



CANADIAN NAVAL REVIEW

VOLUME 8, NUMBER 2 (SUMMER 2012)

**Estimating the Cost
of Naval Ships**

**From the Shores
of Nova Scotia to
the Hindu Kush**

Collaboration in Space

**National Shipbuilding:
Where We Are and
Where We're Headed**

**Canada's Asia-Pacific
Energy Trade Prospects**



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VOLUME 8, NUMBER 2 (SUMMER 2012)

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- provide a source for the public examination of Canadian naval and maritime history and for the development of lessons learned.

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HMCS Victoria moored in the Magnetic Silencing Facility at Naval Base Kitsap-Bangor for a deperming treatment. Deperming reduces a ship's electromagnetic signature as it travels through the water.

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Editorial

Out of Sight, Out of Mind

Over the past eight years, *Canadian Naval Review* has published material on a smorgasbord of maritime security subjects – from the Arctic to procurement to piracy. But we have never included an article about one maritime issue that is critical to the everyday lives of Canadians. We have never published anything about undersea/submarine cables. It's time to rectify that oversight.

Cables for the purposes of communication have been laid under the seas since the 1840s. The cables began by carrying telegraph messages and then telephone traffic, and now they carry telephone, internet and other data traffic. Now even landlocked countries are maritime states as they enjoy the benefits of submarine cables that transfer information to land systems.

The earliest cables spanned short distances – across the Rhine, across the English Channel from Dover to Calais, across New York Harbour, for example. The success of the early ventures emboldened people to try for ever greater distances, in particular across the Atlantic and to Asia. One early proposal to cross the Atlantic was to lay cable from Ireland to Newfoundland as the closest points, and then on to continental North America. Even now laying cable across such a vast expanse seems difficult, but imagine the leap of faith that had to occur in the 1840s when this was first being discussed. Nonetheless, investors were found and the cables were laid.

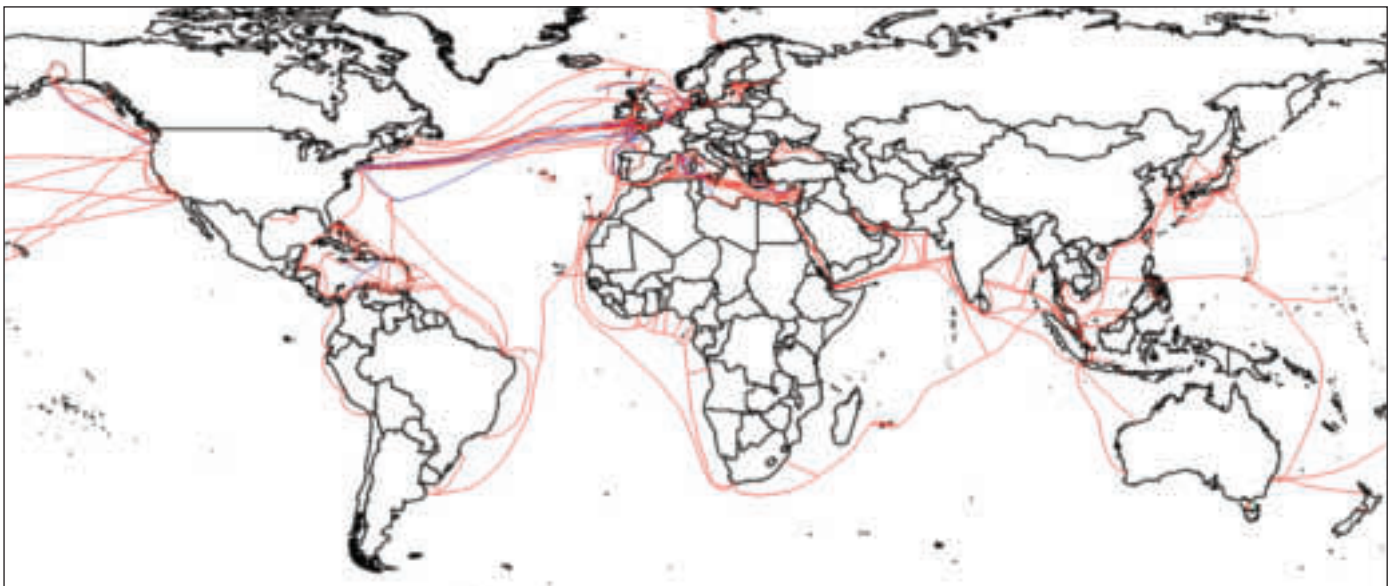
In 1853 when US Navy Lieutenant Matthew Maury, who had done survey work off the east coast of the United States, was asked if he thought it was possible to lay undersea cable across the Atlantic Ocean, he replied that, yes, the undersea conditions made it *possible*, but:

I [do not] pretend to consider the question as to the possibility of finding *a time calm enough, the sea smooth enough, a wire long enough, a ship big enough*, to lay a coil of wire sixteen hundred miles in length.¹

He concluded, however, that he was sure that “the enterprise and ingenuity of the age, whenever called on with these problems, will be ready with a satisfactory and practical solution of them.”

The early enterprises had some serious technical problems to overcome. How would the cables be laid? How would they be insulated? How could the signal be boosted over such large distances? These questions took ingenuity and a few expensive failures to answer. Cables first crossed the Atlantic in the 1850s (although this original cable failed very quickly), connected Britain to India in the 1880s, and crossed the Pacific Ocean in the early 1900s. Technology progressed and all continents – except Antarctica – are now connected by a tangle of submarine cables.

Technology also increased the speed of data transfer. The early cables had a rate of telegraph transmission of about 10-12 words per minute. This seems painfully slow in 2012, but at the time this was significantly faster than mailing a letter. In the 1950s the first trans-atlantic telephone cables were laid, and in the 1980s fibre-optic submarine cables were developed. Today, the speed of transoceanic communication is not measured in words per minute but by unimaginable chunks of data that can be transferred in the blink of an eye – terabits of information per second. Along some routes, depending on the circumstances, transmission speed approaches the speed of light. The



A map illustrating submarine telecommunication cables around the world in 2007.

Credit: Wikimedia Commons



The well-protected entrance to a submarine cable landing station at Cox's Bazar, Bangladesh.

quality of data transferred via cable is much better than via satellite, and more reliable – indeed, satellites carry only a tiny percentage of international communications traffic. Undersea cables transmit almost 95% of all international data.²

Laying submarine cables is expensive and it has historically been undertaken by private consortia of operators. In the 1990s there was a scramble to lay cables and capitalize on new technology and thirst for information. Billions of dollars were spent, and the cable system expanded as new lines were laid and old ones were replaced. As in everything, the action began to shift from the Atlantic Ocean to the Pacific Ocean. The mad rush slowed with the bankruptcies of a number of cable operators, but cables continue to be laid.

So why do we care about submarine cables? As pioneers in the business, the British were quick to realize that cables were hugely important communication devices, but they were also aware that the cables were vulnerable during war-time, particularly on land. They were a security risk, and could be cut to interrupt communication or tapped into for information. We rely on the information passing through these cables, and that means they are an important piece of our economic infrastructure. In general, multiple submarine cables are laid so that the loss of one cable does not necessarily shut the entire system down. However, building total redundancy into the system is expensive, and cables tend to be located in roughly the same place because operators cluster around the optimal route from A to B, so an accident or attack in that area may damage more than one cable.

Faults in the cables are surprisingly rare, but even at the bottom of the ocean cables are vulnerable. To make them less vulnerable, operators began to bury the cables in the 1980s. Nonetheless, they can still be accidentally damaged by fishing nets, anchors, dredging and resource exploitation, or by earthquakes, ocean currents and even sharks (there's a Youtube video of a shark attacking a cable).

There were three incidents of severely damaged submarine cables in 2008, leading to disruptions across the Middle East and Asia. The earthquake off Japan in 2011 led to significant damage to cables.

Intentional human actions to damage undersea cables have been rare but they occur. The Convention for the Protection of Submarine Telegraph Cables was signed in 1884 to ensure that states do not purposely damage cables but this hasn't eliminated the behaviour. Examples include British and German actions during the First and Second World Wars to destroy communications of the other by cutting cables. It is rumoured that during the Cold War, Soviet 'fishing' trawlers 'accidentally' dragged and cut US communication cables, and the United States apparently succeeded in tapping into Soviet cables. There have been no confirmed terrorist attacks on submarine communication cables, but in 2007 pirates stole an 11-kilometre section of a submarine cable that connected Thailand, Vietnam and Hong Kong, and attempted to sell it as scrap, and there have been delays to cables being laid into Africa because of piracy off the coast of Somalia. Cable-laying (and repair) ships can be vulnerable to attack as they are big, slow and follow a specified route.

After several accidents in 2001 that damaged its cables, Australia became sharply aware of their importance – and their vulnerability. For this reason the government passed legislation in 2005 to permit the creation of submarine cable protection zones to safeguard vital cables. There are now three protection zones which extend one kilometre to either side of the cable out to a depth of 2,000 metres. Within the protection zone certain activities are prohibited, such as fishing, lowering/raising an anchor, exploration/exploitation of resources, and any activity that might lead to connection with the sea bed. Penalties can be steep including fines and up to 10 years imprisonment.³

Canada does not rely on submarine cables as much as Australia so there are no Canadian protection zones. However, if we are doing vulnerability assessments, we would be wise to keep in mind that although they are out of sight, submarine cables are a vital information and economic link for Canada. 🇨🇦

Dr. Ann Griffiths

Notes

1. US Navy Lieutenant Matthew Maury, quoted in Bill Glover, "History of the Atlantic Cable and Underseas Communication," available at <http://www.atlantic-cable.com/Cables/1857-58Atlantic/index.htm>. Emphasis in the original.
2. Kathryn Young, "The Economic Importance of Submarine Cables," *Semaphore*, Issue 2 (2012), Sea Power Centre - Australia.
3. *Ibid.*

Estimating the Cost of Naval Ships

Commander David Peer

Introduction

Defence procurement costs are in the news regularly. While new naval ships have not been in the spotlight as much as the F35 recently, they are not immune from the challenges of estimating the cost of procurement. The government tabled documents in the House of Commons on 8 May 2012 which indicated that the delivery of the Arctic Offshore Patrol Ships has been pushed back to 2018 and the cost of the estimated \$3.1 billion project has already risen by \$40 million. The Arctic ships are not the only ship acquisition project to make the news. In 2009 the government halted the procurement of the Joint Support Ships (JSS) when responses to the request for proposals made it clear that the \$2.9 billion allocated for the program was not sufficient. Peter Cairns, President of the Shipbuilding Association of Canada, stated that the government's budget for shipbuilding projects has been unrealistic for the capability desired.¹

How hard is it to estimate the cost of a new naval ship? As most professionals involved in ship acquisition will tell you, estimating costs is fraught with risk and uncertainty, and it is a skill not widely understood. Now that Canada is entering a period of sustained fleet renewal for the Royal Canadian Navy, it is important that all those involved in the discussion of the future fleet – academics, journalists, politicians and the public – understand the complexity of estimating the cost of a naval ship.

Any discussion on the future navy must consider two questions:

- What is the required capability?
- What will it cost?

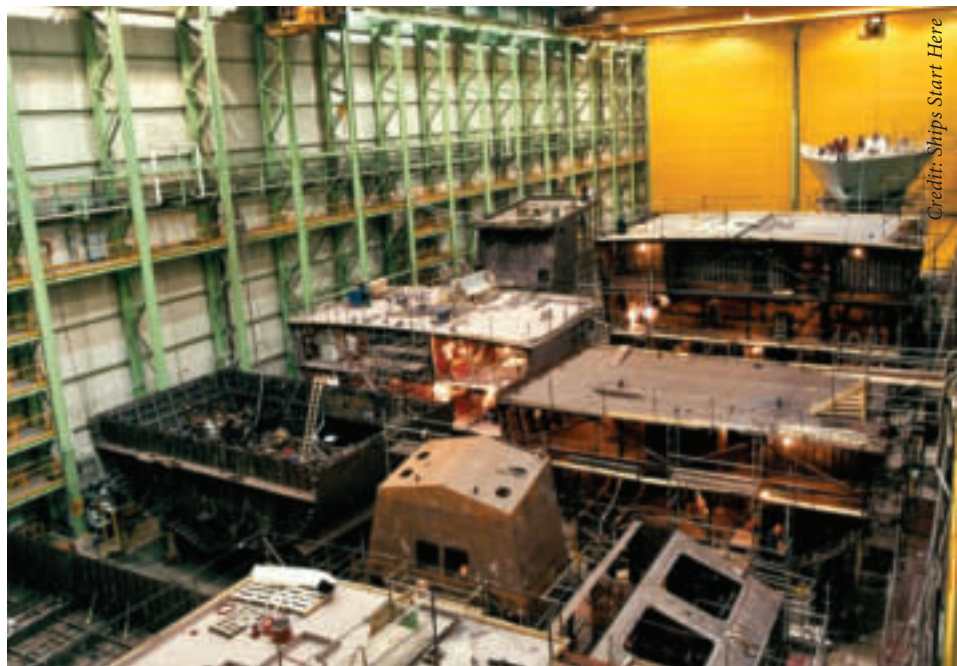
In the Canadian context, the cost of a ship project is fixed very early in the process which makes estimation of the cost to design and build the ship one of the key early tasks. Before any detailed information is known, the government must know how much money to set aside to acquire a ship and whether that amount represents good value. The government has an obligation to taxpayers to ensure that military equipment whether for the land, the sea, or the air is purchased at the right price, at the right time and with the right capability. The cost-estimating challenge is to understand how cost and capability are related and then to use that knowledge to guide decisions to acquire the right ships for the requirement.

Naval ships are unique. No other piece of defence materiel is so complicated and is designed and built in so few numbers to unique requirements. Consider Canadian ships, they are able to serve worldwide from the Equator to the Arctic because distinctive requirements exist for Canada's three-ocean navy.

The Cost-Capability Challenge

Before embarking on any procurement project, the government's first steps are establishing the capability of the equipment desired and, most important to taxpayers, establishing the maximum cost. In the end, the government must decide what Canada is willing to pay for military capability.

When the government announces a new military project and the cost for it, that cost becomes a not-to-be exceeded boundary for the project. The dilemma then is predicting a budget within which a contractor can find an acceptable design solution for government. Setting budgets for projects is not done lightly. Unfortunately, budgetary costs must be set very early in the ship acquisition process when only capability requirements and design concepts are available. The government must become familiar with what a warship should cost. It has no excuse for not doing this – the government must be an informed purchaser. However, this is more challenging than it seems. The design and build of naval ships one of the most complex engineering endeavours since a naval ship is a system of systems, the integration of which usually involves many



A frigate under construction at Irving Shipbuilding in Saint John, New Brunswick.

Credit: Ships Start Here

designers, engineers and technicians from a variety of companies and equipment manufacturers.

Becoming informed involves a series of investigative studies and concept designs intended to explore the cost-capability relationship of purpose-built and military off-the-shelf (MOTS) designs. This early work is challenging because it must be done by the Department of National Defence (DND) without consulting industry. Design solutions from shipbuilders that come with costs are not readily available, and would take millions of dollars to develop. In any case, it is not a realistic approach because part of the exercise is determining the capability the country can afford before engaging any suppliers. The goal is to establish a cost ceiling for a project that will permit an acceptable design solution. If the estimate is low, then capability tradeoffs become necessary. If the cost estimate is too low, then an acceptable design solution becomes impossible because the desired capability is simply unaffordable.

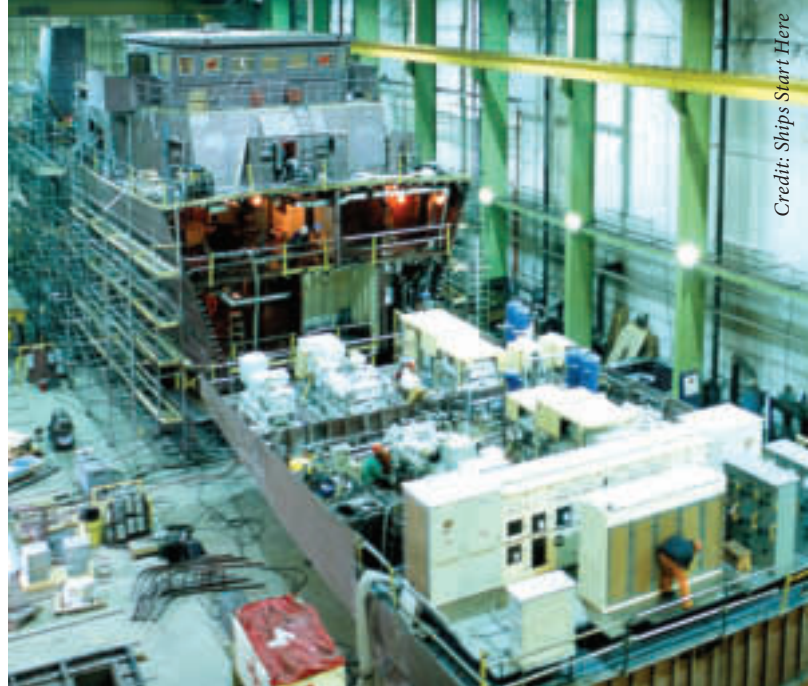
Cost Models and Design Tradeoffs

Early and accurate estimates of the cost of a ship are very important – this is a paradox because early estimates are rarely accurate. If early cost estimates are too low and the budget the government allocates for a project is insufficient, the problem may not become apparent until suppliers respond with proposals. This not only wastes time, it places the procurement in jeopardy because it is not easy to reallocate money between projects

Initial cost estimates for a purpose-designed ship typically quote an error of $\pm 40\%$, so the risk of under- or over-predicting cost with early estimates is significant. Over-predicting cost is problematic because equipment acquisition is planned for years, and over-predicting diverts financial resources from other important projects. Yet no project can proceed without an indication of cost so the estimate risk must be accepted and managed. The risk is that cost is underestimated and the procurement process fails.

Most of the work supporting the cost estimate of a purpose-designed ship is done using concept designs that explore a series of solutions that might be acceptable. This exploration allows examination of capability and various design tradeoffs to give a variety of different options. Each option must have an associated cost. This early stage examination of design capability and cost is critically important because decisions are made that will set the basic architecture of the ship and ship systems, which affect both construction and through-life cost.

The traditional early cost-estimating tool used for this work assumes that the weight and the cost of various systems and equipment are linked. Weight is the most



Maritime Coastal Defence Vessel under construction at Halifax Shipyard.

convenient attribute upon which an initial design cost may be based because it can be easily scaled and adjusted for different ship sizes, even with limited design information. Historical information from a known design and cost data for selected major systems and equipment can provide first approximations of ship cost for a series of concept designs that meet the capability requirement.

Another reason that weight is such a useful indicator for cost is that weight data is also an important element of a ship design. Draft, trim, heel, stability, strength and sea keeping are just some of the ship characteristics that are affected by weight or influence weight. Weights are also easy to predict from existing ships because they will vary predictably with ship characteristics. The key is selecting the ship characteristics where strong correlation with weight exists. For example, the size and weight of a power plant and the minimum compartment length for an engine room are related to the propulsion type and the installed power. The weight of the pipes in a ship correlates well with ship length. The magic in predicting cost is developing the Cost Estimating Relationship (CER) that links a weight to cost. Different CERs are used for different weight groups. When all the weight groups are added together, it gives the weight of a ship. The designer can then use the costs from an existing ship of one size with one group of weights to predict the cost of a new ship of a different size and different weights. When precise costs are known – such as the cost of a propulsion engine, equipment or system – that cost can be directly included.

