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Fiscal Sustainability of Canada's National Defence Program

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The mandate of the Parliamentary Budget Officer (PBO) is to provide independent analysis to Parliament on the state of the nation's finances, the government's estimates and trends in the national economy; and upon request from a committee or parliamentarian, to estimate the financial cost of any proposal for matters over which Parliament has jurisdiction.

This report provides PBO's estimate of the fiscal gap between the status quo budget allocations and the cost of sustaining Canada's status quo national defence forces. Parliamentarians may wish to examine scenarios that will reduce or eliminate the gap between the cost of maintaining the current force structure and the amount of funding being allocated to paying for it.

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Executive summary

This report examines sustainability of the national defence program by providing two estimates: a ‘source of funds’ forecast, meaning a forecast of future defence budgets; and a ‘use of funds’ estimate, meaning the cost of delivering a national defence program.

The Parliamentary Budget Office (PBO) estimates that the current force structure of the Department of National Defence (DND) is unsustainable at current funding levels. To achieve sustainability, it will be necessary to change the force structure, increase the amount of funding allocated to DND, or implement a combination of the two.

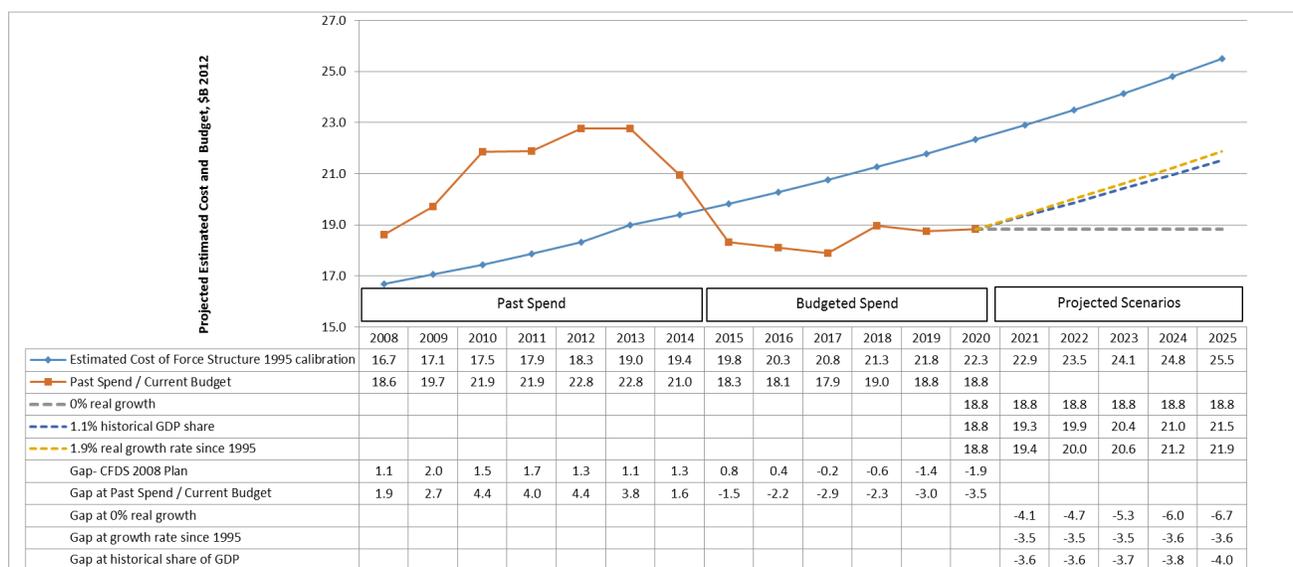
In the 2013-2014 fiscal year, DND expenditures totalled \$21.5 billion, accounting for 1.1 per cent of gross domestic product (GDP). Of that amount, roughly half went toward personnel costs and roughly one-third was used for operations and infrastructure; the balance went toward the acquisition and replacement of capital equipment.

The government’s Canada First Defence Strategy (CFDS) promised to raise the nominal (non-inflation adjusted) annual increase in defence expenditure to 2 per cent starting in fiscal year 2011-2012, investing a total of \$490 billion over a 20-year horizon, in an effort to provide the military with reliable funding.¹

However, PBO’s long-term defence program affordability estimate (the ‘should-cost’ estimate) indicates that defence costs will become unsustainable over the next 10 years. Our modelling shows that until 2014, there were sufficient funds to maintain the program. The cost to maintain Canada’s national defence force structure increased at roughly 1.5 per cent per year in real terms (adjusted for inflation) from 1995 to 2014; over the same period, defence spending increased 1.9 per cent per year in real terms.

In Summary Figure 1-1, PBO estimates that the annual, inflation-adjusted rate of growth in the cost of maintaining the force structure from 2015 onwards will be 2.5 per cent per year.

Summary Figure 1-1 Historic and forecast defence budgets against cost to maintain force structure



Sources: Fiscal Reference Tables, PBO, DAS Ltd.

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PBO calibrated the model to the 1995 force structure, to ensure that the slope of the expenditure line to 2012 and beyond was reasonable. Because the model is driven by force structure, notably the size of the regular force and associated equipment and support costs, calibrating to a different year will produce a different outcome. The report should be read with that in mind. Please refer to Section 3.5 Model Sensitivity, on page 14, for more detail.

1 Introduction: Fiscal sustainability of Canada's National Defence program

The legislative mandate of the Parliamentary Budget Officer (PBO) includes providing independent analysis on the state of the nation's finances. This report examines defence sustainability by providing two forecasts: a 'source of funds' forecast, meaning a forecast of future defence budgets; and a 'use of funds' forecast, meaning the cost of delivering a national defence program.

Canada's National Defence program consumes about 7 per cent of total government expenditures, and accounts for roughly 20 per cent of total direct program expenditures. At present, Parliament has an incomplete picture about the medium and longer-term affordability of the defence program.

Although departmental spending estimates published in the Report on Plans and Priorities present the department's estimate of its funding requirements over a three-year period, it is subject to considerable variation in the transition from planned activities to execution.² Consequently, parliamentarians do not have a complete picture of the sustainability of the defence program at current or future funding levels.

Near-term defence budgeting and procurement decisions can have significant consequences for the

composition and costs of the nation's defence program that continue many years into the future.

Recognizing this fact, other countries provide greater detail regarding long-term defence expenditure sustainability plans.

In the United States, the Department of Defence (DoD), in conjunction with the President's budget, publishes a five-year Future Years Defence Program (FYDP). It is then assessed by the US Congressional Budget Office (CBO) to provide Congress with a 15-year projection of DoD budget requirements.³

In the United Kingdom, the Ministry of Defence (MoD) committed to publish a *Statement of Affordability*, partly in response to significant affordability problems in its budget in 2009, and following the Strategic Defence and Security Review in 2010. The statement is an attestation to Parliament of the gap between the costs of the defence program and the long-term forecast budget allocation.

