



Military/Naval Procurement in Canada: A Flawed Process

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His greatest victory was at the Battle of Amiens, which German Field Marshall von Ludendorff described as the "blackest day of the German Army in the history of the war," and which Field Marshall Lord Byng of Vimy described as "the finest operation of the war."

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Introduction

Armed with the *Canada First Defence Strategy*, insofar as funding and equipment replacement are concerned, life should be rosy for the Canadian Forces for the next 20 years (i.e., out to 2028). But cancellation of the navy's Joint Support Ship (JSS) procurement, the fact that two (of three) qualified bidders for the Halifax Class Modernization (HCM) project opted out of that procurement, and the concurrent (with JSS) cancellation of the Coast Guard's Mid-Shore Patrol Vessel procurement, leads one to believe that such may not be the case.¹

Although the reasons may be different for each of these setbacks, in their own ways they each point to a procurement process that does not serve the best interests of the nation. There are other examples where this process has been shown to be less than satisfactory, and they're not just with navy procurements as both the army and air force have had their setbacks too² - perhaps the most glaring being the delayed acquisition of Search and Rescue Fixed Wing Aircraft. Announced formally in *Budget 2004*, this project has gone nowhere under two separate governments.

Given the complexity of their design and construction, warship procurement is arguably the most complex procurement activity our government undertakes and, in this article, we examine the process that has been followed by the navy over the past 60 years in acquiring most of its ships.³ In doing so, we'll point out the flaws in the current process and, hopefully, identify some steps that can be taken to remedy the present



situation.

Background

In 1949, the Royal Canadian Navy – as it was at the time – embarked on an aggressive program to replace many of its fighting ships that had been the mainstay of the navy during World War II. In all, from 1950 until 1965, a total of 20 modern destroyer escorts were designed, constructed by a number of shipyards across the country, and commissioned into the navy in four batches, or classes. These were followed in the late-60s/early-70s with four new destroyers and, in the late-80s/mid-90s with twelve new frigates – three shipbuilding projects over a span of about 50 years.

approximately 200 people in its project management offices to oversee the project.

The following table summarizes this period of shipbuilding activity in Canada.⁴

Still with prime/design agent responsibility, in the early/mid-1960s the navy modernized the seven St. Laurent Class destroyer escorts to become helicopter-carrying destroyers and, in the mid/late-1960s/early-1970s, also modernized the weapon systems aboard four of the Restigouche Class destroyers. In the early-1990s, with the first phase of the Halifax Class (also known as the “Canadian Patrol Frigate” or “CPF”) project in progress, the navy modernized the weapons and main machinery in the four DDH-280 Class destroyers⁷ though, as with the CPF project, industry (but in this instance not the shipyard) took total

Project		Time-frame	Shipyard(s)	Prime/Design Agent Responsibility
Destroyer Escorts	St. Laurent Class (7)	1950-1957	Halifax Shipyard (4) Davie Shipbuilding (2)	Navy
	Restigouche Class (7)	1953-1959	MIL (Sorel) (3) Canadian Vickers (4)	
	Mackenzie Class (4)	1958-1963	Burrard Drydock (4)	
	Annapolis Class (2)	1960-1964	Victoria Machinery Depot (2) Yarrows (1) ⁵	
Destroyers	Iroquois Class (4)	1969-1973	MIL (Sorel) (3) Davie (1)	Navy
Frigates	Halifax Class (12) ⁶	1987-1996	St. John Shipbuilding (9) MIL Davie (Lauzon) (3)	Industry

