

From: kevin.page@parl.gc.ca [mailto:kevin.page@parl.gc.ca]
Sent: Thursday, 19, April, 2012 17:33 PM
To: Ross D@ADM(Mat)@Ottawa-Hull
Cc: Fonberg R@DM@Ottawa-Hull; Lindsey K@ADM(Fin CS)@Ottawa-Hull
Subject: Response to your inquiry

Hi Dan,

It was good to talk with you yesterday. In an effort to get this to you quickly, please find attached a PDF copy of my response to your inquiry. I will send hard copy to you and others via messenger.

Best wishes,

Kevin Page

Parliamentary Budget Officer / Directeur parlementaire du budget
Ottawa Ontario K1A 0A9
Tel. / Tél : 613-992-8026
Fax / Téléc. : 613-947-8480



Thursday, April 19, 2012

Mr. Dan Ross
Assistant Deputy Minister (Materiel)
Department of National Defence (DND)
101 Colonel By Drive
Ottawa, Ontario K1A 0K2

Re: Inquiry regarding the Operating & Support (O&S) definition used in PBO lifecycle cost estimate (F-35)

Dear Mr. Ross:

A handwritten signature in blue ink that reads 'Dan'.

It was good to speak with you yesterday and I thank-you for your inquiry, which is attached as Annex I below. As you know, the Parliamentary Budget Officer (PBO) was tasked by a parliamentarian to estimate the lifecycle or total cost of ownership of the proposed acquisition and sustainment of the F-35. The request to the PBO was similar in this respect to the November 10, 2010 motion of the House of Commons Standing Committee on Finance (FINA) (see Annex II) where the committee requested DND to produce and, if necessary, undertake their own life cycle costing.

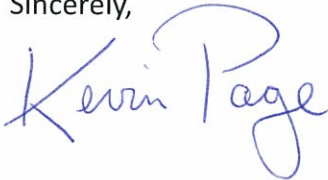
From a cost accounting perspective, as you well know, total cost of ownership includes both acquisition costs and operating costs, less any proceeds on disposition at end of life. Total operating costs include both total fixed costs and total variable costs.

Our contractor and collaborator, Decision Analysis Services Ltd. (DAS), was engaged to work with us to estimate the life cycle cost of proposed F-35 procurement, which includes Operating & Support (O&S) costs. The engagement methodology used O&S as defined by US Department of Defense (DoD) practices (see Annex III). A similar definition can be found in the DND Costing Handbook (see Annex IV). For further reference, we have included in Annex V the Treasury Board policies that refer to life cycle costs. Consistent with the engagement methodology and as described in the report, we used a top-down model to estimate O&S in order to capture the total life cycle costs.

We have also received a new request from a parliamentarian under Section 72.9 (d) of the *Parliament of Canada Act* (Act), requesting the PBO undertake an update of the life cycle cost estimate of the F-35. Pursuant to the PBO's statutory authority under Section 79.3 of the Act, we would like to request that DND provide information and documents that provide a full life cycle cost of the F-35 aircraft, with life cycle cost being defined in the DND Costing Handbook (Annex IV). Further we would encourage DND to

assume in its analysis, the Average Unit Procurement Cost (AUPC) published by the US Government Accountability Office (GAO), an independent, nonpartisan agency that works for the United States Congress. The last published figure for AUPC is US\$137 million per aircraft for all variants in GAO's report of March 20, 2012 (Table 1, Page 4). You may wish to undertake a sensitivity analysis to provide a range of potential AUPC figures. We would also ask that sustainment costs, including O&S, be reconciled with the estimates published by the US DoD Cost Analysis and Program Evaluation (CAPE) unit. This letter is being copied to the deputy head of DND, consistent with the stipulations in 79.3 (1) of the Act.