In conjunction with that statement, the MoD publishes detailed defence acquisition plans 10 years into the future.⁴ The UK National Audit Office provides its own independent analysis of that plan to the House of Commons and is building capacity to eventually provide an audit opinion of the Statement of Affordability.

The Australian Strategic Policy Institute, a government-funded defence think tank, produces an annual defence budget brief. The report's purpose is to scrutinize in detail defence expenditure, cost, and policy decisions over a long-term horizon.⁵

While it is true that the long-term plans of the United States and United Kingdom can also be subject to variations from plans to execution, it is important to note that these long-term assessments are nonetheless made available to their respective legislatures.

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The fundamental purpose of these analyses is to advise the legislatures and citizens of these respective countries on the long-term affordability of their defence programs in addition to providing a framework for an informed legislative debate around an appropriate budget allocation. At present, there is nothing comparable provided by DND to Canada's Parliament.⁶

1.1 Background – The defence portfolio

For the purpose of this analysis, the expenditure amounts provided for the National Defence portfolio, as outlined in the Public Accounts of Canada, are used as a proxy for the budget provided to maintain the defence force structure. Strictly speaking, expenditures in the portfolio can be broken out as follows in Table 1.

Table 1 Canada's National Defence portfolio

Agency	Expenditure (\$M)	Percent of Total
Department of National Defence	\$18,764.4	98
Communications Security Establishment (CSE)	443.6	2
Military Grievances External Review Committee	5.9	-
Military Police Complaints Commission	5.5	-
Offices of the CSE Commissioner	1.9	-

Source: Public Accounts of Canada 2014

Although the portfolio includes some items that are not strictly related to the cost of the force structure, the table above shows that the dollar value of these items is not material.

1.2 Use of funds - What is Canada's National Defence program?

National Defence is a government program with three key objectives:⁷

1. Defence of Canada: protecting Canada's interests at home and abroad.
2. Defence of North America in partnership with the United States.
3. Contributing to international peace and security.

The ultimate purpose of Canada's defence program is to defend Canada's interests and sovereignty and to keep all Canadians safe and secure. Canada's National Defence program is delivered by DND.

The program's 'fundamental purpose is to employ military armed forces, including deadly forces, lawfully at home or abroad, at the direction of the government'⁸. It relies primarily on the *ability* and *readiness* to project military force to meet these objectives.

To do so, DND must remain flexible, prepared, and capable of sustaining an agile world-class force, one that is able to protect Canadians at home effectively, while remaining a strong and reliable partner on the continent, all while making a valuable contribution to international security.⁹

DND manages Canada's defence program using a combination of personnel and equipment readiness. *Readiness* is the term used to define the state of equipment and personnel. Both effort and budgetary resources are required to maintain equipment and personnel at specified levels of combat capability.

Equipment requires regular renewal, replacement, and maintenance to meet a certain level of operational capability. Personnel require regular

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training, almost always necessitating the use of equipment, to meet appropriate levels of operational capability.

1.3 What is force structure?

“Force structure” is the combat-capable part of a military organisation which describes how military personnel, their weapons, and their equipment, are organized for operations or demanded by the environment of the conflict.

Force structuring considers the allocation of military personnel, their skills, and the relationship among military units required to provide mutual support during military operations as a military capability of the armed forces in part or as a whole. In Canada, the military organization is known as the Canadian Armed Forces.

The combat-capable part of the organization relies extensively on the efforts of the non-combat-capable portion of the organization for support in providing materiel and resources. These include construction and maintenance of defence infrastructure and works needed to support the Canadian Armed Forces across Canada, as well as research relating to defence and security science and technology, and providing equipment and technological advantages needed to defend Canada’s interests.

Changes in force structure can be caused not only by modifications in forms of warfare and doctrine and changes to the threat environment, but also by rapid change in technology and budgetary considerations based on the wider national economy.¹⁰

For the purposes of this analysis, the PBO defines the costs incurred in supporting the combat and non-combat capable parts of the organization as the cost of the defence program’s force structure.

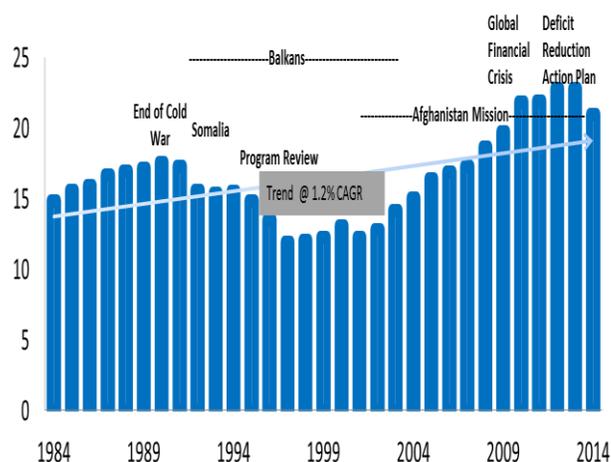
The budget allocation made available to support the force structure is represented in this analysis as the

‘National Defence’ portion of the government’s direct program expenses, as reflected in the Department of Finance Fiscal Reference Tables (FRT).¹¹

1.4 Source of Funds - Historical defence budget allocations

Figure 1-1 below shows, annual defence spending in Canada has increased in real (inflation-adjusted) terms over the past 30 years at an average annual rate of 1.2 per cent. However, it has varied between periods of significant growth and periods of significant decline.

Figure 1-1 Historical defence expenditure (\$B 2012)



Sources: Fiscal Reference Tables, Veterans Affairs Canada

Following the end of the Cold War in 1989, defence spending was reduced almost 30 per cent in real terms from the 1990s to the mid-2000s as Canada attempted to address significant fiscal deficits.

For example, in the early 1990s, the Forces consisted of 87,000 regular force personnel, which was reduced to 60,000 by 1999 as a result of Program Review. In 2008, the CFDS provided resources to expand the regular force to 70,000 and the primary

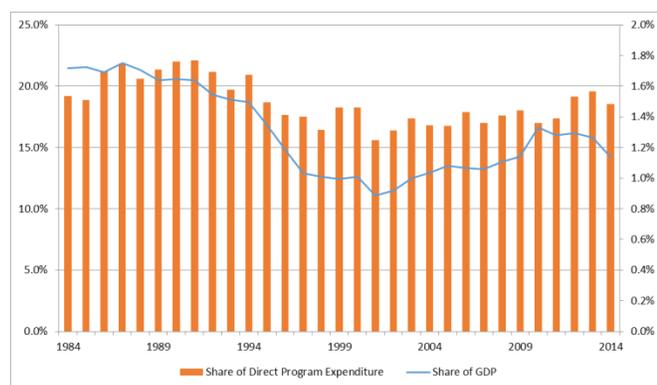
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reserve to 30,000. Currently, the regular force numbers 68,000 and the primary reserves, 27,000.¹²
13

As seen in Figure 1-2, defence spending as a share of GDP hovered around the 1.7 per cent range from 1984 to 1991. Subsequently, defence spending as a share of GDP steadily declined from 1.5% in 1992 to 1 per cent in 1999. The proportion remained at that level until 2010, when the increases promised in CFDS brought defence spending up to 1.3 per cent of GDP.

