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THE NATIONAL SHIPBUILDING STRATEGY AND THE CANADIAN SURFACE COMBATANT



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In the years to come, the Royal Canadian Navy (RCN) will undergo a dramatic recapitalization as the country replaces its ageing combat fleet. How this happens and what it will cost are important considerations that have attracted a great deal of attention in recent weeks. More complex than many headlines imply, the realities of shipbuilding and costing are essential elements that must be understood. With this in mind, the Naval Association of Canada (NAC) has produced this report to highlight and clarify some of this complexity, while dispelling some common myths.

This paper is not without controversy, particularly given the fact that the Parliamentary Budget Officer (PBO) is now working on reviewing the costing of the Canadian Surface Combatant (CSC) Program. That PBO work is essential, contributing as it does to a better understanding of the costs and risks inherent in this technologically complex project, which is vitally important to Canada's sovereignty, defence, and prosperity.

What the NAC offers is a framework for understanding those costs and comparisons. This paper presents facts, not opinions. It is the product of numerous consultations with knowledgeable individuals who have written on this subject in the past. It has undergone a rigorous vetting by several former government employees with significant experience on the National Shipbuilding Strategy and CSC Project files. It is hoped that this work, combined with the PBO Report, will give Canadians a more complete understanding of the CSC Project and how vital it is to Canada.

Yours Aye,
Bill Conconi
President | Naval Association of Canada
February 4th, 2021
<https://www.navalassoc.ca/>

The NAC is a not-for-profit corporation with charitable status. Our membership consists of approximately 1,000 individuals, tied to Branches across the country. Membership is open to anyone who supports our objectives, the primary one being to educate Canadians and their leaders on the importance of Canada's Navy to our nation's well-being, economic prosperity, sovereignty, and defence. Our extensive research output – which includes research papers, briefing notes, and bibliographies – provides a solid base of understanding for Canadians as the importance of Canada's maritime interests. In the main, we are a group of retired naval personnel and civil servants, but our membership includes serving RCN members and defence industry personnel. Those still serving are few in number; however, and none hold any positions of leadership or authority within the Association.



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In February 2019, the government of Canada announced the selection of the British Global Combat Ship as the template for its next generation warship. An expensive and complex undertaking, the construction of fifteen Canadian Surface Combatants (CSC) represents both the future of the Royal Canadian Navy (RCN) and the most complex element of the National Shipbuilding Strategy (NSS)¹ – a multi-decade effort to rebuild Canada's shipbuilding industry and replace most of the country's federal fleets. This fleet renewal – with the CSC as its centerpiece – is the largest defence and security procurement in Canadian history. Understandably, the cost, size, and complexity of the undertaking has attracted attention, concern, and at times, misunderstanding.

At the forefront of this consideration is the question of cost. From an initial 2008 placeholder budget of \$26.2 billion, the project costs have increased to \$56-60 billion. In February 2019, the Parliamentary Budget Officer (PBO) estimated that final costs could be as high as \$70 billion.² Citing unspecified members of parliament and industry representatives, journalist David Pugliese has recently suggested that the NSS's current course could be altered to achieve cost savings with a less expensive ship.³ Publicly available numbers seem to make the case for such a course correction, with competing warship designs often priced well below what the PBO and the Department of National Defence (DND) suggest the CSC will cost. Yet, there is considerable danger in simplifying so complex a process, and such a sophisticated platform, to a simple number. Often missing from the public reporting is the detailed breakdown of the costs involved in building these ships – between the actual construction of the vessels and the project costs that would exist regardless of the selected

Construction of HMCS Harry DeWolf,



design. Missing also is the broader strategic value of domestic shipbuilding and marine services, the benefits to the Canadian economy, and the challenges of comparing two different warship designs – due to their dissimilar capabilities and because of the unreliability of the publicly available costing data. This paper highlights both the broader value to Canada of the NSS and the difficulties of comparing the CSC to alternative vessels. In so doing, the Naval Association of Canada's goal is to add nuance to what are often purely economic comparisons and to suggest a more holistic way of understanding Canada's approach to shipbuilding and the CSC Project.