For two of these projects, the navy relied upon its in-house design capabilities as well as those of its contracted-out Naval Central Drawing Office, and managed what were, in effect, “build-to-print” construction contracts with the shipyards. For the third project, the entire responsibility - total system responsibility - was undertaken by industry though the navy still had a staff of

system responsibility while the navy oversaw the project.⁸

With the CPF ships nearly complete and the DDH-280s being modernized, the navy embarked on another shipbuilding project, though this time for a much smaller ship for the naval reserves – the twelve Maritime Coastal Defence Vessels (MCDVs).⁹ For this project SNC-Lavalin was the prime



contractor and these ships were built by Halifax-Dartmouth Industries which, during the MCDV project, became part of the Irving Shipbuilding group. Once again, total system responsibility was undertaken by industry as the design agent and prime contractor.¹⁰

While the 20 ship St. Laurent and follow-on classes experienced the normal challenges of complex projects, they were ultimately completed successfully. Being in control of the project, the navy was able to incorporate design changes/improvements – structural as well as basic features – as the ships in the different classes were built. For example, the superstructure and the forward gun and sonar equipment were changed on the Restigouche and Mackenzie Classes, and the Annapolis Class (the final two ships of the overall project) were built with a helicopter hangar deck and variable depth sonar (these two features were added to the seven St. Laurent class ships when they were modernized in the early/mid-60s).

That said, the DDH-280, CPF, and MCDV new construction projects were also successful, though the DDH-280 project was the subject of an examination of the government's decision-making process,¹¹ and it ultimately impacted the CPF procurement. However, the fact remains that today the navy has a modern frigate/destroyer fleet that is as good as, or better, than similar warships in any of the allied navies.

We have good ships with well-trained crews and that fact is often reflected as NATO and coalition responsibilities are regularly assigned to the Canadian navy. And, with the recently-announced Halifax Class Modernization contracts, these ships will be appropriately outfitted for the remainder of their operational life (i.e., till about 2030(+/-)).

What remains as urgent are projects to replace the support ships (AORs) and the Iroquois Class destroyers as all of these ships (three AORs and four DDHs) have now surpassed their design lifetime.

The Current Situation

So, what has happened since then (i.e., since the 1950s/60s/70s) and can we now recover such that we can build on past successes? Hopefully, the answer to the second part of this question is a resounding “yes”, but change will be needed. Notwithstanding that government-industry relationships have changed since the CPF project, some of the factors that today impact directly and/or indirectly, and/or exacerbate the shipbuilding situation are listed below:

- The threat/capability deficiency is more complex today than it was 20-30-40-50-60 years ago, thus forcing a more demanding operational requirement statement that ultimately is transposed into a technical statement of requirements against which the industry must bid. In doing so, the navy sometimes defines the requirement down to the finest detail as opposed to asking for the industry's solutions to a broader capability-based requirement.
- The navy has gone through a period where its personnel, though suitably educated and trained, are fewer in numbers and, in some cases, particular classifications and trades have all but disappeared. For example, within Maritime Engineering there are today far fewer people trained as naval architects and constructors than there were up to the 1980s, and these are the people who once led the conceptual studies and design trade-offs. They are also the people who once were able to completely design our warships and manage and oversee their construction. A similar situation has occurred with civilian personnel within both the Department of National Defence and Public Works and Government Services as downsizing led to early retirement of highly experienced engineers in the 1990s. Younger engineers who joined DND to fill some of those vacancies



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simply do not have relevant – and necessary – experience.¹²

