. The second round was carried out in three phases fairly similar to those shown in Figure 3, taken from the CBP Handbook,[35] but with some differences. DCI staff revised the menu of capabilities, called the JCF, starting from a set of capability domains (Command, Sense, Act, Shield and Sustain) that each break down into specific capabilities at progressively lower tiers. During this round, 114 capabilities were evaluated.
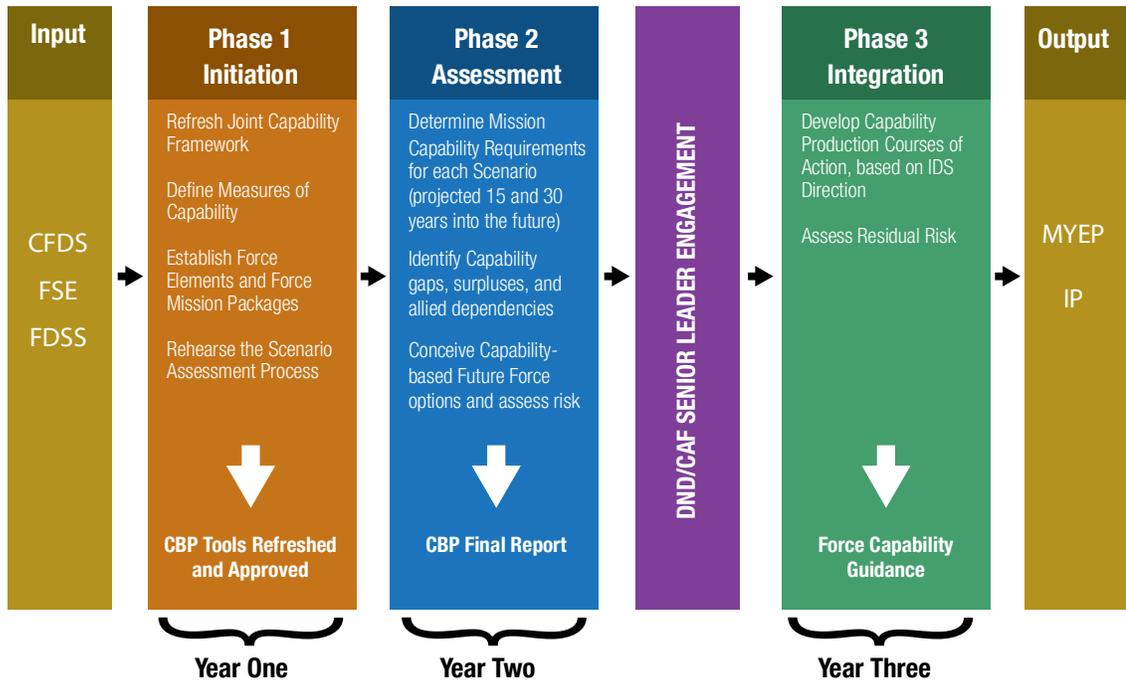
Input	Phase 1 Initiation	Phase 2 Assessment	DND/CAF SENIOR LEADER ENGAGEMENT	Phase 3 Integration	Output
CFDS FSE FDSS	Refresh Joint Capability Framework Define Measures of Capability Establish Force Elements and Force Mission Packages Rehearse the Scenario Assessment Process ↓ **CBP Tools Refreshed and Approved**	Determine Mission Capability Requirements for each Scenario (projected 15 and 30 years into the future) Identify Capability gaps, surpluses, and allied dependencies Conceive Capability-based Future Force options and assess risk ↓ **CBP Final Report**		Develop Capability Production Courses of Action, based on IDS Direction Assess Residual Risk ↓ **Force Capability Guidance**	MYEP IP
	Year One	**Year Two**		**Year Three**	

Figure 3. Current CBP process[36]

An FD Scenario Set (FDSS) of eight scenarios was developed to align with the six mandated missions of the *Canada First* Defence Strategy (*CFDS*):[37]

- conduct daily domestic and continental operations, including in the Arctic and through NORAD;

- support a major international event in Canada, such as the 2010 Olympics;

- respond to a major terrorist attack;

- support civilian authorities during a crisis in Canada such as a natural disaster;

- lead and/or conduct a major international operation for an extended period; and

- deploy forces in response to crises elsewhere in the world for shorter periods.

The scenarios were drawn from a Future Security Environment (FSE) document.[38] During Phase 1, military staff under the DCI developed operational objectives and force packages (consisting of force elements) to meet the requirements of the scenario crisis, and those of any allied forces assumed to make up the notional coalition. Operational planning procedures were tailored to the CBP activity that consisted in identifying necessarily distinct lines of operation, and the implied sequence of decisive points on each planned line of operation.

The steps in Phase 2 were carried out by Joint Capability Planning Teams (JCPTs) consisting of officers and non-commissioned members (NCMs) reporting to the DCI, plus subject matter experts in each service and from across the Department. The teams discussed scenario dynamics before assessing at each decisive point the appropriate measure of capability (MoC) values for the employed capabilities. In Phase 2, each capability provided by the force packages was assessed and rated for its importance to mission success (Mission Critical, Mission Essential, Mission Routine or Not Allocated) and for the adequacy of the force elements to provide the needed effects (No Capability, Ad Hoc, Matched or Affluent). Throughout this activity, free text comments were collected in order to compile qualifications with respect to judgments and important underlying considerations. However, the analysis did not specifically take into account investment costs or divestment savings, and referred only to the requirements indicated in the generated capability analysis. The CBP Final Report was produced, feedback was received from senior leaders, and Force Capability Guidance (FCG) was issued. The final report included specific capability recommendations, each with a description of related capabilities that needed specific investment, sustainment or divestment, and the context warranting the action, although the specific content of both documents is classified.

One of the realizations that emerged in 2012 from more than one source[39] was the need for more military personnel in operational units. However, the fiscal constraints of the time made it unlikely that the GC would authorize CAF growth beyond its approximately 68,000 regular force positions.[40] Consequently, the positions required would have to be created by removing less critical military positions in each service and within the DND institution that were freed up through some combination of reassignment of work to civilians, alternative service delivery, business process innovations, and assumed risk. The establishment changes required to make this adjustment were to be set out in the Multi-Year Establishment Plan (MYEP), a five-year schedule for reallocating positions between organizations that was to be reviewed every three years. The development of an analysis able to identify a suitable supply of institutional military positions to be reallocated began in earnest in September 2012, and two reports were submitted in the spring of 2013.[41] The recommendations in the analysis as to how to source the needed positions categorized the supply by organizational activity, but did not address interdependencies between organizations. The author's report documenting the initial MYEP position sourcing analysis[42] outlines alternatives for a more holistic and compelling analytical approach. With the complexity of the problem recognized, an interim approach based on fairly sharing the burden of giving up regular force positions was adopted, and a more robust analysis strategy was developed.[43] In summer 2016, DND formally endorsed the development of a more integrated strategy for defence team human resource management[44] in order to ensure holistic analysis and treatment of the risks involved in reallocating military positions from more institutional to more operational roles.[45]

The most recent three-year CBP cycle began in the fall of 2013, and once again followed the pattern in Figure 3. A rewritten FSE document[46] focused less on the broad circumstances that may arise in the future and more on those of specific military consequence, and is thus a document better suited to supporting FDSS development of ten scenarios spanning the six *CFDS* missions. Six MoCs were defined, including Scale, Survivability, Reach, Persistence, Responsiveness and Interoperability. The Scale MoC was intended to assess the basic effectiveness of the capability, which is difficult to do with a single scale for all capabilities. Therefore, four subcategories of capability effectiveness were developed

(lethality, command and control, sustain, and generic) in order to better accommodate the diversity of capabilities to be assessed. Each MoC consisted of seven levels, although only Reach, Persistence and Responsiveness had anchored scales (e.g., Instant, Seconds, up to Months). The other MoCs had unanchored, descriptive scales (Very High to Very Low).

Phases 1 and 2 have produced their respective outputs,[47] but a plan for operational force structure capacity analysis using stochastic modelling was postponed because of the change in government and the announcement of a Defence Policy Review (DPR).

A graphic shown in Figure 4, produced by Paul Massel,[48] provides an overview of the changing methodology used for military CBP as practised within DND. It shows separate instances of its application with numbers defined, not according to full cycles completed, but according to separate adjustments and refinements of the methods used to carry out CBP, including the development and use of new tools to support them. Thus, the first full cycle involved the development and implementation of spirals 4 and 5, while the second cycle was the result of spirals 6 and 7. Spiral 8 represents the third full cycle, ending with a final report expected by the end of 2016, and in accordance with CBP process requirements, a Force Capability Plan (FCP) sometime later. However, the standard process may play out differently in light of the government's DPR, the completion date of which is unknown at this writing.
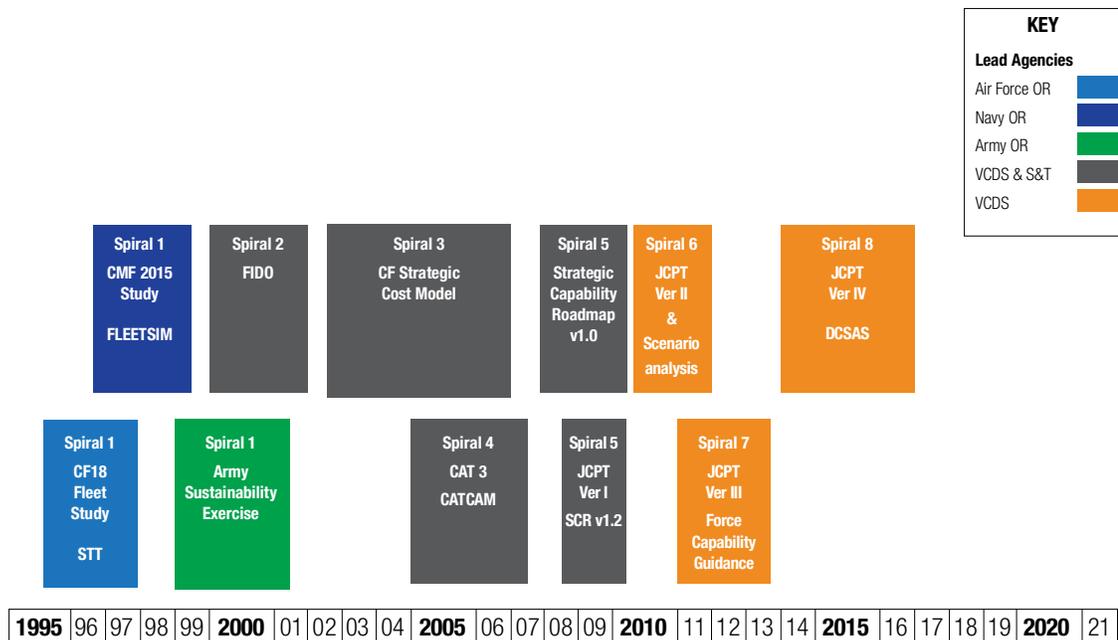
Figure 4. 20 years of CBP development in DND[49]

A Mature Generic CBP Model

A follow-up report to the 2003 TTCP technical report, written by Dr. Ben Taylor,[50] provides a useful CBP overview of particular successes and practical challenges to the institutionalization of CBP. In the report, he provides a generic CBP process diagram showing the logical flow of information and inputs that lead to an affordable, balanced set of investments that in turn result in the delivery of materiel and enable forces of optimal capability to deal with expected operational demands, which is Figure 5. The red-coloured top item illustrates input from above the defence organization. Gold-coloured items are essential inputs to the CBP process that produce the gray items in sequence, culminating in the blue coherent national force development plan informed by both resource constraints and risk.