Impact of the National Shipbuilding Strategy

The decision to build Canada's federal fleets at home, rather than procure them abroad, was an important one, with significant economic and strategic ramifications. In the early 2000s it was clear that many of Canada's aging ships would need to be replaced. Both the Coast Guard and the Navy required recapitalization and this shipbuilding backlog presented both a challenge and an opportunity. In 2001, federal policy called for this building to be undertaken in Canada; a policy reiterated in 2006 and endorsed by both Liberal and Conservative governments.⁴ This decision was nothing out of the ordinary – it is both Canada's *modus operandi* and standard international practice when it comes to large defence acquisitions.⁵ While an immense and costly project, the recapitalization of its combatant and non-combatant fleets offered Canada the opportunity to rebuild its maritime industry, much of which had atrophied from years of neglect. Earlier, isolated attempts at procuring vessels had been a failure; the Coast-Guard's Mid-Shore Patrol Vessel and the RCN's Joint Support Ship Project cost taxpayers and industry tens of millions with nothing to show for it.⁶ What was clear was that Canada had lost the ability to manage complex shipbuilding projects. Its infrastructure and design capabilities had been whittled away by the Program Review of the 1990s and the resultant reduction in defence spending which caused the delay or cancellation of major defence projects. At the same time, vital corporate knowledge dissipated with retirements and downsizing across DND, Industry Canada, and Public Services and Procurement Canada (PSPC).⁷

Building ships in Canada therefore became a question of more than just joining steel – it meant rebuilding the complex system of project managers, designers, maritime engineers, and other human capital that goes into building some of the most sophisticated warships in the world. The NSS was the government's answer to that renewal: a long-term effort to support two shipyards with a consistent set of

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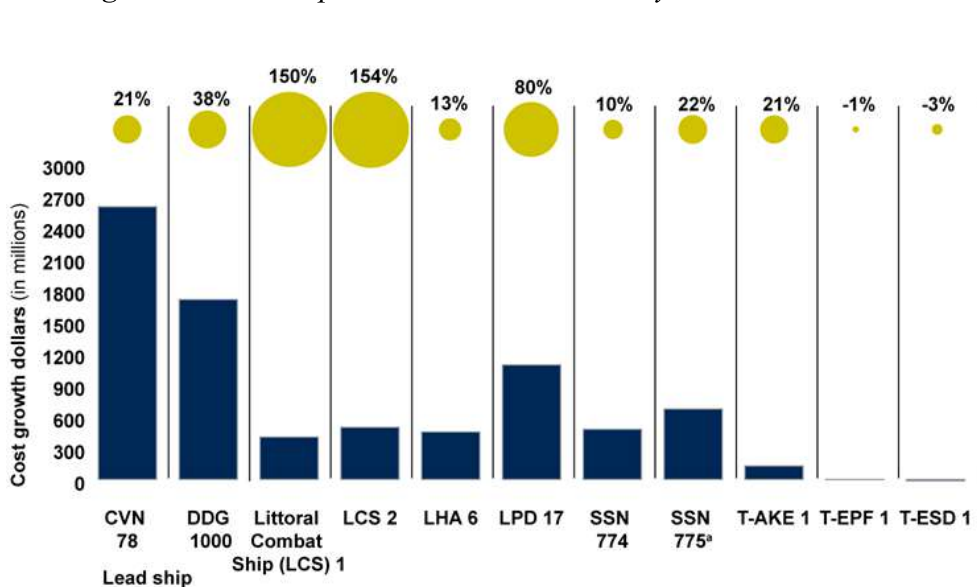
orders to break the boom-and-bust cycle, which has historically prevented Canada's maritime industry from taking root and sustaining itself. The decision was made that large federal ships would be built in Canada by Canadian workers, and Irving Shipbuilding in Halifax and Seaspan's Vancouver Shipyards were selected to build them.

The decision to go this route was made for obvious reasons. No government is anxious to spend tens of billions of dollars overseas if it can be put to work at home, particularly in high-tech, value-added industries. The NSS was a massive undertaking and invariably became the subject of criticism as timelines shifted to the right. Naturally, rebuilding an industry, modernizing the country's shipyards, and building complex vessels with a new workforce resulted in higher costs. However, for complex warship projects the challenge of cost certainty and overruns is not unique to Canada. A detailed study by the United States Government Accountability Office (GAO) showed that lead ships in the American Navy typically cost a total of \$8 billion USD more to construct than initially budgeted.⁸ In Figure 1 this cost growth is shown, illustrating how the three US lead ships exceeded the budget by 80% or more, as indicated in Figure 1.

In making the decision to build locally, Canada accepted that it probably would pay more for ships and they would take longer to build. Eric Lerhe puts that the 'build at home' premium at roughly 10%.⁹ This has naturally attracted criticism, with calls to buy off the shelf from an experienced foreign yard.¹⁰ Yet, there is a great deal more complexity behind the economics and strategic value of shipbuilding than such simple costs comparisons tend to yield.