Since 1995, defence spending has not exceeded 1.3 per cent of GDP. In 2013-2014, defence spending was \$21.5 billion, about 1.1 per cent of GDP. Over the past 30 years, defence spending as a portion of all government direct program expenditure has remained relatively constant, within a range of 18-22 per cent.

Figure 1-2 Defence expenditure as a share of direct program expenditures (LHS) and GDP (RHS)



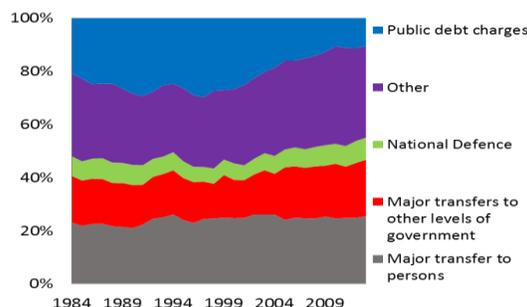
Source: PBO, Fiscal Reference Tables

Figure 1-3 illustrates defence spending as a share of total government spending, relative to other forms of major government expenditures.

Defence spending as a share of total government spending, which includes public debt charges, transfers to individuals, and transfers to other levels

of government, has averaged 6.9 per cent of total government expenditure over the past 30 years.

Figure 1-3 Federal government expenditures (per cent of total)



Source: Fiscal Reference Tables

2 Methodology - Assessing fiscal sustainability of the defence program

This report assesses the cost of the current force structure, projects that cost forward for 10 years into the future and compares the projected cost of the force structure to the projected budget available. It does not take into account any substantive changes in force structure. Its purpose is to provide a baseline 'status quo' estimate, to be used as a starting point for discussion and debate.

2.1 Forecasting future defence budgets

Although the Department of National Defence presents its budget request to Parliament on a partial accrual¹⁴ basis, PBO's budget forecast relies on past expenditure as recorded by the Department of Finance in the Fiscal Reference Tables, as well as projected expenditures as recorded in successive federal budgets.

These figures are recorded on an accrual basis. The force structure cost (discussed in Section 2.2 "Projecting the future cost of the force structure") is also calculated on an accrual basis. Box 1 below outlines why an accrual basis is appropriate for projecting program sustainability.¹⁵

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All of the figures used in this section are drawn from the Fiscal Reference Tables, Budget Plans from 2010, 2012, and 2014, as well as information received from the Department of Finance through an information request made by the PBO,¹⁶ which provided a year by year defence budget allocation from 2008 to 2020.¹⁷ In addition, PBO adjusted the budget forecast to reflect projected increases in wages and salaries that would not have been included in the department's forecast budget.¹⁸ Unless otherwise noted, all figures have been adjusted for inflation, using 2012 as a base year and using the Consumer Price Index inflation factors published by Statistics Canada.¹⁹

Box 1 Budgeting in the federal government: accrual and modified cash basis

The Government of Canada adopted full accrual accounting as its basis for budgeting in Budget 2003. It provides information on: (a) a government's ability to meet its financial obligations, both short- and long-term; (b) a government's ability to maintain the level and quality of its services and to finance new programs.²⁰

This PBO report is a study of the sustainability of the defence program in future years. The amounts allocated in federal budgets to DND represent the government's resource commitment to enable delivery of the defence program. These funds are set aside in the fiscal framework on an accrual basis.

Departments seek authorities from Parliament on a cash basis to ensure sufficient resources for program delivery in the short term, but this does not provide sufficient information to address points a) and b) above.

There can be significant differences in cash vs. accrual expenditure amounts for any given year. For example, in 2013-2014, the Department of National Defence expended \$19.2 billion on a cash basis, but used \$21.5 billion of 'fiscal room' on an accrual basis.

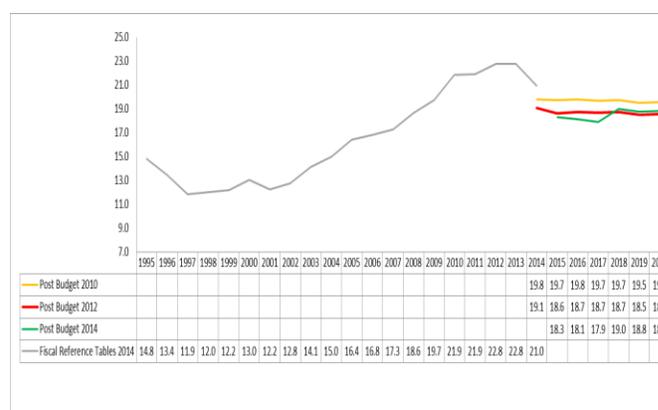
The difference represents the non-cash costs of the amortization, or 'wear and tear', of DND's capital assets and equipment, as well as any funds that have been set aside to fund current or future capital investments.

Since the Canada First Defence Strategy was introduced in 2008, successive federal budgets have

adjusted expenditures for the defence program in response to the recession of 2008.

Figure 2-1 outlines in grey the historical expenditure, followed by the succession of spending reductions first announced in Budget 2010. It is important to note that the historical defence expenditures include funding for overseas military operations and the 2010 Olympics.²¹

Figure 2-1 Historic and forecast defence budgets (\$B 2012)



Sources: Fiscal Reference Tables, PBO

2.2 Projecting the future cost of the force structure

To determine the affordability of the defence program, it is necessary to project the estimated cost of maintaining the force structure over the longer term.

To undertake this portion of the analysis, PBO engaged Decision Analysis Services Limited (DAS) a UK consulting firm specializing in defence costing. It has provided similar analysis to the UK Ministry of Defence.

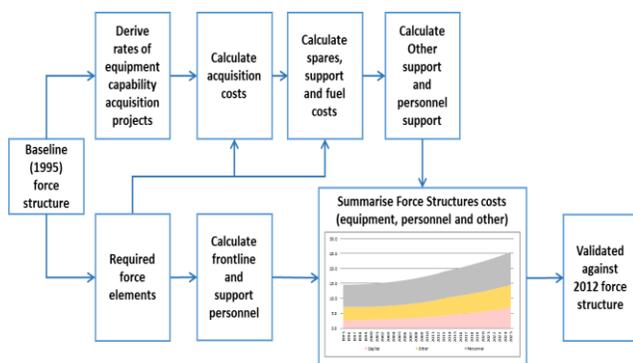
2.2.1 DAS force structures model

The DAS force structures model is designed to provide insight into the long-term impact of the key cost drivers on future department of defence budget

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needs. Using key assumptions (Appendix A - Key Model Assumptions), the model represents all support, “tooth to tail” and equipment acquisition costs and is designed to project these costs beyond the traditional three-year reporting period of the Estimates. Figure 2-2 below provides a schematic to illustrate how the model operates.