- Except for the destroyer escort project (St. Laurent and follow-on classes), as shown above, naval shipbuilding in Canada occurs at infrequent intervals – on average about 20 years between major projects. Thus, there is no continuity for the shipyards and the associated industries. In turn, this situation has seen a reduction in the number of shipyards in Canada that are able to build ships of destroyer/frigate size and larger for the navy and those that continue are likely not in a position to invest in the necessary infrastructure and workforce in anticipation of future naval projects.¹³ The government has contributed to this shipyard rationalization process and, under pressure from other countries, stopped subsidizing the industry several years ago.¹⁴ Alternatively, there is a national strategic imperative in building warships though in Canada this does not seem to be fully recognized or appreciated.
- The government has introduced complex procurement processes that, from start to finish, can take 15-20 years to complete. These involve letters of interest that often lead to source qualification, contracted project definition phases during which two companies (or teams) compete to produce a final design, then the final “build” and “support” contracts with their onerous requirements, mandatory terms and conditions, and outdated industrial benefits obligations. This lengthy process, though full of good intentions, often leads to a distorted view of the indigenous shipbuilding industry and its capabilities. It does not identify companies or teams that are suitably qualified to undertake the work, and it is incorrectly based on the premise that the government always “had it right” when it stipulated its budget and developed its requirements and specifications.
- Coupled with the complicated procurement process, there are three government departments that have key roles in ship procurement – DND as the end user defines the operational and technical requirements, project management requirements and determines the budget; Public Works and Government Services negotiates the contract and manages it; and, Industry Canada has responsibility for industrial and regional benefits. Thus, despite the fact that PWGSC is seen to have the lead, it’s not their requirement and it’s not their money and therefore no one department or individual can be held accountable for problems with defence programs. In this regard Canada stands out as one of the few NATO countries to divide various procurement functions among separate departments and, if the government were to address and resolve only this aspect of defence procurement, it would go a long way towards resolving the current crisis.
- One of the principles of the procurement process is to ensure that there’s adequate competition, preferably amongst Canadian companies, a notion that is not the panacea that it might appear to be. Unfortunately, the source qualification part of the process tends to create a mirage of competition well before all the facts are known and before the business decisions can be made. This is likely what happened with the Halifax Class Modernization project when two of three qualified (by the government) combat systems integrators withdrew from the competition. The only good part of that situation was that one qualified bidder remained. It must, however, be recognized that there will be occasions when only a single product or platform meets the military requirement. In those



cases it should be incumbent on the government to make a strategic decision and proceed with a sole source acquisition – such as was done for the C-17 procurement. A case in point, the government has stalled and tried to create an artificially competitive environment for the replacement of fixed wing search and rescue aircraft such that the air force now must try to maintain the Buffalo aircraft well beyond their intended life.

A Way Ahead

Some of the issues outlined above may be beyond control and, if that's the case, a suitable work-around must be found as the issue itself will not simply disappear. On the other hand some of these issues can be addressed and changes can be made – without in any way diluting the overall integrity of the process.

Outsource the Design Process.

It's extremely unlikely that the navy will ever rebuild its pool of naval engineering expertise to the point it was prior to about 1990 and, even if it could be done, it might prove to be absolutely unaffordable and it may not be wanted in the first place. But, the navy should maintain the core of talent that it presently has and, to the degree necessary, could augment this by outsourcing more to industry.

The approach currently used by the navy (i.e., contracting with naval engineering support companies) could be expanded upon to include contracting with qualified ship design firms (ideally in Canada or elsewhere if necessary) whereby one or more companies – or perhaps a joint venture – could be awarded a long-term contract to undertake all of the navy's conceptual analyses and preliminary/detailed design work – i.e., work that was previously done in-house by naval engineers or work that is, in part, done during the project definition phase. In doing this, the

navy could, once again, in effect, develop its own detailed designs, have these validated through third party modelling and simulation, and return to the “build to print” form of ship procurement.

While this approach might seem to place design risk with the navy, such risk could be mitigated by having the selected shipyard(s) – the ones that will actually build the ships – also undertake design validation process as part of their contract. In addition, the navy's design team could act on the government's behalf to oversee the work of the shipyard thereby ensuring that the government's requirements are being met.

The overall effect of this approach would be to reduce the risk to both the shipyard and the government and to speed up the overall procurement schedule (design alternatives could be developed well ahead of time and there would not be need for the letter of interest step or the usual project definition phase).

Requirements.