The economic rationale for the NSS was to ensure that the defence dollars spent would be sunk back into the Canadian economy. While narrow analyses of ship costs do not examine the direct and indirect value to the broader Canadian economy and industrial base, this economic impact was always a driving force behind the NSS. The details of the NSS's impact on the Canadian economy have been explored in depth elsewhere and, while calculating the full implications is impossible, it has clearly

Figure 1: Lead ships cost overrun in US Navy



^aSSN 775 is the second Virginia class submarine, but was the first hull delivered by Newport News shipyard. SSN 774, the lead ship of the class, was delivered by Electric Boat shipyard.

Source: GAO analysis of Navy documentation. | GAO-18-238SP

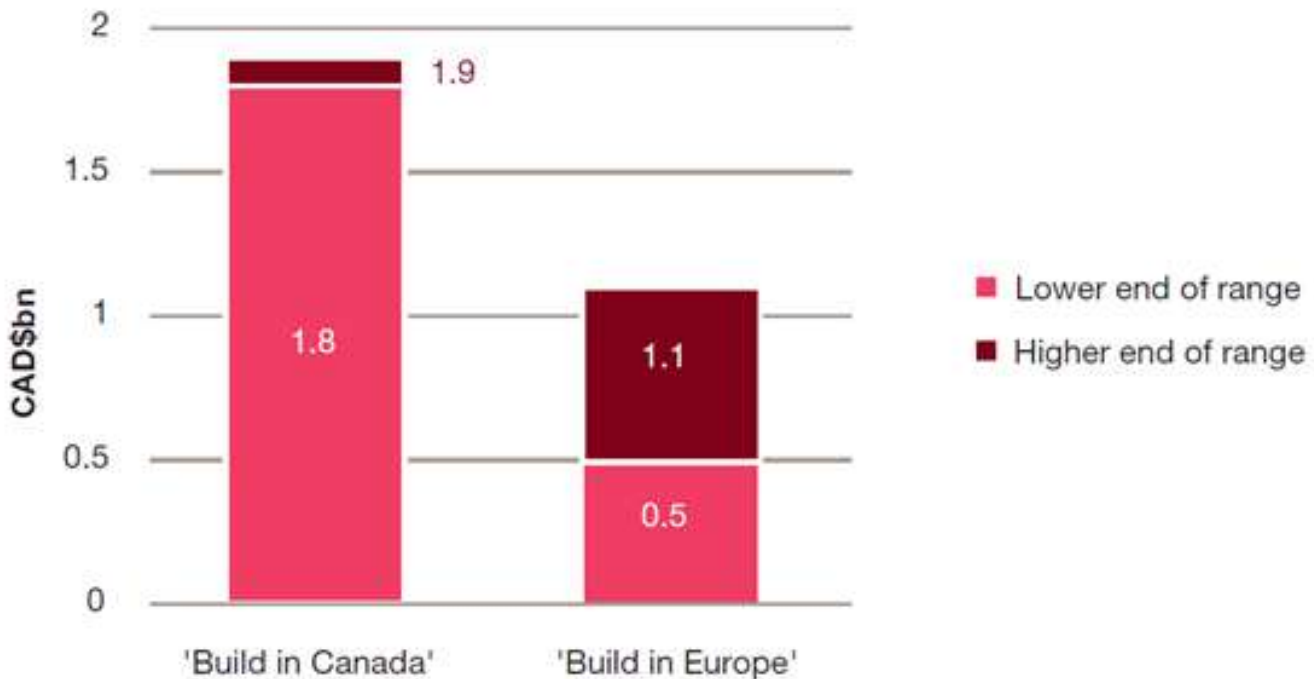
CVN 78	Ford-class nuclear-powered Aircraft Carrier
DDG	Arleigh Burke-class guided missile Destroyer
LCS1	Freedom-class Littoral Combat Ship
LCS2	Independence class Littoral Combat Ship
LHA	America-class Amphibious Assault Ship
LPD	San Antonio-class Amphibious Transport with a dock
SSN 774	USS Virginia nuclear powered Attack Submarine
SSN 775	USS Texas nuclear powered Attack Submarine
T-AKE	Lewis and Clark-class dry Cargo Ship
T-EPF1	Spearhead-class Expeditionary Fast Transport Ship
T-ESD 2	John Glenn-class Expeditionary Transport Dock Ship

been significant. In their 2017 study on the subject, PricewaterhouseCoopers LLP concluded that the local economic and tax benefits would allow Canada to build the CSC for 13% less than had they been ordered from a European yard.¹¹ The reason for this is clear. While the need to retool the Canadian shipbuilding industry may create inefficiencies and drive up costs in the short and medium term, the overall economic and tax benefits compensate the government for that premium. Irving Shipbuilding, for instance, calculates that one-third of its labour costs comes back to the federal and provincial governments in taxes on wages alone.¹²