Unique Features of Canadian Military CBP

It is instructive to compare Figures 3 and 5 and to focus in on some of the distinctive features of the Canadian CBP process. Elements common to both, beginning in Phase I, are the initial government guidance—i.e., up until the end of the most recent federal election in the fall of 2015, this was the *Canada First* Defence Strategy (*CFDS*)—and documents describing the future security environment (FSE). CFD guidance shapes the selection and definition of scenarios to reflect current defence priorities. The Canadian interpretation of Capability Partitions includes the following:

- refresh of the hierarchical taxonomy of capabilities in the JCF;

- definition of MoC scales and values to be used during this round; and

- development of a force element list and selection from it to define force mission packages per scenario.

Phase II begins with the gathering together and process orientation of Joint Capability Planning Team members from across the Defence team. Work begins with scenario analysis and operational planning to identify the operational tasks or lines of operation (LoOs) and the decisive points in each. This constitutes the determination of Capability Goals in Figure 5.
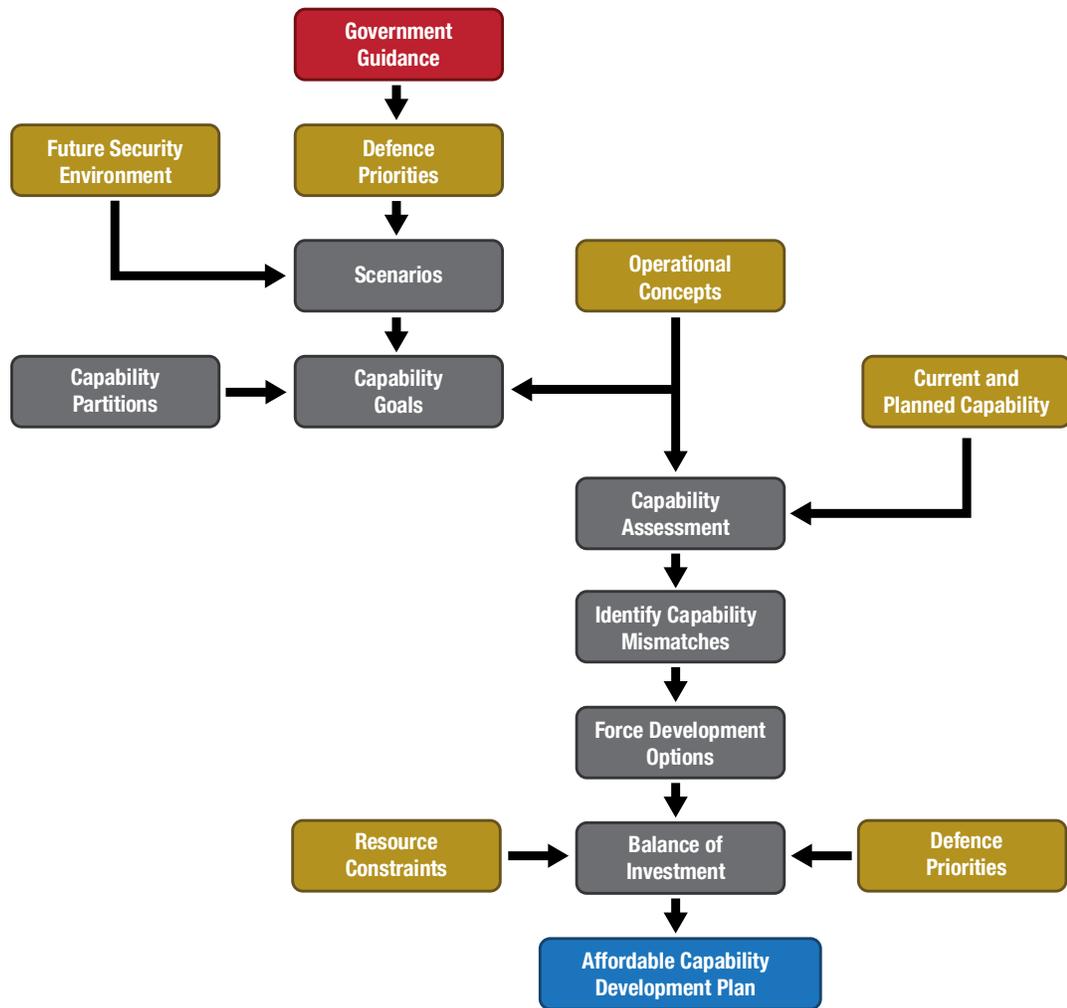
Figure 5. A generic CBP process[51]

The adequacy of the capabilities provided by the assigned force packages is then assessed through group analysis and professional military judgment. A necessary step during this stage is to obtain detailed, specific knowledge of the performance trajectories expected of each capability in what is called the Force of Tomorrow over time, given that capability-enhancing investments have specific dates for the delivery of initial operational capability (IOC) and full operational capability (FOC). Once these steps are completed for each scenario, the Capability Assessment phase is complete.

Then, the team can go to the Identify Capability Mismatches phase, during which it reviews the performance of capabilities across all scenarios in order to identify systematic weaknesses and associated risks. These analyses, combined with the text comments collected from JCPT participants, are used to identify specific FD initiatives suitable for managing the risks identified in the foregoing.

These are the Force Development Options built into the next block. All of these are outlined in the CBP final report, and spelled out in greater detail in the FCG, according to the direction developed through senior leadership engagement.

At this point, the Canadian CBP process diverges from the generic one in that Phase III never addresses Resource Constraints in specific terms. Instead, in Phase III, guidance is developed by capability area and sometimes by specific capability, with each designated as either "Invest," "Sustain" or "Divest." A list is drawn up of "Related Projects" that are sometimes actual projects, but more often platforms addressed by multiple projects. No specific account is taken of total estimated project costs, let alone planned spending amounts by year. The only definition provided as to the meaning of Invest, Divest and Sustain is relative increase in, reduction of or maintenance of capability levels, and these changes might be in quantity, effectiveness, or readiness levels. However, the CBP process as designed stops short of developing an Affordable Capability Development Plan (ACDP) that acknowledges and accommodates resource constraints and addresses specific capital projects. This omission of financial aspects from military CBP in Canada is also a significant divergence from its description in P. K. Davis' *Analytic Architecture for Capabilities-Based Planning, Mission-System Analysis, and Transformation,* [52] which specifically includes choice within an economic framework.

It should be stated that there is at least one good reason for military CBP, as illustrated in Figure 3, *not* to advance all the way to an ACDP. The Balance of Investment used to inform the plan includes all capital investment needs. Excluded from the Figure 3 analysis are other Defence capital investment needs, such as the following: capital equipment used exclusively for military training, such as simulators; recapitalization and improvement of real property used or not used during military operations, such as ranges, training facilities, military hospitals, military accommodations and dining facilities; and, large-scale institutional investments in personnel and resource management systems, to name a few. A good balance of capital investment requires holistic analysis of all competing capital investment needs. Since the scope of military CBP in Canada is much narrower than this, there must be input from other investment analysis processes carried out in parallel with CBP that can be taken into consideration at the same time as CBP results when determining the appropriate balance of investment. Otherwise, balance must be defined *a priori* in terms of capital budget segmentation for planning purposes, and this requires a final validation step where the operational capability risks implicitly assumed by not funding the highest-priority, unfunded, military capability capital projects are compared with the risks assumed by not funding the highest-priority, unfunded, capital projects in other categories.

It is worth noting that during the first full cycle of CBP, completed in 2008 and consisting in the delivery of the SCR, specific candidate investments were processed and placed in rank order.[53] The most immediate impact of the SCR was the foundation it provided for the 2009 IP submitted to and accepted by the Treasury Board of Canada. However, because the SCR did not explicitly deal with institutional capital investment needs, it is not known how institutional capital investment needs were addressed in the 2012 IP.

Another approach that highlights uniquely Canadian aspects of military CBP is to compare it with Davis' distilled definition of Capabilities-Based Planning, provided in P. K. Davis' *Analytic Architecture for Capabilities-Based Planning, Mission-System Analysis, and Transformation*[54] and quoted previously,

which incorporates four key elements: definition and consideration of capabilities; planning under uncertainty; addressing a wide range of challenges and circumstances; and resource constraints necessitating choice. The fourth was just addressed, but the first three merit a brief comment in turn.

The determination to plan in terms of modular capabilities is clearly seen in the requirement to define and update the JCF, which provides the taxonomy of military capabilities, from which the planning process selects those relevant to each scenario. However, the JCF for the second cycle defined a menu of 114 capabilities for use in scenarios, and the third cycle defined 76 capabilities for evaluation. Indeed, the terms for defining the CAFs capability future were changed considerably for the third cycle. While the changes in the JCF for the third cycle may bring real improvement, such changes undermine the transfer of insight between cycles. In principle, JCFs need not change between cycles, because the operational tasks to be carried out by military forces actually change very little over time. What does change is technology and the ways it can be employed to better carry out those tasks. Therefore, capability frameworks of enduring utility are best defined in terms of operational end states achieved. On these, various military services will have less trouble coming to agreement. When that agreement extends to the CFD, i.e., the Strategic Joint Staff who manage force posture and readiness and the service FD communities, the pathway opens up to achieving a commonly understood language for describing future CAF capability attributes across all three horizons.[55] A strong starting point for developing an enduring JCF is the NATO capability framework. If departures from it can be clearly mapped back to it, the investment promises to bring consistency and save considerable work in preparing annual capability reports for NATO.

