


OFFICE OF
THE PARLIAMENTARY BUDGET OFFICER




BUREAU DU
DIRECTEUR PARLEMENTAIRE DU BUDGET

Budget Analysis for the Acquisition of a class of Arctic/Offshore Patrol Ships

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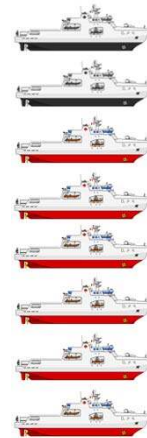
A/OPS Project Objectives

- **Scope:**
 - 6 to 8 ice-capable patrol ships
- **Schedule:**
 - Begin construction September 2015
 - Project completion 2024
- **Budget:**
 - \$2.8 billion (i.e., \$3.1 billion less jetty infrastructure)



PBO Report Objectives

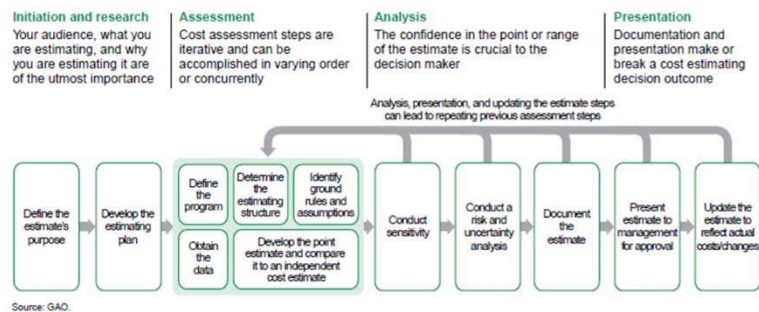
- Estimate the cost of building each ship
- Determine how many ships can be built within budget
- Estimate when the last ship will be completed
- Determine the impacts of project delays



METHODOLOGY



GAO Cost Estimating Process



TruePlanning™ Software

Hardware Cost Drivers

Technology

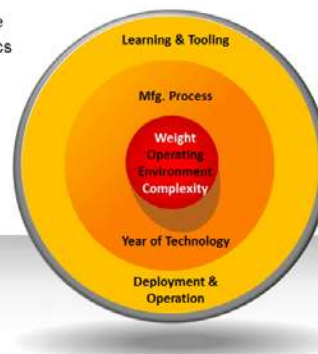
- Manufacturing Complexity for Structure
- Manufacturing Complexity for Electronics

Size

- Weight of Structure
- Weight of Electronics

Others

- Engineering Complexity
- Percent of New Structure
- Percent of New Electronics



PRICE
Webinar

Assumptions

- includes development and production costs
- is calculated in “as spent” Canadian dollars
- assumes 3.3% annual escalation (1.3% above Bank of Canada target of 2%)
- assumes ship weight of 6,400 tonnes
- assumes more systems integration (i.e., communications equipment) than Svalbard
- assumes one development ship and 5 to 7 production systems (system is individual ships)
- assumes development began March 1, 2013
- assumes construction of development ship will begin September 1, 2015 and will be no later than December 2018
- assumes the remaining ships will be completed by December 1, 2024
- assumes 10% profit on the contract
- assumes 15% HST on the contract