Because Canada lacks the capability to produce some of the specialized systems being incorporated into the CSC, contracts ensure that suppliers offset that money flowing out with investments back into Canada. These Industrial and Technological Benefits (ITB) have been enormously beneficial to Canada and extend beyond defence into many other sectors of the Canadian economy.¹³ Reportedly some CSC Project subcontractors have made commitments of over 200% of the value of the potential contract to win business. While this indirect contribution to the Canadian economy is significant it remains a less reliable contributor to economic growth than direct project spending.¹⁴ Recent reporting by David Pugliese emphasises the difficulties of quantifying and tracking these investments.¹⁵ A similar conclusion was reached by PricewaterhouseCoopers in its 2017 analysis, which showed that direct, local construction remains a far greater and more certain economic driver.¹⁶ This assumption underpins the economic rationale of the NSS: local spending offers the best return for the government, through tax and economic growth. There are immediate benefits to the government as well as long-term advantages from a rebuilt industry that provides upgraded training for an entire workforce and establishes a reinvigorated maritime supply-chain across Canada.

In advancing the NSS, Canada faced the added difficulties of building complex ships while simultaneously rebuilding a complex industry. That rebuilding process was slow and invariably led to

Figure 2: Benefit to cost ratio: benefit to Canada from every \$1 billion spent



PricewaterhouseCoopers LLP, “Value for Canada The cost versus benefit to Canadians of the National Shipbuilding Strategy,” (May 2017).

While the broader economic impacts of the NSS are difficult to factor into the unit cost of an individual warship, the strategic value of the program is immeasurable

delays – which, in turn, led to price inflation for the ships being produced. In procuring military equipment, the surest way to increase cost is to introduce delay. Major warship costs have historically grown well beyond the economy-wide rate of inflation, with a Rand Corporation study placing that inflation at between 7-11% per year on average over the last 50 years.¹⁷ Ian Mack offers a similar estimate of roughly 10%.¹⁸ Looking at this process at work in Canada, Ryan Dean's 2015 study of the Arctic and Offshore Patrol Ship (AOPS) Project showed how delay reduced the government's buying power, contributing more to price increases than any other factor.¹⁹

Moving slowly to implement the NSS was unavoidable for Canada. Not only had its shipbuilding capability withered but the government's own capacity to execute major projects had atrophied. Outside third parties had to be engaged, which expended additional time and resources. Considerable time was spent negotiating with the shipyards and conducting industry consultations and independent reviews while attempting to ensure maximum transparency. Renovating the shipyards in Halifax and Vancouver was expected to take approximately 36 months²⁰ but actually lasted 60. Given that Canada had not undertaken a major warship construction project comparable in complexity to the CSC in over 25 years there was much to relearn. This necessitated extensive consultations with industry from 2012 to 2016, including CSC Project Industry Days and ship visits that consumed significant time and effort from the project staff. The direct benefits of such unprecedented consultations are hard to determine, but from many in industry they were viewed as excessive and unnecessary.

While the broader economic impacts of the NSS are difficult to factor into the unit cost of an individual warship, the strategic value of the program is immeasurable. Beyond the dollars and cents of procurement considerations rests the basic strategic rationale for having a navy: Canada is a maritime nation that must protect its interests on the world's oceans and its national security against threats from the sea. At a time of growing great power competition and threats to the freedom of the seas from both state and non-state actors, that dynamic is becoming more important every year. Generating that capacity entails far more than the simple acquisition of a warship; it includes maintaining, repairing, and refitting these complex weapon systems over their expected thirty five-year plus lifespans. Unfortunately, the physical infrastructure and human capital needed to do that work had disappeared during the lean years of post-Cold War budget cuts. Some of the costs incorporated into the NSS, expressed in the price of the ships being built, are these long-term investments in physical plant, corporate knowledge, and supply chains that are difficult to value.

Without the vibrant shipbuilding industry and industrial supply



chain that is being resurrected by the NSS, Canada would be unable to efficiently maintain and refit these new ships. Costs for overseas maintenance are roughly 25% higher than work performed domestically²¹ and this still leaves Canada dependent on foreign yards in even the best of times. In times of crisis, an indigenous capacity to equip and refit ships is essential. It is certain given past experience that any defence emergency affecting Canada would involve the country's allies as well, all of whom would naturally prioritize their own forces for refit and repair, leaving Canada with high-end warships, but no ability to sustain them when it was needed most.²² Canada must therefore, ensure that its requirements can be met in ways that permit independent action.