This approach to cost estimation is one of the simplest, but it is still time consuming. As well, getting good data to develop a model and the CERs is often difficult, particularly if current cost information is not available. More significantly, the weight-based system of cost estimation has one important limitation – weight-based cost models

cannot easily account for the cost of the *complexity* of a ship design.

Getting good data for a cost model is difficult; getting recent *Canadian* data is nearly impossible. In the 1990s DND's Chief of Review Services (CRS) explored the comparable costs of ships from other states in a review of the cost and capability of the Canadian Patrol Frigate (CPF) project and noted how difficult costs were to determine. This experience highlighted the challenge of getting accurate information on costs. For one thing, shipyards do not release production cost data, and an added complication today is that Canada has not built major warships since the CPFs in the 1990s. At that time, CRS used data from *Jane's Fighting Ships* and *Forecast International* to predict the cost of comparable warships but noted that the information was not sufficient to support hard conclusions on the relative performance and cost of the ships.²



Maritime Coastal Defence Vessel *Edmonton* under construction at Halifax Shipyard in 1996.

Cost estimation based on weight can provide data on the design and build of a ship, but it is not a reliable way to estimate all project costs. What is considered in project costs can be controversial, as the debate on the F35 cost figures shows. The life-cycle costs of operating and maintaining a ship for its design life must also be estimated to determine total cost. The US Navy's Naval Sea Systems Command (NAVSEA) life-cycle cost data shows that on average, over a 25-year life, the cost of operation and maintenance is almost double the cost of acquisition.³ One would expect a similar or higher ratio for the RCN since Canada typically operates ships for 30 to 40 years.

Challenges with the Cost-Estimating Process

The government's ability to estimate ship cost will never be perfect, no matter which method is used as long as the acquisition process is competitive. In the interest of fairness and impartiality, the acquisition process effectively places a wall between those setting requirements and those developing solutions. The competitive acquisition

process has an underlying ideology that this process "unleashes creativity that can solve virtually all problems."⁴ But competition in a restricted marketplace makes it hard to estimate cost. Norman Friedman, a noted US naval historian, has argued that a competitive process for warship acquisition has a profound effect on the ability to predict cost for both the government and the bidder.⁵ Unfortunately, for the bidders it creates problems because:

- the scope for creative and innovative cost-saving solutions is often very limited; and
- bidders assume significant risk if forced to bid on flawed requirements, which drives up costs. The alternative is to refuse to bid or to submit a non-compliant bid.

The process can raise problems for government as well because:

- the implication of flawed requirements only become clear when the bids arrive with costs higher than expected;
- if problems occur once a contract has been written, it is extremely expensive to backtrack on any of the requirements in order to reduce costs; and
- if contract terms are badly written, the builders may deliver an unexpected solution that cannot be compared with other solutions for technical merit or cost.⁶

Friedman used the example of the USN's DDG-1000 to illustrate an important point about problems with ship requirements. The *Zumwalt*-class was supposed to be the cheap, disposable ship for the future. The problem, Friedman points out, was that the USN did not seem to realize that the stealth requirements placed on the class would drive the cheap, disposable ship to three times the size of a CPF or result in a hull form that needed active stabilization because it no longer had stability in all conditions.⁷

The USN experience is not unique. We have our own Canadian example, the Joint Support Ship (JSS). The JSS project was intended to deliver three multi-mission highly capable ships. The government announced the project in 2004 timed to replace the navy's aging fleet of replenishment vessels. The government terminated the competitive procurement process in 2008 because the design solution for the ship's capability requirements could not be found within the allocated budget.

The Canadian government has a National Shipbuilding Procurement Strategy (NSPS) that is designed to counter some of the costing challenges posed by the competitive process. The NSPS used a staged competitive process to engage and select shipbuilders early, before design even

engage and select shipbuilders early, before design even commenced in many cases, thus creating an environment in which discussions can occur between those setting capability requirements in the government and those responsible for developing the design solution in industry. Nevertheless, limitations in cost estimating will still occur because capability requirements and associated budgets are set before contractors are engaged to determine the solution.

The biggest limitation in Canada right now is lack of reliable data for weight and cost relationships. We have not built any frigates since the 1990s. The last time Canada built a supply ship was the 1960s. DND cost estimators do not have good data from contractors. As a result, estimators use cost and weight relationships derived from other documents or sources – thus they are estimates of estimates. Almost no feedback is possible to correct major errors in cost, at least until after the budgetary limits are set and responses are received from contractors. Recent and relevant data are just not available for cost estimation in Canada.

Accounting for design complexity is important. Recent US trends in naval shipbuilding have shown a steady increase in the complexity of warships. This leads to higher costs because complexity requires more design effort and construction hours. The influence of complexity is seen in the cost per ton difference for different ship types and in the variance within the ship type. Ships that are more complex cost more per ton. This means that cost estimation should include consideration of both weight *and* complexity, and cost estimations should not be derived from just looking at ships of similar weight but also ships of similar complexity.

The huge difference in cost per ton between naval and commercial ships occurs for several reasons. Unlike commercial ships which function with relatively small crews, naval ships dedicate significant space for large crews. As well, naval ships often have relatively large propulsion systems in small spaces, electrical and cooling systems must be capable of greater loads, and weapon and sensor systems must be carefully positioned. All electrically powered equipment and systems need power and control cables and cooling water, all of which compete for prime space sheltered from the effects of enemy weapons. This means that naval ship specifications are inevitably more numerous and complicated. Competition for space and location challenges the designer to optimize arrangements and carefully control the ship's centre of gravity.

Figure 1 illustrates in a simple graph the challenge of complexity by comparing the labour required to build a

Table 1.
Comparison of Costs Among Ship Types

Ship Type	Average Light Ship Cost [\$US/1000 Ton]
Conventional Submarine	103 to 347
Nuclear Submarine	185 to 250
Destroyer	122 to 168
Frigate or Corvette	70.8 to 217
Aircraft carrier	69.8 to 67.0
Cruise ship	10.0
US built crude oil tanker (medium)	6.93
Chemical product tanker (small)	2.84
Container ship	3.10
Crude oil tanker (medium)	2.20
Oil product tanker	1.63
Bulk carrier (small)	1.26
Bulk carrier (medium)	0.88

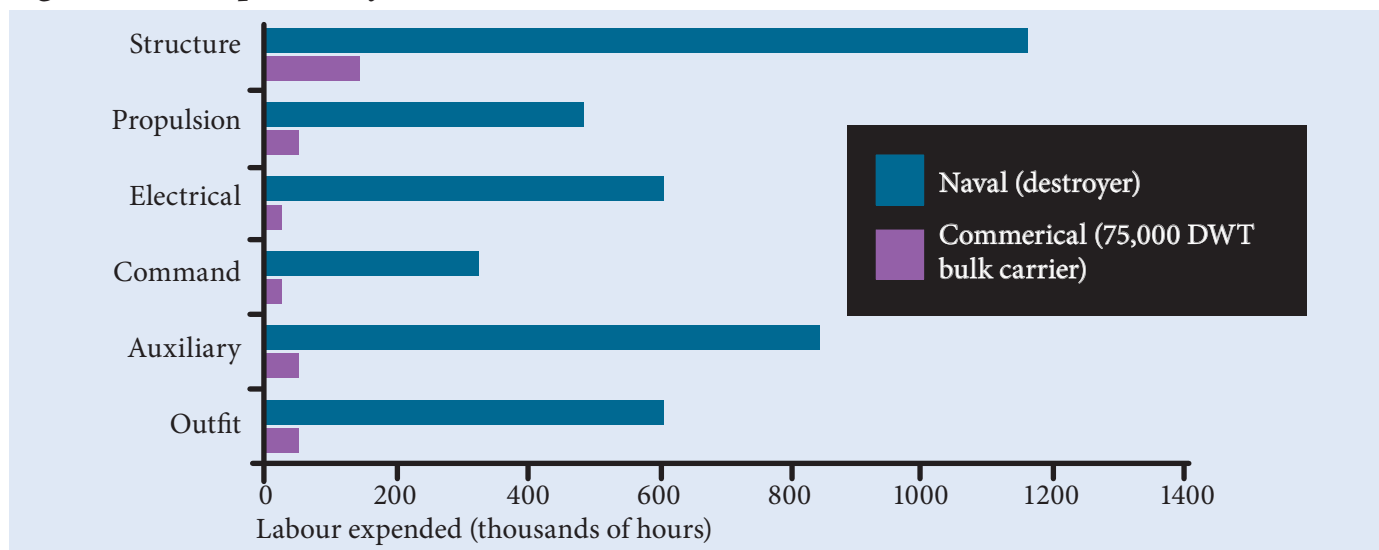
Source: John Birkler, et. al., "Differences Between Military and Commercial Shipbuilding: Implications for the United Kingdom's Ministry of Defence," RAND Report MG-236 (Santa Monica: RAND Corporation, 2005), statistics taken from Table 3-1, available at http://www.rand.org/content/dam/rand/pubs/monographs/2005/RAND_MG236.pdf.

destroyer and a bulk carrier. Note the difference in labour hours that complexity requires.

Another challenge for cost estimating is the time involved in the acquisition process. The significant time that the process takes means decreased value of the budgeted amount and increased costs associated with inflation. Everyone is aware that military procurement can take a decade or longer between the announcement of a project and the signing of a contract. Over that time the value of money erodes, and the price of commodities changes. The time value of money is often ignored in the discussion, but every year a project budget sits unused, it buys less. A recent example of this is the JSS project. The project and its budget of \$2.6 billion was first announced in 2004. The ships will now be built as part of the NSPS in the near future. Every year since 2004 inflation has reduced what the project budget can buy.

Assuming that the JSS contract is signed in 2014 and the government starts paying for the ships, that would be 10 years since the initial budget was established. Taking into account annual inflation rates since 2004 and an estimated annual rate of 2% for 2012 and 2013, a contract to build the JSS would require \$3.83 billion in 2014 for the same capability that \$2.6 billion would have bought in 2004. Since the JSS budget is fixed, \$2.6 billion in 2014 will only

Figure 1. A Comparison of Labour Hours



Source: John Birkler, et. al., "Differences Between Military and Commercial Shipbuilding: Implications for the United Kingdom's Ministry of Defence," RAND Report MG-236 (Santa Monica: RAND Corporation, 2005), available at http://www.rand.org/content/dam/rand/pubs/monographs/2005/RAND_MG236.pdf.

buy Canada two-thirds of what that amount could have bought in 2004. Because of this, the design solution must sacrifice capability requirements to stay within budget which means that Canada will receive less capable ships and possibly fewer less capable ships. Practically, a two-thirds reduction in buying power will have a significant effect on the resulting design solution. Only when the design contract is announced will the actual reduction in buying power become apparent.

But inflation is not the only enemy. In the RAND monograph *Why Has the Cost of Navy Ships Risen*, the authors note that the cost growth trend in naval ship construction since the 1960s is twice the rate of inflation.⁸ The additional increase above inflation was caused by 'requirements creep.' This phrase refers to the tendency over time of navies – and this applies to equipment purchases for the other branches of the armed forces as well – to replace older ships with more capable and more complicated ships. This often means that simple traditional tasks are now undertaken by extremely capable and expensive ships.

Conclusion

The expectations that cost estimates will be accurate are often unrealistically high because the difficulty of calculating accurate costs is not really understood. If costs rise, it can lead to the perception that costs are not well controlled when in fact cost estimates are just estimates continually being refined as cost-capability relationships are better understood. The government has made an important step with the NSPS to create relationships between government and industry that will improve the cost estimates of Canadian naval ships as shipyards on the East and West Coasts start building ships again. When actual cost data become available for

cost models, estimates for future ship classes will become more accurate, alleviating some of the current challenge in predicting cost.

But even with more accurate data in the future, estimating the cost of building Canadian naval ships will be challenging! Budgets are just best estimates of the cost of a capability that are outlined early in a project. We must expect cost-capability tradeoffs to become necessary as more accurate costs become known. Design complexity is difficult to estimate when cost data comes from different ship types. Finally, even low inflation and the gradual increase of other costs can play havoc with any fixed budget given enough time. 🍷

Notes

1. Lee Berthiaume, "Armed Arctic Vessels Face Delay in Latest Procurement Setback" *Postmedia News*, 8 May 2012, available at www.canada.com/story_print.html?id=6588081.
2. Chief of Review Services, Department of National Defence, "Report on Canadian Patrol Frigate Cost and Capability Comparison," 7050-11-11 (CRS), 26 March 1999, available at <http://dsp-psd.pwgsc.gc.ca/Collection/D2-127-1999E.pdf>.
3. Fred Harris, "Total Ownership Cost (TOC)," Presentation at the American Society of Naval Engineers Day 2011, Arlington, Virginia, 10-11 February 2011, p. 3, available at www.navalengineers.org/SiteCollectionDocuments/2011%20Proceedings%20Documents/ASNE%20Day%202011/Presentations/Harris.pdf.
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5. *Ibid.*
6. *Ibid.*
7. *Ibid.*
8. Mark V. Arena, Irv Blickstein, Obaid Younossi and Clifford A. Grammich, *Why Has the Cost of Navy Ships Risen?* RAND Monograph 484 (Santa Monica, RAND Corporation, 2006), available at www.rand.org/content/dam/rand/pubs/monographs/2006/RAND_MG484.pdf.

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From the Shores of Nova Scotia to the Hindu Kush: A Sailor's Experience in Kabul

Commander Hugues Canuel*

Canada's combat mission in Afghanistan was concluded a year ago, alternatively celebrated in the media as a great and noble achievement or decried as a wasteful expenditure of lives and resources.¹ Much less coverage was allotted at the time to the effort undertaken by the Canadian Forces (CF) to mount a training mission in the Kabul region as troops were being withdrawn from Kandahar province. *Operation Attention* has become central to Canada's commitment to the international effort in Afghanistan and all elements of the CF were called upon to provide personnel in support of that endeavour.

I was assigned to the contingent provided by the Royal Canadian Navy (RCN) during the pivotal early period. My experience cannot be presented as typical of the hundreds of individuals who eventually deployed for *Operation Attention* in 2011-12. Nevertheless, it was representative of the smaller group employed in senior positions within the headquarters of the NATO Training Mission - Afghanistan (NTM-A) as staff officers or advisors to units of the Afghan National Security Forces, whether the police, army, air force or within the higher ministries. This article will outline my recent experience, addressing some aspects that may not have received much coverage in the mainstream media. First though, I will briefly lay out the background to the mission and its rapid evolution through the course of the rotation.

Mission Background

Operation Attention refers to the Canadian Contribution Training Mission - Afghanistan. Most personnel are assigned to NTM-A, the training pillar of the UN-mandated, NATO-led International Security and Assistance Force (ISAF).² NTM-A delivers training and professional development to the Afghan National Army and the Afghan National Police, as well as the various ministries involved in the security sector. Such work is conducted alongside that of ISAF's two other main pillars – ISAF Joint Command (IJC), which is responsible for operations, and ISAF Special Operations Forces (SOF), which coordinates both the employment of coalition special forces and the provision of advisors to the Afghan Army and Police.³

As the Canadian contribution grew in strength to about 925 all ranks through the latter half of 2011, detachments were established in different camps distributed through-



Credit: Colonel Nick Pond, British Army

Commander Hugues Canuel with downtown Kabul in the background after a morning march up the foothills of the Hindu Kush in September 2011.

out the capital region, and satellite teams proceeded to Mazar-e-Sharif in the north and Herat in the west.⁴ The headquarters of NTM-A is accommodated in Camp Eggers.⁵ This secured compound, named after US Army Captain Daniel W. Eggers who was killed near Kandahar on 29 May 2004, is located in the capital's downtown area next to ISAF Headquarters and the seat of the Afghan ministries.

The Canadian footprint in Camp Eggers grew through the summer of 2011 from a dozen personnel to nearly 100 (including all military and civilian police personnel). As the Canadian contingent increased, the NTM-A structure itself was quickly changing. Such evolution was required to meet the shift in focus of the allied mission. Formally activated on 21 November 2009, NTM-A is mandated to "support the Government of the Islamic Republic of Afghanistan as it generates and sustains the Afghan national security forces, develops leaders, and establishes enduring capacity in order to enable accountable Afghan-led security."⁶ This required an initial emphasis on recruitment and expansion but priorities have since

changed to the areas of instruction skills ('train the trainer'), leadership, literacy, accountability and institutional development.⁷

This evolving focus greatly affected the Canadian mission during the initial rotation of *Operation Attention*, especially for those personnel employed in Camp Eggers. Senior officers and non-commissioned members (NCMs) were integrated in the NTM-A command team while others served in staff positions or in advisory duties with the Afghan security forces. Junior operators and technicians were also employed with the movement teams escorting coalition representatives through the streets of Kabul on a daily basis. Several of the more senior individuals would be re-assigned during their tour in order to meet NTM-A's changing priorities as well as the increasing maturity of the Afghan units – indeed, I went from advisor to successive staff appointments. This path provided a unique insight into the various components of the NATO training mission, including work with both Afghan Police and Army units and made for a remarkable tour.

Pre-Deployment Training

Such flexibility in employment while in theatre was facilitated by the short but effective period of pre-deployment training required for all personnel assigned to *Operation Attention*. The task of delivering this instruction was greatly complicated by the fact that the deployment of Canadians was staggered over the course of several months in order to facilitate the in-flow of hundreds of individuals newly assigned to NTM-A. Unlike *Operation Athena*, where the bulk of personnel would deploy to Kandahar as an integrated battle group following months of common training, instruction for those proceeding to Kabul had to be delivered in stages as successive waves of personnel deployed to Afghanistan from April to October 2011.

I must praise the tremendous effort put forward by senior leaders of the 3rd Battalion Princess Patricia's Canadian Light Infantry as it was tasked to coordinate and deliver such training even as most members were getting ready to deploy themselves.⁸ Reluctantly leaving command of HMCS *Preserver* in Halifax but eagerly looking forward to the mission ahead, I found myself bound for the Edmonton Garrison in May where I joined a disparate group of about 100 individuals scheduled for deployment in July.

As I quickly learned, the start of a good army day usually involves a parade so we all fell into ranks on that very first morning, anxious to commence our preparations for the diverse duties awaiting us in Afghanistan. An eclectic group it was. Sailors, soldiers and air personnel of all

ranks – from Captain (N) to Privates – and all trades were present, with a wide range of experience in terms of overseas deployments and combat experience. Regulars and Reservists, whether looking forward to their first deployment or one last adventure before retirement, quickly evolved into a dynamic team, with all individuals eventually contributing their unique perspective and experience as the group completed a wide range of training.

