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For Want of Frigates ....

The Multi-Mission Corvette Project

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The Naval Association of Canada | Corvette Series

For Want of Frigates
Requirements for a Multi-Mission Corvette

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This Naval Association of Canada series is devoted to examining options for Canada's Multi-Mission Corvette Project. Support for this work is provided by the Canadian Maritime Security Network.

Executive Summary

As Canada replaces its Kingston-class MCDVs, a new fleet of light warships will be needed to both assume the MCDVs' existing roles and provide the RCN with the capabilities needed to manage great power competition. This paper offers an overview of the kinds of capabilities that the RCN should prioritize in its search for a multi-mission corvette.

"Were I to die at this moment, 'want of frigates!' would be stamped on my heart."
– Horatio Nelson

Despite commanding a fleet of heavily armed capital ships, which won many decisive battles, including his last at Trafalgar, Admiral Horatio Nelson placed special value on the small, flexible ships of his navy. The frigates of the Royal Navy (RN) at that time were the smallest of the rated ships, with between 20 and 28 guns. In 1793, the RN had 99 frigates, which represented over a third of its 295 rated ships, yet Nelson still wanted more.[1] He understood that small ships provide flexible options. In Nelson's time, they were deployed independently for scouting and commerce raiding missions, and these operations allowed junior officers and sailors to acquire the skills and experience needed for later success in larger ships.

In acquiring the Maritime Coastal Defence Vessels (MCDVs), the force developers in the Royal Canadian Navy (RCN) displayed their own understanding of the value and flexibility of small ships. The original statement of requirements included five high-level requirements: the ships had to be built in Canada, they had to be inexpensive, they had to be operable by naval reservists, the

design had to have role flexibility included, and they had to be inexpensive to operate.[2] The requirement to have the ships crewed by naval reservists led to a plan to imitate the employment of RN reservists in Hunt-class minesweepers and to focus the combat mission of the vessels on mine-clearance operations. However, the requirement for an inexpensive design led to less optimal steel-hulled mine countermeasure (MCM) vessels, which, unlike the RN's Hunt-class vessels with their fiberglass hulls, would be vulnerable to magnetic mines while conducting minesweeping operations.

Equipped with 12 sub-optimal minesweepers, the RCN proceeded to squeeze the maximum value out of its small, flexible ships. First, it assigned the ships an ever-increasing mission set, which included the training of junior officers and sailors, sovereignty patrols on all three coasts, drug interdiction in the Caribbean Sea and eastern Pacific, capacity building with West African navies, and eventually participation in the North Atlantic Treaty Organization's (NATO) Standing Naval Mine Countermeasures Group (SNMCMG). Second, as the aging Halifax-class frigates required longer maintenance periods, reducing their availability, the RCN recognized the potential of the MCDVs to fill part of the experience gap and began to crew the ships with more Regular Force officers and sailors. And third, the RCN closely tracked the innovation in MCM operations and recognized that remote vehicle technology meant that minehunters no longer needed to enter the minefield. They began pairing the MCDVs with clearance divers, equipped with remote minehunting gear, to make the MCDVs into capable MCM ships, as originally intended.

The 25-year history of the MCDVs should be seen as a success. At a low cost and with small crews, ships built in Canada have contributed to maintaining Canadian sovereignty, gained credit with the United States through counter-drug operations, fulfilled part of Canada's commitment to NATO, and represented Canada to partner nations around the world. Importantly, while conducting these missions, they have prepared generations of sailors for more complex operations in larger warships.

Notwithstanding that success, as RCN force developers consider how to replace the MCDVs' capability, they should also consider the significant shortcomings of the MCDVs. Because the ships were designed for the inshore minesweeping mission, they lack the size necessary for good seakeeping in Canadian waters, for flexible multi-mission fits, or for adequate self-defence armaments. Also, the ships lack the speed to be effective in a multi-threat military or constabulary role. And most importantly, while the ships provided valuable at-sea mariner and leadership experience, their limited combat capabilities did not contribute to tactical experience or the development of a naval, warrior culture. The challenge, then, is to build a replacement for the MCDV that maintains the success of a ship that is small and simple enough to be inexpensive and crewed with a smaller, more junior ship's company, yet large and combat capable enough to overcome the shortcomings of the current design and thereby deliver more operational and strategic effect.

The need for more operational and strategic effect is evident in any examination of Canada's current geopolitical situation. When the MCDVs were built in the 1990s, the world was entering a unipolar moment in which Canada and our allies faced no credible military threat. The lightly armed MCDV was perfectly capable of contributing to constabulary missions and conducting MCM operations in a permissive environment, provided by allied air superiority and sea command.

With the return of great power rivalries, however, Canada needs the ability to deny enemies the capacity to threaten North America with strikes launched from within Canada's maritime estate. If the RCN is incapable of this task, then Canada should anticipate that the United States will ignore our sovereignty if it deems it necessary to defend itself. Defending Canada's own sovereignty, which includes the world's longest coastline, requires a mixed fleet of aircraft, submarines, and large and small warships. And while this task is the RCN's top priority, Canada will still want the option of contributing forces to multinational efforts to maintain a rules-based order, which will demand a portion of the RCN's capacity.