Ship Costs versus Program Costs

Some confusion normally surrounds ship costing terminology, a fact that Eric Lerhe attributes to the inability or unwillingness of states to provide complete costing data on their warship acquisitions. Commonly cited ship costs are often the "sail-away" prices, which is the cost to purchase a single ship. What it excludes is program management, tests and trials, initial onboard spares, tools, weapons, fuel, government procurement salaries, software, facilities in direct support of the ship or its construction, ship training, technical data and expenses, and a host of other incidentals.²³ In Canadian costing, these are called program acquisition costs and can make up 40% to 50% of the cost of the project.²⁴ Even if Canada were to build offshore, program costs would remain sizable since they would include the salaries and benefits of all government of Canada personnel assigned to the project. The Canadian Patrol Frigate Project of the 1980s/90s, for instance, included over four hundred personnel at its peak, from DND, Public Works and Government Services Canada, and the Departments of Industry, Justice, and Regional Industrial Expansion. The salaries and benefits for this staff added at least \$308 million [roughly \$500 million in 2020 dollars] in project costs. Significantly, neither NATO nor the US government permits the inclusion of salary or benefits in their project management calculations, adding another complication to cross-national comparisons for Canada.²⁵

Canada also faces added costs compared to other nations because it lacks the standing project management capacity present in nations such as the United States. Because Canada does not build warships continuously, DND must stand up a dedicated project staff for each project. This activation has

costs as the organization faces steep learning curves, needs equipment and housing, and often outside expertise. Due to the complexity of the CSC Project, the government has created an additional layer of oversight in a Secretariat using staff from DND, PSPC and Innovation, Science and Economic Development Canada – all of which are billed to the project.

Canadian shipbuilding projects are also more comprehensive than is commonly understood. While the ships themselves are at the heart, there is also spending on necessary infrastructure, rolled into the price of the vessels. For example, the AOPS Project costs included not only the price of the ships but also jetty improvements in Esquimalt and Halifax, as well as a deep-water berthing and fueling facility in Nanisivik, Nunavut. Likewise, the CSC Project includes the construction of a Land Based Test Facility, with new buildings constructed to specific security requirements and a complete combat system of the ship (including radars) provided for trials and testing before installation in the first ship. This is the same with schoolhouses that will house simulators to support the training of the ships' companies on both coasts. There will also be jetty upgrades to accommodate the much larger ships. These are not mere concrete piers, they include cranes, fibre optic information systems connections, electrical connections, and potable water and black/grey water connections. There will also be changes to the Fleet Maintenance Facilities to support a new class of ship and, while the In-Service Support Contractor (ISSC) will supply some infrastructure, Canada will pay for it through the ISS contract.

CSC Project Costs

Over the past twelve years, the estimated cost of the CSC Project has increased considerably. As stated earlier, in 2008, the CSC Project's original placeholder budget was set by DND at \$26.2 billion; from there it grew to \$62 billion in 2017, and perhaps more in 2021.²⁶ This inflation is commonly attributed to project mismanagement and DND's gold plating its requirements. The reality, however, is more complex. The huge increase in cost estimates in 2017 is one of the main reasons for the scrutiny that the CSC Project is currently facing. Yet, that initial \$26.2 billion costing, the origins of which have never been explained, was never intended to be a definitive estimate,²⁷ nor was Canada well placed to make one. As the Auditor General wrote in 2013:

"The initial budget for each class of military ship was set years before construction will begin. As such, the estimates were very imprecise and should be regarded as, at most, placeholders. As the military ships are complex developmental projects, their design will be defined more precisely over time, which will result in greater certainty on the cost of the vessels. It is not realistic to expect that the original budget cap will remain the same from a project's conception to completion."²⁸

Canada was particularly ill suited to set reasonable budgets in the early years of the project given how badly its capability to generate high-end cost estimates for defence platforms had deteriorated.²⁹ Even Canada's allies, with more established ship procurement processes, regularly suffer from similar budget overruns.³⁰ The two US Navy Littoral Combat Ship variants, for instance, saw significant cost inflation.³¹

The cost of the CSC Project also grew as a result of lengthy procurement options analyses, endless inter-departmental consultation, and industrial growing pains. Timelines were extended even further by the fact that the CSCs could not be the first ships of the combatant fleet within the NSS. Given the complexity of a modern warship, it was decided that the revitalized Irving yard should build the less sophisticated Harry DeWolf-class AOPS first as a way of gearing up the facility and developing skillsets and processes on an easier build.³² While this strategy was logical it caused years of delay and eroded buying power.