As a naval officer with no combat arms background or prior experience in a theatre of operations such as Afghanistan, I most appreciated the training related to the common skills and general awareness required to survive – literally – during the mission. Much was gained from weapons handling, combat first aid and convoy procedures as well as cultural awareness instruction. Of course, training together and working shoulder to shoulder during these



Warrant Officer Tim MacCormac of the Canadian Contribution Training Mission – Afghanistan demonstrates how to prepare a charge to dispose of unexploded ordnance during a class with Afghan National Army soldiers.



Credit: Master Cpl. Rory Wilson

Major Meijin of the Afghan National Army speaks to Afghan soldiers during a counter-ambush exercise in Kabul. Looking on is Captain Alan Younghusband (standing second from right), of the Canadian Contribution Training Mission - Afghanistan.

weeks paid huge dividends during the actual deployment. Although we would eventually find ourselves distributed among various NTM-A bodies and accommodated in several camps around Kabul and beyond, our duties – especially for the most senior individuals – would require us to interact with other branches of the training mission and travel to several of these camps on a routine basis. One cannot over-emphasize the value of the personal bonds built prior to the deployment in facilitating the rapport that was so helpful to discharging both NATO and Canadian responsibilities throughout the course of the mission.

Experience as Advisor and Staff Officer

Having completed training and pre-deployment leave, our eclectic group mustered in Edmonton in mid-July for the long flight to Afghanistan where I was tasked to take on the duties of Advisor to the Chief of Staff of the Afghan National Civil Order Police (ANCOP). Somewhat similar in concept to a European gendarmerie, ANCOP has a large role in counter-insurgency operations, and is tasked to restore and maintain order in designated areas, especially during sensitive or dangerous disturbances and riots. It also conducts operations that require a high level of training and tactics as well as special capabilities such as a mobile quick reaction force.⁹

My employment with ANCOP was a result of the Royal Canadian Navy's original commitment – among others – to provide a contingent of 12 officers and NCMs to the agency. However, ANCOP had been the focus of

considerable effort on the part of NTM-A since it came into existence in 2009 so that it was one of the more advanced elements of the Afghan National Police by the summer of 2011. It was rapidly realized that the Canadian naval contingent assigned to ANCOP headquarters for *Operation Attention* could be better employed elsewhere in view of more pressing requirements. Most of us were re-assigned to other priorities except for the advisors to G1 (Personnel) and G4 (Logistics), as they continued making a valuable contribution in these areas where the police force still experienced difficulties in terms of policy making and sustainment planning.

Nevertheless, I remained with ANCOP for close to two months before being re-assigned. This experience provided a valuable understanding of NTM-A's structures and procedures as well as a greater understanding of the Afghan National Security Forces and the variety of coalition personnel employed in their support. Actual instruction of police tactics and procedural training is often discharged by contractors, mostly veterans from US police forces, including several from the southern states. This usually made for hilarious staff meetings with Alabamians and this French-Canadian trying to comprehend each other without an interpreter at hand! Of course, interaction with the Afghans was always fascinating. It was captivating to observe the interaction of senior officials with such different backgrounds, whether in terms of tribal affiliation or having come up through the ranks either as pupils of the rigid, Soviet-inspired staff system or as freewheeling Mujahedeens.



Royal Canadian Navy sailors conducting pre-deployment training at CFB Edmonton in June 2011. From left to right: Lieutenant (N) Omar Masood, Chief Petty Officer First Class Lee Brown, Captain (N) Haydn Edmundson, Commander Hugues Canuel, Lieutenant (N) Vicky Marier, Lieutenant (N) Darrell Warner, and Lieutenant (N) Jon Maurice.

My next assignment was as Staff Officer (Special Police) to the Assistant Commanding General - Special Police and Protection Force (SPPF), a newly created organization under the NTM-A Deputy Commander - Police. ACG SPPF was tasked to support the provision of equipment and infrastructure to a variety of special police elements such as those assigned to the General Directorate Police Special Units (GDPSU). This component of the Afghan National Police provides specialist tactical capabilities to support counter-insurgent and counter-narcotics operations as well as activities against organized crime through the provision of sophisticated capabilities including crisis response units of the SWAT model, covert intelligence and surveillance, as well as close personal protection for government figures and judicial authorities.¹⁰

Symbolic of the dynamic nature of the NTM-A structure, ACG SPPF was dissolved in November 2011, at which point I was again transferred to a new entity, the Deputy Commander Special Operations Forces (DCOM SOF).¹¹ This organization came into existence as a result of the decision to centralize support within NTM-A for special elements of both the Afghan National Police and National Army. Within DCOM SOF, I remained involved with questions related to force structure (through the management of unit *tashkil*, the Afghan manning document similar to the Western Table of Organization and Equipment) and seeking coalition funds for equipment and infrastructure.

This assignment proved most challenging, especially as the Afghan National Army Special Operations Command (ANASOC) is one of the few elements of the Afghan security forces still growing towards its final

structure as envisioned for the post-2014 period, including the implementation of a Special Mission Wing that will incorporate ground and air movement assets.¹² I had to develop an in-depth familiarity with the Ministry of Defence and ANA authorities and structures, reach out to the staffs of the NTM-A Deputy Commander - Army and the Deputy Commander - Air as they both supported ANASOC development, and very quickly develop an insight into Afghan commando and special forces units as well as their coalition advisory teams. Gaining such first-hand experience with both special police and army units was necessary so that I could represent their interests knowledgeably when appearing in front of various coalition authorities in order to secure funding for issues ranging from specialist pay to the acquisition of armoured vehicles and the building of new headquarters and training facilities.

Being involved with Afghan units and coalition advisory teams based throughout the Kabul region required regular visits to several headquarters, schools and training sites. The reward was leaving the grind of staff work behind. The cost? Too often it was a gruelling march up the foothills of the Hindu Kush, as I learned that marching uphill on rocky paths at dawn is another favourite army morning activity! These visits were always great opportunities to meet extremely dedicated Afghans serving in these elite units routinely called upon to face the most extreme elements of the insurgency. As well, dealing with advisors from across the international coalition was incredibly rewarding because it gave me the opportunity to meet with experienced individuals of a wide range of backgrounds. Admittedly, it could also be frustrating given the occasional lack of interest by special forces types for the drudgeries of paperwork and budget planning! Nevertheless, as the growth and training of



Private Curtis Perren demonstrates an urban operations fire position to soldiers of the CCTM-A Rapid Reaction Force during training at Camp Phoenix in Kabul.



Memorial held at Camp Eggers, Kabul following the tragic loss of Master Corporal Byron Greff on 29 October 2011.

Afghan special police and army units are central to the ISAF campaign plan, I expect DCOM SOF will remain at the forefront of the NTM-A effort through the next two years, making it a great challenge for those employed in that element of the training mission.

Conclusion

One may wonder whether a naval officer or NCM is truly suitable for employment as an advisor or a staff officer involved in the development of the security forces of a landlocked country in the throes of an insurgency. The performance of the RCN contingent deployed for *Operation Attention* Roto 0 put such questions to rest. Subject to gaining the necessary survival skills in the pre-deployment training, naval officers and senior NCMs have the hands-on leadership, detailed planning and administrative abilities required to make a valuable contribution in a multitude of roles. Short of advising on actual police and army tactics, naval personnel are more than capable of providing worthy advice to senior Afghan officers employed in formation headquarters and ministerial positions on matters of strategic and operational planning, budgeting, personnel policies, etc. Appointments at NTM-A headquarters require those same abilities and staff skills as would be necessary in similar employment in service or joint headquarters in Canada.

Employment as part of a training mission rather than a combat mission does not mean that there is no longer a threat, as experienced with the regrettable loss of Master Corporal Byron Greff on 29 October 2011. Afghanistan is a challenging place, but deploying to *Operation Attention* turned out to be a remarkable and highly rewarding experience. Canada assumed a very important role during this initial rotation as the Canadian mission grew into the second largest national contingent within NTM-A, thus

gaining a large role in shaping the alliance's effort. Such influence is bound to continue as troop-contributing states reduce their footprint in the coming years and Canadians continue to leverage their professionalism both as advisors and staff officers throughout the NTM-A structure. Although the grind of the work in Camp Eggers is sometimes eerily similar to those frustrations encountered in headquarters at home, it is important to remind oneself of the value of such contribution in support of Afghanistan's march to security and self-sufficiency. 🇨🇦

Notes

- * The views expressed herein are those of the author alone; they should not be construed as those of NATO, the Canadian government or the Department of National Defence.
1. The CF deployed to Kandahar in *Operation Athena*. Combat operations officially ceased in July 2011, although the Mission Transition Task Force remained until December 2011 to conclude Canadian activities at the Kandahar Airfield. For background on *Operation Athena*, see www.cefc.com.forces.gc.ca/pa-ap/ops/athena/index-eng.asp.
2. Although ISAF is not a 'blue-helmeted' United Nations force, it has operated under a Chapter VII (peace enforcement) UN mandate since 2003. NATO assumed leadership of ISAF in August 2003 and received its first UN Mandate in October of that same year. The mandate has been renewed annually, most recently on 12 October 2011. See United Nations Security Council Resolution 2011 (2011) at www.un.org/News/Press/docs/2011/sc10408.doc.htm.
3. On the ISAF command structure, see www.isaf.nato.int/isaf-command-structure.html.
4. The Canadian mission has a "legislated personnel cap" of 950 CF members but the number of deployed personnel at any given time varies based on operational requirements. For a breakdown of mission elements as of 24 May 2012, see www.comfec-cefc.com.forces.gc.ca/pa-ap/ops/fs-fr/cctma-cmfa-eng.asp. Note that the Herat team was stood down in early 2012, and the government announced that a further 100 CF personnel would be repatriated without replacement over the course of the summer 2012.
5. For details of Camp Eggers, see the US Department of Defense "Welcome Packet - Camp Eggers," available at <http://ntm-a.com/wordpress2/wp-content/uploads/2011/07/NTM-A-Welcome-Aboard-Package-15-Jun-11.pdf>.
6. Department of National Defence, Fact Sheet, available at www.cefc.com.forces.gc.ca/pa-ap/ops/attention/index-eng.asp.
7. On the change of focus that occurred through 2011, see articles written by the former commander of NTM-A, Lieutenant General William B. Caldwell, "Building the Security Force that Won't Leave," *Joint Forces Quarterly*, Issue 62 (2011), pp. 74-80, available at http://ntm-a.com/wordpress2/wp-content/uploads/2011/07/JFQ62_74-80_Caldwell-Finney.pdf; and "Helping the Afghans Help Themselves," *Proceedings* (July 2011), pp. 32-37, available at http://ntm-a.com/wordpress2/wp-content/uploads/2011/07/20110701-Proceedings_Helping-the-Afghans-Help-Themselves.pdf.
8. Given the scale of the task, many personnel also had to complete individual training at the Peace Support Training Centre in Kingston, Ontario. For more on that institution, see <http://armyapp.dnd.ca/pstc-cfsp/default-eng.asp>.
9. NTM-A/CSTC-A, "Afghan Ministry of Interior (MoI) Advisor Guide," Version 1.0, 9 May 2011, 1-4 and 1-5, available at http://ntm-a.com/wordpress2/wp-content/uploads/2011/07/Afghan_MoI_Advisor_Guide_Version_1.0_9_May_2011.pdf.
10. *Ibid.*, 1-6.
11. The mandate of DCOM SOF is in the DND Fact Sheet, "NATO Training Mission - Afghanistan," available at www.cefc.com.forces.gc.ca/pa-ap/ops/fs-fr/NTMA-eng.asp.
12. For a short overview of ANASOC, see US Department of Defense, "Report on Progress Toward Security and Stability in Afghanistan," 27 April 2012, pp. 24-25, available at www.defense.gov/pubs/pdfs/Report_Final_SecDef_04_27_12.pdf.

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Collaboration in Space: The Silver Bullet for Global Maritime Awareness?

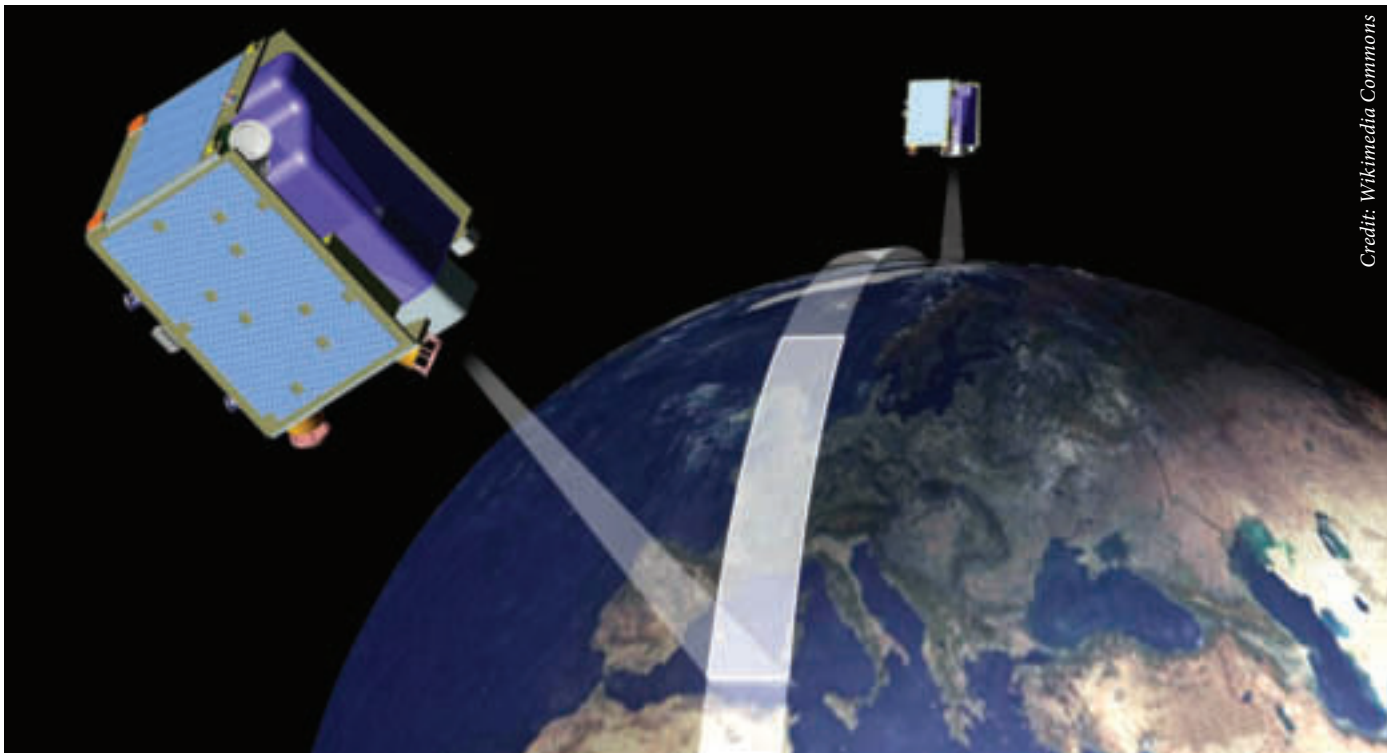
George (Guy) Thomas

There is no silver bullet to achieve complete maritime security, not now, nor in the foreseeable future, but all maritime countries working together can make the seas much safer and more secure. One of the primary steps they could take would be to create a global space partnership (GSP) initially focused on the maritime domain. Such a concept has been under informal discussion for some time by many people, especially in countries with large, exposed shorelines such as Canada, Norway, Japan and Italy. The maritime focused portion of the GSP is called Collaboration in Space for International Global Maritime Awareness (C-SIGMA). A GSP would have much broader capabilities than just the maritime domain but the critical vulnerabilities of maritime assets and the potential huge economic impact their loss could generate have created a pressing need for much better awareness of the maritime domain.

Increased awareness starts with better ocean and coastal surveillance. This point has been borne out twice recently. First, there has been recent recognition that piracy is alive and well in the 21st century and is a growing, not

diminishing, threat. Second, the terrible attack from the sea on Mumbai, India, in November 2008 by just a few men paralyzed that multi-million person city and brought attention on the need for better maritime awareness. Many practitioners and researchers have come to believe that unclassified space systems will play a major role in any effective maritime awareness system. Space systems cannot do it all, so collaboration and coordination with terrestrial systems as well as the mining and analysis of data contained in hundreds, if not thousands, of data bases is also needed. Likewise, coordination is needed down to the responding tactical units, but those are wholly different issues and will not be addressed here.

Oil may be the world's lifeblood, but oceanic commerce is its backbone, if not the entire skeleton. While the horrendous attacks on the United States on 9/11 did not have a maritime element, they served as a wake-up call in many venues, not just in the United States. The maritime entities of the world – military, civil and private alike – looked at their situation in the new reality and quickly understood their vulnerabilities and the potential consequences.



Credit: Wikimedia Commons

Unclassified space systems, like these RapidEye imaging satellites, could play a major role in any effective maritime awareness system.

Since that terrible day a number of organizations have examined how to protect their maritime assets both individually and, in growing numbers, collectively. Most saw increased maritime domain awareness (MDA) to be of primary importance to the smooth functioning of commerce on the world's oceans, the crucial supporting frame of the world's economy, and vital to the national interests of many states. Added to the threat of piracy or sea-borne attack is also a growing realization that misuse of the oceans can lead to significant environmental damage and huge loss of natural resources. Thus there is little wonder that a wide variety of organizations either have developed or are developing systems and concepts of operations (ConOps) dealing with regional, if not global, maritime awareness.

The potential unique contributions of civil space systems to international global maritime awareness is a subject of growing interest. No one country or even any existing collection of countries has the stature, breadth and depth to organize a meaningful coalition to protect oceanic commerce, the maritime environment and the broad range of individuals who use the maritime domain for a multitude of endeavours including profit, conveyance and recreation. It will take international collaboration and cooperation on a nearly unparalleled scale to provide this protection and assure the safe and secure use of the world's oceans. The only organization that has addressed a task similar in scope is the International Civil Aviation Organization (ICAO), which deals with the smooth and secure functioning of the civilian aviation industry, and that effort took almost 40 years to reach full functionality after the need was first articulated. It is possible that because the maritime domain has been an integral part of the world's commerce and conveyance systems for thousands of years it will be much harder to create an organization to regulate it.