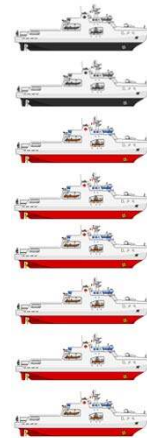


Model calibrated with Canadian-built, ice-capable, Coast Guard Ships

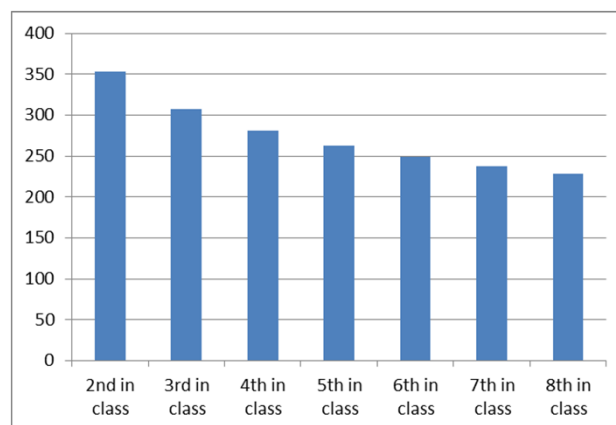
Ship Name	Complexity of Structure	Weight of Structure (lbs light)	Reported Cost (then-year million\$)
Louis St-Laurent	4.327	20,939,520	\$170
Henry Larsen	3.755	12,992,000	\$104
Amundsen	3.702	12,788,160	\$ 52
Des Groseilliers	3.648	12,613,440	\$ 65
Pierre Radisson	3.744	12,199,040	\$ 52
Griffon	3.719	4,883,200	\$ 14
Edward Cornwallis	3.634	7,403,200	\$ 60
Sir William Alexander	3.626	7,443,520	\$ 60
Ann Harvey	3.611	7,461,440	\$ 60
George R. Pearkes	3.640	7,479,360	\$ 60
Sir Wilfred Laurier	3.628	7,965,440	\$ 60
Martha L. Black	3.645	7,483,840	\$ 60
Samuel Risley	3.636	5,051,200	\$ 41
Earl Grey	3.619	4,977,280	\$ 41



RESULTS

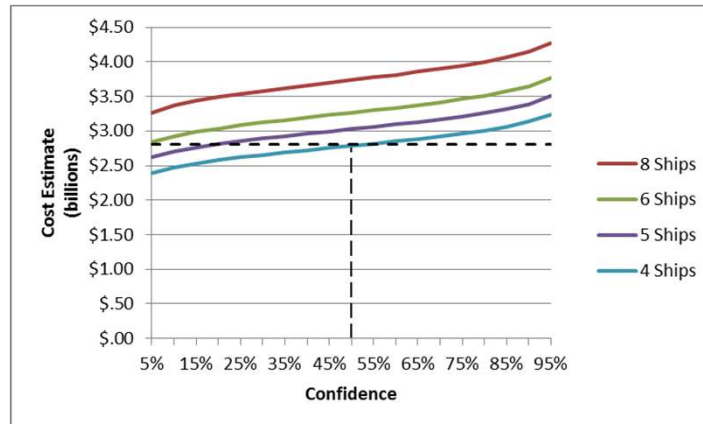


Learning curve reduces people
years needed to build a ship



But not the number of months to completion

Estimated cost of delivering 6 to 8 ships exceeds the budget

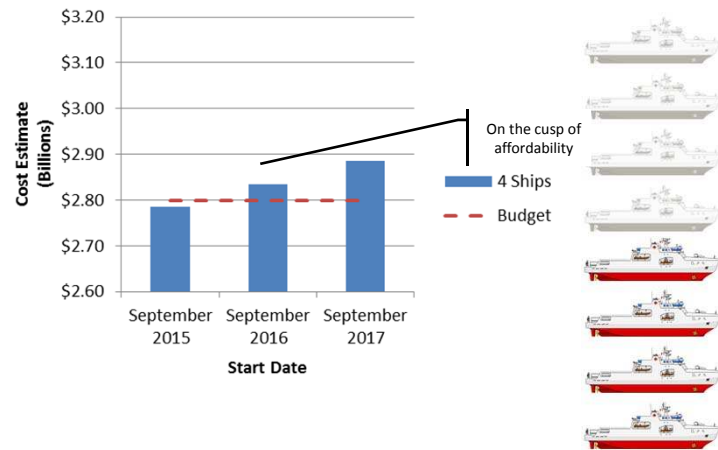


Budget and scheduling implications of building only 4 A/OPS

- NSPS developed to eliminate boom and bust cycle which erodes yard capabilities
- A/OPS selected as “stepping stone” to CSC project
- If the CSC does not begin construction in 2021:
 - Early completion of A/OPS could cause the yard to wind-down prematurely
 - Labour efficiency could diminish
 - Lost opportunity to share yard overhead between projects