Figure 2-2 Force structures model overview



Source: DAS

The model is designed to provide an understanding of budget envelopes, constraints, and the likely consequences of major defence policy changes.

The model does not provide annual forecasts, but rather identifies long-term cost trends.

Similarly, the model does not look at individual procurement programs or short-term changes in management programs such as the *Deficit Reduction Action Plan*.²² The model is not intended to replace detailed, bottoms-up analysis of present and future force structures.

2.2.2 Model operation

The DAS model uses parametric modelling techniques²³ that rely on data taken from public domain sources. Parametric estimating is a technique used to develop cost estimates based on previously observed and validated cost estimating relationships. For example, there exist well-known statistical

relationships between the weight of a jet airplane and its cost of manufacture and support.

The DAS model uses dozens of cost estimating relationship models. It relies on extensive research into rates of escalation for types of defence equipment, unit costs of contemporary equipment, trends in development timelines, trends in service lives, and real rates of growth in personnel costs. Some of these data are published within the Source Book of Defence Equipment Costs.²⁴

To establish a baseline personnel cost, the model requires the establishment of traditional frontline force structure units (that is, ships, regiments, squadrons and so on), and from there, estimates of the associated personnel, including those in training, command and administrative posts.

2.2.2.1 Equipment acquisition

At any time over the study period, there will be a number of major equipment acquisition projects ongoing. The model assumes that year-to-year variations are minimized in order to smooth the funding cycle.

The model, therefore, attributes an average annual funding requirement for each project in any given year. This does not allow the model to represent the details of any one project in any given year. But the point of this study is to project what funds are required over the study’s span to complete whatever projects are included over their respective time horizons.

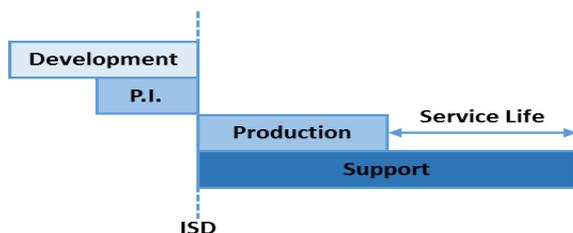
Overhead factors are also established for minor projects, logistic overheads, costs of training and number of service support personnel, using information from the current force. These factors are assumed to apply in all years.

To provide an annual requirement to meet the specified force structure, the model runs through the following activities:

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- Identifies replacement strategies for each equipment type and computes replacement equipment costs, in accordance with a standardized equipment replacement schedule (Figure 2-3).

Figure 2-3 Acquisition of a unit of force element equipment is represented as a generic project cycle within the industrial sector



For a domain (air, land, sea), it is assumed that the acquisition community is active continuously i.e. development of next generation equipment will follow completion of the current programme

Where Production investment (PI) is high e.g. air systems, then it is assumed first units are delivered prior to full scale production

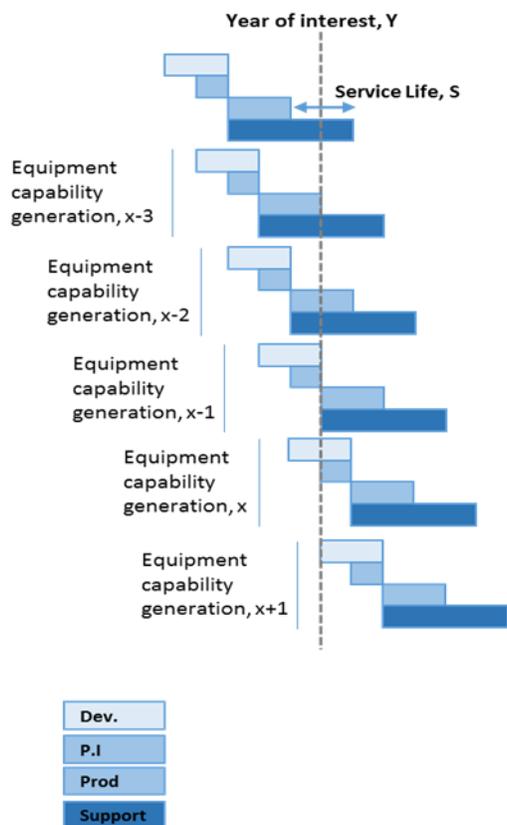
Source: DAS. ISD is In Service Date

- Identifies the number of front line personnel required to man this structure and applies its historic ratio data to compute the associated personnel cost for the specified force structure, including the 'back-room' personnel.
- Calculates the associated spares, repairs, and consumables cost of the proposed force structure.
- Assumes that the acquisition community is actively developing next generation equipment following completion of the current acquisition program. The acquisition cycle is assumed to be a continuous set of development, production investment, production, and support activities (see Figure 2-4).
- Adds allowances for personnel and other support so as to obtain total materiel running costs.
- Computes and stores data as above for the start and end years of the period being considered and for the years immediately following both of

those to get a rate of cost growth (or decline). At the start and end of the planning period, the model calculates the required rate of spending and the associated cost escalation rate required to maintain the given force structures.

- Through interpolation between these start and end data (both expenditures and rates of change of expenditures), the model estimates expenditures in each year of the period covered for each of nine categories of expenditure: capital, personnel and other operating costs for each of Naval, Land and Air technology areas.
- The model then aggregates these calculations appropriately to provide the overall defence budget expenditure required to support the status-quo force structure into the future. It is important to note that the model assumes that existing capabilities will be maintained.²⁵

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Figure 2-4 Acquisition is a continuous set of activities

Source: DAS

Thus, if we consider Year “Y”, we can see that there are a number of concurrent equipment generations at varying stages of their lifecycle. These are used to determine average costs of development, production, and in-service costs calculated using the parametric cost estimating relationships described earlier.

Equipment operating costs include provision of spares, repairs, and the like to keep equipment in use; accommodation and other personnel support, such as bases and infrastructure; as well as other support activities, such as the significant resources dedicated to supporting defence procurement.

Costs of spares, repairs, and consumables are estimated from production cost, quantity, and

equipment type using statistical relationships derived through analyses of a large number of past comparable projects.