The tendency today seems to be in over specifying everything and, as a result, issues that should best be left to the shipbuilder are not, thus leaving the shipbuilder with little scope for coming up with alternatives – that is, the specification has pre-defined the solution and in turn this determines the cost even though there may be more cost-effective alternatives, but the shipyards' hands are tied. In addition, since specifications are usually written or at least contributed to by a number of persons, there is often variation in the detail provided in different parts of the specification. This dilemma could also be addressed by having the navy's design team take responsibility for developing all technical specifications.

And, before technical specifications are ever issued, the navy should verify traceability between, and conformity with, the operational requirement and the derived technical requirement. Another major issue is the tendency for the government (operators and engineers) to stipulate hundreds if not



thousands of mandatory requirements without understanding that many are not really mandatory and that the more there are the more difficult it is to deliver a cost-effective and compliant solution. In addition, the navy must ensure that its requirements are consistent with those stipulated by classification societies such as Lloyds and by other recognized bodies such as the International Maritime Organization.

At the same time, the need for invoking military standards and/or military specifications needs to be given thought as many industrial/commercial specifications are actually better and more current than their military counterpart and they often don't have the same high cost that is always associated with military standards and specifications.¹⁵ This is particularly true when it comes to specifying requirements for in-service support as invoking military specifications for logistics support probably doubles the cost over a accepting a modern, flexible, commercial approach.

Shipyards and Competition.

Today, of the five major shipyards left in Canada (Kiewit Offshore Services [formerly Marystown Shipyard] in Newfoundland, Halifax Shipyards, Davie Yards Inc. in Lauzon [formerly MIL Davie], Seaway Marine & Industrial Inc. in Port Weller [formerly Canadian Shipbuilding and Engineering], and Washington Marine Group in Vancouver and Victoria) only three have built ships for the navy since the end of the Second World War (Halifax Shipyards, Davie Yards, and WMG) and, coincidentally, Canada really only needs three such shipyards to cost-effectively procure its naval ships. But Canada needs shipyard facilities on both coasts. Historically, most shipyards have been on the east coast but adequate naval presence and naval facilities – government and commercial – are also needed on the west coast as the Asia-Pacific region continues its rapid expansion.

Thus, it would behove Industry Canada to undertake a source qualification

from amongst these five shipyards and, based on reasonable criteria, pre-select at most three Canadian shipyards that can be contracted to build naval ships of frigate/destroyer size and larger ships, up to nominally 35,000 tonnes. Then, with design specifications produced by the navy's design team, the government could negotiate contracts with a perhaps a subset (one or two) of these yards on a "right of first refusal" basis. That is, say the government wants to procure three ships; it goes to the first shipyard and says "we want to procure three ships of this design and we're giving you the first opportunity to bid; are you interested?" If they're interested, the government contracts with them. If they're not interested, the government goes to the next shipyard, etc. If none of the three are interested, the government goes offshore.

Ship Acquisition Schedule.

When a ship is built, it will have a design life based largely on how long the hull should last if properly cared for. In addition, it may have a time identified for a major mid-life update or modernization when many of its systems might be replaced as well as a schedule of periodic refit periods. Typically, the lifetime for Canadian naval ships has been somewhere between 35 and 40 years. However, studies conducted by other navies (for example, Australia, the Netherlands) have shown that mid-life modernization projects are not cost-effective and that, for destroyer/frigate type ships, it is best to keep them in operation for at most 15 years then replace them while they still have some resale value (to a third tier navy).¹⁶ Coupled with a "continuous build" concept whereby ships are always being built at a rate of one or two per year, this would ensure that Canada always has a modern, state-of-the-art navy of 16 to 24 ships.¹⁷

Government Accountability.

It's perhaps surprising that the Auditor General hasn't jumped on this as an area for



concern but the issue described earlier that three government departments are involved with different areas of responsibility thereby leaving no one point for accountability needs to be addressed. Using Australia's Defence Material Organization as a model, total responsibility for defence procurement (including requirements, budget, terms and conditions, and industrial benefits) would be assigned to a to-be-created organization within DND and it would report directly to the Minister. Of course, this would apply to all military procurement, not just naval procurement

Terms and Conditions.