The political aspects of forging that collaboration are the real challenge. Still, a tangible goal, with both technical and policy aspects to work toward, will assist in focusing the political and policy discussions. Building C-SIGMA, the collaboration of the international community to build a universal maritime awareness system for the world using space systems as its backbone, is one such attainable goal. The two critical segments of that universal awareness are shared surveillance assets and a universal common operational picture. I will focus on the why and how of developing the required surveillance assets and let others

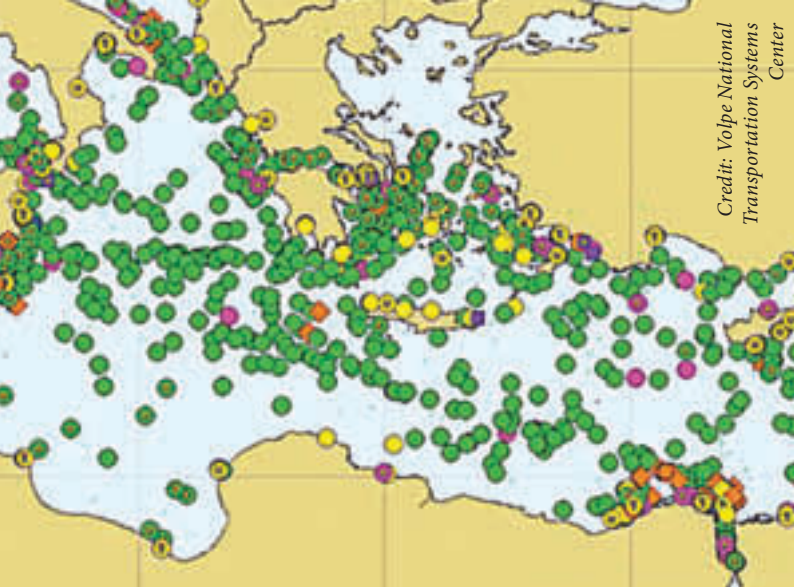


Police search for attackers during the 2008 attacks in Mumbai. Events like these attacks have illustrated the need for maritime vigilance.

address the operational picture. Indeed there is much research on the operational picture with such programs as Cooperative Nations Information Exchange System (CNIES), Virtual Regional Maritime Tracking Center - Automated (VRMTC-A), Regional Maritime Awareness Capability (RMAC) and the Maritime Safety and Security Information System (MSSIS). There is less attention paid to the front end of the chain, the sensor end. One needs to look at both, in balance. I will try to restore that balance here.

Most maritime concepts of operations assume some form of layered zones of surveillance and defence, from well offshore, to high-value targets within ports and adjacent waterways. Generally there are one or more zones between those zones including approaches and coastal zones. The end game, the protection of the high-value targets, is a major goal. Those targets include not just significant ships, but also port infrastructure and other targets of high economic, political, or military value – including power plants, sewage treatment facilities, chemical plants, critical bridges, historic monuments, and the like. The diversity of the targets available greatly compounds the awareness problem, but every bit of defence helps. Early warning is critical, although the traditional emphasis on port surveillance systems indicates that many do not understand the importance of early warning, and the need for it to begin far off shore, if not with the surveillance of the supporting shore infrastructure across the seas.

Many different groups have studied what collection systems (platforms and sensors) are needed to support the core maritime domain awareness, and what technology is available or will be in the near future. Thus whatever specific maritime awareness plan is finally agreed to by all concerned, the basic technology to carry it out is reasonably well understood. The number and type of collection systems may change as may where and how data will be fused and analysed, and the decision-making sequence,



A screen capture depicting vessels in the Mediterranean Sea tracked using the Automatic Identification System and the Maritime Safety and Security Information System.

but the basic technological choices remain pretty much the same. C-SIGMA is a paradigm shift in that until very recently few have considered space systems in this manner. Indeed, in the realm of international collaboration the output from such surveillance systems could be put to very different uses by each of the international participants.

All of the studies have basically concluded no one system can do it all, even in a single zone, much less across all zones of interest. Maritime domain awareness requirements span areas from coastal and harbour surveillance and warning to pervasive surveillance of the broad ocean area. The bottom line is that we will need 'systems of systems' in each zone. There is no doubt that much can be gained by adding together what we now have to build a collaborative information environment and create a robust user-defined operational picture, tunable by users to their particular needs.

Much has already been done over the last few years. The hurdles to be overcome are now much more policy-derived ones rather than technology challenges. Nonetheless, the fact is that if we are to provide persistent and pervasive surveillance of all the areas needed to establish maritime domain awareness, we will need both better surveillance systems and more of them. We will also need the means to process, fuse, analyse, display and disseminate available data, make accurate decisions, and interdict any suspicious vessel before it enters any of our ports or approaches anything of value. But, as I said earlier, we need more information at the front end of the Detect-Analyse-Decide-Act (DADA) chain if we are to be successful in most scenarios.

The most promising class of systems for pervasive ocean surveillance is that provided by satellites operated by a broad range of government and civil organizations. No one system or even type of systems can do it all. This is

true even when considering the most sophisticated space systems. There are at least four basic types of space-based systems that need to be used in conjunction with each other in this process; six, if you count weather and navigation spacecraft. Two of the four employ active sensors:

- Synthetic Aperture Radar satellites (SARSats); and
- Electro Optical (EO) imaging satellites.

The other two are based on communications systems:

- Individual transponders linked to communications satellites (e. g. Iridium, OrbComm, etc.); and
- Automatic Identification System (AIS), a system originally designed for collision avoidance and safety of navigation but increasingly being used as a primary ship-tracking system.

Let's briefly look at these four types of satellite systems. The Canadian government currently operates two SARSats in a public-private partnership with McDonald, Dettwiler and Associates. It launched the first one in 1996 and it has been sufficiently successful that a much more capable system, RADARSAT 2, was launched in late 2007. Canada is expected to launch an additional three to six radar-equipped satellites within the next decade. These systems operate in five basic modes and at low resolution have very wide sensor swaths. Most, if not all, of the coming three to six SARSats will be equipped with AIS receivers. Germany, Italy, India and Israel have all launched radar satellites and several other countries are moving that way. Each of these satellites carries SAR sensors that can see through cloud cover and detect vessels and their wakes day or night. They have also developed the software to exploit the products of a range of types of satellites. While there are currently only about 10 truly civilian space-imaging systems in orbit today, several companies/countries have plans to add more.

The next types of system – the EO satellites – are also operated by a number of countries and companies. Their capabilities have expanded to the point where even a layperson can look at an image and immediately recognize a specific building and even, in many cases, identify which types of cars (trucks, sedans, convertibles, etc.) are parked in its parking lot.

The third type of satellite is the communications transponder system which is carried on the InMarSat, Iridium, Global Star, OrbComm and other communications satellites. These satellites can send and receive short, formatted messages with information such as location, speed and status (hot/cold, open/closed, on/off, etc.) Owners of fishing vessels and other types of highly mobile platforms

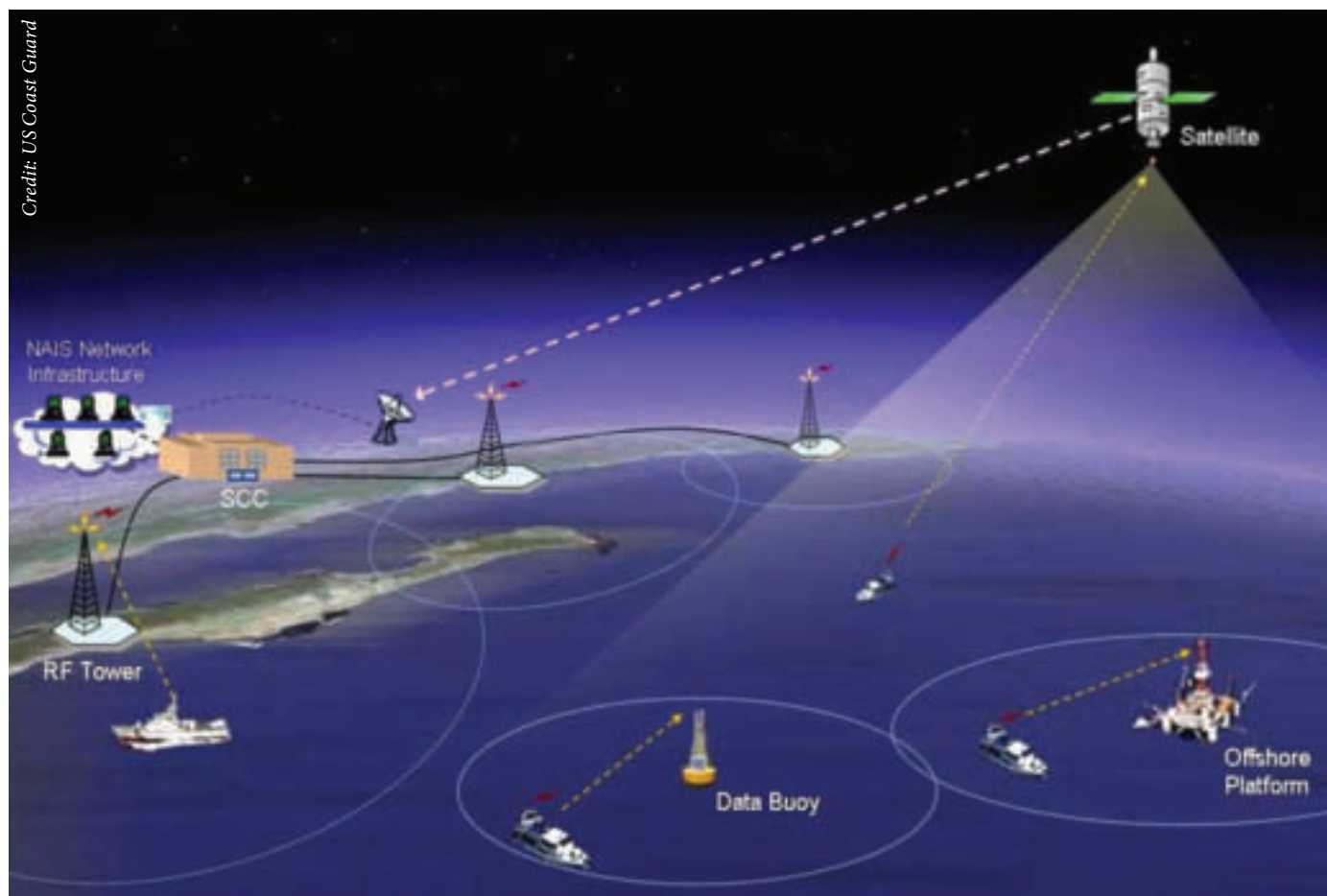
employ these systems to maintain an active track of their assets for a variety of reasons. As an example, fishing vessels must be able to prove they did not go into restricted waters. Tugboat companies need to be able to track all of their movable assets on a near hourly basis for business purposes. Many other companies employ these self-reporting systems for other business, security and/or safety reasons.

The fourth type is a new type of space-based system. The International Maritime Organization (IMO) and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) designed the Automatic Identification System (AIS) as a collision avoidance and traffic management system. AIS automatically provides everyone within line-of-sight range of its signal (about 20 miles) information about the name, course, speed, size, depth of vessels and navigation hazards such as oil rigs and lighthouses. In October 2001, I recognized that if the AIS signal could be collected from space it would revolutionize how ships were tracked worldwide. After a number of false starts, I was able to get the US Coast Guard to fund the development of a very capable AIS collector

onboard an OrbComm communications satellite. On 19 June 2008, OrbComm launched the satellite and thought so much of the idea it launched five more of its own at the same time. After about six months in orbit those six satellites failed due to a problem with the satellite bus, not the payload. However they were in space long enough to prove the concept and give OrbComm engineers excellent data for future systems. It has announced plans to launch at least 21 more. Several companies and countries have also launched AIS collectors. COM DEV of Canada also very quickly recognized the potential of space-based AIS and has now created a spin-off company, exactEarth, to develop and market a constellation of its own AIS collectors. Several other countries and companies are also planning to launch more. Thus there is a growing capability, which will only increase, to track ships' AIS on a worldwide scale. The initial results of these efforts are very promising.

Developments on the Ground

There has been great interest in many countries about enhancing their ability to know what is happening in their maritime domains. Canada has developed its own



"Systems of systems" are required to cover broad ocean area. In this artist's depiction, satellite and shore-based AIS receivers connect to the US Coast Guard's National AIS (NAIS) network.



An image of the Pond Inlet area captured by RADARSAT-1 in August 2001. Ships from a student expedition are highlighted by the red circle.

ship-detection software called OceanSuite and the various satellite processors have been designed to complement each other to optimize ship-detection performance. The European community is working together to leverage its resources. The two latest Constellation of Small Satellites for the Mediterranean basin (COSMOS SkyMed) SAR satellites are to be part of the future Multinational Space-based Imaging System (MUSIS), which will combine the resources and space assets of Italy, Belgium, Greece, Germany, France and Spain, and other European countries could join.

The United States has also been very active in this field. A large player in the area of US civilian space for maritime awareness is the Center for Southeastern Tropical Advanced Remote Sensing (CSTARS) at the University of Miami. In cooperation with Vexcel Corp. of Boulder, Colorado, it developed OceanView, a software program that provides rapid automated analysis of all the images coming from data sources and picks out images of vessels. It can generally tell the size, type, course and speed of the vessel from images provided by most civilian space-borne sensors.

Several organizations are taking steps to improve processing of the images. These organizations also hope to gain additional access points by establishing mobile downlink sites in new places. This is important because the usefulness of the reporting is related to the time between the collection of the data and its downlink to a station for processing and reporting. There are already downlink sites but they are limited to certain areas. Downlink sites in such places as the Indian Ocean, South America, east

Asia and other locations would allow for wider collection opportunities and more timely reporting, a core requirement for a truly worldwide system. A worldwide consortium of states would make that a much easier problem to solve.

No one system is able to do it all but a judicious mix of the systems should allow partner states to detect, identify and track nearly all vessels that approach their coasts. There is no single silver bullet but there are some pretty effective copper and silicon ones, and space systems are the key. We just need to collaborate on an international scale in order to realize their potential.



A RADARSAT-1 mission control antenna at the John H. Chapman Centre in Saint-Hubert, Quebec.

The international communities in both the maritime and space segments of the world already cooperate with each other in many ways. The International Space Station, a habitable multinational space station launched in 1998, is a major case in point; another is the IALA and the IMO. The list is quite long, and getting longer. The international maritime and space communities should take the next step and join in setting in motion the process to build broad agreement, and establish an international body to build and run a global space partnership. 🤝

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National Shipbuilding: Where We Are and Where We're Headed

Ken Bowering

On 21 July 2011 three shipyards submitted detailed proposals to the federal government in response to the National Shipbuilding Procurement Strategy (NSPS) Request for Proposal (RFP). Three months later the government announced that Halifax Shipyard and Vancouver Shipyards had been selected respectively to build Canada's next generations of combat ships for the navy and non-combat ships for the navy and coast guard. Now, one year later, while actual shipbuilding contracts have not yet been awarded, the NSPS shipbuilding programs are moving ahead and the future looks promising for these two shipyards – and for the marine industry.

The main reason there was an NSPS stems in part from recent failures in ship procurement programs, namely the navy's Joint Support Ship (JSS) and the coast guard's Mid-Shore Patrol Vessel (MSPV) projects, both of which were terminated because customer expectations could not be met within the available budget.¹ The problem from the perspective of the shipyards is that the time between shipbuilding projects has been long – 20-25 years or more – and that most of the risk gets passed to the shipyard. Thus there's a significant learning curve which, when coupled with onerous terms and conditions, increases the overall cost to the government.

This experience, combined with independent studies, government analysis and the practice of allied countries, pointed to the need to move to a long-term, strategic relationship with a limited number of shipyards. So, in the fall of 2008, the federal departments involved in shipbuilding and procurement established a National Shipbuilding Procurement Strategy Office. The office was led by the Department of National Defence (DND) and included professionals from Public Works and Government Services Canada (PWGSC), Fisheries and Oceans, and Industry Canada.

The NSPS office concluded that approximately 70 million person-hours of federal fleet new-build labour were affordable within the constraints of existing DND and Canadian Coast Guard (CCG) project budgets. It also determined that shipbuilding and procurement practices needed to be improved if the navy and coast guard were to be successful in procuring ships to fulfill their operational commitments. In January 2010, the office transferred to PWGSC and the NSPS Secretariat was created.



Credit: Seaspan for NSPS

A shipbuilder at work at Vancouver Shipyards.

The NSPS was formally announced on 3 June 2010 and has since followed a set schedule beginning with an Industry Day on 27 August 2010 that engaged members of the shipbuilding industry and encouraged their comments. On 20 September 2010 a Solicitation of Interest and Qualification (SOIQ) was issued with responses received on 8 October 2010. From this, five shipyards were shortlisted to receive the NSPS RFP.

The approach taken by the secretariat – and endorsed by DND/Canadian Navy and Fisheries and Oceans/CCG – was to create a process whereby two shipyards would be identified and offered the opportunity to build combat and non-combat ships over 1,000 tonnes. The competitive process involved extensive dialogue between government and shipyards, and its objective was to be as fair and open as possible.

The secretariat also engaged an independent third party – First Marine International (FMI) – to assess the current (pre-RFP) capabilities of the five shipyards.² These assessments, along with FMI's 'target state' assessments (the state at which shipyards needed to be in order to build



An aerial photograph of Irving Shipbuilding's Halifax Shipyard site.

the combat and non-combat ships), were individually provided to each shipyard. Thus, going into the RFP, each shipyard knew where it stood and where it needed to improve. The competitive questions were how they would propose to do it and how much it would cost – to Canada and the shipyard.

The RFP was issued on 7 February 2011 to the five pre-qualified shipyards and required the bidders to respond in terms of:

- the shipyard's plans to get from the FMI-assessed current state to the target state;
- the cost to get to the target state and how much would be borne by the shipyard and how much by Canada;
- the financial capability of the shipyard to undertake the work package; and
- a 'Value Proposition' whereby the shipyard would commit to growth and sustainment of the greater marine industry.

When the RFP closed on 21 July 2011, three of the five qualified shipyards submitted proposals – two for the combat ship package and three for the non-combat package. Evaluation of the proposals resulted in Halifax Shipyard (Irving Shipbuilding Inc.) and Vancouver Shipyards (Seaspan Marine Corporation) being selected respectively for the combat ship package (Arctic Offshore Patrol Ships and Canadian Surface Combatants) and the non-combat ship package (Offshore Oceanographic and Fisheries Science Vessels, Joint Support Ships, and Polar Icebreaker). From all indicators the process and evaluation achieved the NSPS objectives of openness, competitiveness and transparency – and it was unique and innovative.

Although media reports led Canadians to believe differently, selection of the Irving and Seaspan shipyards did not result in actual contracts to build ships. Instead, the government invited the shipyards to enter into Umbrella Agreements which, in essence, would lead to their being asked to submit, in due time, detailed cost, schedule and technical information for the respective shipbuilding projects.³

Where We Are Today

NSPS was designed to create a long-term relationship between government and the shipyards with the Umbrella Agreements providing for direct discussion on schedule, cost, risk and performance issues, and a commitment by the shipyards to allow their accounting books to be scrutinized during the process. As well, the government has the opportunity to examine the shipyards periodically – within three years for the non-combat package and six years for the combat package – to confirm they are attaining their commitments.

As a preliminary risk reduction step for each project, shipyards will be asked to undertake design studies and/or to quantify and qualify schedule, cost and supply chain risk. Under a 'design-then-build' process, the shipyard will respond to requirements, statements of work, and terms and conditions in two or three separate stages in what amounts to project definition, detailed design and production design phases.

The engineering work will be undertaken in advance of and separate from the contract for ship construction. This is to allow greater precision in material and equipment selection and pricing, and reduce the shipyard's planning,



An artist's depiction of the Arctic Offshore Patrol Ship.

rework and error contingencies. It is also expected to be a significant factor in reducing cost and schedule risk to the government.

This design-then-build approach has already commenced with both shipyards and negotiations are currently underway for the lead project in each package. The lead projects are the Arctic Offshore Patrol Ships in the combat package, and the Science Vessels (the Offshore Fisheries Science Vessel (OFSV) followed by the Offshore Oceanographic Science Vessel (OOSV)) in the non-combat package. Preliminary JSS project discussions are also underway.