Paul succinctly surveys the elements of planning under uncertainty in *Lessons from RAND's Work on Planning Under Uncertainty for National Security*,[56] and sets out seven separate strategies for mitigating capability risk and summarizing work done to implement each one. Fundamentals include the need for exploratory analysis of the uncertainty space in order to identify the dimensions most relevant to the success of any plan and the parameters warranting more detailed exploration. Doing so results in much richer future insight than a single-point estimate and enables planning for the purposes of importing flexibility to address mission variations, adapting to various operational settings, and resilience against operational shocks.

Taking uncertainty into account is arguably the most difficult part of the Davis CBP definition to implement. The current DND approach to CBP goes no further than to articulate and explore a main variant of each of the scenarios in the FDSS. While reference is made several times in the CBP Handbook to the need for stakeholders to discuss "critical uncertainties that will drive the scenario vector,"[57] the exact meaning of this phrase is never given. The JCPT judgments all assume one set of scenario circumstances. Thus, uncertainty tends to get lost, resulting in ten single-point estimates of capability sufficiency. Comments from participants often note important dimensions that will affect judgments, but there is no systematic exploration of the possibility space and, therefore, no explicit handling of uncertainty in JCPT judgments.

Efforts to address the wide range of challenges and circumstances that the Canadian military will face go no further than to develop a range of scenarios intended to span the most relevant parts of the operational spectrum, and then assess tailored force packages in relation to each scenario mission.

Less rigorous exploration of possible convergences of future trends could be used to generate a wide variety of brief thought pieces to build a richer sense of the range of challenges and circumstances to be faced, while also helping to explore the uncertainties of the more fully developed FD scenarios.

Missing economic framework

The exclusion of financial constraints from the CBP analysis process may have limited its ability to provide a solid foundation for the 2013 capability investment plan. Upon analysis, the Treasury Board of Canada Secretariat (TBS) would not submit it to Treasury Board without some revisions and departmental commitments to capital investment governance improvements, including a commitment to revisit the question of which of the competing candidate investments would mature in order to proceed through to definition and be allocated capital funding. It was because of this DND commitment to the TBS that the Capital Investment Program Plan Review (CIPPR)25 initiative was set up in 2014, with a mandate from the VCDS and the chief financial officer (CFO) of DND "to undertake a rationalization of all investments at the Identification (ID) and Option Analysis (OA) stages before fall 2104. The aim is to produce a DND/CAF consolidated balanced folio consisting of critical, viable and affordable capabilities representing best value for money as well as institutionalizing a process that will be transparent, repeatable, rigorous and coherent against which all present future investments will be assessed."[58]

In the resulting activity, a model was developed to quantify the value of what each capital project promised to deliver, and a portfolio optimization approach was implemented in order to determine the combination of investments that promised to deliver the best total modelled value for money within the constraints of capital funding remaining to be allocated. Project value was modelled in terms of criteria originating:

- above Defence (including alignment with legislation, government policy and government priorities);
- at the senior levels of Defence (including CBP gaps and Defence Renewal priorities); and
- within project-sponsoring organizations (based upon relative priority that L1 seniors assign among their own projects).

The software developed within SPORT to support CIPPR is called Visual Investment Plan Optimization and Revision (VIPOR),[59] and it continues to generate growing interest outside Defence for several reasons:

- VIPOR uses appealing and illuminating visualizations to characterize candidate projects and constructed portfolios;
- VIPOR is interactive and allows users to manually drag and drop investments into or out of a portfolio and re-optimize around the added constraints, thus enabling real-time discovery of the opportunity cost of any project;

- VIPOR incorporates project dependencies so that a dependent project forced in drags with it others on which it depends, while supporting projects removed will take those they support with them; and

- VIPOR includes a model of project delivery capacity using fiscal proxies for project delivery burden and capacity.

The resulting analysis has since informed the official identification of those capital investments expected to be assigned funding budgets once they mature. This has also clarified which candidate investments are not expected to progress to expenditure authority under current funding levels, thus informing a more efficient assignment of sponsor and central effort to the advancement of major capital projects.

In light of the current approach taken by Canada to CBP, the creation of the CIPPR process was a necessary step for DND to take, since the CBP process stops just short of translating CBP insights into specific investment advice, and because careful consideration must also be given to institutional investments. The CIPPR process—because it considers the full range of departmental investment options and has developed a model of project deliverable value that goes beyond military operational capability—provides the broader analysis that is necessary if the ACDP at the bottom of Figure 5 is to span all major DND capital investments.

While the purpose of central CBP, as stated in the CBP handbook, is to inform Invest-Divest-Sustain (IDS) decision making, the process has fallen short of that mark because of its disconnection from "an economic framework necessitating choice." By taking no account of specific candidate investments and their costs, the process leaves unaddressed issues relevant to investment correction. In addition, the assumptions on which the analysis was based are better suited to identifying gaps in capability planning than in capability investment. This limits its suitability for the purposes of CIPPR, although this outcome is understandable since CIPPR and the decision processes it would inform were both defined after the most recent CBP cycle was set in motion.

A cynic might speculate that military CBP's avoidance of economic constraints was calculated to maintain pressure on the government to provide more funding to make it all affordable, thus excusing military leaders from restraining their own capability appetites, and leaving that task for the more civilian, institutional part of DND. However, a number of events and initiatives within DND over the past few years have shone more and more light on just how closely the interests of the military and civilian parts of the Defence team are linked. A case in point was the MYEP analysis mentioned on page 88. As the dynamics of this interdependency become better understood and appreciated, differences of thought in what is appropriate work for a civilian and for a member of the Forces—many of them more culturally than practically defined—are being bridged. The need for a holistic understanding of the entire organization is receiving increasing attention. As the fiscal constraints continue, there is a growing readiness to explore the actual limits on both CAF and DND capability in more holistic terms. However, the subject of FD in Canada's air force will be introduced first, before we return to enterprise-level capability planning in the last section.

Force Development in the RCAF

General Hillier, who established the central mandate for CBP while he was CDS, is well remembered for coining the term "decade of darkness" to describe the series of cuts to Canadian defence spending in the 1990s that left the CAF much in need of capability investment. That period was only the most recent episode in a longer series of events that still leave a mark on RCAF FD. These events are therefore briefly recounted here before I describe the current state of RCAF FD and its linkages to CBP.

Background

Unification of the RCN, the Canadian Army (CA) and the RCAF in 1968 arguably dealt the greatest blow to the RCAF. Only the Air Force saw all of its professional military education institutions dissolved or repurposed to joint-level functions, as well as several of its fleets placed under the control of other services to provide operational support, while having no environmental command of its own as a counterpart to Mobile and Maritime Command; that is, until 1975, when Air Command (AIRCOM) was established in Winnipeg. From 1968 onward, strategic doctrine and force development effectively ceased, making air force development a matter of system replacement until the Commander of AIRCOM convened an Air Doctrine Symposium in 1984, leading to the setting up of an Air Force Doctrine Board.[60] The Board then oversaw the development of *Project 2010 – A Flight Plan for the Future*, a 25-year FD look-ahead, and a decade later, the more ambitious *Project 2020 – A Flight Plan for Change*.[61] *Project 2020* results were published in three phases over two years, and set out global trends and factors affecting defence planning (Phase I), a vision of required air force missions, tasks and attributes (Phase II), and a plan to achieve them (Phase III).[62] Unfortunately, full release of and action on the plan were pre-empted by the release of the 1994 Defence White Paper and a decade of subsequent federal budgets imposing successively smaller end states for DND that by 2005 had shrunk the RCAF to half the strength that it had at the end of the Cold War, leaving it fragile and greatly in need of a strategic vision to mobilize its own transformation.[63] When DND issued *Shaping the Future of Canadian Defence: a Strategy for 2020* in 1999, the Navy and Army promptly developed their own service versions,[64] while the Director General of Air Force Development (DG Air FD) drafted and redrafted a series of Air Force papers[65] that seemed to respond, but were widely criticized within the Air Force. Its only extant strategic doctrine, *Out of the Sun*, dating from 1996, was rescinded in 2004 without replacement. The crippling and marginalizing reorganization that occurred at the time of unification, followed by only gradual reconstitution in the 1970s and 1980s, and later by 15 years of incremental downsizing, resulted in an Air Force almost completely divested of strategic visioning and force development capability.[66] Although the responsibility for FD belonged to DG Air FD, the organization was further hampered by a series of restructurings (as were much of the air staff) that began coincidentally with the 1999 release of *Strategy 2020*.[67]

Recognizing the serious need for RCAF investment in future air warfare concept development and experimentation (CD&E) leading to strategic development, the Air Force leadership decided in 2003 to set up the Canadian Forces Air Warfare Centre (CFAWC) at Canadian Forces Base (CFB) Trenton to address this void. However, because there was little recent experience and sparse knowledge of the dynamics of strategic FD, attempts to re-establish the capability in a new organization proved chaotic, thus thwarting development and acceptance of the structure, processes and governance necessary for

FD to achieve its objectives. Differing understandings of CFAWC's mandate and conflicting visions for its operating paradigm resulted in an extended struggle to find a footing for CFAWC in proactively exploring future needs and opportunities in air capability development.[68] The RCAF drafted and circulated an "Air Force Strategy" in 2007 that was endorsed by the Chief of the Air Staff (commander of the Air Force) and the CDS for internal use, but not for publication. Neither "Strategic Vectors" nor the "Aerospace Capability Framework" was formally rescinded. A 2009 draft "Air Force Strategy" informed by the *Canada First* Defence Strategy[69] was submitted to the senior DND management committee, but excluded from formal reference by the DND's senior strategic guidance products. As late as 2011, the RCAF still lacked both a functional FD framework and processes for developing, promulgating and monitoring implementation of an RCAF strategy.[70]

In the Foreword to the 2016 *Future Concepts Directive*, Lieutenant-General (LGen) Michael Hood, Commander of the RCAF, provides a succinct and, in light of the above, stoic summary of the current RCAF FD situation:

> Our capstone strategic publication *Air Force Vectors* (AFV) establishes: who and what we are as an Air Force, the air power we output, and our mission and vision. It would seem this should suffice to enable us to proceed with building that Air Force, and indeed historically that is the broad approach we have undertaken. We have used the core Air Force roles to define and build individual fleet capabilities. We have modified existing fleets based on bottom-up ideas related to that fleet. We have replaced expired fleets with modern versions of the same type of aircraft.
>
> This was effective in a paradigm where the technical nature of air power change predominantly remained focused within those same stovepipes of capability; more manoeuvrable and faster fighters, bigger transports, better radars, etc. Consequently, although the RCAF postulated a Conceive-Design-Build-Manage (CDBM) model of force development, the Conceive stage required (and received) little formal attention as an approach of "update and replace" was usually adequate. This is no longer the case, as AFV has identified that the RCAF can only optimally contribute to national strategic effects via a capability-based approach that includes Canadian Armed Forces partners, Government, industry, and other nations [71]

RCAF Strategic Guidance Framework

In the past five years, much progress has been made. The publication of *Air Force Vectors* (*AFV*)[72] ushered in the establishment of a functional strategic guidance framework, setting forth a clear statement of the RCAF identity, the RCAF's place in the CAF, and its mission and core processes. It articulates a vision for the RCAF as an agile, integrated air force with reach and power (AIRPower) essential for CAF operations, defines six core processes that are key to fulfilling the RCAF mandate,[73] and describes a structure for its implementation through a suite of strategic documents that would follow—a Campaign Plan, Annual Planning Directives, and a Future Concepts Directive.

Also published in 2013 and updated in 2015 was the *RCAF Campaign Plan* (CP)[74] providing details of the six LoOs that basically carry out the same core responsibilities listed in *AFV*. The CP includes sub-LoOs with work component milestones, decision points, and key success criteria for the next five years, thus managing the tension between the Sustain and Change agendas. In particular, it fully describes the "Develop and Innovate Air Power" core process outlined in *AFV* so as to include the following, as shown in Figure 6.
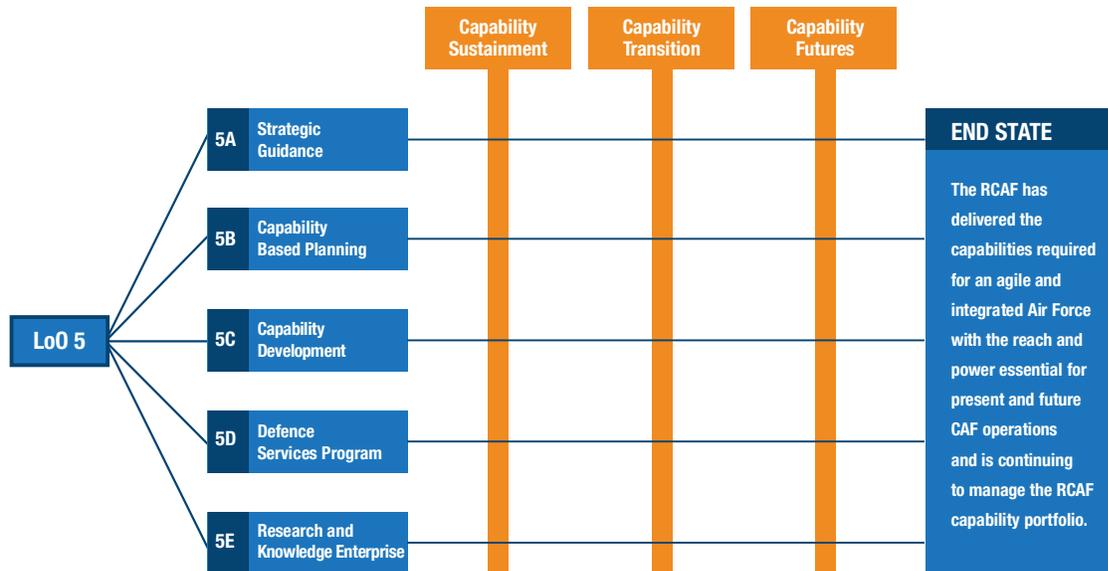
Figure 6. Sub-LoOs of the RCAF force development system[75]

- 5A – Strategic Guidance,

- 5B – Capability Based Planning (support for the CFD-owned process),

- 5C – Capability Development (RCAF development of its future),

- 5D – Defence Services Program (shepherding projects that will deliver the future RCAF through PAP), and

- 5E – Research and Knowledge Enterprise: support for RCAF FD from CFAWC, DRDC, Assistant Deputy Minister (Materiel) [ADM(Mat)] and knowledge generation occurring outside of DND.

Also published in 2013, revised in 2014 and 2016, is the Royal Canadian Air Force *Future Concepts Directive* (FCD)[76] which describes the FD processes used by the RCAF in terms of how they fit into the broader CAF FD context, which is shown in Figure 7. In particular, it focuses on CD&E processes (in the Conceive box) and input to CAF FD from the grey bar at the bottom.

Overarching Defence Planning & Management (DP&M) Framework

CAF Force Development System

CONCEIVE	DESIGN	BUILD	MANAGE
• Government & Defence Policies • FSE • People • Resources • L1 Inputs	• Risk • Balance • PRICIE • L1 Inputs • Ensure project alignment	• Definition & Implementation of projects: IOC & FOC	• In-year Operations • Measuring performance • L1 Inputs

CFDS

CAF/DND Strategy — Capability Based Planning Process — FCG MYEP — VCDS Project Approval Process

ID   OA   DEF   IMP

Force Posture & Readiness Process (SJS)

Lessons Learned / Urgent Operational Requirements / Capability Deficiencies

Figure 7. CAF Force Development System [77]

The FCD also introduces a taxonomy of concept types with type examples, as shown in Figure 8, and includes integrating concepts that may help the RCAF achieve new consistency of action with other allied players in the operating environment.

STRATEGIC CONCEPT

RCAF Future Air Operating Concept (FAOC)

OPERATIONAL CONCEPT

RCAF Future Arctic Operating Concept

RCAF Future Operational Support Concept

RCAF Future Force Generation Concept

RCAF Future Sustainment Concept

FUNCTIONAL CONCEPT

RCAF Core Airpower Capabilities

Future Control of the Air	Future Attack	Future Surveillance & Reconnaissance	Future Air Mobility	Future Support to Joint Operations & Civil Power
				SAR / Battlefield Mobility

ENABLING CONCEPT

Figure 8. RCAF FCD taxonomy of concept types [78]

An example of a strategic concept is the Future Air Operating Concept (FAOC). CFAWC is drafting an FAOC describing how the RCAF will fight in the 2030 time frame, just beyond Horizon 2. The drafting of a FAOC began as early as 2011,[79] although it has been difficult to find the appropriate way to develop a FAOC. A DRDC CORA operational research team supporting and co-located with CFAWC has circulated for comment preliminary drafts of a scientific report setting out a FAOC concept that has gained traction and clarified the desired approach.[80]

RCAF FD Process Advances Under Development

CFAWC is developing a three-force construct that segments the RCAF's future into stages, each associated with force development processes appropriate to its associated degree of uncertainty. The stages are basically defined as follows:

- Force of Today includes the RCAF in being (capabilities of the moment) and plans to improve capabilities of the moment [through] any decision that has currently been made or has been planned with respect to any of the capability components[81] (PRICIE).[82] For example, if the RCAF decides today to complete a life cycle upgrade on a platform in 20 years' time, it is making a force-of-today decision even though the actual activity takes place in the future.

- Force of Tomorrow [is informed by] work to determine if current decisions are valid. Example: Ongoing analysis of the decision to conduct the life cycle upgrade. Over time, things may occur where the upgrade is conducted sooner or later, or the equipment is replaced because of a change in requirement or capability component.

- Future Force [is informed by] analysis of the FSE and the future operating environment (FOE) in order to establish capability requirements for the Force. Example: Based on new required operating concepts, technology advancements and personnel requirements, the Force requires new capabilities or modified current capabilities.

The criteria distinguishing the Force of Today from the Force of Tomorrow are important to understand and merit some discussion. The example offered under Force of Today, i.e., a decision to "complete a life cycle upgrade on a platform in 20 years' time" must be understood as a decision to commit funding to a life cycle upgrade, not just to a plan to carry out a life cycle upgrade. This is important because the RCAF or any service can only carry out minor capital projects under its own expenditure authority limits, currently defined as capital investments with procurement costs lower than $5M. This means that larger capital projects, even if they have the strongest possible support from the Commander of the RCAF, will only be delivered if they win in the cyclical competition[83] for limited amounts of uncommitted capital funding, mature to enter the Definition phase, and obtain GC agreement with senior Defence endorsement of the project's request for expenditure authority to carry out its plans. A change in the decision to upgrade the air frame may be initiated by the RCAF upon a review of RCAF priorities, but it might also originate with the GC if the expenditure fulfils a vision not shared by the government in power (e.g., the Chrétien Liberals' cancellation of the EH101 Sea King replacement), or is otherwise seen to hamper the achievement of major political objectives. So, it is not the RCAF's or even the CAF's Force of Today; it is the GC's Force of Today.

In order for FD decisions by the CAF, and ultimately by the GC, to develop the CAF required to meet future operational challenges, these decisions need robust support. The detailed operational constraints, the conceptual foundation, the tactical logic, and the capability dependencies taken into consideration in service FD capability investment plans need to be made meaningfully available to CFD as the central capability authority, to the CAF capability manager, to those persons building and assessing national capability plans (CFD), and to those persons who must authorize sound investment decisions. These facts highlight the importance of an integrated FD system. Successful execution of the CBP process depends on a clear understanding of how and why specific capability investments will prepare the CAF for the future.

An influence map outlining how the knowledge and plans of other defence stakeholders should have a bearing on RCAF development over all three time horizons has been developed with DRDC CORA support at CFAWC and is shown in Figure 9.[84]

The framework reflects a great deal of holistic thinking about the wide variety of references that need to be used in RCAF capability planning. The line leading to the right from the VCDS block in the top-left corner acknowledges the role of CBP and CBP products on CAF FD and the impact that government decisions taken during the Defence Policy Review can be expected to have on the vision for the RCAF.