Personnel support costs and expenditure in support of other activities (such as defence procurement) are treated as overheads on the costs of personnel and capital expenditure. This calculation uses ratios of personnel support to personnel costs and ratios of other support to capital expenditure obtained via analysis of the 2007 UK defence budget, calibrated to the Canadian situation.²⁶

2.2.3 Calibration and model inputs: ‘Canadianizing’ the model

The force structure model was calibrated against historical and current Canadian force structure inputs. This process involved detailed collation, synthesizing, and triangulation of the data sources.²⁷

The DAS ‘should cost’ model projects the cost of maintaining the force structure as it exists at 2012. In order to ensure that the slope of the expenditure curve was reasonable, the model was calibrated to back to 1995. The year 1995 was chosen because it represents the last year of the round of major budget cuts that occurred during Program Review, and it represents the mid-point of the effect of the cuts. With the assistance of subject matter experts and using public domain data, PBO undertook an inventory of the force structure elements and composition in 1995 and in 2012.

Once the inputs were established for 1995, the model was used to forecast the expenditure required to move from the 1995 force structure to the 2012 force structure. This was compared against actual expenditures over that time period.

The model also requires an input of the spending broken out by capital, personnel, and other expenses. While DND does not report expenses in this manner, PBO was able to provide this

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information using public accounts data supported by independent analyses.²⁸

The most significant challenge to calibrating the model was ensuring that the cost base used in the model and the cost base used by DND were aligned. This required some effort in normalizing inflation and currency exchange rates, as well as ensuring that any modifications to equipment types were reasonably accounted for in the model.

3 Model results

The DAS force structures model returns results in a variety of formats. To ensure that the model was predicting reasonable results for the Canadian situation, we compared the change in the estimated cost of the force structure from 1995 to 2014 against actual defence expenditure for the same period.

We also broke out the defence expenditure by service area, and by standard object of expenditure. If the model was behaving reasonably, we would expect that the changes in force structure cost and composition predicted by the model compare reasonably closely with current conditions.

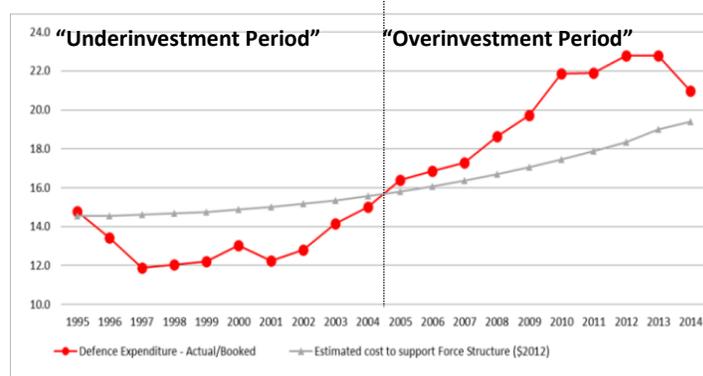
It is important to remember that the model assumes ongoing capital replenishment and replacement; it also assumes that year-over-year variations are minimized. There will be small discrepancies between actual expenditure figures for any given year and what the model returns as a 'should cost' expenditure amount.

3.1 Force structure cost vs. expenditures

Figure 3-1 illustrates the cyclical nature of defence spending in Canada. The most significant budget cuts under program review occurred from 1995 to 2004 and are represented as the 'underinvestment' period on the chart. The cumulative defence expenditure over that period of time was roughly \$13.4 billion below what our modelling showed was

required to maintain the existing force structure. A variety of studies undertaken since that period confirm that the national defence program suffered from symptoms of 'hollowing-out'.^{29 30 31 32}

Figure 3-1 Estimated cost to support the force structure against actual expenditure 1995-2014 (\$B 2012)



Sources: Fiscal Reference Tables, DAS Model Projection

Once Canada's fiscal situation was stabilized, defence spending started to increase the following year in recognition of the fact that the defence program needed to be re-built.³³

Consequently, the period from 2005 to 2014 shows cumulative expenditures exceeding the 'should-cost' total by roughly \$20.9 billion. From 1995 until the end of fiscal year 2014, there is a cumulative surplus of \$7.5 billion between what was spent and the estimated cost to support the force structure.

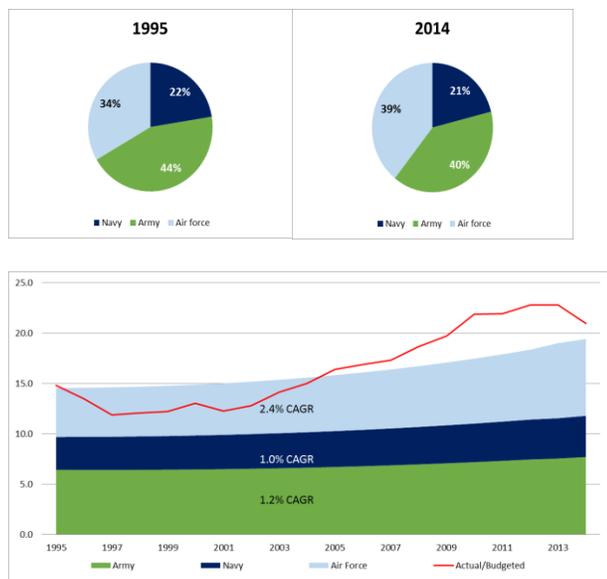
The recent budget cuts at the Department of National Defence appear to signal the start of potentially another period of underinvestment. The model shows that the cost of maintaining the current force structure is projected to grow at an inflation-adjusted rate of 2.5 per cent per year from 2014 to 2025, (Figure 3-5 on page 14), which is higher than forecast real GDP growth of 1.6 per cent per year over the same horizon.

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3.2 Force structure cost: Army, Navy, Air Force

Figure 3-2 shows the costs of the force structure broken out by service area, and the changes in those costs from 1995 to 2014.

Figure 3-2 Historical defence budgets and share by service area, 1995-2014 (\$B 2012)



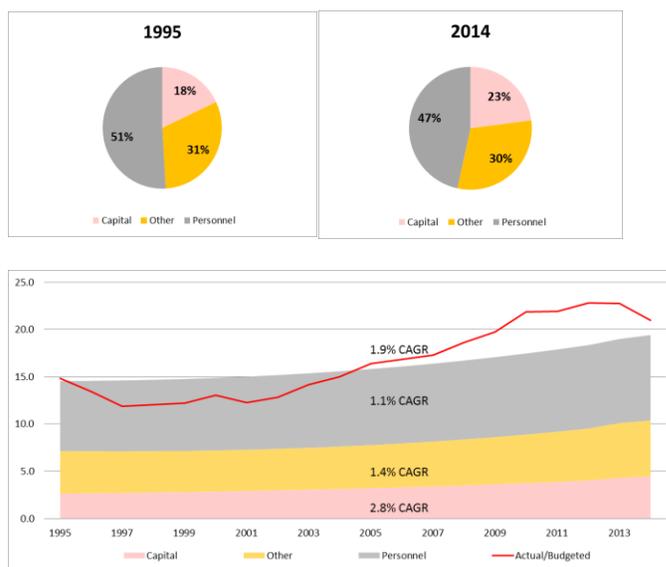
Source: DAS Model Projection. CAGR = Compound Annual Growth Rate

While the Army's component of total expenditure remains the largest from 1995 to 2014, its share has fallen due to relatively low cost escalation. Each of the services made a range of changes in its force structure between 1995 and 2012. The cost growth to fund these changes is much higher in the Navy and Air Force.³⁴

3.3 Force structure cost: personnel, capital, other operating

Figure 3-3 shows the costs of the force structure broken out by key standard objects of expenditure: personnel expenditures, capital expenditures, and other operating expenditures.