Sincerely,



Kevin Page
Parliamentary Budget Officer

c.c.: Mr. Robert Fonberg, Deputy Minister, National Defence
Mr. Kevin Lindsey, Chief Financial Officer, National Defence



Enclosures: Annex I to V

ANNEX I

----- Original Message -----

From: DAN.ROSS@forces.gc.ca [<mailto:DAN.ROSS@forces.gc.ca>]

Sent: Wednesday, April 18, 2012 12:16 PM

To: Page, Kevin

Cc: JENNIFER.HUBBARD@forces.gc.ca <JENNIFER.HUBBARD@forces.gc.ca>

Subject: JSF Operating Costs

Kevin, good to talk this morning.

As promised, here is a list of what we costed as on-going departmental operating costs for the JSF project.

- Personnel salaries and allowances;
- Fuel and lubricants;
- Base support services such as food, supply, security, transportation, etc;
- Base engineering services for infrastructure maintenance and repair;
- IT and telecommunications and other base technical support;
- Unit administration including travel, office supplies, etc.and
- Contracted base support through leases, service contracts, etc.

Confirmation of the scope of your estimates with regard to these would be greatly appreciated.

Best regards,

Dan

ANNEX II

Finance Committee Motion

November 10, 2010

Excerpt

The committee also orders that the Government of Canada provide the committee with electronic copies of the following:

...

- All documents that outline acquisition costs, *lifecycle costs*, and operational requirements associated with the F-35 program and prior programs (CF-18). Such documents include but are not limited to the Selected Acquisition Report (SAR) and the report of the US Department of Defence's Joint Estimating Team (JET) both relating to the F-35;¹

¹<http://www.parl.gc.ca/HousePublications/Publication.aspx?DocId=4792929&Language=E&Mode=1&Parl=40&Ses3> accessed April 11, 2012.

ANNEX III

Cost Analysis Guidance and Procedures²

US Department of Defense

December 11, 1992

Excerpts

CHAPTER 1 - GUIDELINES FOR THE PREPARATION AND MAINTENANCE OF A COST ANALYSIS REQUIREMENTS DESCRIPTION (CARD)

Page 9

C1.4.1. Each CARD should be comprehensive enough to facilitate identification of any area or issue that could have a significant effect on life-cycle costs and therefore must be addressed in the cost analysis. It also must be flexible enough to accommodate the use of various estimation methodologies. In some sections of the CARD, it may be possible to convey the information pertinent to cost estimation in a few sentences or a single matrix and/or table. In other sections, more detailed information may be required. The input options available to CARD preparers are identified in enclosure 1. Note that if a source document is referenced in the CARD, the full document (or pertinent extracts from it) must be included as an attachment to the CARD. MIL-STDs and other widely available references need not be attached; however, the exact location where the widely available information may be found shall be referenced, i.e., title of document, author(s), document number, and physical location.

Page 11

1.1.4 **Government-Furnished Equipment and Property.** This paragraph identifies the subsystems that will be furnished by the Government and included in the life-cycle cost estimates for the system. Any Government-furnished commercial off-the-shelf (COTS) software should be addressed in the discussion. Where Government-furnished equipment or property is common to other weapon systems, the text should identify how the costs will be accounted for.

CHAPTER 2 - CRITERIA AND PROCEDURES FOR THE PREPARATION AND PRESENTATION OF COST ANALYSES TO THE OSD CAIG

Pages 29, 30

C2.1.3. The cost estimates should include all sunk costs and a projection for all categories of the life-cycle costs for the total planned program required to respond to the need as defined in the Mission Needs Statement (MNS), and delineated in the Operational Requirements Document (ORD), System Threat Assessment Report (STAR), Acquisition Program Baseline (APB), and Test and Evaluation Master Plan (TEMP) (DoD 5000.2-M (reference (b))), to include the following:

C2.1.3.1. Research and Development (R&D). The cost of all R&D phases (i.e., Concept Exploration and Definition, Demonstration and Validation, and Engineering and Manufacturing Development) should be

² <http://www.dtic.mil/whs/directives/corres/pdf/500004m.pdf> accessed April 11, 2012.

estimated beginning with program initiation through development. Nonrecurring and recurring R&D costs for prototypes, engineering development equipment and/or test hardware (and major components thereof) should be shown separately. Contractor system test and evaluation and Government support to the test program should be fully identified and estimated. Support, such as support equipment, training, data, and military construction should be estimated. The cost of all related R&D (such as redesign and test efforts necessary to install equipment or software into existing platforms) should be included. Appropriate use of Contractor Cost Data Reporting (CCDR) will be made in reflecting actual costs and projecting future costs (see Part 20 of reference (b)).