For several years now, the government's approach to stating the terms and conditions that apply to contracts is nothing less than archaic, dictatorial, and confrontational, and it serves to create confrontation between the parties from the onset. In essence, the government wants everything their way and there's no possibility of negotiation in order to reach a middle ground compromise.

In shipbuilding projects these terms and conditions can run to in excess of 200 pages of complex terminology often requiring (teams of) lawyers to interpret and understand; many are outside a layman's general knowledge.¹⁸ In addition to the many other onerous demands the government puts on the contractor, these terms and conditions often unrealistically demand that the bidders turn over all intellectual property – whether funded by the project or not – to the government to basically use as it may wish. Even giving it to competitors! Furthermore, the government requires that bidders pass these same terms and conditions on to lower tier subcontractors, in spite of the fact that, by doing so, the cost just continues to rise.

The government also mandates how and when it will pay for the procurement and generally, through holdbacks, requiring parental/bank guarantees/bid bonds, and sometimes forcing the bidder to take

responsibility for economic adjustments and exchange rate fluctuations, passes the financial risk to the bidders who must also take responsibility for all schedule and technical risk. There's no question of sharing risk; it's all borne by the bidders.

There are other cost drivers in the terms and conditions, such as:

- Fixed price (government preference and often mandated) versus cost plus and the linkage between cost-constrained acquisition and life cycle costs;
- Liability clauses that lead to unlimited liability on the contractor plus the potential for severe liquidated damages should there be any shortfall in delivering industrial benefits;
- Government project management oversight requirements and reporting processes that are often excessive and, with a constrained budget, sacrifice product for process; and
- Risk and total system responsibility is to the account of the contractor but the government maintains direct oversight, design review and approval and what's effectively government control of the work flow. The result is that the contractor has all of the responsibility but the government retains all the authority. With regard to design review and approval, at least in the case of ship procurement, there is often a lack of clarity between the government's role and that of the applicable/called up classification societies.

Industrial and Regional Benefits.¹⁹

Liked by some and hated by others, IRBs are a fact of life in our government procurement system, but the government's approach to them is extremely short-sighted although there's no question that Canada should reap a benefit when money is spent offshore.



That said there are projects in which IRBs should have a strong influence in the final decision and others in which they should have no influence at all. For example, since armoured tanks, jet fighters, and heavy lift aircraft are not designed or manufactured in Canada – and they probably never will be – it makes eminent sense to ensure that, for procurement of these platforms, there is a strong requirement for industrial benefits and perhaps even 100% is too low. On the other hand, since we do have aerospace, armoured vehicle, and shipbuilding industries in Canada, it makes no sense to penalize them with onerous IRB requirements (they are already providing them!), and thus a requirement to deliver 65% industrial benefits with an incentive-based desirable target of 100% would be more reasonable.

But, the government's IRB policy should be there to help and encourage Canadian companies and not – as it does now – ridiculously tie their hands. The fact is that procurements are now calling for 100% of industrial benefits, plus equitable regional and acceptable small business benefits. And, when doing this, it's now customary to demand that at least 60% be committed to and clearly and fully identified in the form of acceptable industrial benefits as part of the bidder's proposal. That means that, in order to ensure at least 60% acceptable benefits, more than 60%, perhaps 75% or 80%, must be identified in the proposal, otherwise the proposal could be deemed non-compliant.

Unlike direct work on a project, industrial benefits are like an investment – an investment in the future – and, in this regard, Industry Canada, as the government's IRB agency, should be more flexible and helpful in identifying opportunities for realization of benefits. In a perfect world there should not be any need other than the contractor's assurance that IRBs, in the amount committed to, will be delivered during the agreed to timeframe. The “who, what, where, and when” variables in the IRB equation should

be able to be left – all of them – until after contract award.