Figure 9. A process construct under development at CFAWC using the RCAFs of Today, of Tomorrow and of the Future

The figure also shows, in a downward direction from the VCDS box, the important roles that other central FD products play in establishing the visions for joint capability infrastructure that each service should plan to accommodate and exploit in future operations (about which more will be said in the next section). Near the middle, just below the CBP process blocks, the RCAF's role in future joint Canadian operations is acknowledged in the explicit reference to the future concepts of the other Canadian military services. The blocks below this acknowledge that the bulk of RCAF operations abroad will be with one or more of our closest allies. In addition, capability advances are seen to routinely require technological advances that are achieved commercially, and academia and Canadian defence scientists can play critical roles in furthering, developing and incorporating these advances into future military systems.

The framework also clearly shows the separate process levels needed to support robust decisions that will deliver the air power needed for Canadian defence in the future. The top layer in each of the Conceive, Design, Build and Manage blocks depicts the specific categories of input needed, while the bottom layer describes required outputs that need to supply FD work being done by other players within and outside the RCAF. Lessons learned from building and managing the RCAF of Today must be used to inform both the RCAF of Tomorrow and the Future RCAF.

It will be important to develop the internal structure of the conceptual option space of the Future RCAF very carefully. In the conceptual option space, the idea of long-term, task-based capabilities becomes very important so as to escape the "system replacement" mindset to which FD thinking defaults without fulsome concept development. The creativity needed to enter and vigorously explore the option space that accompanies the FOE will produce competing, overlapping and mutually inconsistent concepts that will muddle the boundaries implied by existing air concepts. They will require analysis and testing to fully define, distill and de-conflict them. In addition, numerous concepts must be developed in order for CD&E to qualify and enable downward selection to only the strongest, mutually compatible candidates. In fact, the absence of such overlap and inconsistency should be seen as a clue that operational imagination has hardly entered the conceptual option space at all.

The RCAF narrative during the last 12 years can be understood as a struggle to implement the processes in the box labelled Conceive the Future RCAF. Without that box, Air Force development is stranded in the "update and replace" paradigm that begins with Designing the RCAF of Tomorrow, without the benefit of Concepts to Address Future RCAF Issues. Taken as a whole, the *FCD* and the development work shown in Figure 9 constitute concerted RCAF efforts to describe and chart a course to attain the end state of achieving consistent, conceptually anchored and strategically informed FD. Figure 9 clearly shows the RCAF's reliance on and integration with key external stakeholders in RCAF capability development to achieve that goal, of which CFD is arguably the most influential.

Clearly, identifying and implementing the terms on which FD processes can become integrated across the CAF will only be possible with everyone on all sides helping to tackle the challenge. Success will bring benefits to all services, but the challenges are significant, not least of which is that the Commander of the RCAF and other service commanders each outrank CFD. The next section looks in further detail at the option space for enhanced linkages between CAF and RCAF FD processes, with a view to finding alternatives that will improve both sets of activities.

Linkages Between RCAF FD and CBP

Ideally, CAF and service FD processes would be simultaneously effective, mutually complementary and synchronized. With three large services with very distinct cultures and approaches to FD, the most important role in achieving integrated FD across the CAF is that of the CFD. Process integration can be expected to have a very direct impact on the success of the CFD and that of his supervisor, the VCDS, in developing the CAF to a point where it continuously fulfils its role in defending Canadian interests and values. The most significant first step may be the development of a shared understanding of how the CAF should logically be developed in terms similar to those in Figure 9. This shared understanding would be the basis of an integrated FD concept. Once defined, it would serve as a framework on which a coordinated and synchronized FD process could be built, with clear linkage points between it and FD processes in each service, and clear expectations of what each can expect from the other. The CFD needs access to the knowledge and logic that underlies the plans of each service, and the services (the RCAF perhaps more than the RCN and the CA) need a framework within which each can conduct analysis that generates a consistent and compelling body of evidence anchored in the Canadian military context to support the strategic capability initiatives that enable the entire CAF to effectively tackle the challenges of the future. Although such integration is attainable only with the support of each of the services, it is inevitable that the most important role in achieving these two outcomes should be that of the nation's central force developer. Therefore, it is worth taking a closer look at how the current CBP process and RCAF FD fit and do not fit together.

Central and RCAF force development approaches

As discussed above, the particular way in which CBP has evolved within the CAF fits nicely within the generic CBP process in Figure 5. The starting points of reference are specifically the FSE and Defence Policy as interpreted by the CFD. However, this contrasts with the terms on which RCAF FD is conceived in *AFV*, which states, "The RCAF is changing its emphasis on the role of futures analysis in its FD process. Acknowledging the practical limits of selecting capabilities based purely on predictive futurology, we will use ongoing analysis of enduring and emerging requirements to inform capability gap assessments and consequent concept development and experimentation."[85]

To address a perceived imbalance in the futures-based approach mandated in 2005, *AFV* in 2012 specifically includes two points of reference not mentioned in CBP: requirements that are long standing, continuing even today, and requirements emerging from recent and current experience. This creates a tension between two contrasting and arguably competing paradigms: one a linear extension from experience into the future, a paradigm rooted in decades of RCAF experience, and the other a more remote survey of the most relevant future challenges and a process that plays out their implications for the adequacy of the force being acquired. The best strategy is for both these approaches to coexist, occupying the places set for them in Figure 9, so that the FD dialogue includes the lessons learned with each approach, thus informing a set of investments including both best bets and suitable hedges. In this case, the unwillingness of the RCAF to lose sight of past and more recent considerations where predictions had a better basis acts as a useful counterbalance to the newer methodology developed specifically for the much less certain, longer-term future where "all bets are off."

Specific Process Linkages

The most authoritative extant reference describing the current state of CBP in DND is the CBP Handbook.[86] However, much has been learned in the two years since it was last edited. Although it is now clearly out of date in some respects, it does give a detailed representation of the thinking that went into the CBP cycle, for which a report on Phase II is soon to be submitted at this writing. The Handbook makes not only many references to "senior leadership" in the context of consultation and reporting, but also more general reference to L1 organizations and specific reference to service FD communities. Figure 10 shows a semantic diagram developed by using keyword searches of the Handbook's content to find references to the wider FD community, and building a conceptual map showing the references that were found. The figure is interpreted by sequencing text in blocks and on arrows into block-shaft-block sentences in the direction of the arrow. The numbers in round brackets refer to the paragraph numbers of the Handbook that state the relationship, and the relevant CBP phases are in square brackets. In the diagram, the service FD staffs are represented by the turquoise block near the middle. The magenta blocks represent each of the various products in the CBP process.

The figure implies that the services will have an impact on every part of the CBP process. However, the process for making this happen is not defined. Service input is obtained *ad hoc*, without any opportunity for the services to plan how they will answer questions asked by the central authority ahead of time and produce pre-defined FD products based on the logic informing their own initiation and refinement of capability projects.

As for the passing of CBP information to L1 FD staff to help them carry out their work, the Director Capability and Structures Analytical Support (DCSAS) will provide knowledge management support through the use of integrated analytical products, as required. However, services will only require such information if they know it is available.

Missing pieces

Recent RCAF experience has shown that it is difficult to re-establish conceptually supported strategic FD after doing without it for four of the past five decades. The creative and analytical work required to explore the capability option space fifteen or more years into the future is not easily planned and executed.

DCSAS

Joint Capability Framework

(0503) design the future force set forth in the FCG [Phase 3]

(0423) assign proportions reflecting the relative importance effort level of each capability provided by their Force Elements in a scenario [Phase 2]

provides knowledge management support through integrated analytical products as required to (0136) [All phases]

must define capabilities in a way that fits into, without necessarily appearing in (0308) [Phase 1]

(0123) will translate into projects and initiative execution

L1 FD Staff

expertise is needed to

(0318, 0401) conduct JCPT assessment work [Phase 2]

will be instrinsically involved in the development of (0205) [Input to Phase 1]

(0312) define FP&R-compliant future force packages [Phase 1]

(0317) define detailed metrics that will provide a foundation of contextual logic that can justify an MoC Assessment score [Phase 1]

overarching strategic guidance directives

the aim, intent & desired capability endstate of IP-assigned resource expenditure

(0123) and LO will oversee via GOFO FD meetings annual DCB briefs, and the triennial CBP cycle that enable regular interactions achievement of

the FSE

are (0123)

provides to L1s (0123)

creates (0205)

a common frame of reference to increase the quality of LO products to better inform senior leader decisions

Integrated Strategic Capability Directives

appear in the annexes of, and manage the process of implementing conclusions of

the FCG

Figure 10. References to L1s / Services in the CBP Handbook[87]

The CBP process helps service force developers by providing periodically updated FSE documents, which is shown by a line in Figure 9. However, this help is almost incidental, creating a setting for future concept development, but little more. A further build-out of the FSE into a document describing the FOE would provide a more relevant reference for both service and central FD work. While the framework in Figure 9 explicitly acknowledges that the concept of the Future RCAF must be informed by the FSE and FCG, the RCAF FD community, in their efforts to obtain value from CBP products to advance their own work, have found little that helps them with concept development.[88] In part, this is because products intended to inform IDS decisions to make capability adjustments fifteen years in the future are actually relevant to the design of the RCAF of Tomorrow, not the design of a Future RCAF. The CBP process is better understood as a filter than as a generator of capability options, and basically depends on services developing their own future concepts. The joint capability planning teams then assess the operational significance of capability development options that are mature enough and useful enough for investments to be made to exploit them.

Future force design must be based initially on coming up with new ideas and using a variety of creative processes in a disciplined way to take advantage of the RCAF's extensive and detailed operational air power expertise and the array of defence challenges that may emerge in the future. Carefully recording the details of the resulting concepts will make it possible to identify alternative air power concepts. Additional concept characterization will be enabled by other processes that systematically explore how well those concepts might meet future operational requirements and how well they fit with current operational paradigms. As concepts mature, it becomes possible to devise experiments to illustrate concept utility in more quantitative terms. Future RCAF options can be constructed from the best of these concepts and existing operational concepts with which they are compatible and complementary. These options, once validated, provide the building blocks for a validated Future Air Operating Concept.

If future concept development is to become an ongoing discipline within the RCAF, concept development must not be treated episodically. Concept work is challenging, and people involved in it must work with abstractions and things that can only be imagined. It is a skill set every bit as perishable as any pilot skill. An enduring concept development and experimentation capability requires sustained and ongoing concept generation, elaboration, development and experimentation processes.