C2.1.3.2. **Investment.** The cost of investment (i.e., Low-Rate Production, and Production and Deployment phases) should include the total cost of procuring the prime equipment and its support; e.g., command and launch equipment; support equipment; training; data; initial spares; war reserve spares; preplanned product improvement (P3I) program; and military construction. The cost of all related procurement (such as, modifications to existing aircraft or ship platforms) should be included. Nonrecurring and recurring costs for the production of prime equipment and major support equipment should be shown separately. Appropriate use of CCDR will be made in reflecting actual costs and projecting future costs (see Part 20 of reference (b)).

C2.1.3.3. **Operating and Support (O&S).** The cost of O&S (i.e., Operations and Support phase) should include all direct and indirect elements of a defense program. Personnel costs should be based on estimates for officers, enlisted personnel, civilians, and contractors, expressed in terms of the Manpower Estimate Report functional categories (see Part 6 of DoD 5000.2-M (reference (b)) and paragraph C2.3.15., below). The O&S estimate should include unit level consumption (consumables, including expendable training stores, and fuel), depot maintenance, sustaining investment, system and inventory management control, and indirect O&S costs. The length of time and costs associated with defense program phase-in, and the length of time and costs associated with steady state operations should be identified. Appropriate use of Visibility and Management of Operating and Support Costs (VAMOSOC). Program data (Chapter 4 of this Manual) will be made in deriving these estimates. These O&S cost elements are defined in Chapter 3 of this Manual, and the Operating and Support Cost-Estimating Guide (reference (f)).

CHAPTER 3 - COST TERMS, DEFINITIONS, AND RELATIONSHIP TO LIFE-CYCLE COSTS, WORK BREAKDOWN STRUCTURES, AND APPROPRIATIONS

Page 44

C3.1. OBJECTIVES

Seven cost terms are standardized by this Manual as follows: development cost; flyaway cost; weapon system cost; procurement cost; program acquisition cost; operating support (O&S); and life-cycle cost. This standardization:

C3.1.1. Provides a uniform and consistent frame of reference for identifying what is included or excluded from each cost term, and how each cost term relates to work breakdown structure elements, budget appropriations, as well as to life-cycle cost categories. It provides the means to ensure decision process.

C3.1.2. Establishes a basic definitional structure for understanding DoD acquisition program cost, when used in budget submissions prescribed in DoD 7110.1-M (reference (m)); Integrated Program Summary (IPS), and Selected Acquisition Reports (SARs) in accordance with DoD Instruction 5000.2 and DoD 5000.2-M (references (a) and (b)); Fiscal Guidance, Program Objective Memorandum, and Program Decision Memorandum in accordance with DoD Directive 7045.7 (reference (n)); and Congressional Data Sheets in compliance with Section 2431 of 10 U.S.C. (reference (o)). Funding determinations will be based on DoD 7110.1-M (reference (m)).

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C3.3.1.3. Life-Cycle Costs. The development costs, both contractor and in-house, of the Research and Development cost category, including the cost of specialized equipment, instrumentation, test, and facilities required to support the RDT&-E contractor and/or Government installations.

C3.3.2.3. Life-Cycle Cost. The flyaway costs (including Government-Furnished Equipment), both contractor and in-house, of the Research and Development and Investment Nonrecurring and Recurring cost categories.

Page 47

C3.3.3.3. Life-Cycle Cost. The weapon system costs (including Government-Furnished Equipment), both contractor and in-house, of the Investment Nonrecurring and Recurring cost categories.

C3.3.4.3. Life-Cycle Cost. The procurement costs (including Government Furnished Equipment), both contractor and in-house, of the Investment Nonrecurring and Recurring cost categories.

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C3.3.5.3. Life-Cycle Cost. The program acquisition costs (including Government Furnished Equipment), both contractor and in-house, of the Research and Development, and Investment nonrecurring and recurring cost categories.