Conclusion

This article has identified some concerns with the government's current procurement process and we have recently seen definitive examples of its shortcomings (e.g., Joint Support Ship). Like the rusted-out equipment that it aims to replace, the system itself has rusted out and is in dire need of overhaul. Yet, there doesn't have to be any losers if the changes are made as we'll all benefit and, in particular, our navy, indeed the entire Canadian Forces will benefit.

Some of the generic recommendations – applicable to naval procurement but also, perhaps, to air force and army procurement – made in this article are as follows:

- industry-based navy design teams – perhaps using a variation on the GOCO²⁰ model;
- tailored/consistent requirements in accordance with commercial practices where possible;
- pre-qualify Canadian shipyards and give them regular work – build-to-print;
- government responsibility and accountability – to make use of the navy design team;
- single accountability point (DND) for government procurement;
- continuous build – up to two ships per year – each with a 15 year operational lifetime – no more mid-life refits – no more rust-out;
- reasonable, negotiable terms and conditions with shared risk;
- reduced government oversight and



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project management requirements (let the contractor do his job – ever watch “Restaurant Makeover”?); and

- a more reasonable approach to IRBs.

In addition to the above generic recommendations, since the navy’s current replenishment ships (HMC Ships PROTECTEUR and PRESERVER) as well as HMCS PROVIDER (which was decommissioned almost a decade ago) are/were well beyond their design life, these three ships – as a minimum – should be replaced as soon as possible. Thus, although it was recently cancelled, it is hoped that the Joint Support Ship procurement to acquire three – preferably four – ships will be reinstated by the new government now that they have been re-elected. In this regard, specific comments and observations that are applicable to the JSS project are as follows:

- Timely resolution of the JSS way ahead is essential to the *Canada First Defence Strategy*, the naval requirement, and minimizing further erosion of the JSS buying power. In the absence of clarity and funds already expended firms will not be able to support project teams indefinitely.
- The key issue to moving forward in a timely manner is resolution of where JSS will be built – in Canada or abroad. Until this is resolved, the government will be assessing apples and oranges and industry will be proposing oranges and apples.
- Correct the government/shipyard relationship and the longer term commitment to build the JSS and future government fleets (navy coast guard, and other) in Canada.
- The key to a different relationship will be better level loading and

strategic commitment to shipyard recapitalization but not borne within a specific project and an understanding of the reality of Canadian shipyard financial capabilities. In other words “use it or lose it”.

- If escalation were appropriately applied to the original \$2.1 billion JSS budget and with a move to commercial T&Cs/project management oversight with better alignment between the technical requirement and the operational requirement, the available escalated funds would come closer to delivering three joint support ships.

Yes, our procurement system is flawed and, as we continue to delay one project and cancel another, we also stand to lose face with our allies such that, the next time we cry wolf, maybe no one will listen. We have the *Canada First Defence Strategy*; let’s live up to it and fix the process and get the projects back on track.

Endnotes

1. Although it’s mentioned here, the Mid-Shore Patrol Vessel is not covered under the *Canada First Defence Strategy* and, for the HCM procurement, the one bidder that remained has since been selected for contract award.

2. The government recognizes that the system is flawed as, in its *Canada First Defence Strategy*, it says “These ongoing procurement reforms will further streamline the contracting process and ensure that it continues to remain open and fair. In addition, the Government will revise the current industrial benefit policies attached to significant procurement projects with a view to encouraging industry to make long-term investments in Canada”.

3. In this paper the term “navy” is used to refer to both the Royal Canadian Navy – as it existed – and the Maritime element of the Canadian Forces as it has evolved since unification. During this evolution, it is recognized that departmental organization, responsibilities, and relationships – as they apply to procurement – have changed substantially.

4. Over the same period other naval ships were built by Canadian shipyards – for example, three replenishment ships were built, one by Davie and two by St. John Shipbuilding. In addition, several commercial shipyards undertook refit and maintenance work and the naval



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dockyards themselves undertook the modernization of some of the ships and supported the submarines.