Defining and Designing the CSC

As discussed earlier, Canada decided to proceed with the NSS and domestic shipbuilding for solid economic and national security reasons and that process has had the continuing endorsement from all the major political parties. The CSC will be a large and expensive multi-purpose frigate with an average sail away price of roughly \$2 billion CAD.³³ Additional program costs are expected to add roughly \$30 billion. The UK has ordered five Type 31 frigates for an announced price of £250 million per ship (\$435 CAD) while the US Navy is building its new Constellation-class for \$800 million (\$1.1 billion CAD) each.³⁴ The price gap is the result of differing capabilities but also the different costing methodologies eluded to above. Yet these prices range from the aspirational to the unbelievable.³⁵

In theory, comparing ship costs should be a clear-cut comparative exercise, something quantifiable that can be distilled down into a spreadsheet. Unfortunately, that is not the case. Like shipbuilding, ship-pricing is an extraordinarily complex exercise which goes well beyond the headline sticker prices pulled from open sources like Wikipedia for inclusion in media – or even government – reporting.³⁶

Purchasing a warship is in no way equivalent to shopping for an item at competing merchants. There is no sticker price and costing methodologies are often radically different. While a foreign build may have a lower advertised price, an attempt to rationalize that platform against the chosen CSC design is an exercise in comparing apples to oranges for a variety of reasons. To begin with, foreign costing estimates may or may not include Government Furnished Equipment such as weapons systems or radars removed from an older ship and reinstalled in the new platform as part of the build. For example, the British government has indicated that, for the Type 31, it intends to repurpose a number of systems, likely including the Sea Ceptor missile system and the Type 997 Artisan radar, currently in service in the Royal Navy Type 23 frigates.³⁷ The US Navy's pricing for its new frigates also excludes systems and associated software, which includes a new version of the sophisticated Aegis Weapon System.³⁸

Similarly, ammunition and spares may or may not be included in the cost, or only partially included. As part of its calculations, Canadian estimates are normally based on a full load of missiles, ammunition, and spares for the lifetime of the vessel, whereas other nations frequently price their ships based on the sail away cost: including an initial load-out and, in some cases, no ammunition or spares. Official costing



for the CSC includes a wide array of expenses that are normally not incorporated by foreign shipyards. These included: two years of spare parts and ammunition, training, government program management, upgrades to existing facilities, and applicable taxes.³⁹ This ambiguity in pricing likely came into play in 2017 when the French-Italian consortium from the firm Fincantieri proposed to deliver 15 FREMM⁴⁰ frigates, built in Halifax for a fixed cost of \$30 billion.⁴¹ The price was lower and with reduced risk, however what it included was never made public. Each shipbuilder offers its most attractive prices for vessels in public relations material, yet these publicly accessible unit ship prices rarely survive first contact with reality and, once project costs and design modifications are added, the final price is invariably higher. Accurately comparing ship costs against one another is inherently difficult until contracts are available for both ships.

A good example of this pricing illusion comes from the Canadian media's continued insistence that Canada had wildly overpaid for the AOPS Project. At \$400 million per vessel the new Harry DeWolf-class AOPVs appear far more expensive than the similarly sized Norwegian ship *Svalbard* (official price \$100 million USD)⁴² or the much smaller Danish Knud Rasmussen-class (official price \$70-80 million USD).⁴³ Yet behind these prices lay heavily subsidised industries that produced official prices unrepresentative of the true cost of the ship. Those ship costs also excluded supporting infrastructure, training, ammunition, spares, many onboard systems, and the huge contingency that is factored into Canadian procurement projects. The price was a mirage and when Canadian representatives requested a price from the Norwegians for a *Svalbard*, they were told that there was no firm 'sticker price' and that it would take over a year to even assemble a realistic quote.⁴⁴ That was the conclusion of the PBO as well, which dismissed the notion that Canada could actually procure a *Svalbard*-class for that all too frequently cited price tag.⁴⁵

Most critically, advertised prices always exclude the costs of modifications to suit local conditions and requirements.⁴⁶ As with house building, the price is based on the base-line model; however any design changes and upgrades will add additional costs in drafting, labour, and materials. This activity is a significant cost in the early part of every warship construction project. After accepting the BAE Global Combat Ship design, Canada began a requirements reconciliation process with Irving and the winning bid team led by Lockheed Martin Canada and BAE Systems. That work has been significant as the ship design has been appreciably altered in some areas from the British Type 26 variant to accommodate specific Canadian needs. These include the ability to operate the large Canadian CH 148 Cyclone maritime helicopter and integrate the Canadian Combat Management System with the US Aegis weapons system, which is built around a large, phased array radar. Like Australia, with similar requirements to Canada, this has meant significant design changes to allow for a larger and more powerful radar system which impacts the overall ship design, particularly as it relates to ship stability and power generation. The British, on the other hand can afford to have a less capable radar system for their Type 26 frigates since they also operate Type 45 Air Defence destroyers which employ comparable high-end radars.