One benefit of NSPS is that Canada can work iteratively with the selected shipyard to determine the optimum solution that marries project requirements with shipyard capabilities. Industry Canada is also engaged with the shipyards to determine how the shipyards will satisfy their Industrial and Regional Benefit and Value Proposition commitments.

Another benefit of NSPS is that the shipyards will work with ship designers to ensure the final designs are efficient and affordable. In this regard, some design work has already been initiated separately by both the navy and the coast guard. In general, the shipyard will be responsible for detailed design and final production design. Other particulars are as follows.

- *Arctic Offshore Patrol Ships*: the definition design has been completed by BMT Fleet Technology and the ship specification and drawing package has been shared with the shipyard.
- *Offshore Fisheries Science Vessel*: the final design and construction specifications have been completed by RALion, the Robert Allan and Alion Science and Technology (Canada and US) joint venture.
- *Offshore Oceanographic Science Vessel*: the final design and construction specifications have been completed by STX Canada Marine.
- *Joint Support Ship*: domestic and military off-the-shelf (MOTS) designs, to be evaluated based upon affordability, capability, risk and best overall package, are under consideration and will be provided to the shipyard in early-2013:
 - the domestic design is being developed by BMT Fleet Technology.
 - the MOTS design, based on Germany's *Berlin*-class, is being provided by ThyssenKrupp Marine Systems Canada Inc.
- *Polar Icebreaker*: the design is being undertaken by STX Canada Marine (to be complete by November 2013).



An artist's depiction of the Offshore Fisheries Science Vessel.

- *Canadian Surface Combatant*: the project is in the options analysis phase; design work has not yet commenced, and extensive industry consultations will be held to determine the most appropriate process.

What about Industry?

There's no question that Irving's Halifax Shipyard and Seaspan's Vancouver Shipyards were aggressive and competitive in responding to the NSPS RFP and were extremely pleased when selected to build the ships for Canada. It was the start of an excellent opportunity to end the boom-and-bust shipbuilding cycle that has traumatized Canada's shipyards for many years.

Both shipyards have indicated their satisfaction with the NSPS process, and thought that it was fair and transparent. As well, both are aware of the opportunities and challenges that they will face in the future – not just in building the ships but also in terms of providing employment and industrial and regional benefits in their provinces and throughout Canada. According to the Conference Board of Canada, the projected economic impact of the work at Irving in Nova Scotia is estimated to be “an annual average of 8,400 direct, indirect and induced jobs for Nova Scotia and 12,400 if you look at all of Canada. A peak of 11,500 new jobs is anticipated for Nova Scotia, 16,000 across Canada, in 2020.”²⁴ Irving Shipbuilding estimates that its workforce, which is currently about 1,300 employees, “may grow by a further 1,400 to meet peak production periods over the 30-year program.”²⁵ The Conference Board of Canada also noted that the work at Irving is “projected to create average annual real GDP for Nova Scotia of \$661 million and generate an average of \$66 million in federal income tax and \$51 million in provincial income tax revenues. Personal income in Nova Scotia has been projected to rise by \$447 million on average each year.”²⁶

In British Columbia the impact of the shipbuilding contract at Seaspan will be huge. According to Jonathan Whitworth, Chief Executive Officer Seaspan Marine Corporation, the contract will “create some 4,000 direct, indirect, and induced jobs with between 1,200 and 1,500 being direct jobs (new employees) at Seaspan.” These will be a combination of skilled, professional and administrative workers, and all will contribute to the economy of British Columbia. According to Whitworth, “every 2-3 years of the NSPS ship construction will have the same economic impact to BC as all of the construction projects associated with the 2010 winter Olympics in Vancouver!”

Lessons Learned and Conclusions

To date, the NSPS has provided some valuable lessons. First, we have learned how valuable engagement is. This may seem obvious, but it is important to listen to those with a stake in the process. Historically this meant only clients. In the future it will mean clients and suppliers in equal measure. Suppliers often have valuable ideas about how to supply the government with what it needs.

Second, governance of the project is important. It is useful to adopt a governance or decision-making process that allows for business choices to be made by clients and



Credit: STX Marine Canada

An artist's depiction of the Offshore Oceanographic Science Vessel.

The NSPS indirectly makes provision for other shipyards to benefit as construction of ships smaller than 1,000 tonnes, to be competed on a project-by-project basis, has been set aside for shipyards other than Halifax Shipyard and Vancouver Shipyards. As well, all shipyards will have the opportunity to compete for the repair, refit and maintenance of vessels and will be open to sub-contracts from Halifax Shipyard and Vancouver Shipyards. Small and medium enterprises will have the opportunity to provide goods and services to all shipyards and other suppliers involved in building and servicing the ships.

procurement staff with direct input from suppliers. And the process will run more smoothly if you make sure there is a robust dispute-resolution process to address concerns and manage risks.

Third, it is tremendously helpful to utilize third-party experts. Participants in the process should seek advice and input from those who are knowledgeable or expert but who do not have a stake in the process.

Application of the NSPS lessons – engagement, governance and involvement of third parties – has been important



An artist's depiction of the Polar Icebreaker.

on several fronts. By holding consultations with suppliers and working to develop a long-term relationship with shipbuilders, the government was able to create an environment of trust and dialogue. PWGSC made it clear that it wanted to know what industry had to say before beginning the procurement process and shipyards were consulted on all aspects of the process.

Third-party consultants – such as First Marine International – helped maintain a fair and transparent process. Other independent parties helped assess the capabilities of competing shipyards, validated the process, and provided expertise on financial aspects of the evaluation. Each helped ensure the integrity of the process.

The NSPS program will create and sustain thousands of jobs in shipbuilding and supporting industries across Canada, and generate significant economic spin-offs, perhaps 5-10 times the original investment. Skilled workers will be required in many trades and this will benefit the marine technology training centres across Canada and also universities with marine programs. Some of the beneficiaries will be the large corporations but Canadian small/medium enterprises will also benefit – directly in some cases and indirectly and/or induced through ‘flow-down’ or ‘spin-off’ in others.

In the space of about three and a half years, Canada, with its NSPS, has progressed to a point which countries (including Canada on previous programs) have typically spent anywhere between seven and 10 years to accomplish. Even though contracts for construction of any of the ships have yet to be signed, some benefits to the approach followed by the NSPS Secretariat include:

- fostering establishment of productive, sustainable shipyards that will motivate technology, production and innovation;
- providing opportunities for systems commonality across platforms;
- continuous build activities, as part of a long-term, strategic relationship, enabling long-term, tailored investments in facilities, tools and processes, management and labour competencies;
- encouraging development of a national marine manufacturing/supply chain capacity and increasing skilled trades training and development; and
- learning curve benefits within fleet builds and from fleet to fleet will create cost efficiencies and will maximize return on initial capital investment.

As ships that will be procured under the NSPS will last through much of this century, our approach to acquiring those ships needed to be modernized. NSPS has been, is and will continue to be a major step in that modernization. 🍷

Notes

1. The MSPV project twice went to tender with unsuccessful results. Re-tendered a third time, a contract was awarded to Irving's Halifax Shipyard. The ships are now under construction.
2. The Secretariat also engaged KPMG, PricewaterhouseCoopers (PwC), and a Fairness Monitor to support the process.
3. The two work packages are spread over quite different time periods – about 8-10 years for the non-combat ship package compared to 30 years for the combat ship package.
4. Conference Board of Canada statistics (May 2011) are cited in “Measuring the Potential Impact of the National Shipbuilding Procurement Strategy on Nova Scotia,” prepared by Jupia Consultants Inc. for The Greater Halifax Partnership.
5. Mike Roberts, Vice-President Corporate Development at Irving Shipbuilding, 25 May 2012, written response to the author's NSPS questionnaire.
6. Conference Board of Canada, cited in “Measuring the Potential Impact of the National Shipbuilding Procurement Strategy on Nova Scotia.”
7. Jonathan Whitworth, Chief Executive Officer Seaspan Marine Corporation, interview by the author addressing the author's NSPS Questionnaire, 8 May 2012.

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Canada's Asia-Pacific Energy Trade Prospects: A Maritime Perspective

Darryl Anderson and K. Joseph Spears

Introduction

Canada is both a maritime state and an energy trade dependent state and in both of these capacities, it is experiencing shifting tailwinds. In particular, the continental energy exports moved by pipeline south over land to the United States are being reassessed as Canada now looks across the Pacific Ocean for new export market opportunities. Canada is dependent on exports. Both import and exports account for 70% of Gross Domestic Product (GDP), of which energy exports are a significant proportion. Pipelines, railways and transmission lines are used to transport via land the vast majority of Canadian energy exports to the United States, the world's largest energy market. Canadian maritime exports to the major Indo-Pacific Basin countries totalled \$49 billion in 2011 mostly to states north of the Tropic of Cancer.¹

International energy trade is not static and has important geopolitical implications. It has particular importance for navies as a significant proportion of the world's energy exports is carried by marine tanker. The strongest driver of change is the geographic location of consumption. The International Energy Agency (IAE) reports in its 2011 "World Energy Outlook" that countries outside of the Organization for Economic Cooperation and Development (OECD) membership are increasingly determining the dynamics of energy markets. In the future, non-OECD countries will account for 90% of the population growth, 70% of the increase in economic output and 90% of energy demand growth by 2035. By this time China will have consolidated its position as the world's largest energy consumer, and will consume nearly 70% more energy than the United States, the second-largest consumer. The rates of growth in energy consumption in India and Indonesia are even faster than in China.²

This article will focus on Canada's growing energy exports to the Indo-Pacific Basin. This region is not only of growing economic importance, it is also an area in which there are tensions based on overlapping maritime claims which could affect sea lanes. This means that the Royal Canadian Navy (RCN) will undoubtedly see increasing service there, and sea power and a flexible approach will become increasingly important as Canada's energy exports increase in the region. The navy must adjust to new threats and dynamics caused by this economic activity. A maritime component must become an integral element of Canada's Asian energy policy. In the coming decades the

export of energy by marine transport from Canada to the Indo-Pacific region will have important implications for Canada's navy and these issues have not been adequately considered in the Canada First Defence Strategy. Nor have they been considered in the navy's strategic plan as outlined in *Leadmark* and subsequent documents such as *Securing Canada's Ocean Frontier*.



A view of Vancouver's waterfront, as seen from Harbour Centre Lookout.

Canadian Energy Trade

In this section we will briefly discuss the major Canadian energy exports – coal, natural gas, oil and uranium. We will begin with coal. Although some people may not realize this, coal is still an important source of energy. Coal has met almost half of the increase in global energy demand. China will account for 67% of growth in global coal consumption through to 2030, and India will account for 33% of the growth. Since both China and India face challenges meeting their needs with domestic production, their growing import requirements will drive further expansion and integration of the global coal trade in the Pacific.³

As a result of increased demand there are numerous mine expansion projects underway in Canada. In 2011, Canada exported 49% of its total coal production by dry bulk vessels. Of Canadian coal exports, 86% was coal used for metallurgical purposes (i.e., coal used in the iron and steel-making industries) and 14% was thermal coal (i.e., coal used to produce electricity).⁴

In Port Metro Vancouver \$164 million in marine terminal expansion projects have been undertaken in response to

the shift in global energy demand. Total export volume not only increased, but thermal coal exports started to rise in 2008 just before China became a net coal importer in 2009. By 2011 the leading export destinations for Canada's largest coal export terminal were Korea, Japan, Europe, China, South America and Taiwan.

The major coal markets for Ridley Terminals Inc (RTI) at the Port of Prince Rupert are Japan, China and South Korea. They account for 90% of RTI's export shipments. In early 2011 RTI completed negotiations to receive coal destined for export markets from customers in the United States, and in October 2011 RTI signed a long-term agreement to handle product from Canada's largest thermal coal export mine. In response to this increasing export demand RTI is investing up to \$200 million to increase the expected total marine terminal throughput capacity to 24-25 million tonnes by the end of 2014.⁵ At that time thermal coal exports from the RTI could rival Westshore's export volume.

Recently, environmental advocacy groups have begun to take notice of the increase in coal exports through Canadian marine terminals and have engaged in a protest to block a rail line leading from Washington State into British Columbia. If environmental protests have started to occur on land by those attempting to bring attention to the negative environmental impacts of coal, protests in the maritime realm are a distinct possibility. This is something security forces need to prepare for.

Canada is also blessed with significant natural gas resources, which it is increasingly exporting to the Asia-Pacific region. The IAE's 2011 "World Energy Outlook" reports that a structural shift in both supply and demand points to a bright future – a golden age – for natural gas.⁶ The BP "World Energy Outlook 2030" reports that non-OECD countries will account for 80% of growth in global gas demand and China will account for 23% of this increased demand. BP also reports that liquified natural gas (LNG) will represent a growing share of gas supply. LNG will contribute 25% of global supply growth 2010-30, compared to 19% for the period 1990-2010.⁷ In 2011 researchers from the Energy Studies Institute, National University of Singapore observed that at the present time North and South America are effectively "gas islands" isolated from the rest of the world, with few significant trans-pacific or trans-atlantic gas flows.⁸ However, these researchers concluded that recent developments in both gas demand and supply have led to a scenario in which



Westshore Terminal at Port Metro Vancouver.

significant growth in LNG export from North America to Asia has become a distinct possibility.

The Port of Kitimat, British Columbia – and to a lesser extent Prince Rupert – appears to be at the epicentre of an emerging North American LNG export industry. Two projects, the \$500 million Kitimat LNG project and the Douglas Channel LNG/BC LNG Export Cooperative received the necessary National Energy Board (NEB) export permit approvals in October 2011 and February 2012 respectively. Petrin/Progress Energy and Royal Dutch Shell are all advancing LNG export projects. In October 2011, Royal Dutch Shell purchased from Cenovus Energy the marine dock facilities and the former Methanex plant in Kitimat that is presently used to import hydrocarbons by tanker. Shell has confirmed that it and Asian partners will be proceeding with a study to develop a 12-million tonne LNG export terminal. Imperial Oil is also considering joining a growing number of companies planning LNG plants on Canada's West Coast. In Prince Rupert, BG Group announced that the port was short-listed for an LNG facility.

From a Canadian maritime transport perspective it is important to note that experience to date with the shipping risks and policy issues associated with LNG tanker traffic has been limited to the relatively new Canaport LNG receiving and regasification terminal in Saint John, New Brunswick. The focus on natural gas exports from the West Coast is a new one, and reflects the changing strategic dynamic away from the Atlantic to the Pacific Ocean.

Because of media attention, when Canadians think of energy exports, they most likely think of oil. The expected increase in oil sands production will strain the existing



Credit: Canaport LNG

An aerial view of the Canaport liquid natural gas receiving and regasification terminal in Saint John, New Brunswick.

pipeline capability, and additional pipeline capacity is therefore required. Thus, a key commercial decision for Canadian oil producers is whether to export oil south into the United States or west to Asia. Currently Canada is almost entirely reliant on a single market – exports to the United States account for close to 98% of Canada's overall oil exports.⁹ Many energy experts have noted that exporting oil to Asia would provide Canada with the benefits of diversification and reduce its reliance on a single market. There are also purely economic reasons favouring export of oil from Canada to Asia. The Singapore Energy Institute researchers noted that under present market conditions the costs of transporting oil to China, Japan, South Korea and Chinese Taipei (via pipeline and tanker) are lower than the costs of transporting oil to the United States (via pipeline).¹⁰

The Trans Mountain Pipeline System (TMPL), operated by Kinder Morgan, moves crude oil from Alberta to the Pacific coast. Since 1953 the 1,150 km pipeline has been transporting crude oil and refined products from Edmonton to marketing terminals and refineries in Puget Sound (Washington State), and to the Westridge Marine Terminal (WMT) in Port Metro Vancouver, which is the only facility on Canada's West Coast that can ship crude oil by ocean-going vessel. In April 2012, Kinder Morgan announced a \$4.1 billion expansion of its TMPL that would more than double capacity on Canada's oil artery to the west coast of North America and Asian markets. The planned TMPL expansion would boost pipeline capacity to 750,000 barrels per day. The project may create the need for a second berth at WMT to accommodate Suezmax-sized tankers (180,000 dwt). If this project obtains regu-

latory approval, tanker traffic at Port Metro Vancouver would increase from an average of five to 10 tankers per month, to between 25 and 30 per month.

Enbridge Pipelines is currently the major carrier of crude oil to eastern Canadian and US markets. However it has proposed the Northern Gateway project which would transport crude oil and refined products from Edmonton west to a marine marketing terminal at the Port of Kitimat. The Northern Gateway proposal represents both a cargo and market diversification opportunity for the port because it currently does not have a marine terminal that can ship crude oil by ocean-going vessel. The project would require that a new 30-inch crude oil pipeline, bulk liquid crude storage facility and marine terminal be built. During operations of the Northern Gateway pipeline it is expected that between 190 and 250 oil and condensate tankers would call on the Kitimat Terminal each year. The Northern Gateway pipeline project is presently before a joint *Canadian Environmental Assessment Act* and National Energy Board Review Panel.

Canada is a country rich in uranium resources and has a long history of uranium exploration and mining. Canada accounted for 18% of primary global uranium production in 2010, second only to Kazakhstan.¹¹ The markets for Canadian uranium output (yellowcake) are largely offshore – Japan, South Korea and Europe accounted for 55% of sales in 2008.¹² The yellowcake is transported by rail or truck to the marine container terminal where it is loaded on to a container vessel for transport.

Asia has been an important consumer of uranium for nuclear power plants. The International Atomic Energy



A tanker under pilotage and receiving tug assistance at Port Metro Vancouver.

Agency (IAEA) reported that in 2010, China, Japan and South Korea had 88 nuclear reactors in operation, accounting for 20% of the total world nuclear electricity production. Led by China with 28 reactors under construction these same countries accounted for 52% of the world's new nuclear power reactor construction. The IAEA estimates that the Far Eastern countries on the Pacific will experience an average growth rate during the period 2010-2030 for nuclear energy of between 5.0 to 6.9%.¹³ This estimation was made before the earthquake and tsunami in Japan in 2011 that led to serious problems at Fukushima Daiichi nuclear facility. As of May 2012, all of Japan's 54 nuclear power plants were shut down. The shutdown may not be permanent, and indeed the Japanese government announced the re-opening of two facilities in June. With the public protests in Japan, however, it is possible that nuclear power generation will be reduced there for the foreseeable future. The market potential in South Korea and China does not appear to face the same level of demand uncertainty as Japan. In response to the generally positive trends, Canada's largest uranium producer planned to increase production to 40 million pounds by 2018, up from an output of 22.8 million pounds.¹⁴

This brief summary demonstrates that the wind of change in international energy trade has reached Canada's West Coast. Increased Canadian energy exports will mean more shipping traffic off the West Coast. Energy exports will bring an increase in liquid bulk crude carriers and new LNG vessel traffic, in addition to the traditional dry bulk carriers, general cargo ships and container ships that have frequented West Coast ports.