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C3.3.7. Life-Cycle Cost. Life-Cycle Cost includes ALL WBS elements; ALL affected appropriations; and encompasses the costs, both contractor and in house effort, as well as existing assets to be used, for all cost categories. It is the TOTAL cost to the Government for a program over its full life, and includes the cost of research and development, investment in mission and support equipment (hardware and software),

initial inventories, training, data, facilities, etc., and the operating, support, and, where applicable, demilitarization, detoxification, or long term waste storage.

Figure C3.F1. Discrete Cost Definitions

TERM	COST CATEGORIES					APPROPRIATIONS					WORK BREAKDOWN STRUCTURE			
	RESEARCH & DEVELOPMENT		INVESTMENT		OPERATING & SUPPORT	NOTE	MPC ^{2/}	MILCON	DAM	OTHER ^{4/}	PRIME DESIGN EQUIPMENT SYSTEM ENG/ PROGRAM MGT SYSTEM TEST & EVALUATION	TRAINING PECULIAR EQUIPMENT DATA SPEC./SITE ACTIVATION	METAL SPARES AND REPAIR PARTS	INDUSTRIAL FACILITIES
	NON RECURRING	RECURRING	NON RECURRING	RECURRING										
DEVELOPMENT COST	\$	\$				\$					\$	\$		5/
FLYWAY COST ^{1/}	\$	\$	\$	\$		\$	\$				\$			
WEAPON SYSTEM COST			\$	\$			\$				\$	\$ ^{6/}		7/
PROCUREMENT COST			\$	\$			\$				\$	\$	\$	7/
PROGRAM ACQUISITION COST ^{2/}	\$	\$	\$	\$		\$	\$	\$			\$	\$	\$	
OPERATING & SUPPORT COST					\$		\$	\$	\$	\$	8/	8/	8/	8/
NOTE: THE SUM OF PROGRAM ACQUISITION, OPERATING AND SUPPORT, AND OTHER COSTS (E.G., MILITARY AND CIVILIAN MANAGEMENT PAY) EQUALS LIFE CYCLE COST														
LIFE CYCLE COST	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$

- NOTES
- 1 GENERAL TERM OUTSIDE OF USMC COMMANDRY CAN ALSO BE CALLED "BOLTPAY" OR "SALARAY"
 - 2 IN USMC TERM AS "ACQUISITION COST" OR "PROGRAM COST"
 - 3 INCLUDES SHIPBUILDING AND CONVERSION; NAVY APPROPRIATION
 - 4 OTHER APPROPRIATIONS IN 6 MILITARY PERSONNEL AND FUNDS ARE INCLUDED AS APPROPRIATE
 - 5 WHEN INDUSTRIAL FACILITIES ARE FUNDED BY NOTE 4 IT WILL BE INCLUDED AS APPROPRIATE
 - 6 GENERALLY OTHER PROGRAM ACQUISITION ELEMENTS (I.E. FLIGHT SUPPORT OPERATIONS AND SERVICES FOR SPACECRAFT) APPLY WHEN PROCUREMENT SUPPORTS
 - 7 EXCLUDES INDUSTRIAL FACILITIES WHEN FUNDED AS A SEPARATE BUDGET LINE ITEM
 - 8 THE MIL STD 883C WORK BREAKDOWN STRUCTURE DOES NOT APPLY

CHAPTER 4 - VISIBILITY AND MANAGEMENT OF OPERATING AND SUPPORT COSTS (VAMOSC) PROGRAM

Page 53

C4.1. BACKGROUND

The adequate funding of Operating and Support (O&S) costs is a key component of defense preparedness. O&S costs frequently exceed acquisition costs for many DoD defense systems. Additionally, the relative importance of O&S cost in total life-cycle costs appears to be increasing as weapon systems become more complex. DoD policy requires the explicit consideration of O&S costs from the beginning of the acquisition process throughout the operational life of a program to manage and control these costs. The OSD VAMOSC program has been established as a means of responding to this requirement.