When comparing different ship classes and costs, this reconciliation process becomes a significant variable. Canada would need to make changes on any design; however, the extent and cost of these modifications would not be known until well into the reconciliation process. The publicly available prices for competing warships naturally exclude this unknowable cost and older designs would likely require significantly more work to revive dormant production plans and bring them up to Canadian requirements. Fincantieri's 2017 FREMM proposal, for instance, could not have included such modifications, leaving the door open to a significant price increase in even a 'fixed price' offer. As such, attempting to make direct comparisons is extremely problematic.

The CSC Build Strategy

How Canada builds its ships is also an important consideration in the overall cost. Seeking to maximize productivity and economies of scale, most shipyards build in batches or ‘flights’ of three or four ships. The Canadian Patrol Frigate, for instance, was built in two batches of six, with the first split between Saint John Shipbuilding in New Brunswick and MIL-Davie in Quebec and the second built in Saint John. This build strategy allows the buyer to secure better prices when purchasing equipment. In comparison, Canada has chosen to extend the CSC build schedule to maximize employment and spread the cost over an unprecedented 33 years. While a slower build will maximize some cost savings as lessons are learned and efficiencies incorporated, there will be few economies achieved through the bulk purchasing of equipment.

Canada originally planned to build 15 CSCs in three distinct flights in two variants. The first variant would be of Air Defence/Task Group Command vessels (3 in number in Flight 1) and the second variant, a General-Purpose Frigate, (12 in number) and constructed in two flights of six ships.⁴⁷ This approach faced some technical challenges and elevated programmatic risks, whether pursuing two distinct ship designs or a single design with modifications between variants. The approach of three separate flights also posed risks in so far as it introduced the potential for an interruption in the build schedule. In the end, the pursuit of two variants was abandoned, as was the segmentation of the 15 ships into separate flights.

For a small, general-purpose navy, a single class of vessels using one design provides flexibility in mission planning, crewing, and ensuring operational readiness. There are also clear supply chain advantages and economies of scale achieved by having fleet commonality. A single class of ships minimizes duplication of fixed project costs in design processes and engineering. During ship construction, this also minimizes the delays and costs of switching between designs.⁴⁸ Simply put,



Canada cannot afford to have a large fleet of specialist ships and must incorporate many capabilities into a single design.

Canada also builds its ships to the highest standards to ensure that the Navy can maximize their service lives. This approach does result in higher costs, but the ships serve Canada much longer. The Halifax-class frigates, for instance, will be retired in the early 2040s after roughly 45 years in service.⁴⁹ Canada is aiming to secure more than thirty years of life from each CSC and, given the RCN's operational history, that is likely an understatement.⁵⁰ Still, that 30+ years is at least 20% more than the USN expects to achieve from its Constellation-class frigates.⁵¹ The Canadian approach to long-lifespans adds short term costs but it has proven effective and efficient. The UK Type 23 frigate project from the 1990s offers a cautionary contrast. Those ships were designed for an 18-year service life to avoid expensive mid-life refits and to keep a continuous drumbeat of naval shipbuilding in the UK. Failure to replace them as planned meant that those ships have all exceeded their designed service lives and are currently undergoing unbudgeted and expensive hull and propulsion renewal to keep them running until replaced by the Type 26 and Type 31 frigates in the 2030s.

Assessing Relative Capabilities and Cost of Warships

Comparing competing warship designs is a complex task; one which entails not only measuring wildly different project costs and contractual requirements, but the actual capabilities of the ships themselves. Not all frigates are created equal and understanding Canada's requirements and what each ship class offers (or does not offer) is vital to understanding the value of the project. This is a difficulty that Parliamentary Budget Officer Yves Giroux raised in an interview with the *The Hill Times*, noting that "comparisons are not very easy to do and there are not that many [countries] in the world where information is readily available [for comparison]." Giroux highlighted the fact that serious "difficulty arises when trying to compare different ships, with different capabilities, being built by different shipyards, and under different timelines ... It's not always easy to compare capabilities that vary greatly from one country to the other."⁵²

Other frigates share little but the name with the CSC. The British Type 31, for instance, lacks area air defence and maritime strike weapons, but most importantly from the Canadian standpoint, it is not designed and equipped for anti-submarine warfare. It will be used for lower-end tasks such as forward presence and patrolling missions, while the British Type 26 frigates undertake higher-end combat and anti-submarine escort duties.⁵³ Notably, because they are part of a multi-class fleet mix which includes dedicated air defence ships, the Type 26 frigates also have a less robust anti-air defence and maritime strike capability than the CSC.