Strategic Considerations for Canadian Asia-Pacific Energy Trade

Finance Minister Jim Flaherty stated in his 2012 budget speech that the government was "undertaking the most ambitious trade expansion plan in Canadian history."¹⁵ Yet, from an energy trade perspective Canada's energy trade efforts may be lagging behind countries in the Asia-Pacific Basin such as Australia. For this reason we believe it is important to explore some of implications of where Canada's international energy trade and maritime policy may be headed. Increased energy exports travelling by sea to Asia have important implications for naval planners and the security of the sea lanes. It will mean that Canada's navy will be required to be highly adaptable and flexible. In the unveiling of the RCN memorial in Ottawa in May 2012 the Prime Minister stated "Canada is a maritime nation, a maritime nation with trade, commerce and interests around the world. Surrounded as we are by three oceans, it can truly be said, that Canada and its economy

float on salt water."¹⁶ And energy exports will float on salt water.

Canada's policy on Asia has been evolving in recent years – from the Prime Minister's refusal to visit China to a much warmer embrace of the region. Trade both to and within the region has experienced significant growth in this century. In recognition of the importance of the region, Canada has indicated an interest in joining the negotiations for the Trans-Pacific Trade Partnership. As well, in February 2012 the Prime Minister led a trade mission to China during which he announced a number of initiatives intended to strengthen the Canada-China commercial relationship. These initiatives included the following:

- the renewal of the Canada-China Memorandum of Understanding (MOU) on Energy Cooperation, which provides a framework to engage China on energy issues. The agreement covers a broad range of energy activities, including energy policy, trade and investment, energy efficiency, oil and gas, nuclear energy, renewable energy, as well as energy research and development; and
- the successful completion of negotiations between Canada and China on an agreement that will facilitate increased exports of Canadian uranium to China.

What is being left out of the energy export policy debate is any substantive discussion of the maritime and national security dimensions. The loudest debates have been about the movement of energy over land. As a major energy exporting state, Canada needs to look more broadly and examine the maritime component of energy exports, including the geopolitical implications and the need for a strong robust navy. If we don't look at these issues on a sustained basis we could see our international trade subjected to threats and no Canadian naval capability to deal with them. As much as possible, Canada needs to stay ahead of the evolving geopolitical situation.

It is interesting that while Canada's trade with Asia is



Yellowcake uranium packaged for shipping at Cameco's uranium mining operation at Rabbit Lake, Saskatchewan.

increasing, Canada and the United States are also moving towards a more integrated approach to border security. This is seen in integration and cooperation in a commercial context. But what will be the consequences of Canada selling energy products to China? Oil is a strategic product, and depending on how American relations with China develop in the future, it could be problematic for Canada to sell strategic resources to a potential competitor of the United States. Canada and the United States have a long history of working together in the North Atlantic Treaty Organization (NATO) since its formation in 1949, and the North American Aerospace Defence Command (NORAD) since its creation in 1958. But these organizations have always focused on threats originating across the Arctic or the Atlantic Ocean. What happens if the focus shifts to the Indo-Pacific Ocean? What people fail to realize is that the Aleutian Islands chain – which is part of North America – extends almost to within sight of Asia. How would increased shipping affect North American perimeter security and the longstanding collaborative approach between Canada and the United States on defence and security?

Both a maritime and a national security lens are required in the Asia-Pacific energy export policy debate. In addition to American objections to selling energy resources to a possible strategic enemy, there is also potential for the United States to create barriers to the marine transport of Canadian energy exports to Asia based on geography or

concerns about environmental consequences. Any west-bound marine tankers on the North Pacific great circle route from the port of Vancouver or Kitimat to markets in Asia would cross through US waters in the Aleutian Islands. Presently at Unimak Pass, which is 10 nautical miles wide near Dutch Harbor, Alaska, the United States imposes no special shipping regime or requirements as it considers these waters in the nature of an international strait. That, however, could change, and this could see restrictions placed on the movement of very large crude carriers which are relatively infrequent travellers of these waters now. The same holds for LNG tankers. As was seen with the blocking of the Keystone XL pipeline within the United States local interests can have a large impact on US policy. The Alaskans have a vivid memory of the *Exxon Valdez* oil spill in Prince William Sound in 1989, and commercial vessels have grounded in these waters. The Commandant of the US Coast Guard, Admiral Robert J. Papp, has indicated these waters are a chokepoint and a strategic priority, and based on this the United States could restrict tanker traffic through the Unimak Pass.

It is interesting that a similar situation exists on the East Coast, but with roles reversed. In this case there was the potential of marine shipment of LNG through Canadian waters in Head Harbour Pass en route to Eastport, Maine. Canada filed a formal diplomatic protest with the United States objecting to the marine transportation of LNG through Canadian waters. The United States has taken the position that under international law the right of innocent



Container traffic at Port Metro Vancouver.



The freighter *Cape Brazil* approaching Lion's Gate in Vancouver's Burrard Inlet at sunset.

passage exists. Without a comprehensive analysis of policy, Canadian actions on the East Coast can come back to affect Canadian export of energy resources to Asia. Canada needs to develop a clear policy on these issues.

One more factor in the export of energy resources is important to note. Canada's trading partners in the Indo-Pacific Basin are among the world's largest ship-owning states, accounting for about 35% of the world's vessel fleet. Countries such as China, Hong Kong, South Korea, Russia, India, Singapore, Thailand and Malaysia all have substantial national flag fleets. The transport of energy products to these countries and aboard their vessels could give rise to port state control, national security and geopolitical considerations that may require a political, law enforcement, commercial shipping and naval intelligence perspective. Canada is not a major ship-owning state and exports have for many years been carried on foreign flag vessels. The increased export of uranium, for example, from Canada to China will raise both supply chain and port security issues.

To date, Canada has not had to consider the practical implications of these maritime transport issues. As it seeks to navigate beyond its continental shores over the horizon, however, Canada would be well served to develop a vigorous salty Asian policy now, rather than at the time of a specific incident or issue. Canada's increasing focus on the Indo-Pacific region needs to be examined in a broader context and it will be important to acknowledge that the navy will have an important role to play in helping to ensure freedom of the seas and naval diplomacy. Naval strategic documents need to consider the increased energy exports and their implications.

What is certain is that a robust and nimble Royal Canadian Navy will serve Canadian interests well in the Indo-Pacific region in this Asian century. 🇨🇦

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A Tale of Two Regions: Halifax and Vancouver and Shipbuilding

Janet Thorsteinson

In May, 2011, as Canadian shipyards worked with municipal and provincial partners to promote their bids for work under the National Shipbuilding Procurement Strategy (NSPS), the Greater Halifax Partnership (GHP) development association put the program's impact in perspective. According to GHP, "[o]nce in a generation, an opportunity emerges that has the potential to be transformative – not only generating significant economic activity but also providing the foundation on which to achieve broader economic growth."¹ The main goal of the NSPS is to deliver Canada's new naval and coast guard fleets. A secondary and intended consequence will be strong, stable communities built around revitalized marine industries.

For Halifax and Nova Scotia, where Arctic Offshore Patrol Ships and Canadian Surface Combatants will be built, the NSPS truly is transformative. The GHP forecasts that it will result in 11,500 jobs at peak employment, with over \$350 million in total tax revenue. It even claims that the NSPS contract will result in the increased demand for "10 new dentists, 19.5 pharmacists, more than 30 new insurance brokers and agents" and perhaps more importantly, potential for "a turnaround in provincial population and migration trends."²

Nova Scotia Premier Darrell Dexter noted in a telephone conversation that generations of Nova Scotians have left the province – 'gone down the road' in local parlance – and many of them are now in Alberta and British Columbia. Premier Dexter referred to what he called "a three-pronged approach to the skilled trade supply chain for Nova Scotians." The first prong is to make sure that as many young people as possible are trained in Nova Scotia so they can get good jobs in the shipyard. The second prong is to convince Nova Scotians who have moved away to come home. And the third prong is, if the positions can't be filled by the first two strategies, to look at an immigration strategy to bring new citizens into Nova Scotia.³

In British Columbia, where Seaspan Marine Corporation will build Joint Support Ships and Coast Guard vessels, the contract will boost the shipbuilding and ship maintenance industries, and provide jobs for many years. Along with other operations at Seaspan, the Honourable Pat Bell, BC Minister of Jobs, Tourism and Innovation, noted in an email to me that the \$8 billion contract could create an average of 4,000 direct and indirect jobs over eight years, including 2,400 jobs at the shipyard alone.⁴



Workers celebrate at the Irving Shipyard in Halifax following the NSPS announcement.

The NSPS seeks to replace a 'boom and bust' pattern of shipbuilding with a predictable program that allows far-sighted infrastructure and human resource investments. In April 2012, Nova Scotia demonstrated its commitment to a sustained shipbuilding program with a \$10 million investment at the secondary school level for a Skilled Trades Centre at Cole Harbour District High School in Dartmouth. A new Manufacturing Trades course is directly linked to shipbuilding employment at the Irving Shipbuilding yards in the province. Skilled Trades Centres elsewhere in Nova Scotia will benefit from a \$5 million provincial fund.⁵ Premier Dexter said "[w]e are very happy about this. It means that we are able to give young people, very early on, a taste of what trades training will look like, in high school. It means that they will be in a position to gain some experience early with the skilled trades. That is a great way of encouraging young people to stay in the province and build their lives here." In British Columbia, the federal government has committed more than \$1 million, joining companies like Seaspan, BC Ferries, Babcock Canada, Thales Canada and Lockheed Martin Canada in support of the Industrial Marine Training and Applied Research Centre.

In February 2012, the simultaneous announcements of the federal Atlantic Shipbuilding Action Plan and Western Canada's Shipbuilding Action Plan underscored the importance of the supply chain, the all-important links between shipyards that assemble vessels and the Canadian



Credit: Seaspans for NSPS

A welder at work at Vancouver Shipyard.

small and medium-sized enterprises that will supply them. The Atlantic Canada Opportunities Agency and Western Economic Diversification Canada are reaching out to these companies to make sure they understand their opportunities and the assistance available to help them earn the necessary certifications, introduce and acquire new technology.

Premier Dexter said “[w]hat is really interesting about that approach is that by getting out very early and inviting people in to have a look at what the opportunities are in the supply chain, we deliver a couple of important thoughts. Here is where you fit in the supply chain now, and here are the opportunities where you might fit in the supply chain later on. So in other words, if you need to upgrade some of your equipment or some skills for your workers, do that now because there will be more opportunities in the supply chain if you make those investments now and are ready to bid on the contracts as they are tendered.”⁶

As Canadian shipyards and their communities mobilized to win NSPS business, with the \$25 billion combat package as the biggest prize, some national news outlets seemed to see the contract as politically divisive, pitting region against region. Headlines such as “Billions in Shipbuilding Contracts will Make Waves for Harper”⁷ and “Shipbuilding Contest Moves in Rough Political Waters,”⁸ made it sound like there is trouble ahead, but the true perception was far different. Premier Dexter denied that the Nova Scotia strategy to win the shipbuilding contract was divisive, and says that it was an attempt to sell Nova Scotia as *Canada’s* shipbuilder and the project as *Canada’s* project not Nova Scotia’s.

Unlike Nova Scotia, shipbuilding in British Columbia is an important but not a crucial part of the provincial economy, but it holds the promise of longevity, particularly when compared with resource projects. The Vice-President of

Business Development at Seaspans Marine Corporation, John Shaw said winning the non-combat and Canadian Coast Guard work makes his company more competitive in specialist vessels around the world. Shaw notes that “[i]t provides a platform for us to be able to compete and build ice-breakers or patrol vessels for other countries.”⁹ BC has other projects such as oil and gas pipelines in the works but as significant as they are, they are not yet approved and may not have the same duration as the shipbuilding contract.

The NSPS is more than shipbuilding. It holds the potential to develop a technologically sophisticated and competitive Canadian shipbuilding sector for the long term. As Shaw said, “[w]e’re not building in years, we are building in decades.”¹⁰

Notes

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After over 30 years in the public service, Janet Thorsteinson became Vice-President Government Relations at the Canadian Association of Defence and Security Industries (CADSI).



Making Waves

'Mind the Gap'

Larry Hickey

Canadian submarines have been the focus of much media attention over the past several months, triggered by reports of HMCS *Corner Brook's* grounding in 2011, and further amplified when images of the damage were widely distributed. Repeated calls have been made by special interest groups, some parliamentarians and many so-called defence experts to scrap the *Victoria*-class "lemons."

There is an alternate view. From my perspective, while the Canadian submarine program might seem to have been a tactical embarrassment to this point, it has also been a strategic success. Put another way, the *Victoria*-class submarines have allowed Canada to maintain an important warfare capability that would have been lost in 1999 more than likely, some would argue, forever.

The question of whether or not our submarines should be scuttled is less about the *Victoria*-class and its perceived difficulties than it is about whether or not Canada wishes to surrender a submarine capability. Indeed, that is exactly what will happen if these submarines are scrapped before another class is acquired to take their place, a process that would most likely take a decade. One has only to reflect on history to understand this. It took Canada about 30 years to develop, from scratch, an operational submarine service that was recognized as such among its allies, and it would require an equivalent period again were there to be a gap in Canada's submarine capability.

The world is an unpredictable place and, unfortunately, our crystal ball has been inadequate in the past. So long as Canada intends to engage on the international stage, its wisest course is to maintain balanced, multi-purpose maritime forces, of which submarine capability is but one component. No single type of platform or sensor is capable of responding across the full spectrum of situations that might arise in the future. Rather, the employment of varied yet complementary maritime forces provides a synergy that surpasses an individual capability operating in isolation. In maritime operations, as in many endeavours, the whole is more than the sum of its parts.

How is it that there is even discussion about putting an end to Canada's submarine fleet? Well, early news stories created a negative perception about the submarines, a portrayal that persisted despite positive reports over the years. Many of the early issues were of little consequence to actual submarine operations yet they became tag-lines

for every subsequent news item, along with a seemingly obligatory reference to the unfortunate death of an officer aboard HMCS *Chicoutimi* in 2004. In short order, the *Victoria*-class boats became like fish in a media fish bowl; all eyes were upon them and every twitch was magnified. As well, the odd disgruntled submariner publicly maligned the boats, augmenting the negativity. From this repetitive and unbalanced coverage, a perception developed that the *Victoria*-class is a flawed, poorly-designed submarine.

This is an unjustified characterization of the platform. With the exception of metallurgic failures of a few valves and electrical insulation at bulkhead penetrators, issues rectified several years ago, there have been very few class-wide problems that have prevented operations at sea. Dozens of serving *Victoria*-class submariners interviewed for a comprehensive capability review in 2011 affirmed their confidence in the Canadian boats.

If the design of the *Victoria*-class is undeserving of the harsh criticism levied to date, the same cannot be said of Canada's management of the submarine program. The causes of program delays are many; indeed it would take considerable space to document and to place them into proper context. Suffice to say, the head of the navy admitted, "[w]e honestly thought that we could do it faster, and I will be the first to say that I think we over-promised, and under-delivered."¹

It is understandable then that there are those who feel strongly that the submarines should be scrapped. However, the majority who urge divestment cite accounting rather than strategic arguments: the submarines have cost billions; or they've spent too few days at sea. From



HMCS *Victoria* performs drills during sea trials in December 2011.



Credit: MCpl Daniel Mallette,
MARPAAC Imaging Services

Rear Admiral Nigel Greenwood, Commander JTF(P) and MARPAC, and CFB Esquimalt Base Commander Craig Baines salute HMCS *Corner Brook* as she exits Esquimalt Harbour.

this it is extrapolated that Canadians received no value from them to date, and little is expected in the future. The assessment seems to be based solely on cost versus the number of days spent at sea, without reference to direct or indirect benefits or the broader, more intangible benefits to maintaining a submarine capability.

The real question is not one of cost but whether they've proven their worth. Days at sea appears to be the sole measure of merit to the pundits; however, they don't explain how this corresponds to performance. Not all days at sea are equal; the *quality* of the sea day is what is paramount for both training and for mission success. Days at sea may be an indicator, but not necessarily a measurement of competency or inherent value to the country.

Have Canadian submarines proven their worth to date? If we use the days-at-sea protocol, your guess is as good as mine, but I doubt that method provides the real answer. Here's what I do know for sure. In the decade that Canada has operated these submarines, they've carried out tests and trials with special operations forces, enforced Canadian sovereignty through fisheries and anti-smuggling patrols, and participated in training with land, sea and air forces in the north. They have contributed to counter-narcotics interdiction in our hemisphere, deployed to European waters and participated in advanced training with US carrier battle groups on both coasts.

Our allies have sufficient trust in our submariners' professionalism that Canadians will control the movements of US submarines in the next Pacific Rim exercise. The gesture is hugely significant; our southern neighbours

are notoriously skittish about assigning control of their boats to non-US commanders. As well during this past decade, at least four Canadian officers gained sufficient submerged experience to succeed at internationally-recognized submarine command courses.

Operating the *Victoria*-class boats has permitted Canada to stay in the submarine business, bringing with it some intangible benefits. Having diesel boats means that measures must be in place to prevent interference with other submarines. That requires our allies to disclose their submarine movements via an international water space management regime, and provides us with a more complete picture of what is happening in the Canadian maritime approaches. Without a submarine capability, our allies would decide that Canada has no 'need to know' and this element of domain awareness would be closed to us. As well, the tap to certain intelligence linkages would dry up. A submarine capability also affords Canada a seat at important tables, and signals that it truly is committed to the international system, and is prepared to back it up with a credible resource.

Notwithstanding the seemingly endless criticism of the submarine program, lessons have been learned and the navy is on the cusp of turning this frustrating situation around. That the *Victoria*-class has positioned Canada to maintain a submarine capability into the future should be considered a strategic success. Now is not the time to dither on following through with the program as it makes little sense to divest of a naval capability without understanding either the full implications of that decision or the potential value of the capability to the country as a whole. Given the extended length of time that would be needed to rebuild a submarine capability were it to be lost, we should be ever cognizant of the caution to 'Mind the Gap.' 🍷

Notes

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Government Cutbacks Threaten Shipbuilding Program: RCN Threatens Itself

Ken Hansen

Despite claims to the contrary by various federal ministers, it is becoming more and more evident that cuts to the federal budget, and especially reductions to the public service, are having a profound effect on how departments will operate going forward. Although the Prime Minister claims that the reductions are just 'backroom efficiency

measures' that will not affect Canadians accessing programs and services, it is becoming more difficult to accept this explanation. Practically on a daily basis, revelations are surfacing that cutting cost has been the only measure of efficiency used to determine the government's policy: there does not appear to be a strategy behind any of this.

Credit: Mike Powell



National Defence Headquarters in Ottawa.

One of the most noteworthy, but least reported upon, aspects of the federal budget was the delaying of \$3.5 billion worth of capital procurement projects for a period of seven years due to the inability of the Department of National Defence (DND) to oversee and manage the projects in the fashion required by Treasury Board regulations. In realistic political terms, the delaying of any program initiative by seven years is so long that it no longer exists on the agenda of the party in power: it is dead money that will simply not be expended and will eventually just disappear. Whether or not these actions will result in a capability deficiency that could imperil Canadian sovereignty or security, or diminish its international reputation is simply not an issue that has received professional or public discussion.