Figure 3-3 Historical defence budgets and share by standard object of expenditure, 1995-2014 (\$B 2012)



Source: DAS Model Projection. CAGR = Compound Annual Growth Rate

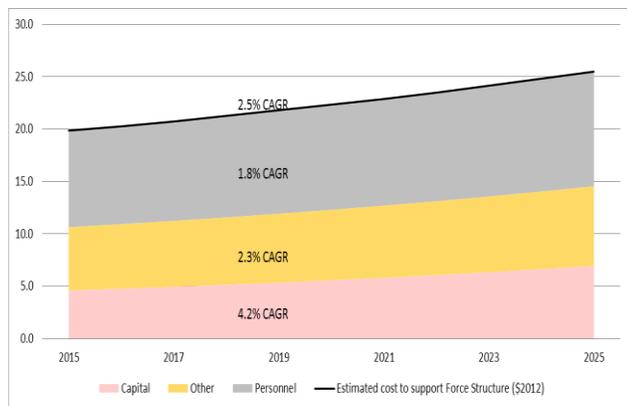
In 1995, personnel costs accounted for 51 per cent of defence expenditure; by 2014, its share had dropped to 47 per cent. Meanwhile, over the same period, the share of defence costs for capital increased from 18 per cent to 23 per cent³⁵.

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Figure 3-4 illustrates the significant growth in capital expenditure that is required over the next ten years in order to maintain the status quo force structure.

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Figure 3-4 Projected defence expenditure by standard object of expenditure, 2015-2025 (\$B 2012)



Source: DAS Model Projection. CAGR = Compound Annual Growth Rate

3.4 Forecast budget scenarios

The government does not publish future budget expenditures on an accrual basis for the defence program beyond what PBO has derived for the fiscal year ended 2020. DND's Report on Plans and Priorities (RPP) outlines the amounts, on a partial accrual basis, that it will request from Parliament over the next three years.

As discussed elsewhere³⁶ the amounts in the RPP are not necessarily a good indication of future spending,

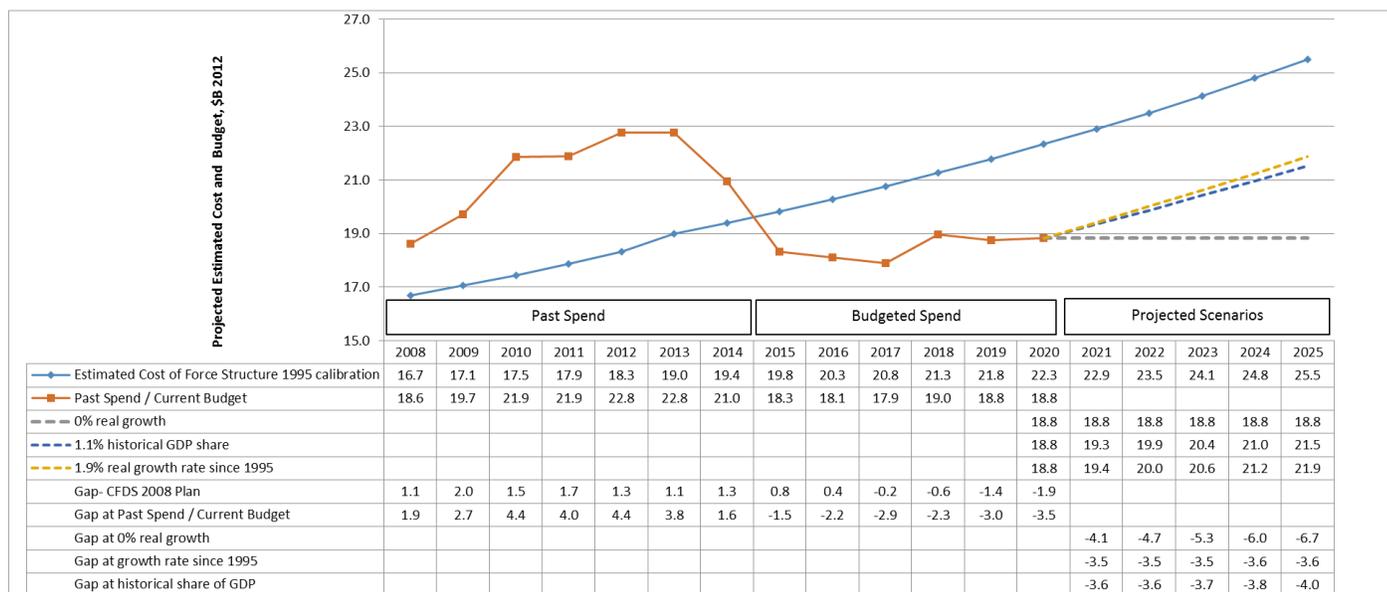
nor do figures on a partial accrual basis provide any indication of longer term affordability (see Box 1 above).

Using fiscal year 2019-2020 as a starting point, the last year for which the Department of Finance has provided a planned budget allocation, PBO overlaid three medium-term expenditure scenarios against the forecast cost of maintaining the current force structure:

1. Maintain defence spending at 0 per cent real growth (that is, growth at the same level as the forecast inflation rate). While to some this may represent a 'worst-case scenario', it is consistent with the revised CFDS.³⁷
2. Maintain defence spending at its average share of GDP over the last 20 years. This represents a baseline status quo. Over the past decade, defence spending has been maintained at 1.1 per cent of GDP. This implies that real defence spending grows at the same rate as forecast real GDP growth.³⁸
3. Maintain defence spending at its historical real rate of growth of 1.9 per cent per year since 1995.

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Figure 3-5 Historical and forecast defence budget scenarios against force structure cost (2008-2025)



Sources: Fiscal Reference Tables, PBO, DAS Model Projections

Figure 3-5 displays the results of the model for these three scenarios. The blue solid line is the estimated cost of maintaining the force structure and the red line represents past spending and the planned defence budget until 2020. The dotted lines represent projections from the three scenarios described above.