Consequently, there is considerable unexplored potential for the CFD to shape its processes in order to provide whole-of-force context and foster FD process consistency that improves the foundations for both service and CAF FD. The current arrangement leaves the CFD at the mercy of services selecting who will represent them in JCPTs, and service force developers guessing at major elements of strategic FD.

What is offered here are a few thoughts for the CFD that will bring greater consistency to FD processes across the CAF, add value to service FD processes, and generate a more comprehensive body of shared knowledge and understood context that will enhance the pools of expertise on which CBP must draw.

Vectors for enhanced central FD leadership

CFD has an opportunity to create a more complete compendium of information to promote and support service FD processes by expanding documents about the FSE beyond a description of possible

or probable futures and including implications for military operations, as well as a document addressing the FOE. It should address interactions between the social, political and technological dynamics of probable futures, and include indications of the potential impact on operations in order to give analysts an idea of potential impacts on capability effectiveness. Support for the development could come from DND staff experts in scientific and technical intelligence, strategic analysis, future concept development, and defence science research in order to develop and outline specific challenges to specific capabilities in each service. The degree to which these challenges threaten to defeat or degrade expected capabilities would be explored by asking questions for which service FD staffs must provide answers that address mitigating concepts and investments, planned delivery of improved capability systems, and how materiel (including computing equipment), personnel and real property elements of capability can enable effectiveness to be achieved. By making it a requirement that services specifically address these issues, they act together to propel those responsible for service FD design into the same future option spaces to address the same operational challenges. This will help to place the CAF FD dialogue within a shared context.

In addition to the above, there is a wider international FD context. The US, the United Kingdom (UK) and NATO as a whole will each face similar challenges in the FOE across the full spectrum of warfare. The position of the CFD is uniquely suited to compiling and interpreting the international context and Canadian service responses to CFD futures-based challenges in a single volume including a summary and analysis of its content. By flagging the impediments to consistent CAF development as an integrated national force, as well as unaddressed or under-addressed operational task requirements, the CFD would provide a valuable body of information for every part of the Canadian FD community. The generated results will be used to compile a much more extensive corpus of information for JCPTs to use in their capability decisions, thus helping to set the bar for the sound judgments required of CBP, and mitigating many of the expertise limitations imposed by the services' varying levels of commitment to the central CBP process. The results would also provide a much more useful overview as the services develop and explore options for their own future capabilities.

Force planning takes up a large part of Defence ERM and includes several dimensions that are driven by or based on CBP. The next section summarizes the main ERM dynamics that interact with CBP and must be taken into consideration as the RCAF plans its own future.

The Current Situation

Drivers of CBP development from inside DND

There are several circumstances that are expected to propel changes in the way the CAF conducts military CBP. Some stem from the CAF's experience with CBP, while others have arisen outside the Department. Those from inside DND include the following:

Force capability monitoring: Defence leaders want to understand how well military capabilities are expected to address defence challenges over time. However, as illustrated for the RCAF, the approach taken in Horizon 1 may differ markedly from that taken in Horizon 3, by bringing unnecessarily

different concept definitions and terminology to the dialogue. An example is the meaning of words such as "capability," as well as the way in which the same capabilities are defined by different defence communities, and even by communities not associated with a specific service. Standardization of the vocabulary used throughout capability stakeholder communities is needed if FD analysis is to foster a shared understanding of how CBP is shaping, and needs to shape, future capabilities over all time horizons. The analytical approach used for the SCR specifically included production of integrated timelines of capability development over a period of up to 20 years.[89] The terms on which NATO manages and reports capability requirements provide a highly relevant starting point toward a stable, shared hierarchical taxonomy of military capabilities for use throughout DND and the CAF.

CIPPR process: The task involved in the CIPPR process is to identify the best possible combination of major capital investments, using the year-over-year cost of project delivery method and a model of the value that each combination promises to deliver. The value model for military capability investments relies on CBP analysis of the capability gaps that will need to be closed or pre-empted by investment deliverables. A necessary condition for useful analysis is for the gap analysis to include an examination of the sufficiency of what DND has already committed to buying and nothing more, excluding from the assessment every investment still competing for capital funding. This approach recognizes that new investment and divestment decisions are based on decisions already made. CBP products fulfil their purpose to inform IDS decisions only to the extent that they differentiate the utility of candidate capability investment deliverables in order to show the relative importance of the capability gaps to be closed or pre-empted and the extent of the closure or pre-emption delivered by each investment. The only way to build an investment case is to highlight the difference between having and not having its deliverables. Therefore, the assessed force must exclude all unfunded deliverables if CBP is to show what it means not to have them.

Integrated human resources strategy: As mentioned in the description of how the second CBP cycle drove the need for a MYEP on page 88, the CAF has broadened the terms of its search to find ways to shift military positions away from more institutional activities and into more operational activities by expanding the analysis to include reserves and civilian employees. The MYEP has been re-scoped to specify adjustments in all three components of the Defence team. It is the author's belief that any analysis identifying and adequately characterizing for mitigation the risks that attend a shift of military positions out of institutional functions must recognize the value to the defence enterprise that is delivered by personnel in those positions. Then, alternative approaches to delivering that same value with reduced military participation can be designed and tested. This will require something such as CBP applied to the DND institution that treats institutional operations in a way analogous to military operations in military CBP. Capability concepts will come to inform the way both the Chief of Force Development and the Chief of Program divisions develop the evolving Defence team to ensure that it can affordably and effectively meet Canada's future defence needs. The current Assistant Deputy Minister for Civilian Human Resources has begun work to define civilian capabilities[90] and has been engaging the Director General for Military Personnel Research and Analysis, a research centre under the ADM for Science & Technology but integrated into the Chief of Military Personnel organization, for the task of modelling the dynamics of civilian HR life cycle processes.

DND use of a departmental results framework for strategic management: A team working under the Chief of Program is leading DND in the development of a program structure called a Departmental Results Framework (DRF). The DND DRF will meet the requirements of the TBS Policy on Results[91] for purposes of government reporting. However, it is also to provide a coherent basis for defence ERM. The main source of that coherence will be its evolution from the Program Alignment Architecture (PAA) announced in 2014, which was designed for the very purpose of enabling coherent defence ERM.[92] The PAA is a hierarchical taxonomy of defence activity spanning the entire breadth of what has to happen for DND to fulfill its mandate. Its overall design is briefly described in Appendix A, and the PAA itself, included in Appendix B to this chapter. At its core, successful ERM depends on a sound understanding of mandate-relevant value and the processes by which it is created and preserved through resource investments. In order to inform construction of an enterprise-level model of value creation and management, enable delivery of the Integrated HR Strategy, and implement DRF-based ERM, DND is about to conduct a systematic survey of defence enterprise activity in terms of how and where DND activity adds value to DND's fulfilment of its mandate for Canadian defence and security. The survey will be carefully controlled to manage the level of detail needed for it to be useful to inform strategic decisions. This will enable construction of a networked model of the way defence activity creates and combines value in the strategic portfolios targeted by each activity[93] and the way in which those strategic portfolios combine to deliver the readiness and operational outputs on which Canada's national defence depends.

Drivers of CBP development from outside DND

As of this writing, several transitions in Canadian defence are underway:

New defence policy: Following the election of Justin Trudeau as Canada's Prime Minister with a Liberal majority in the House of Commons, the government issued a new mandate to the newly appointed Minister of National Defence (MND), and released the mandate letter to the public online.[94] Since then, the new government has initiated a DPR with public consultations. This will likely result in a new policy foundation for the CFD's future CBP process.

Capital funding levels: The greatest impact of the CIPPR process, and especially of the VIPOR software developed to support it, has been to provide, perhaps for the first time ever, a clear understanding of the opportunity cost of each of the major capital investments competing for unallocated capital funding. This detailed understanding is making it possible for the DPR to address perceived gaps between what the government has expected Defence to do in the coming decades and the capital funding provided for the task. Any shift in capital funding levels will create increased impetus for the CBP products to provide analysis suitably grounded for future investment trade-off analysis in the CIPPR in order to make full use of the insights required from military CBP.

Conclusions

Military CBP in Canada is at a turning point. After three full cycles, its role of informing capability investment decision making is only now coming into clear focus. This clarity presents an opportunity to align the production of CBP outputs with the specific decisions they must inform, investment-related and otherwise, and to foster greater coherence in FD activity across the services. The RCAF, in particular, stands to benefit from greater central FD leadership, having recently produced the RCAF Strategic Guidance Framework and currently redesigning FD processes that can discover and develop concepts that can be used to implement the most advanced air power capability options. The RCAF staff involved in this work clearly acknowledge that they depend on other stakeholders to fill in the rest of the picture, and that the work is an excellent starting point toward achieving an integration that can be very useful for CAF development in the service of Canada's defence interests.

The CFD has an opportunity, with VCDS support, to help each of the services enter more fully into the conceptual option space, where evolving challenges can be understood militarily, and technological breakthroughs can be used to take advantage of new capability opportunities in the FOE. The growing need to manage risk in the defence institution arising from the squeeze between continuing fiscal restraint and increased operational personnel requirements is creating a demand for new types of analysis that are able to model and inform institutional risk management. With a Defence Policy Review nearing completion and a new US government, many changes to the strategic defence planning environment are in play. At the same time, departmental leadership in developing the analyses required to meet these needs is rising to the challenge. If a place can be found in the force development dialogue for the various FD perspectives of the CAF and of the RCAF, in particular, and if experience with capability-based techniques of enterprise-level FD can be leveraged to address the challenges of workforce development, then DND is poised to advance toward a much fuller realization of the benefits of what P. K. Davis defines as "*planning, under uncertainty, to provide capabilities suitable for a wide range of modern-day challenges and circumstances while working within an economic framework that necessitates choice.*"[95] [emphasis added]

Appendix A: Understanding the Program Alignment Architecture

Many readers will know that DND announced a new PAA in 2014. However, many Defence Team members bristle at the mention of the PAA because of their experience with previous versions. In general, the idea behind the PAA and the real power of the 2014 one is not widely appreciated. In reality, the new PAA is based on a surprisingly simple idea illustrated below.

Since 2003, the TBS has required federal departments to have a PAA that will bring consistency to strategic reviews conducted to inform resource reallocation decisions, and which will serve as a structure for reporting to Parliament and to Canadians what it does with tax money to fulfil its mandate from the GC. There are two key reasons for having a PAA:

• to determine the links between resources invested and results obtained; and

• to draft a simple narrative of what DND does to fulfil its mandate to Canadians.