The reasons why DND is unable to administer these projects are numerous but mainly have to do with a lack of qualified and experienced people with which to staff the project offices charged with oversight responsibility for them. There is excellent Canadian historical precedent with which to contrast this situation. Aaron Plamondon, in *The Politics of Procurement*, explains that when Canada was preparing to build the *St. Laurent*-class warships, plus their numerous spin-off sub-classes, the naval leadership was able to explain that the navy required a properly

staffed Canadian naval design authority. In 1948 the Liberal government of Prime Minister Louis St. Laurent authorized the growth of the Engineer-in-Chief's department significantly, "supported by civilian engineers, technologists and project managers."¹ The Naval Central Drawing Office and the Naval Central Procurement Agency were also organized as part of this measure to ensure program success. Most of this capability was lost, with the navy's acquiescence, in previous cutbacks. The naval leadership in the 1950s knew that there are both military and civil components to these offices but that valuable historical lesson does not seem to have been retained by subsequent generations of admirals, nor were they prepared to fight the government axe over the recent loss of civilian members of the defence team. These cutbacks to the public service will ensure that shortages of civilian engineers, technologists and project managers will remain critical and, worse, that the work environment in the projects will be poisonous in the future.

The tactical focus of the military is the other major reason the problem will not be solved any time soon. By this I mean the inability – and sometimes unwillingness – of the navy to think institutionally for the long term. I have heard senior admirals complain about their inability to divest themselves of daily activities for even a few hours to think strategically as a means of getting ahead of the big issues that loom before the institution. These include a shrinking recruitment base, crumbling infrastructure, new expectations from the government and, not least, the major issue of fleet renewal which is complicated by rising costs but shrinking budgets. It's not an easy job being the admiral in charge of the navy these days.

The admiral's job is made harder when the navy values tactical proficiency more than it does intellectual capacity as the standard for advancement to the most lofty of ranks. This is nothing new. What William Gilbert and Arthur Sullivan were alluding to when they wrote their famous line about polishing brass handles in their musical "HMS Pinafore" which opened in 1878, was the Royal Navy's (RN) fascination for tactical minutia instead of strategic relevance and operational effectiveness. Andrew Gordon's masterpiece, *The Rules of the Game: Jutland and British Naval Command*, explains that the greatest heroes of the RN from the age of sail did not give a toss for spit and polish or any other such trivialities. They were all about winning wars and preserving Great Britain's strategic advantage: sea power. But, somehow, the RCN has inherited the RN's culture of the steam age, at least as far as setting institutional goals, and it is now trapped in what is known as a means-end inversion that results in goal displacement.

The strategic goal for the RCN, as well as the Canadian Coast Guard and RCMP for that matter, should be to achieve maritime security for Canada. A secondary goal would be to contribute to global security in the maritime environment. But when caught in a mean-ends inversion, according to Professor Hari Das, “an organization reverses its priority between its goals and means, where the means [the fleet] becomes a goal and the goal [achieving maritime security for Canada] is assigned a lower priority.”² This, he maintains, “is common among modern bureaucratic organizations.”³ An organization that prizes ship command above all other appointments will, quite naturally, be preoccupied with ensuring that the fleet survives in the best condition and view that accomplishment as the highest professional legacy for future generations of sailors. To think otherwise is obviously disloyal.

Das advises that such problems of priority are serious indications of an organization in decline. His other indicators of organizational decline include: increased internal conflict over declining resources; increased individual stress, especially for leaders; increased ‘political action’ by internal members and a sub-unit focus as the decline process continues (i.e., jettisoning appendages as core capabilities are protected); increased resistance to change, coupled with suspicion of new ideas, hypersensitivity to criticism and tightly controlling information; increased turnover as valuable employees jump ship because they realize there is no future; and lowered motivation levels in the workforce as more work has to be done with fewer employees and fewer resources.⁴ Does any of this sound familiar? It should to anyone who has served in the navy over the past decades.

The May 2012 announcement that the Arctic Offshore Patrol Ships will be delayed by at least three years and that

the \$3.1 billion project will cost \$40 million more than anticipated,⁵ is just the latest in a long series of indicators that problems of strategy plague both the government and the navy. Without a better linkage between strategy and policy, problems that imperil the shipbuilding plans of the government and the institutional aspirations of the navy are bound to continue into the foreseeable future. 🚢

Notes

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NSPS: A Blunder for the Ages?

Lieutenant-Commander (Ret'd) Ian Yeates

Like many in the RCN community, I was very pleased to learn of the National Shipbuilding Procurement Strategy (NSPS) and the awarding of, as I then understood, contracts with an East and West Coast shipyard for the new navy ships. It was exciting to see progress on a replacement program for our current fleet, and grossly overdue. I confess to not necessarily paying attention to all the details, but I took the broad outline of what had been notionally approved to assume that it was all over save for the cheering and champagne.

I should know better – I have been around long enough to know that surface appearances and reality are usually anything but congruous and so it is in this case. To my dismay, an article appeared in my local paper (17 June 2012) with the headline “Shipbuilding Strategy Might Not Be Seaworthy.” I read it and learned that contrary to my understanding based on the government’s rosy announcements, no signed contracts exist at all. Negotiations with both shipyards will continue for a significant period and cutting steel is, apparently, postponed into a God-knows-when future.

The more I read, the more I conclude that my hopes and expectations for this entire enterprise are ill-founded to put it mildly. The much-touted \$35 billion to be spent over a 20-year time span (not sure when the clock starts: last fall? when the contracts are signed?) is frankly not very much at all. It represents \$1.75 billion per year, spread between two shipyards. This is a tidy sum for you and me but not much out of a total federal budget of \$245 billion

Credit: Corporal Martin Roy, Formation Imaging Services, Halifax



HMCS *Summerside* and HMCS *Moncton* conduct underwater mine detection exercises in Sydney Harbour during Exercise Frontier Sentinel.

(2012-13 FY). If you assume no increase in the current spending of the government over that 20-year time frame, total expenditures would be \$4,900 billion, of which our magnificent shipbuilding program of \$35 billion represents a trivial 0.7%. This is not quite the bank breaker that some imply. I think we can conclude it is a fairly small investment.

The *effectiveness* of this investment is another matter. No matter its relatively small scale in big picture terms, it is increasingly evident even at this date that it is not likely to end well. I foresee four problems.

First, as is exasperating and tiresome but utterly inevitable with government initiatives, the game of politics is front and centre. While initial announcements are given much attention in government PR material, in which claims of strong support for the military and industry are front and centre, at the end of the day there seems to be very little meat on the bone. Military contracts are particularly prone to this disease. So, here we have an announcement that really means very little, save for the choice of the lucky shipyards to get the contracts. Indeed, the announcement rather weakens the negotiating hand of the government to state the self-evident. I am not optimistic that the outcome will be particularly impressive from the navy's perspective – we'll have fewer ships than needed at a far higher cost per unit than notionally assumed with the \$35 billion figure.

Second, the NSPS process underlines the inexperience of our procurement system for these types of contracts. How could it be otherwise? The unfortunate souls in the RCN charged with managing this initiative are inexperienced given the once-a-generation nature of such programs. Their opposite numbers at Treasury Board, Public Works, Privy Council Office, Prime Minister's Office, and whoever else is playing in the sandbox, are no better off.

Third, the NSPS process underlines how inexperienced our so-called shipyards are in actually delivering the goods. Again, how can it be otherwise given the rarity of such contracts. The senior leadership of the shipyards is anxious about meeting shareholder expectations for profit and the avoidance of risk. This is quite normal. And what is also normal in Canada is asking the public sector to absorb losses while the private sector gets to enjoy profits. This is a habit of the private sector and its dealings with an often hapless public sector. No one can pretend to be surprised at this behaviour.

Fourth, the creation of a viable naval shipbuilding industry is, in my view, a quixotic endeavour. We've gone through this before and it ended in tears. We built the *Halifax-*

class of frigates at enormous cost and then watched the shipyards, built so painfully, wither and die. As well, the reality is that the domestic market is inadequate for a sustained industry, and this means Canada requires an export strategy. While one doesn't like to be negative, I highly doubt foreign markets are particularly open to a Canadian product. All the things that make a warship a warship are not and never will be Canadian – propulsion equipment, auxiliary machinery, weapons and sensors are overwhelmingly foreign. Why is the NSPS different from the past?

It seems to me that there are three possible approaches to consider here regarding the re-equipping of the RCN. One approach is to reorient the entire strategy into a permanent program – no \$35 billion limit. This would see the steady stream of orders for frigates, air defence destroyers, command and control ships, tankers, mine-sweepers whether we needed them or not. Surplus vessels would be sold on the secondary market. This could mean construction of one a year, one every two years, whatever, the specifics can be established in due course. The point is it would place our shipyards on permanent contract basis.

The second approach is to throw in the towel and accept the fact we are not in the warship-building game. We would buy what we need from overseas on an off-the-shelf basis. Lots of choice exists. There is nothing special about our needs that cannot be readily supplied by offshore shipyards. Arguments to the contrary are utterly unconvincing to this observer. This would be by far and away the cheapest (and fastest) approach. We would undoubtedly get what the navy needs, likely for far less than \$35 billion and in a far shorter time frame than 20 years. As an aside, we are in, and can remain in, the repair and overhaul game. Indeed the two 'winner' shipyards basically do this work at present. Lots of jobs remain in play.

A third approach is to cooperate with a few like-minded countries (Australia, NATO allies, the United States) and jointly build vessels for our mutual needs. Yes, this involves a significant amount of administrative friction and unseemly arguments about who gets what. This approach is difficult given the problem of inherent parochialism, but it would be cheaper than our current approach, although more expensive than off-the-shelf purchases.

There is not the space here to examine the issue of cost-effective defence spending over the years. Suffice to say, we have rarely received value for money in the past and even at this early date, I see little evidence that this equation is about to change. The NSPS is well on the way to demonstrating this all-too-common outcome. 🍷

A View from the West: A Geostrategic Case for Canadian Submarines

Daniel Baart

The debate regarding the acquisition and maintenance of submarines for the Royal Canadian Navy (RCN) fleet is a long, highly politicized affair that dates back to the period just prior to the First World War. Previous contributors to *CNR* have covered this history extensively, and most agree that a capable submarine force is a near necessity in ensuring the defence of Canadian interests. While much of the interest has focused on coastal defence roles – particularly in the Arctic – this analysis will focus more on the importance of submarine forces in an internationally deployed capacity.

This article will not specifically address the RCN's current fleet of *Victoria*-class submarines but it will address some similar issues. This is because underlying much of the criticism of the *Victoria*-class is public scepticism regarding why the navy needs submarines at all. From the vantage point of the West Coast this is baffling given the dramatic expansion of submarine fleets in states throughout Asia. The interconnectedness of Canada with this region and the probable future roles of the RCN there present a solid argument for a credible Canadian submarine capability.

The navy has not been successful at convincing Canadians why we need submarines, possibly because it has not provided an explanation. A commentator in *Broadsides*, *CNR*'s online discussion forum, has noted that "the submariner community continues to operate on the assumption that 'smart people know why we need them' without a clear explanation."¹ It could also be said that a major part of this is a general misunderstanding amongst public audiences as to what submarines are actually for. This is understandable as naval operations are technical enterprises, and technical-minded people have a reputation for not explaining their craft to the layperson. Other commentators have rightly added that it is the *government's* responsibility to convey the rationale of its spending decisions, and not the navy's.² Regardless of who is responsible, the result is the same – the public remains unconvinced.

Public conceptions of submarine operations are drawn from their most observable historic roles in the campaigns against shipping during the world wars or the clandestine Cold War undersea campaigns dramatized in film and popular fiction. They are either viewed as the naval equivalent of a sucker-punch, slamming torpedoes into the sides of unsuspecting ships, or the super-secret tools

of superpowers. While both interpretations are partially valid, the reality is, of course, more nuanced. Submarines are not solely anti-surface raiders and are not exclusively useful to global hegemons. Some public commentary seems to suggest that the purchase of submarines is geopolitical posturing, a misguided attempt by Canada to become involved in world affairs disproportionate to its size or strategic position, and denying that submarines are useful for a range of maritime roles, for states of all sizes.



HMCS Victoria arrives at Naval Base Kitsap-Bangor, Washington State, for a port call and routine maintenance.

Submarines can play a variety of important roles in domestic security operations, but securing our own waterways and approaches is only the start. Because its economy is so deeply reliant on maritime trade, Canada shares a responsibility in helping to maintain freedom of navigation around the world. The fact that trade destined for or leaving from Canadian ports travels through some of the most politically volatile areas in the world is of concern, regardless of how geographically distant Canada may be from these locales. While this is not an argument for submarines specifically, the regional security dynamic in the areas most likely to be involved in future crises would argue for a stronger sub-surface warfare capability.

In a prior "View from the West" article, Christian Bedford documented the dramatic expansion of sub-surface fleets in the Asia-Pacific region, suggesting that the balance of submarine activity had shifted from the Atlantic to the Pacific Ocean.³ Worldwide, numbers indicate that about one-third of the world's seafaring states currently have a submarine capability, and the number of boats is increasing. Forty-one states currently deploy roughly 450 vessels,

and another 150 are expected to be built over the next decade.⁴ The growth in Asian fleets is related to the fractious nature of the region and its unresolved disputes over overlapping maritime claims and maritime resources. Many analysts agree that the South China Sea, where there are intractable multilateral boundary disputes, is the most likely scene for future maritime conflict. Three of the six claimants to the disputes currently field submarines. By referring to the growth of these foreign fleets, I am not suggesting that the RCN should join in bandwagon fashion, but rather I'm suggesting that future conflict at sea will undoubtedly feature a greater role for submarine forces. The states involved, which have varying degrees of political and economic power, have all independently assessed their defence requirements and concluded that submarines should be an important part of their defensive postures. Canada is within its rights to come to different conclusions regarding its own defence.



HMCS Corner Brook pulls into Submarine Base New London, Connecticut, for a port visit.

The utility of submarines in deployed operations is well established, particularly their intelligence acquisition and area-denial roles. Deployed submarines can grant forces the ability to keep track of enemy vessel movements, while at the same time limiting these movements through threat of engagement. These immediate, tactical and operational effects have been covered elsewhere, but the associated benefits to overall strategic defences have been less emphasized. The fact is that submarine capability lends a boost to navies operating in submarine-rich waters. To put it simply, if you live in an area where your neighbours have submarines, you need to have submarines too. Submarine operations remain closely guarded between states – even among allies – and information will be shared mainly because states realize it is important to avoid collisions among submarines. Understanding of their uses comes largely through possession. In addition, submarines

themselves – particularly stealthy diesel-electric designs – are amongst the most versatile anti-submarine warfare platforms available.

RCN submarines would provide immediate support in the form of area-denial, surveillance and anti-submarine warfare capabilities, as well as a greater long-term understanding of the operational practices of other submarine-equipped states. An oft-mentioned spin-off benefit of this capability is the value our allies, particularly the United States, have reportedly placed in a Canadian diesel-electric submarine force. Critics have pointed to this as a sign that submarine acquisition was somehow not in Canada's interests but rather the result of pressure to serve some foreign demands. This is based on two conceptions in the public mind, that Canada is, first, isolated entirely from the rest of the world – economically and in terms of security threats – and, second, strong enough to protect itself without cooperating with like-minded allies. Both of these are mistaken. Despite its apparent distance from the rest of the world, Canada is a trading state that relies heavily on interaction with other states. As well, Canadian security at home and success in operations abroad are dependent on the forging of mutually-beneficial relationships with allies. Military equipment that will be operationally beneficial to Canada's own defence should be seen as an even better investment if our friends can also benefit.

The Canadian public is admirably dedicated to ensuring the accountability of elected officials. Problems arise, however, when governments and expert communities stumble in their ability to explain the rationale behind a significant expenditure of resources. I believe that the operations and international roles of the RCN would be greatly enhanced by a credible submarine capability, particularly in light of the evolving security dynamic within the Asia-Pacific region. It is important to ensure that opposition to Canadian submarines is not based on a lack of understanding of their utility. 🇨🇦

Notes

1. David Perry, "Why Submarines?" BroadSides Online Discussion Forum, available at <http://naval.review.cfps.dal.ca/forum/view.php?topic=36>.
2. See, for example, Tim Dunne, "Journalists Sub-par on Sub Debate," *Hali-fax Chronicle Herald*, 3 March 2012, available at <http://thechronicleherald.ca/opinion/69517-journalists-sub-par-sub-debate>.
3. Christian Bedford, "Submarine Procurement in the Indo-Pacific Region," *Canadian Naval Review*, Vol. 7, No. 1 (Spring 2011), pp. 35-36.
4. "Research: With 150 New Submarines to be Built until 2021, the Submarine Market Seems to be on Solid Ground," *Defense Update*, 2 May 2012, available at http://defense-update.com/20120502_world_submarines_2011-2021.html.

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Plain Talk: Design Flaw: The Long Path from NSPS to Ships

Sharon Hobson

The National Shipbuilding Procurement Strategy (NSPS) has generally been accepted as a huge improvement in how the government intends to acquire ships. But there is a large gap between announcing a process and delivering an actual ship. The government must now negotiate contracts for the individual shipbuilding projects. As Mr. Terry Williston, Executive Director of the NSPS Secretariat, emphasized to the participants at the 1 June 2012 Naval Association of Canada conference in Ottawa, there is still “a tremendous amount of difficult work to get to those [individual] contracts” and before the first steel can be cut for the navy’s new ships.

That hasn’t stopped the Conservative government in the meantime from claiming all the political credit, while leaving the bureaucrats to clean up the details. It started with Public Works and Government Services Minister Rona Ambrose announcing the process at CANSEC, the Canadian defence and security trade show, in 2010. Then in October 2011 the government revealed the winners of the two umbrella contracts under which \$33 billion worth of government ships will be strategically sourced. Irving Shipbuilding, which owns Halifax Shipyards on the East Coast, will build Canada’s combat ships under a contract currently estimated to be worth \$28 billion. The ships include Arctic/Offshore Patrol Ships and Canadian Surface Combatants. Seaspan’s Vancouver Shipyards on the West Coast is to build the government’s non-combat ships, worth about \$5 billion. These include the Royal Canadian Navy’s (RCN) Joint Support Ships and the Canadian Coast Guard’s Polar Icebreaker, Offshore Oceanographic Science Vessel and Offshore Fisheries Science Vessels.

In January 2012 Prime Minister Stephen Harper visited both Vancouver Shipyards and Halifax Shipyards to announce agreements-in-principle had been achieved for the two work packages. Then in February 2012 the government signed the two umbrella contracts.

The first of the navy projects to go ahead will be the \$3.1 billion Arctic/Offshore Patrol Ships (A/OPS). The navy requirement is for six to eight ships with a range of 6,800 nautical miles, capable of a minimum sustained speed of 17 knots, and able to navigate through one metre of first-year ice. It will have a helicopter hangar, be able to operate an organic light helicopter, and support CH-148 Cyclone

operations. It is to have a 25 mm gun as its primary weapon system and be fitted for, but not with, 12.7 mm heavy machine guns.

BMT Fleet Technology received the Definition, Engineering, Logistics and Management Support (DELMS) contract for the A/OPS in May 2008. At the time, the schedule called for the first ship to be delivered in 2013. Since then, however, the project has been delayed but the expectations were that the contract would be awarded this year, and the first ship delivered in 2015. The ‘difficult work’ noted by Williston, however, is apparently further delaying things.