The gap between the blue line and each of the three dotted lines represents the gap between the estimated cost of the force structure and the funding being provided. That is, the gap indicates the amount the estimated funding falls short of the estimated amount required to maintain the 2012 military force structure. The figures in the table are in billions of dollars. Negative numbers reflect a gap between budgets and estimated cost, and positive numbers reflect a surplus of budget relative to cost. The lowest cumulative gap is \$33.0 billion, and is calculated by summing the figures in the row entitled 'Gap at Past Spend/Current Budget' and 'Gap at growth rate since 1995'. The highest cumulative gap is \$42.1 billion, and occurs when defence spending

growth from 2015 to 2020 is held to the rate of inflation.

3.5 Model Sensitivity

The model highlights the significant affordability challenges that will occur post 2015 in maintaining the capability of the 2012 force structure with projected defence budget allocations. As such, the model is sensitive to large changes in force structure.

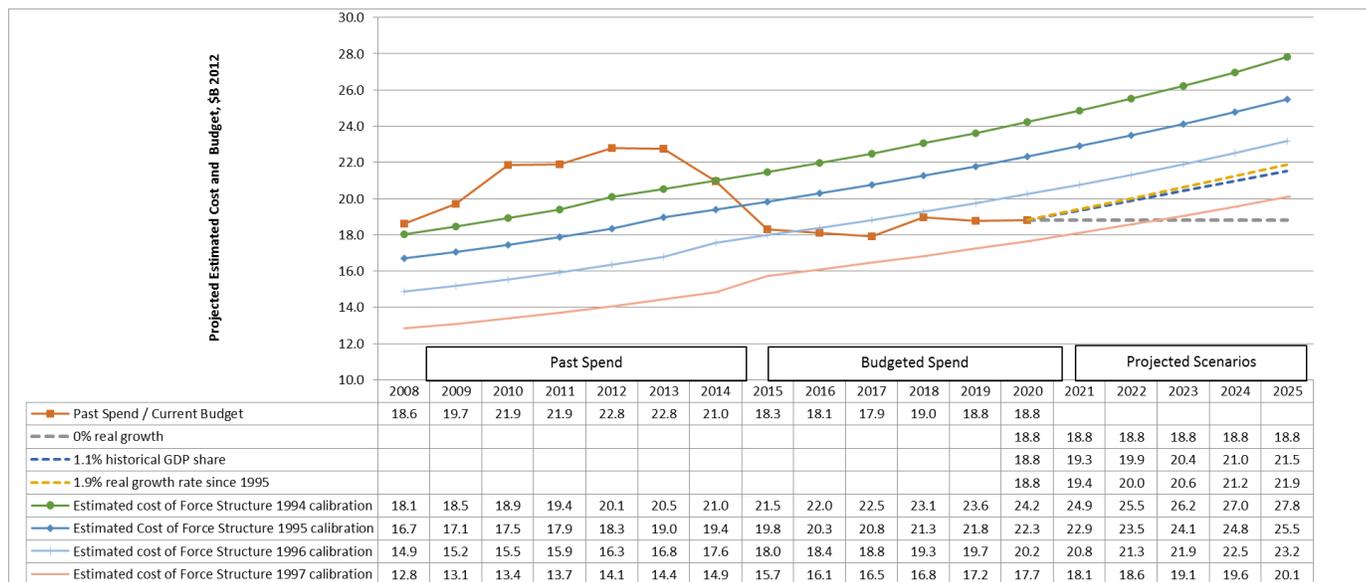
Figure 3-6 below presents the gap between the estimated budget and the estimated costs of maintaining the force structure to levels of three alternate years: 1994, 1996 and 1997. These years reflect – respectively – a larger force structure, a somewhat comparable force structure, and a smaller force structure than that of 2012. In 1994, for example, the regular forces numbered 75,693, which dropped significantly to 60,300 in 1997. The equipment and operating expense requirements for smaller armed forces is significantly less than one that is almost 15,000 members larger.

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When calibrating the model to the 1994 force structure, the model calculates a cumulative *gap* of between \$54.2 billion and \$63.3 billion. When calibrating to 1995, the gap is between 33.0 and

42.1, and for 1996 it is 10.1 and 19.1. When calibrating to the 1997 force structure, the model estimates a cumulative *surplus* of between \$9.7 billion and \$18.7 billion.³⁹

Figure 3-6 Sensitivity of estimated force structure costs using different calibration years



Source: DAS Model Projections

Undoubtedly, maintaining a larger force structure – such as that in 1994 (the green dotted line) – will increase the estimated costs, just as maintaining a smaller force structure – such as that in 1997 (the solid orange line) – will decrease the estimated costs. The purpose of these results is to provide estimates of the costs of maintaining alternate force structure levels in the context of the estimated budget.

Maintaining the 2012 force structure, however, is better aligned with the objectives in the CDFS. With the drop in defence spending announced in Budget 2012 and subsequent years, another period of underinvestment appears evident. Even if the funds removed in recent budgets are re-allocated to future years, trend spending on defence needs to grow significantly from its base of 1.9 per cent in order to match the 2.5 per cent growth in the cost of maintaining the existing force structure over the next

10 years. Spending growth would also need to increase much higher than the 0.6 per cent long-term growth projected by DND in the Canada First Defence Strategy.⁴⁰

4 Conclusions and observations

As a result of the underinvestment through the 1990s, the model illustrates the cumulative affordability gap that existed until the early 2000s. The model shows that it was only with the significant spending increases seen in the latter half of the 2000s that the affordability gap was closed and capability was able to be maintained and to some extent re-built. However, the recent cuts to the defence budget point to an impending affordability gap beginning in this fiscal year.

The outcomes of a fiscal gap in the defence program are beyond the scope of this paper⁴¹. However, if

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program costs and the budget allocation are not brought to equilibrium, there will be a reduction in the capabilities of the current force structure. This means a reduction in the numbers and types of equipment and potentially a reduction in the number of personnel in the Armed Forces⁴². This would also result in the government falling short of its CFDS commitments.

Ultimately, it is the role of policy makers to decide on the future role of the defence program, the makeup of the force structure to support that role, and the budgetary allocation required to support that force structure.

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Appendix A - Key Model Assumptions

Capital Expenditure includes expenditure on:

- Armed forces and peacekeeping forces
- Defence ministries and other government agencies engaged in defence projects
- Paramilitary forces; when judged to be trained, equipped and available for military operations
- Military space activities

Personnel Expenditures include:

- Expenditures on current personnel (military and civil)
- Military personnel retirement pensions
- Military personnel and their families' social services

Procurement Expenditures include:

- Military research and development
- Military construction
- Military aid (reflected in expenditures of donor country)

Excluded Military Related Expenditures:

- Civil defence
- Current expenditure for previous military activities
- Veterans' benefits
- Demobilization
- Conversion of arms production facilities
- Destruction of weapons

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Endnotes

¹ National Defence and the Canadian Armed Forces (2008)

² By way of example, Budget 2014 removed \$3.1 billion from the defence capital procurement budget. Only a portion of this reduction was reflected in DND's spending plans for 2014-15 to 2016-17.