ANNEX IV

Costing Handbook Second Edition –April 2006 A-FN-007-000/AF-001

Directorate of Strategic Finance and Costing
Department of National Defence

Excerpts

Page 2-2

Operating Costs - Operating costs include: personnel costs such as the activation of reserves, overtime cost of civilian employees, and the costs of any other personnel hired to provide service; rations, quarters, temporary duty, travel and transportation; variable and step variable operations and maintenance costs of equipment; total operating costs for facilities and materials consumed. The cost of capital assets purchased by the Department for the purpose of providing the service may also be included.

Page 5-15

5.0 OPERATIONS AND MAINTENANCE (O&M)-FUNDED ELEMENTS

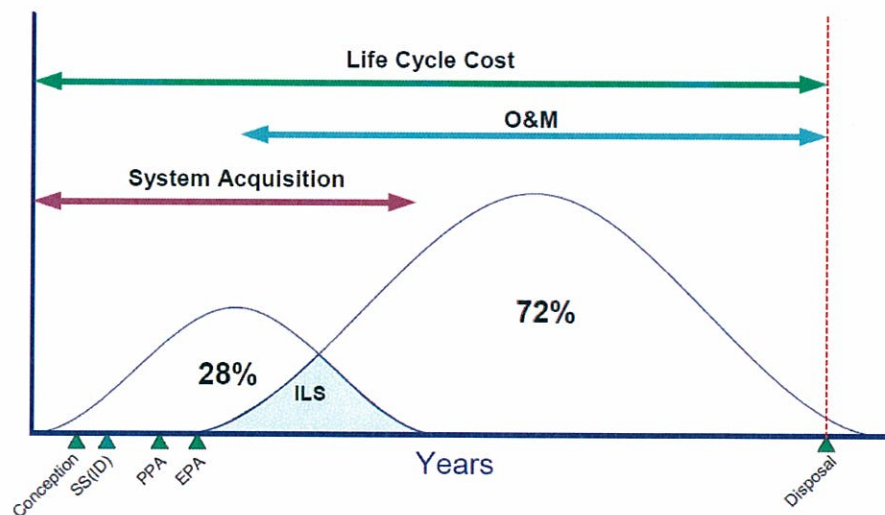
- a. Field Maintenance Civilian Labour**
- b. System-Specific Base Operations
- c. Replenishment Depot-Level Repairables (Spares)**
- d. Replenishment Consumables (Repair Parts)**
- e. Petroleum, Oil, and Lubricants (POL)**
- f. End-Item Supply and Maintenance
- g. Overhaul
- h. Integrated Materiel Management
- i. Supply Depot Support
- j. Transportation
- k. Software
- l. System Test and Evaluation, Operational
- m. System Engineering/Program Management
- n. Project Management Administration (PM Civ)
- o. Other Project Management Costs
- p. Training
- q. Other O&M

Page 5-7
Life Cycle Costs

21. Life cycle costs have gained increasing importance within the approval process and in many cases must be assessed in order to develop a full appreciation of the differences between options under consideration. Life Cycle Costing (LCC), also called Whole Life Costing by some practitioners, is a technique to establish the total cost of ownership. It is a structured approach that addresses all the elements of this cost and can be used to produce a spending profile of the asset or service over its anticipated life-span¹. The results of an LCC analysis can be used to assist management in the decision-making process where there is a choice of options. The accuracy of LCC analysis diminishes as it projects further into the future, so it is most valuable as a comparative tool when long term assumptions apply to all the options and consequently have the same impact. Projects that are likely to involve significant life cycle expenses once the asset is in service must attempt to provide an estimate of the total cost of ownership. Life cycle costs are an essential part of any submission that goes to the Minister, and potentially TBS for approval in the form of a decision document.

22. As a rule of thumb, total O&M related expenses represent 72% of an acquisition's total cost. As one can see from the diagram (Figure 5-1), once the acquisition process begins following an approved SS(EPA), O&M is expended immediately. However, some of these costs (in the shaded area) are comprised of initial logistic support (ILs) identified by the project, usually two to three years of operating costs and spares required to get the project going and to provide analysis on the budget impact. The 72% rule should be used as a basis prior to gathering specific data on operating, maintenance and engineering parameters.