A metal fabrication apprentice and his mentor at Irving Shipbuilding working on a Hero-class Mid-Shore Patrol Vessel for the Canadian Coast Guard.

The design that is handed over to the shipyard must be further developed into a construction design. Shipyards used to have their own design teams to do this but now most rely on outside organizations. Naval architect Paul Barbeau, President of NAVTECH in Quebec City, says maturation of the design can present difficulties, with weight being the biggest challenge. If the size of the hull is insufficient for the weight of the ship’s payload, then

the ship's speed and manoeuvrability will be affected. Therefore, the shipyard needs a contract that spells out exactly when it will become accountable for the effectiveness of the design. Barbeau says that sometimes a shipyard will do a preliminary design in order to confirm the design's feasibility once it receives the contractual design from the Crown.¹

There is talk within industry that Irving wants a separate contract for the design stage of the process. Given that the negotiations for a shipbuilding contract and a separate design contract could be extensive, the navy is now not expecting to see the first of these ships until 2018. Moreover, the unexpected additional contract costs will likely result in a purchase of only four to six ships.

The same design concerns arise with the \$2.6 billion Joint Support Ship (JSS) program. The two ships – with an option for a third – are classed as non-combatant vessels under the NSPS, and are to be built by Vancouver Shipyards. But the design of the ships, the primary role of which will be to support the navy's task groups, will be provided by either ThyssenKrupp Marine Systems Canada (TKMS) which is modifying its Type 702 *Berlin*-class to meet Canadian requirements, or BMT Fleet which has been working with the project office since 2002 and which was recently awarded a \$9.8 million contract to develop its preliminary design into a contract design. Vancouver Shipyards will have to decide if it too wants a separate design contract in order to take the design it is given through the production process.

Contractual complications are not the only obstacles to be cleared before the navy starts receiving new ships. Shipyard capacity is another. The government has not clarified the sequencing of the ships to be built by Vancouver Shipyards. While the first non-combatant ships to be built will be the three Offshore Fisheries Science Vessels for the Canadian Coast Guard (CCG), there's been no decision on what comes next, the Polar Icebreaker or the JSS. Both are high priority projects for the CCG and the RCN, but only one can be built at a time. And if the JSS is built first, the coast guard will have to wait until the two JSS have been completed (we can assume there won't be a third ship despite the option existing on paper). That would seem to argue against the JSS being moved to the head of the line.

There is also the issue of cost. One of the criticisms levelled against the NSPS approach has been that because there is no longer a competition for who will build the ships,



Seaspan CEO Jonathan Whitworth and Prime Minister Stephen Harper touring Seaspan Shipyards in January 2012.

neither Irving nor Seaspan has an incentive to negotiate a low price. But to avoid exorbitant costs, Peter Cairns, President of the Shipbuilding Association of Canada, says the government will have built a ceiling on profits into the umbrella agreement and the companies will have to open their books so that Ottawa can keep a close watch. (However, since the umbrella agreements have not been made public, we don't know to what profit level the companies and the government have agreed.)

But even if the government has signed a contract which protects against over-paying for the ships, there is still a budgetary problem. Despite government assurances that the Canada First Defence Strategy provided enough funds for all the equipment listed within it, most observers have always doubted this was true. Now, Canadian Press has acquired documents under the *Access to Information Act* which reveal that the government knew there would not be enough money to pay for all the new equipment. A briefing note prepared in spring 2011 for Associate Defence Minister Julian Fantino says "[t]he funding reductions from Budget 2010 and the reduced funding line going forward will make the CFDS unaffordable."²

What exactly will be squeezed over the next few years is unclear. But the delays and contractual complications for the A/OPS and JSS can't be providing the RCN with much comfort, especially with the hugely expensive 15-ship Canadian Surface Combatant project waiting in the wings. 🍷

Notes

1. Paul Barbeau, interview with author, 6 June 2012.
2. Associate Defence Minister Julian Fantino quoted in Lee Berthiaume, "Tories Knew Military Plan 'Unaffordable,'" *The Ottawa Citizen*, 5 June 2012.

Sharon Hobson is an Ottawa-based defence analyst and former Canadian correspondent for *Jane's Defence Weekly*.

Warship Developments: Life Extension Refits

Doug Thomas

In the fairly recent past, 20 years was the planned service life of frigates and destroyers, at which point they were placed in the reserve fleet, or paid-off and scrapped. This was certainly the case with RCN ships built in World War II, which were retired after about 20 years – most of them in the mid-1960s. Vessels constructed after WW II have had greatly extended service lives, effectively a doubling of service life to 35-40 years due to better building and maintenance methods (modular covered construction, cathodic protection of hulls, better preservatives, and more-easily maintained and replaced gas turbine and diesel propulsion and electrical generation systems).

With such extended service lives, it is necessary to conduct major refits of electronic systems at mid-life, which is now some 15-20 years after initial commissioning. This is required for a number of reasons: rapid technological advances, which often mean that parts for the original systems are no longer available; the necessity to update weapons and sensors to maintain requirements to respond to more complex threats; and the escalating cost of new construction which makes it cost-effective to update the current fleet. With media and political disapproval of major capital defence projects – often to excess, in my opinion – it is politically expedient for governments to authorize funds to extend the lives of existing ships rather than build new ones.

Some states have designed ships for short service lives with the intention of selling rather than refitting them, and replacing them with new ships. This was the case with the Royal Navy's (RN) Type 23 frigates, known as the *Duke*-class, and designed and built during the same period as Canada's *Halifax*-class frigates. The *Dukes* were designed in the 1980s for 18 years of service, then to be paid-off for overseas sale and replaced with a modern ship. This has not worked out well: new ships were not authorized, and the RN has retained 13 of the 16 Type 23s for a planned 35-36 year service life for which they were never designed. They are also rather small and not well-suited to mid-life updates.

In the United States too, lives of ships are being extended rather than ships being replaced. A major factor in this is today's much smaller shipbuilding budget compared to the Cold War when a 600-ship US Navy was under construction to oppose the Soviet fleet. An example of longevity is the USS *Enterprise*, the first nuclear-powered aircraft carrier, which will finally be paid off next year after 53 years of commissioned service. This seems like a very long time, but in fact the USN's other nuclear carriers of the *Nimitz*-class and new *Ford*-class are designed for a 50-year lifespan. Factored into this lifespan is a Service Life Extension Plan (SLEP), whereby all of a ship's systems and structure are overhauled with a view to being upgraded to good-as-new condition.



HMCS *Halifax* at Irving Shipbuilding for mid-life refit.

In Canada, the support ships *Protecteur* and *Preserver*, as well as destroyers and frigates, are long-lived too. *Protecteur* will soon reach the grand old age of 43 years and the DDG HMCS *Iroquois* is celebrating her 40th birthday this year. *Iroquois*' replacement – probably a destroyer variant of the Canadian Surface Combatant – is unlikely to be commissioned for another 8-10 years. Canada's current destroyers will likely achieve 45 years of service through refits to extend their service lives by at least another five years. Luckily, the 12 *Halifax*-class frigates, the core of the Royal Canadian Navy, are now undergoing a mid-life refit known as the Halifax Class Modernization/Frigate Life Extension Project (HCM/FELEX).

These frigates have been in service since the mid-1990s and were designed with a 15-year combat system lifespan. Updating combat



A view of work being done during the refit of a *Halifax*-class frigate.

systems is the primary target of HCM, but there are also necessary hull and propulsion (platform) components. For example, a new Integrated Platform Management System (IPMS) will replace the Integrated Machinery Control System initially installed, and a stern flap will make the ships more fuel efficient, slightly faster and quieter. The work package will also change flight deck, hangar and helicopter haul-down characteristics to accommodate the new CH-148 Cyclone helicopter.

This is a very complex process, with a number of steps which all require detailed management so that at the end of the process all 12 ships will emerge with identical equipment fits and capabilities. Prior to each mid-life refit (MLR), a series of engineering changes will be conducted, principally by the Fleet Maintenance Facilities in the dockyards on each coast. This work will form the foundation for each MLR, which will be preceded by a

four month extended work period during which equipment will be removed for repair and overhaul or disposal, and all non-standard fits will be removed. Once this is completed, the 18 month MLR will commence in Irving Shipyards in Halifax and Victoria Shipyards in British Columbia. The shipyards will work in collaboration with Lockheed Martin Canada, which is the prime combat systems integrator, and L-3 Communications which is the IPMS contractor.

Following the MLR, each ship will conduct trials and necessary work periods in order to complete testing of new systems, and then undergo a crew and equipment work-up in order to achieve the assigned level of combat readiness.

This process started with HMCS *Halifax* in 2010, and the last ship – HMCS *Toronto* – is planned for completion in 2018. So far all appears to be going well. Seven frigates will be updated in Irving Shipyard and the other five will be done in Victoria Shipyards. At the moment four frigates are in various phases of this refit, with the recent arrival of HMCS *Winnipeg* in Victoria Shipyards. At the peak of the program, five frigates will be undergoing HCM/FELEX at the same time.

The total work package is estimated at about \$4.5 billion. This includes \$3.1 billion for HCM/FELEX, \$900 million on individual capital projects to improve capability, and \$450 million to deal with specific equipment obsolescence and supportability issues. Much of this work would have had to be done anyway but by packaging the work as described, and ensuring a common standard of equipment and capability for all ships of this class, Canada will have a globally-deployable, multi-purpose combatant fleet for several full decades to come.

So, is this good value for money? If the decision had been to replace these frigates now with new ships, unit cost would likely have been in the vicinity of \$1.2 to \$1.5 billion each, for a total of \$14.5 to \$18 billion, so MLR certainly appears to be a prudent financial decision. Nevertheless, these ships will eventually require replacement as part of the future Canadian Surface Combatant program. Irving Shipbuilding has been selected as the builder of 15 vessels first to replace the existing *Tribal*-class destroyers such as HMCS *Iroquois*, and subsequently to build a frigate variant gradually to replace the *Halifax*-class. Building, operating and maintaining a fleet with these capabilities is not inexpensive but Canada is a G8 country with imports and exports transported by sea, and blessed with the world's longest coastline and extensive offshore resources. Canada can afford and must have a strong navy if we wish to safeguard these vital national interests. 🇨🇦

Book Reviews

The Oxford Companion to Canadian Military History, by J.L. Granatstein and Dean F. Oliver, Don Mills, ON: Oxford University Press, 2011, 528 pages, \$70.00 (hardcover), ISBN 978-0-1954-3088-2

Reviewed Colonel P.J. Williams

Capitalizing on renewed Canadian interest in military heritage, J.L. Granatstein and Dean Oliver have produced an excellent volume which covers the subject literally from A to Z, or more specifically from “Abbott, Douglas Charles” (a soldier in the First World War and later Minister of Defence) to “Zouaves” (19th century soldiers raised in part by the Roman Catholic Church in Quebec to help defend the Papal States in Rome during the wars for Italian independence). Both authors are well qualified to write on the subject, Granatstein himself having authored some 60 books and Oliver serving as Director of Research and Exhibitions at the Canadian War Museum in Ottawa.

The authors’ aim was to cover “the key events, issues and ideas that have populated Canada’s military past.” As already alluded to, the book is organized alphabetically and is liberally illustrated with photos, maps and artwork. There are several appendices at the end which cover those who filled key posts as serving officers, elected officials and senior public servants, up to the present day. Most entries provide cross references to other related subjects in the book and many also provide suggestions for further reading.

Some books like this have a tendency to be mere dry recitations of facts, but I did not find that to be the case here. Indeed, the authors appear to have gone out of their way to appeal to as wide an audience as possible. Thus, there are many topics one would not expect to be included in a book with a title such as this, including “National Interests,” “Sexual Discrimination,” “Post Traumatic Stress Disorder,” “Canadianization,” and “Military Language” (which provides a somewhat humorous review of our military lexicon). The book also has entries on the “Afghanistan War” and the “War on Terror.”

Canadian military history has not been without controversy, and several such episodes are covered in detail, including the “Dieppe Raid,” the “Bomber Command Controversy” (one of the lengthier entries), the “Somalia Affair,” “Unification” and “Conscription.” In the Preface, the authors devote considerable space to de-bunking popular belief in “Canada-as-peacekeeper,” calling it, “laughably imprecise and brown with age.” To be fair, no

book covering such a wide canvas can ignore this subject and so the book contains an entry of almost six pages on, you guessed it, “Peacekeeping.” This entry is followed by one on “Pearson, Lester Bowles,” to which some might say, how Canadian is that?

On the whole these subjects are treated objectively by the authors, although I did find a tendency in some entries for a degree of emotion to creep in. Here I speak of entries, which I found both instructive and entertaining, such as “Autobiography, Military,” “Biography, Military” and “Research and Writing” (another lengthy entry). Here the theme is that Canada has not been a highly prolific country, whether chronicling the deeds of military leaders (indeed there is a dearth of accounts from senior leaders themselves) or in marketing such works when they are produced. In a sense one could argue that one of the authors’ main aims in producing this book was to encourage people to take up the cause of Canadian military history scholarship, like those such as Colonel C.P. Stacey, Desmond Morton and Terry Copp (all of whom receive their own entry in the book).

Given that this is a naval journal, mention must be made of how this book will appeal to the reader with maritime interests. Here the authors have done great service to the navy and the book contains entries such as “Admirals, World War II,” “Atlantic, Battle of the” (which merits over five pages), “The Royal Canadian Navy,” “the Mainguy Report” and “Destroyers.”

In short, this book covers military events both great (the “Home Front, World Wars I and II,” the single largest entry, at over seven pages) and small (the “Defence Research Board,” the shortest, at a few lines), as well as the obscure (for example, the “Terrace Mutiny in British Columbia” on 23 November 1944, which I had never heard of before). The role of First Nations is also covered with entries on “Poundmaker” and “Tecumseh.”

It was indeed a pleasure to read through and review this book, and one hopes that it will soon be translated so as to reach even wider Canadian audiences. Strongly recommended. 🍷

Australia’s Response to Piracy: A Legal Perspective, edited Andrew Forbes, Canberra: Sea Power Centre - Australia, Papers in Australian Maritime Affairs No. 31, 2011, 123 pages, ISBN 978-0-642-29738-9

Reviewed by Gavin Charles

Modern piracy is a truly global problem. Every contemporary state is tied in some way to the international maritime

shipping industry – as a flag state, a port destination, a home to mariners, or simply through reliance on goods shipped by sea. The famous declaration made by Cicero, the Roman statesman, lawyer and philosopher, that pirates were *hostis humanis generis* – the enemies of all mankind – is truer than ever in today's globalized world, where an armed robbery or hijacking at sea can affect states far from the incident in question. It is therefore important to consider the ways in which states, institutions and organizations can collaborate to respond to the growing problem of piracy.

Australia's Response to Piracy: A Legal Perspective is the product of a seminar for Australian government officials organized by the Sea Power Centre - Australia and the Australian National Centre for Ocean Resources and Security at the University of Wollongong in 2009. An edited collection of eight short essays, the volume seeks to shed light on the legal issues and challenges associated with counter-piracy operations in the contemporary era, with a special focus on Australian interests and activities. The book combines analysis of the severity and import of international piracy with an exploration of the relevant Australian and international law.

One might expect a book written from an Australian perspective to emphasize regional concerns, particularly southeast Asian piracy. With a few notable exceptions, however, this volume focuses on the piracy threat in and around Somalia, where Australia has joined numerous other states in conducting naval patrols and surveillance. The one chapter which deals explicitly with southeast Asian piracy does so largely in comparative fashion, with a central argument that the presence of law and order and the inaccessibility of heavy weapons in southeast Asia combined with the region's archipelagic geography make Somali-style hijackings unlikely. Again, one might expect to see the discussion relevant only to Australia, but this is not the case. Much of the discussion of the international law pertaining to counter-piracy operations is also relevant for other states participating in missions off the Somali coast.

The book's chapters comprise a good survey of the diverse actors and response options in the struggle against Somali piracy, including those at the international, national and industrial levels. The authors agree (and the facts certainly suggest) that Australia is capable of effectively assisting the international effort to restrict the scope and severity of Somali piracy. A number of legal issues are raised in association with this effort, some of which are specific to Australia (such as the limited provisions in Australian law for prosecuting extraterritorial piracy in domestic courts)

and some of which are pertinent more broadly (such as the special provisions the UN Security Council has made for pursuing pirates into Somali territorial waters).

The volume is primarily oriented toward exploring the various legal implications of potential governmental responses to piracy. Such a focus is perhaps unsurprising, given that the audience of the original seminar consisted of government officials, and the book does a fine job of noting and assessing a variety of legal issues and challenges associated with state efforts to prevent and prosecute acts of piracy. Still, it would have been useful to have more discussion of the controversial and murky legality of various industrial responses to piracy – most prominently, ransom payments and utilizing private armed protection on board commercial ships.

Overall, *Australia's Response to Piracy* is a useful overview of the legal context for the Australian response to extra-territorial maritime piracy. As national governments, international institutions and industry organizations continue to face piracy and develop new responses to this serious threat, a solid understanding of the relevant law is and will remain essential. 🏴‍☠️



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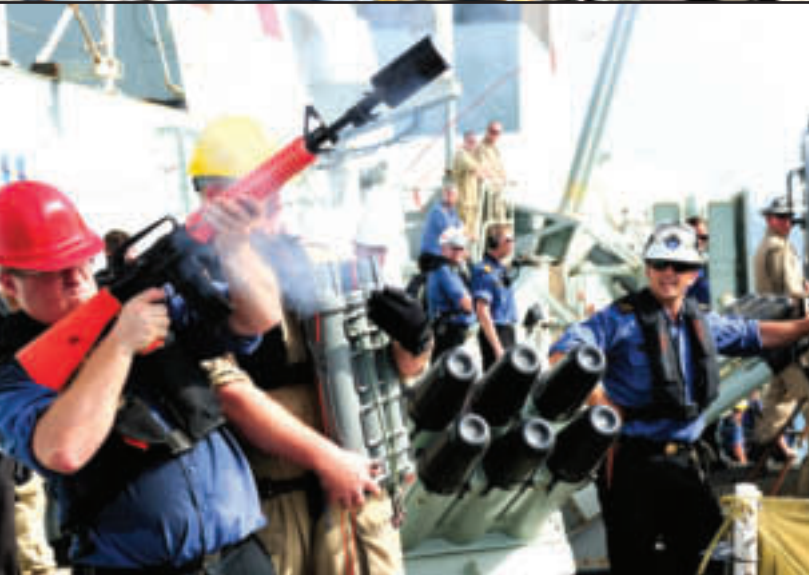


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Operation Artemis

These photos were taken in May-June 2012 as HMCS *Charlottetown* participated in *Operation Artemis* in the Arabian Sea region. In *Operation Artemis*, the Canadian Forces participate in maritime security and counter-terrorism operations with task force CTF 150, which operates under Combined Maritime Forces (CMF). CMF is a multinational naval partnership to promote security, stability and prosperity across approximately 2.5 million square miles of international waters in the Middle East, which encompass some of the world's most important shipping lanes.

All photos by Cpl Ronnie Kinnie, Formation Imaging Services, Halifax