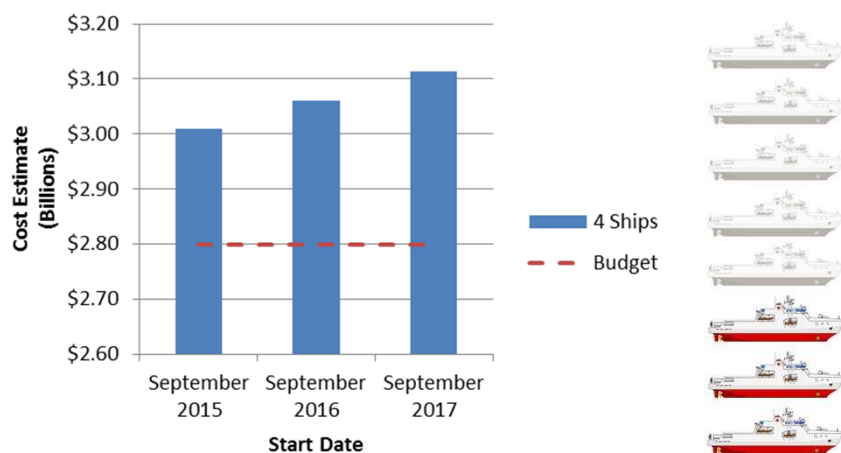


Delays erode purchasing power at a minimum of 3.3% per year



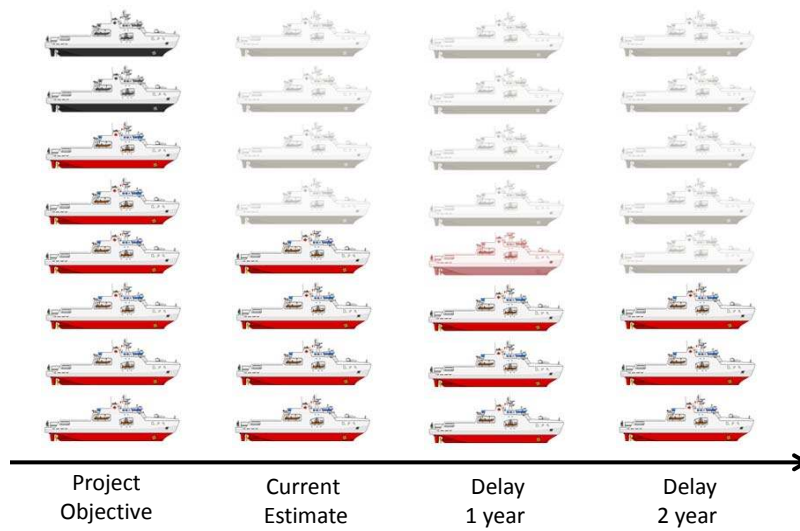
50% confidence level

The cost of a one year delay may be as much as one ship



80% confidence level

Summary



Questions?

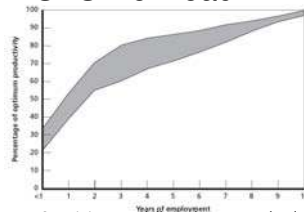
THANK YOU

BACK-UP MATERIAL

Finding a link between qualitative data and TruePlanning inputs

Qualitative

1. Similar to the Svalbard, but the design will be unique
2. Staffing ramp-up required to support NSPS workload



Engineering Complexity

	Experience of Personnel				
	Extensive, Familiar Product	Normal, Familiar Product	Mixed, Some Product Familiarity	Limited, Unfamiliar Product	
Scope of Design Effort					
Simple Modification, Existing Design	0.2	0.3	0.4	0.5	
Extensive Modification, Existing Design	0.6	0.7	0.8	0.9	
New Design, Existing Technology	0.9	1	1.1	1.2	
New Design, New Product Line	1	1.2	1.4	1.6	
New Design, Unfamiliar Technology	1.3	1.6	1.9	2.2	
New Design, State of Art Technology	1.9	2.3	2.7	3.1	

RAND, Sustaining Key Skills in the UK Naval Industry (2008)
http://www.rand.org/content/dam/rand/pubs/monographs/2008/RAND_MG725.pdf, p. 35