Previous PAAs did not perform either of these activities very well because DND staff were preoccupied with the organizational structure of DND. While structure is critically important to help us do our jobs, it misses the point. The new PAA is strictly about turning money into actual defence. If you want to identify where something belongs, the most relevant question to ask is this: How does this activity add value to the defence of Canada?

The new PAA includes a map where you can locate the answer to that question. It was designed specifically to enable tracking of the transformation of money spent into valuable defence outcomes. The following explains the PAA structure and provides additional information:

1. Job 1 is combat operations; so it is also Program 1. The essence of combat is force elements going out the door to stand against what threatens Canada's future, domestically and continentally (1.1) or internationally (1.2). Everything we do in both settings relies on functions that operate anchored in Canada (1.3), including overarching C2 (1.3.1), Intelligence ops (1.3.2) and Op Support (1.3.3). (All three of these sub-programs have ongoing elements and commitments that are domestic [1.1.2-1.1.4], international [NATO 1.2.3] or both [1.3.4 Mil diplomacy / Global engagement].)

2. We also do non-combat things that Canada cares about, and these are Program 2. They include providing assistance when disasters hit (2.1) and providing support for the safety and security of Canadians at home (2.2). We also stay connected to the culture with heritage, ceremony and youth programs (2.3).

3. Combat operations are only possible if you have ready force elements, and Program 3 is where we produce them, whatever their role:

    a. producing force elements that know how to operate is 3.3;

    b. making sure they can work with other ready force elements is 3.2;

    c. keeping them ready once they get ready is 3.1; and

    d. organizing and coordinating 3.1–3.3 happens in 3.4.

4. It is assumed with all of the above that you already have the necessary ingredients to create force elements. Program 4 is where we set up and maintain the necessary resource pools or "Capability Elements" and make them available, including:

    a. military personnel (4.1);

    b. military equipment (4.2);

    c. real property with military purpose (4.3); and

    d. military information systems (4.4).

The availability of each pool depends on our ability to manage its life cycle, including:

    i. figuring out what we have and what we need for this cycle; and then

    ii. acquiring what we need and do not have;

    iii. preparing what we do have;

    iv. upgrading as needed;

    v. maintaining all of it;

    vi. disposing of it at the end of its useful life; and

    vii. learning how life cycle management needs to change.

Each of these tasks is done in some form for each pool of Capability Elements.

5. The purpose of all of the above is to deliver our current set of military capabilities; however, the world keeps changing and what we can do must change along with it or become ineffective. All of the work involved in identifying and implementing the required capability changes takes place in Program 5.

    a. Capabilities are managed individually by military services, either traditional (CA, RCN, RCAF or statement of operational requirements [SOR]) or by newer mini-services, such as space, cyber and chemical, biological, radiological and nuclear (CBRN), which are temporarily maintained by CFD. Advancement of specific capabilities takes place in 5.1:

        i. the design of capability improvements and all the project management necessary to deliver them takes place in 5.1.1;

        ii. figuring out how we will use them once we get them is done in 5.1.2; and

iii. everything involved in investing in defence-relevant science to enable management and changes in defence takes place in 5.1.3.

b. Defence success comes only with consistent defence planning for the use of capabilities and to implement changes across the whole set of capabilities. This takes place in 5.2, and includes the following:

i. studying the FSE and testing various future force concepts in relation to the FSE to determine which of the competing capability investments is most needed (5.2.1); and

ii. managing utilization of what we currently have for the long term (5.2.2).

Note: All of the above rely on the service of military *and* civilian personnel. Civilian personnel are integral to Programs 1 to 5, although many play a part in Program 6, the one generic to federal departments. Internal Services are defined by the TBS. Where an activity seems to overlap with the above, consider it to be part of Program 6 only if it is not specifically included in programs 1 to 5.

6. Doing all of the above is impossible without the departmental institution, and much of what they do takes place in Program 6 – Internal Services. Because these services are common to every federal department, they follow a standard pattern set by the TBS as follows:

a. Management and Oversight (6.1) focuses on executive-level action. This includes generals and flag officers. Direction below that level only stays in 6.1 if it cannot be identified closely with either programs 1 to 5 or sub-programs 6.2 to 6.10;

b. Communications (6.2) is mostly done by the ADM (Public Affairs);

c. Legal Services (6.3) is where the CAF Legal Advisor plays a role (activities of military lawyers under the Judge Advocate General [JAG] are part of 4.1.9);

d. Human Resources Management (6.4) is where the Assistant Deputy Minister, Civilian Human Resources (ADM[HR Civ]) plays a role. It is the non-military counterpart of 4.1, i.e., ensuring that there is an available pool of civilians for use in specific functions. Most civilians are not in 6.4, which contains only HR professionals, HR managers and HR administrative support staff;

e. Financial management (6.5) includes activities above and beyond any specific element of programs 1 to 5;

f. Information management (6.6) is an Assistant Deputy Minister, Information Management (ADM[IM]) responsibility, and consists in making sure that DND has provided and protected access to the information we need and disposes of what we do not need;

g. Information technology (6.7) consists in safeguarding non-defence-specific networks, applications and user support, and is conducted under the oversight of Shared Services Canada;

h. Real Property (6.8) concerns institutional property that does not have a direct role in programs 1 to 5, and therefore concerns the specifically institutional footprint (because DND leases most (or all) of its space in Ottawa, there is relatively little activity in 6.8.);

i. Non-military equipment life cycle processes (other than acquisition) come under 6.9; and

j. Acquisition comes under 6.10, and includes centralized support for contracting and procurement.

The accumulation of value from spending Canadian tax money can be tracked as we move upward through the PAA:

- Program 6 establishes the requirements of all federal departments, regardless of their specific domain;

- Program 5 works out how and what we need to do over time to carry out what the defence mandate requires of us;

- Program 4 makes available pools of each type of military resource needed to prepare force elements for use in defence;

- Program 3 takes those military ingredients and shapes them into force elements that it prepares and keeps prepared throughout the readiness cycle. At this point, Defence has provided deterrence and enabled the CDS to put options on the Prime Minister's desk; and

- Programs 1 and 2 enable the Defence team to actually go out and do what only Defence can do for Canada.

With this structure, you can find a place for everything we do with Canadian tax dollars, and say why we do it. This makes for meaningful reporting.

A good illustration of this is the "Snowman Diagram" in Figure A1, showing the Defence team's most important strategic inventories (ovals) and the way they build on each other:
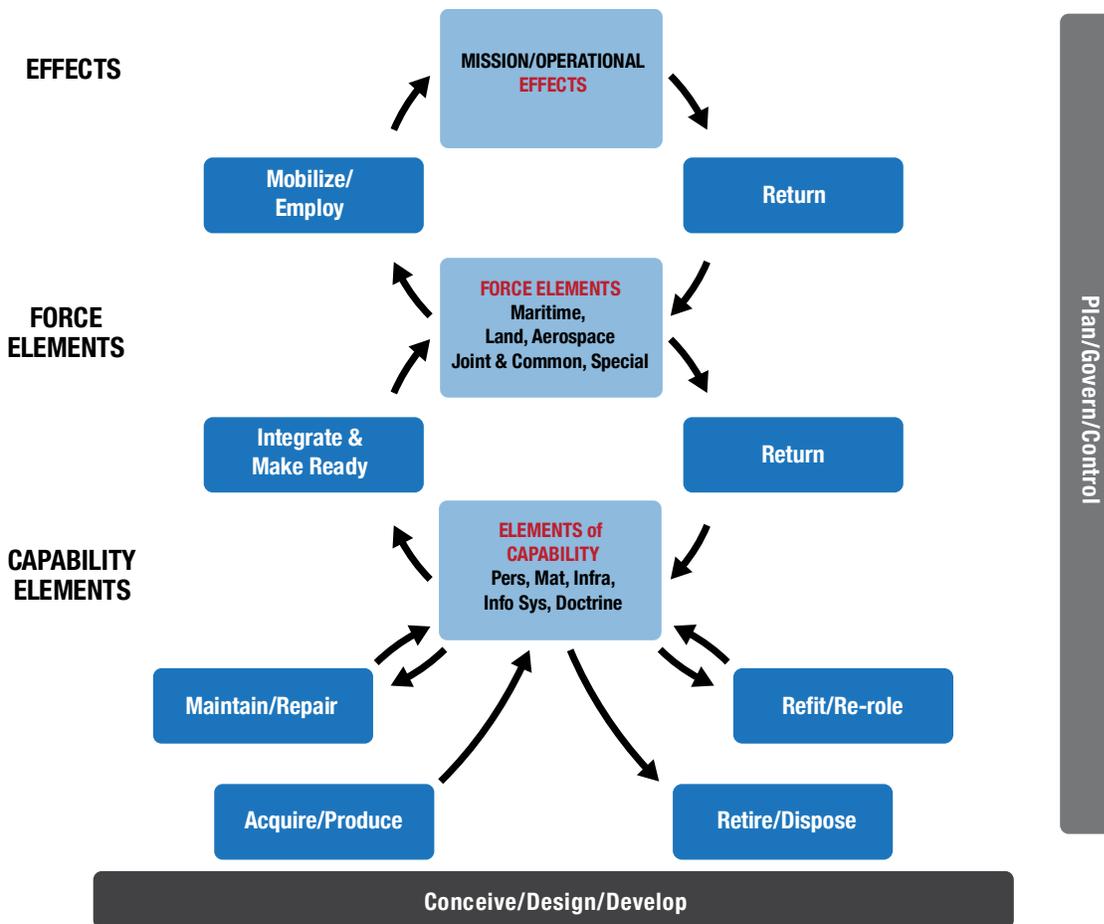
Figure A1. A conceptual model of defence processes shown in the 2014 PAA[96]

- "Mobilize / Employ" and "Return" are Programs 1 and 2;

- "Integrate and Make Ready" and "Return" are Program 3;

- The other four blue boxes are Program 4, although they appear differently for each type of capability element;

- The "Conceive/Design/Develop" bar at the bottom is essentially Program 5; and

- The "Plan/Govern/Control" side bar can be found throughout the other programs, but at the executive level, it tends to be 6.1 – Management and Oversight, along with some supporting institution-wide analysis.