³ Future Years Defense Program (FYDP) (2010)

⁴ National Audit Office (2013)

⁵ Thomson (2014)

⁶ In 1998, the Auditor General undertook assessments of DND's ability to modernize the armed forces and concluded that the department did not have adequate funds to do so. See Office of the Auditor General of Canada (2008)

⁷ National Defence and the Canadian Armed Forces (2014)

⁸ Bland and MacDonald (2012)

⁹ National Defence and the Canadian Armed Forces (2014)

¹⁰ United States Air Force (2010)

¹¹ Department of Finance (2014)

¹² Department of National Defence (2011)

¹³ National Defence and the Canadian Armed Forces (2014)

¹⁴ There are three types of accrual: Full, Modified and Partial. The major difference between "modified" and "full" accrual is that under "modified" accrual accounting, non-financial assets such as capital assets are expensed when they are acquired, whereas under "full" accrual accounting, capital assets are expensed as they are consumed (amortized/depreciated) over their useful life.

"Partial" accrual accounting followed for the Estimates is somewhere between "cash" accounting and "modified" accrual accounting. Under the "partial" accrual basis currently followed by individual departments, some expenses are accrued, but not all; revenues are on a pure cash basis; and, non-financial assets are expensed on acquisition.

See Treasury Board of Canada Secretariat (2000)

¹⁵ The 'Accrual Envelope' is funding set aside in the Fiscal Framework for Defence, and provides a source of funds for capital acquisitions in the year of purchase and a source of operating funds to implement CFDS and sustain new capital investments. Hood (2015)

¹⁶ The PBO has the legal right to request economic and financial data from government departments. These requests, as well as the government's responses, are posted on the PBO website. Budgets 2011 and 2013 were

not included because there was no significant information pertaining to the defence budget.

¹⁷ http://www.pbo-dpb.gc.ca/files/get/infReq/132?path=%2Ffiles%2Ffiles%2FResponse_IR0115_FC_Defence_Expenditures_EN.pdf

¹⁸ Except in the event of an operating budget freeze, departments are compensated for changes to terms and conditions of employment from a central budget allocation, TBS Vote 15. See <http://www.tbs-sct.gc.ca/ems-sgd/sups/c/20142015/atbcv-accct-eng.asp> for a description. PBO uses a projected nominal wage increase of 4.5% per year (http://www.pbo-dpb.gc.ca/files/get/publications/191?path=%2Ffiles%2Ffiles%2FFed+Personnel+Expenses_EN.pdf), which works out to roughly 2.5% per year adjusted for inflation. The adjustment for the transfer of authorities to Shared Services Canada is \$306 million per year as per the Main Estimates, 2012-2013 (<http://www.tbs-sct.gc.ca/est-pre/20122013/me-bpd/me-bpd-eng.pdf>). PBO assumes that services of a comparable value will be delivered to DND, thereby reducing DND's expenses by the same amount.

¹⁹ The GDP deflator, a measure of the change in prices of all goods and services produced (as opposed to the change in prices of a fixed basket of goods which is the basis of the Consumer Price Index), is also a valid basis of analysis. The results are not materially different.

²⁰ Public Sector Accounting Standards Board (2014)

²¹ Total incremental funding for these expenses amounted to \$6 billion in constant 2012 dollars from 2001 to 2011. This amount differs from PBO's 2008 estimate of the cost of the Afghanistan mission (http://www.pbo-dpb.gc.ca/files/get/publications/6?path=%2Ffiles%2Ffiles%2FPublications%2FAfghanistan_Fiscal_Impact_FINAL_E_WEB.pdf). The cost of military operations is published by DND in its RPP. In some instances, DND is required to absorb some of the cost of these overseas operations in its existing budget. These amounts were provided by DND through an Access to Information request A-2011-1104.

²² Treasury Board of Canada Secretariat (2011)

²³ For more information on parametric cost estimating, see International Society of Parametric Analysts (2008)

²⁴ Pugh (2007)

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²⁵ This does not always translate into a one-for-one replacement. This may mean, for example, fewer but more capable force structure units going forward.

²⁶ For example, adjustments were made to the size of different major force structure elements (battalion, squadron, regiment, ship) between the UK and Canada.

²⁷ PBO will publish in a separate note the methodology and assumptions used to collect and assess the force structure inputs.

²⁸ Stone (2009)

²⁹ Manifested most significantly in a shortage of trained personnel, loss of airlift and surveillance capability in the Air Force, loss of command, control and air defence platforms in the Navy and loss of direct and indirect fire capabilities and wheeled logistics vehicles in the Army. Douglas L. Bland (2004)

³⁰ A very recent example is the complete loss of at-sea replenishment capability for the Navy.

³¹ The Conference of Defence Associations Institute (2002)

³² Cohen (2003)

³³ National Defence and the Canadian Armed Forces (2008)

³⁴ It is important to remember that the Army is personnel intensive, while the Navy and Air Force are capital intensive. If overall capital spending is changed, the effect is felt disproportionately on the Navy and Air Force.

³⁵ The figures are close but not identical to the amounts that would be found in the Public Accounts. The model is projecting higher capital costs based on the existing force structure inputs. The lower capital expenditure figure in Public Accounts reflects the significant amount of lapsed capital budget funds at DND over the past few years.

³⁶ Perry (2014)

³⁷ CAGR for defence spending from 2008, the starting point of the CFDS to 2020, the last year for which we have information for the DND budget allocation, is effectively flat in inflation-adjusted terms.

³⁸ PBO's real GDP growth rate forecast for the period 2020-2025 is 1.5 per cent per year.

³⁹ Adjusting the calibration year results in a shift of the expenditure curve, but does not change its slope. The slope is derived by calibrating the model using the two years for which PBO has actual force structure data: 2012 and 1995.

⁴⁰ National Defence and the Canadian Armed Forces (2008)

⁴¹ The CDA Institute's Strategic Outlook 2014

(DeKerckhove, F. and G. Petrolekas (2014). THE STRATEGIC OUTLOOK FOR CANADA. Vimy Paper, Conference of Defence Associations Institute: 55-60.) provides a cogent discussion about Canada's security considerations. It proposes five scenarios of future capabilities of the force structure concurrently with budgetary requirements.

⁴² By way of example, the model shows that the projected defence budget would be more than sufficient to maintain a force structure that resembles the one that existed in 1997. In order to maintain equilibrium, however, the existing force structure would have to be significantly reduced.