Canada is acquiring the CSC high-end multipurpose frigate for sound strategic reasons rooted in Canadian force structure, defence requirements, national geography, and fleet size.⁵⁴ What an individual ship can accomplish is less important than the effect that a navy as a whole can achieve. Canada's European and American allies are procuring both high-end and low-end warships as part of a fleet mix that also includes systems that Canada does not have. Nuclear attack submarines, cruisers, and aircraft carriers give some NATO allies a wide array of specialty capabilities spread across several types of ships – allowing their frigates to specialize. The FREMM frigates in service with the Italian navy – and those planned for the US Navy – are principally ASW ships with some general purpose capability, while the French have fielded an anti-air warfare variant. In each case there is a trade off as the ship specializes, yet those platforms' vulnerabilities are covered by other ships in those much larger fleets. The American FREMMs, for instance, will not require as robust an air-defence capability because that is provided by US cruisers and destroyers.

Conclusion

Canada's naval policy, *Leadmark 2050*, states that "building a navy is a series of 40 to 50-year investments, each one of which ... determines what future governments will have at their disposal to respond to events that can be scarcely imagined when a class of warships is on the drawing board."⁵⁵ The NSS and the future fleet of CSC were designed not simply to replace the Halifax-class frigates and Iroquois-class destroyers, but to give Canada flexibility and options in the face of an increasingly uncertain global security environment. A broad strategic initiative to revitalize Canada's indigenous shipbuilding and maintenance capabilities, the NSS was conceived not only to capture the maximum economic benefit from shipbuilding, but to ensure that the future Navy could be supported effectively in peacetime and quickly in crisis. The cost of rebuilding that infrastructure and human capital is high but must be balanced against the significant economic stimulus coming from the billions of dollars which will be injected into the Canadian economy.

As the most complex output of the NSS, the CSC Project has seen its projected costs increase beyond the initial \$26.2 billion budget placeholder as Canada defined and costed the full scope of this complex industry and ship building endeavour. Cost increases beyond this first full estimate have been largely due to delays and the subsequent reduction in buying power. Yet, a simple dollars and cents comparison to similar warship designs is extraordinarily complex, and too frequently over-simplified. Drawing cost comparisons means standardizing vastly different approaches to costing, taking into consideration project costs that are rarely public, and redesign expenses that are – by their very nature – speculative. Canada's unique strategic requirements and position in the world, its need for a long-lived, multi-role, globally deployable frigate capable of working in the near-Arctic or in tropical waters adds costs and can be difficult to value precisely.

Clear communications have been a government failing in recent years as Canadians have not been given a transparent appraisal of the project's price tag and the nature of the costs. In 2016 the government recognized that issue, identifying problems with "insufficient communications ... on the cost, timelines and progress of various builds." The assessed solution was more regular reporting, yet this was never acted upon.⁵⁶ This information vacuum has been filled with criticisms, emanating from industry, opposition parties, and media commentators – some of it legitimate but much oversimplified or misguided. It would be dangerous to allow false comparisons and an incomplete understanding of what the NSS was intended to accomplish to delay or scuttle the now well-advanced CSC Project. Such delay would risk a serious capability gap if the Halifax-class frigates, like the Iroquois-class destroyers, are retired without replacement.

A broad strategic initiative to revitalize Canada's indigenous shipbuilding and maintenance capabilities, the NSS was conceived not only to capture the maximum economic benefit from shipbuilding, but to ensure that the future Navy could be supported effectively in peacetime and quickly in crisis.

Ensuring that Canadians get the best value for their money is an important task. It is essential however, that Canadian decision makers consider the analysis within the complex framework that we have laid out in this paper, and which has been elucidated in detail by Canadian naval procurement experts and strategists since the NSS was initiated.⁵⁷ The differences between Canadian shipbuilding and the CSC Project on the one hand, and foreign warships alternatives on the other, are complex and often ambiguous. It must be recognized that Canada's future fleet was selected for unique Canadian requirements in a world where maritime strength is rapidly regaining its currency.

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Notes

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