These are broad generalizations to help understand the big picture, and there are lots of exceptions, because the work of Defence is more complex than this.[97]

Appendix B: Program Alignment Architecture

National Defence Program Alignment Architecture (PAA)			
Strategic Outcomes	**Programs**	**Subprograms**	**Sub-subprograms**
Defence operations and services improve stability and security, and promote Canadian interests and values.	1.0 Defence Combat and Support Operations	1.1 Domestic and Continental Defence Operations	1.1.1 Operations to defend Canada against armed threats
			1.1.2 Ongoing defence, security and sovereignty of Canada operations
			1.1.3 Ongoing defence operations through NORAD
			1.1.4 Ongoing continental defence operations in cooperation with the US
		1.2 International Combat Operations	1.2.1 International operations over extended periods
			1.2.2 International crisis and surge response operations
			1.2.3 Ongoing defence operations through standing NATO commitments
		1.3 Ongoing Centralized Operations and Operational Enablement	1.3.1 Overarching command and control of domestic and international operations
			1.3.2 Ongoing defence intelligence operations
			1.3.3 Operational support services
			1.3.4 Military diplomacy and global engagement
	2.0 Defence Services and Contributions To Government	2.1 Disaster Relief and Humanitarian Operations	2.1.1 Domestic and continental assistance and response operations
			2.1.2 International humanitarian assistance and disaster response operations
			2.1.3 Non-combatant evacuation operations
		2.2 Defence Services for Canadian Safety and Security	2.2.1 Counterterrorism, terrorism event response and consequence management operations
			2.2.2 Assistance for major Canadian event operations
			2.2.3 National Search and Rescue Program
			2.2.4 Search and rescue operations
			2.2.5 Defence services for other government departments and agencies
			2.2.6 Canadian Safety and Security Program
		2.3 Military Heritage and Outreach	2.3.1 Military history, heritage and awareness
Defence remains continually prepared to deliver national defence and defence services in alignment with Canadian interests and values.	3.0 Defence Ready Force Element Production	3.1 Force Elements Readiness Sustainment	3.1.1 Maritime roles – readiness sustainment
			3.1.2 Land roles – readiness sustainment
			3.1.3 Aerospace roles – readiness sustainment
			3.1.4 Special operations roles – readiness sustainment
			3.1.5 Joint and common roles – readiness sustainment

National Defence Program Alignment Architecture (PAA)

Strategic Outcomes	Programs	Subprograms	Sub-subprograms
		3.2 Force Elements Integration Training	3.2.1 Maritime environment – integration training
			3.2.2 Land environment – integration training
			3.2.3 Aerospace environment – integration training
			3.2.4 Special operations environment – integration training
			3.2.5 Joint – integration training
			3.2.6 International and domestic – interoperability training
		3.3 Force Elements Production	3.3.1 Maritime environment – force element production
			3.3.2 Land environment – force element production
			3.3.3 Aerospace environment – force element production
			3.3.4 Special operations – force element production
			3.3.5 Joint and common – force element production
		3.4 Operational Readiness Production, Coordination, and Command and Control	3.4.1 Maritime environment – force element production, coordination, and command and control
			3.4.2 Land environment – force element production, coordination, and command and control
			3.4.3 Aerospace environment – force element production, coordination, and command and control
			3.4.4 Special operations environment – force element production, coordination, and command and control
			3.4.5 Joint and common – force element production, coordination, and command and control
	4.0 Defence Capability Element Production	4.1 Military Personnel and Organization Life Cycle	4.1.1 Military personnel – regular force portfolio management
			4.1.2 Military personnel – reserve force portfolio management
			4.1.3 Military personnel – recruitment
			4.1.4 Military personnel – transition and release
			4.1.5 Military personnel – professional development training
			4.1.6 Military personnel – occupation training
			4.1.7 Military personnel – morale and well-being
			4.1.8 Military personnel – health care
			4.1.9 Organization – security, protection, justice and safety
			4.1.10 Military personnel and organization – strategic coordination, development and control

National Defence Program Alignment Architecture (PAA)

Strategic Outcomes	Programs	Subprograms	Sub-subprograms
	4.0 Defence Capability Element Production	4.2 Materiel Life Cycle	4.2.1 Materiel – portfolio management
			4.2.2 Materiel – acquisition
			4.2.3 Materiel – equipment upgrade and insertion
			4.2.4 Materiel – divestment and disposal
			4.2.5 Materiel – engineering, testing, production and maintenance
			4.2.6 Materiel – inventory management and distribution
			4.2.7 Materiel – strategic coordination, development and control
		4.3 Real Property Life Cycle	4.3.1 Real Property – portfolio management
			4.3.2 Real Property – acquisition
			4.3.3 Real Property – divestment and disposal
			4.3.4 Real Property – operations, maintenance and repair
			4.3.5 Real Property – environment and remediation
			4.3.6 Real Property – strategic coordination, development and control
		4.4 Information Systems Life Cycle	4.4.1 Information systems – portfolio management
			4.4.2 Information systems – acquisition, development and deployment
			4.4.3 Information systems – system management and user support
			4.4.4 Information systems – strategic coordination, development and control
	5.0 Defence Capability Development and Research	5.1 Capability Design, Development and Integration	5.1.1 Capability design and management
			5.1.2 Concept, doctrine development and warfare experimentation
			5.1.3 Science and systems development and integration
		5.2 Strategic Direction and Planning Support	5.2.1 Strategic capability planning support
			5.2.2 Strategic force posture planning support

National Defence Program Alignment Architecture (PAA)			
Strategic Outcomes	**Programs**	**Subprograms**	**Sub-subprograms**
	6.0 Internal Services	6.1 Management and Oversight	
		6.2 Communications	
		6.3 Legal Services	
		6.4 Human Resources Management	
		6.5 Financial Management	
		6.6 Information Management	
		6.7 Information Technology	
		6.8 Real Property	
		6.9 Materiel	
		6.10 Acquisition	

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Abbreviations

ACDP	Affordable Capability Development Plan
ADM	Assistant Deputy Minister
ADM(HR Civ)	Assistant Deputy Minister (Civilian Human Resources)
ADM(IM)	Assistant Deputy Minister (Information Management)
ADM(Mat)	Assistant Deputy Minister (Materiel)
ADM(S&T)	Assistant Deputy Minister (Science & Technology)
AEP	aerospace effects production
AFV	Air Force Vectors
AIRCOM	Air Command
CA	Canadian Army
CAF	Canadian Armed Forces
CAT	CDS Action Team
CAT3	CDS Action Team 3
CATCAM	CDS Action Team Capability Assessment Methodology
CBP	capability-based planning
CD&E	concept development and experimentation
CDS	Chief of the Defence Staff
CF	Canadian Forces
CFAWC	Canadian Forces Air Warfare Centre
CFB	Canadian Forces Base
CFD	Chief of Force Development
CFDS	*Canada First* Defence Strategy
CIPPR	Capital Investment Program Plan Review
CJTL	Canadian Joint Task List
CMF	conceptual military framework
CORA	Centre for Operational Research and Analysis
CP	campaign plan
DCB	Defence Capability Board
DCI	Director of Capability Integration
DCSAS	Director Capability and Structure Analysis Support
DG Air FD	Director General Air Force Development
DG CSI	Director General, Capability and Structures Integration

DM	Deputy Minister
DND	Department of National Defence
DPR	Defence Policy Review
DRDC	Defence Research & Development Canada
DRF	Departmental Results Framework
DTB	Defence Terminology Bank
ERM	enterprise resource management
FAOC	Future Air Operating Concept
FCD	Future Concepts Directive
FCG	Force Capability Guidance
FCP	Force Capability Plan
FD	force development
FDSS	force development scenario set
FOC	final operating capability
FIDO	Fundamental Investigation of Defence Options
FLEETSIM	Fleet simulator, Strategic capability roadmap
FOE	future operating environment
FP&R	force posture and readiness
FSE	future security environment
GC	Government of Canada
GOFO	general officer/flag officer
HR	Human Resources
ID	identification
IDS	Invest-Divest-Sustain
IOC	initial operating capability
IP	Investment Plan
JCF	Joint Capability Framework
JCPT	Joint Capability Planning Team
L0	level 0
L1	level 1
LoO	line of operation
MND	Minister of National Defence
MoC	measure of capability

MYEP	Multi-Year Establishment Plan
NATO RTO	NATO Research and Technology Organization
NCM	non-commissioned member
Op	operation
OPFOR	opposing force
Ops	operations
PAA	Program Alignment Architecture
PAD	Project Approval Directive
PAP	project approval process
PCR	project completion report
RCAF	Royal Canadian Air Force
RCN	Royal Canadian Navy
S&T	science and technology
SCR	Strategic Capability Roadmap
SOF	special operations forces
SOR	statement of operational requirements
SPORT	Strategic Planning Operational Research Team
STT	Strategic Task Team
TBS	Treasury Board of Canada Secretariat
TTCP	The Technical Cooperation Program
ver	version
VCDS	Vice Chief of the Defence Staff
VIPOR	Visual Investment Plan Optimisation and Revision

Notes

1. In order to make the term "environment" available for its more generic meaning, this chapter uses the American term "service" to refer to the CA, the RCN and the RCAF.

2. Canada, DND, VCDS*: About Us,* January 20, 2016, accessed July 18, 2018, http://www. forces.gc.ca/en/about-org-structure/vice-chief-defence-staff.page.

3. Most technical publications are available through the searchable DRDC Defence Research Reports website at http://pubs.drdc-rddc.gc.ca/pubdocs/pcow1_e.html.

4. Canada, DND, VCDS*: About Us*.

5. Canada, DND, *DTB,* record 32172, http://terminology.mil.ca/index-eng.asp#.

6. Canada, DND, *Report on Transformation 2011*, July 2011, accessed July 18, 2018, http:// www.forces.gc.ca/en/about-reports-pubs/transformation-report-2011.page.

7. Canada, DND, VCDS, Director Defence Program Coordination 6, *Project Approval Directive 2015*, April 8, 2015, accessed July 27, 2016, http://vcds.mil.ca/sites/intranet-eng. aspx?page=18032.

8. Canada, DND, Project Approval Directive 2015.

9. Canada, DND, CFD, *Capability Based Planning Handbook,* 2014.

10. The classic example is delivering indirect fires into an area, which can be delivered by land-based artillery, offshore naval gunfire, aerial bombing and other means.

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