Figure 5-1 – Life Cycle Costs



¹ United Kingdom. Office of Government Commerce, Life Cycle Costing
<http://www.ogc.gov.uk/sdtoolkit/reference/deliverylifecycle/lifecyclecosting.html> accessed 4 May 2005
² BMB Consulting Services, Ottawa. Business Case Essentials presentation Winter of 2002/03

23. In order to estimate the required annual recurring O&M, the total O&M estimate less the ILS identified within the project costing should be used. This will be in the range of 60%-66%³ of the total life cycle cost. In terms of total acquisition cost this is approximately 1.5 to 2 times the total cost of acquisition including ILS. When one takes into account total O&M related costs, including ILS, this amount represents approximately 2.5 times the cost of acquisition. (All estimates are assumed to be actual costs incurred or \$BY of the acquisition, resulting in \$BY for the first year of operation. These amounts would need to be inflated for subsequent years)

$$\text{Annual Estimated O \& M} = \frac{1.5 \rightarrow 2 \times \text{Acquisition Cost}}{\text{Life Cycle (in Years)}}$$

24. For a project whose life is in the order of 20 years this would represent between 3 to 3.3% of the total life cycle cost or 4.5 to 6.6% of the acquisition cost on an annual basis. Therefore, a \$1B project (excluding ILS) would expect to consume between \$45M to \$66M in annual costs in the combined categories of Personnel, O&M and NP providing that the demand in operations is at an average rate. This is true for major capital projects with a stable lifecycle. Other types of projects (IT for example) would need to demonstrate different hypotheses as the life cycles are considerably shorter. Estimating the NPV of upgrades at regular intervals may normalize this situation.

³ United States Department of Energy, Infrastructure Division. Order 430.1 A, Life Cycle Asset Management, Chap 23 www.sc.doe.gov/sc-80/sc-82/430-1/430-1-chp23.pdf, accessed 4 May 2005 5-8

ANNEX V

Treasury Board Policies with Life Cycle Requirements

Inherent in procuring best value is the consideration of all relevant costs over the useful life of the acquisition, not solely the initial or basic contractual cost.

- Treasury Board Contracting Policy

Excerpts

Contracting Policy (2003, 2008)³

9. Best value

9.1 General

9.1.1 As stated in the policy, the objective of government procurement contracting is to acquire goods and services and to carry out construction in a manner that enhances access, competition and fairness and results in best value or, if appropriate, the optimal balance of overall benefits to the Crown and the Canadian people. Inherent in procuring best value is the consideration of all relevant costs over the useful life of the acquisition, not solely the initial or basic contractual cost.

Policy on the Management of Materiel (2006)⁴

6. Policy requirements

6.1 Deputy heads are responsible for ensuring that:

...

6.1.3 Capital acquisition, operations and maintenance, and disposal strategies are developed based on the findings of this ongoing and systematic performance assessment and on an economic and program analysis that considers the full life cycle costs and benefits of alternative solutions to meeting program needs for materiel assets.

Policy on the Management of Projects (2007, 2009)⁵

Appendix B – Project Brief

4. A project brief includes complete descriptions of the following:

...

4.6 The business case reflecting the results of benefit-cost and options analyses and a description of each option considered. Comparison of options should be based at a minimum on a preliminary asset life-cycle cost estimate for each. Any strategic direction that has been given approval-in-principle or that limits available options should be provided.

³ <http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?evttoo=X&id=14494§ion=text> accessed April 10, 2012.

⁴ <http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=12062§ion=text> accessed April 10, 2012.

⁵ <http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=18229§ion=text> accessed April 10, 2012.

Policy on Investment Planning – Assets and Acquired Services (2007, 2009)⁶

6. Policy requirements

6.1 Deputy head

Deputy heads are responsible for ensuring that:

6.1.1 Investment planning, in terms of governance, systems and people, is in place and maintained.

6.1.2 Departmental investment planning:

...

- Takes into account the whole-of-life cost of stewardship based on the life cycle of assets and acquired services.

⁶ <http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=18225§ion=text> accessed April 10, 2012.