5. Laid down and launched by Burrard Drydock in Vancouver but completed by Yarrow's in Esquimalt.

6. This project was done in two 6-ship phases with three of the first six ships being built by St. John Shipbuilding and three by MIL Davie – by government direction. The six ships in the second phase were all built by St. John Shipbuilding.

7. The prime contractor (Litton) for the DDH-280 Class modernization project (TRUMP) was awarded through a competitive bidding process although the government directed that a particular shipyard (MIL Davie) perform the actual ship work. The flexibility demonstrated by the use of the different approaches will be important when considering future options for procurement practices.

8. In this article while the “industry” is sometimes indicated as the “prime contractor” it should not be construed that the “shipyard” and the “prime contractor” are necessarily the same entity. In fact, for the DDH-280 modernization project, the prime contractor (Litton) was not the shipyard (MIL Davie). However, for the CPF project, the prime contractor, St. John Shipbuilding, was the lead shipyard.

9. When the MCDV project commenced, the shipyard – where the MCDVs were eventually built – went by the name Halifax-Dartmouth Industries Limited. During the project HDIL was acquired by Irving Shipbuilding of St. John, NB and is now known as Halifax Shipyards Ltd.

10. See note 7. As for the DDH-280 modernization project, the MCDV prime contractor was not the shipyard.

11. “The DDH 280 Program: a Case Study of Governmental Expenditure Decision-Making” by Jack Arsenault, in *Canada's Defence Industrial Base*, David G. Haglund, ed., Kingston: Ronald P. Frye & Company, 1988, pp. 118-136, ISBN 0-919741-47-9 (“The DDH Program: a model of how not to build Canada's next warship, the CPF”, by J.W. Arsenault, Canadian Forces Command and Staff College, 1981 may shed additional light).

12. One of the CPF project's objectives was to develop and establish a “Canadian Centre of Excellence” for Ship Design and Systems Integration to address the developing gap between the Navy's internal design capability and the increased cost of internal resourcing within the Navy. Unfortunately the lack of continuity of shipbuilding programs kept this goal from being fully realized.

13. This was the case before the CPF project and the government essentially recognized this by stipulating the strategic industrial benefit to modernize the Saint

John shipyard; in the 1990s another government paid to close the yard. In addition, of the eight shipyards listed in Table 1, only four are still in business today. The other four (were) shut down several years ago.

14. Like several other countries, Canada at one time provided subsidies to its shipbuilding industry. However, while Canada ceased doing this, other countries did not cease, thus reducing the competitiveness of our shipyards in the international marketplace. At present, there seems to be a worldwide shortage of commercial shipbuilding capacity and, as a result, some of our shipyards – despite not being subsidized – are surviving, though not from government work. Meanwhile, our aerospace industry is effectively subsidized and it flourishes internationally.

15. It should be noted that military standards and specifications were introduced to help generalist military staff write specifications without their having to have in depth engineering/technical knowledge and expertise. Today, with qualified engineers on staff it should not be necessary to write everything in terms of the generic “cover everything” military standards and specifications and then be surprised at how much it costs.

16. It is recognized that care must be taken with regard to previously-completed studies and any assumptions made regarding the evolution of ship systems' architectures which could overturn their conclusions regarding the program costs of sustaining naval capabilities.

17. Currently budgeted at over \$3 billion, the Halifax Class Modernization contracts – shipyard work (refits) and combat system modernization will take place over roughly 10 years during which time Canada could (depending on the outcome of sustainability/longevity studies on the DDH-280 Class) at times be left with as few as five operational ships.

18. Teams bidding on the Joint Support Ship Project were required to submit in excess of 100,000 pages of documentation.

19. See note 2. The government recognizes that the IRB process is flawed and has said that it intends to fix it

20. GOCO – government owned, contractor operated

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