It is evident that 15 River-class destroyers and up to 12 diesel submarines – each of which will only be available for high-readiness taskings during a portion of their operational cycles, due to maintenance and training requirements – will not be sufficient. Adding small, less expensive (but still capable) warships is the most efficient way to increase the capacity of the RCN to meet its challenges. The primary mission of the MCDVs' replacement should therefore be to extend Canada's ability to monitor its maritime estate and to deny potential enemies the ability to operate there. Required capabilities include submarine detection and prosecution, both minelaying and minehunting, and performing surface strikes. Secondary missions include the ability to contribute to allied defence through these same capabilities. Only after these capabilities are incorporated into the design should the tertiary constabulary mission set be accommodated.

Sea denial is not commonly thought of as a mission for the RCN. Many observers will argue that the RCN should be capable of exercising sea control in Canada's own waters. When facing a peer or a superior enemy, however, an initial sea-denial strategy will allow Canada to deter and, when necessary, defend its territory from attacks originating in its maritime estate and to attrite the enemy's force. Sea-denial missions against enemy submarines will require modern sonar, torpedoes, and the ability to extend the range of anti-submarine warfare (ASW) through uncrewed aerial vehicles (UAVs). The MCDVs' replacement must be able to contribute to the ASW fight but will play a secondary role, behind submarines, long-range patrol aircraft, and helicopter-equipped destroyers. For this reason, the selection of sonar should balance capability with space requirements. Additionally, with the secondary ASW role that the MCDVs' replacements will play, the requirement for ASW platforms to be quiet should be balanced against the greater cost and complexity of this design feature.

Sea denial against enemy ships, or anti-surface warfare (ASUW), will require speed, strike missiles, and, again, the use of UAVs to extend the range of both detection and attack. As with the ASW mission, the selection of ASUW weapons will require a careful balance of capability, size, and the number of weapons. The use of UAVs may provide flexible options to increase the ASUW capability of the ships while limiting the space required. While crewed helicopters provide more flexibility, their greater size and crewing requirements would make the ships more expensive to operate.

Beyond using UAVs in place of crewed helicopters, the design should actively seek options to limit the vessels' size. These choices include sensors, weapons, boats, and, most importantly, crew size. The highest level of automation possible should be used in operations, engineering, and watchkeeping to free up the limited number of sailors for maintenance and special evolutions, such as replenishment at sea, boardings, and the control of uncrewed vehicles. Additionally, the RCN

should resist the temptation to create an at-sea command platform. With modern communications, this function should be conducted ashore.

One option to limit size is the concept of modularity for specific capabilities that are not required for all missions. The addition of minehunting and minelaying capabilities through this concept would add to the sea-denial capabilities of the ship. With the uncertainty created by the renewal of great power competition, Canada must have the capability to reopen ports after an enemy has laid mines in Canadian waters. The reverse side of this issue is that sowing a defensive minefield – an ability that Canada does not presently have – is the easiest way to deny the enemy the ability to operate in Canadian waters.

As with the sea-denial mission in Canadian waters, the return of great power competition means that air superiority and sea control cannot be assumed when Canada commits its forces to multinational operations in support of the collective defence of allies and partners. For this reason, in replacing the MCDVs, the most important requirement is to acquire a warship that is capable of self-defence in all warfare areas. In anti-air warfare (AAW), this will require a balance between keeping the ships small enough to not be primary targets for the most expensive and sophisticated enemy weapons, while also ensuring they are large enough to accommodate the required sensors and passive and active air defences. Striking this balance will be one of the most important decisions in the ships' design, and while limiting the AAW capability to point defence, every effort should be made to procure innovative soft- and hard-kill defences for the most challenging threats, while not gold-plating the ship.

Designing a ship capable of sea denial against enemy submarines and surface ships, and of defending itself against attack, necessitates a larger platform than the MCDV, which measures 55 metres in length and displaces 970 tons. This will deliver the added benefit of improved seakeeping, which has been a significant weakness of the MCDVs. Ships operating in Canadian waters face some of the roughest conditions in the world, and crew effectiveness is negatively impacted by poor seakeeping. Exactly how much bigger the replacement ships need to be to accommodate the increased capabilities and deliver improved seakeeping will be based on their design, but a survey of similar ships being constructed around the world shows a range of 80–130 metres in length and a displacement of 2,000–3,000 tons. The cost of the hull is a small portion of the ship's total cost, compared to the combat systems, so size should not be limited by the cost to build. However, the larger the ship, the more effort and expense it will require to maintain. Additionally, since an important objective is to provide experience to more junior officers and sailors, the ship's design should be as small as possible, while ensuring the inclusion of all key capabilities and improved seakeeping.

While the RCN demonstrated the value of the MCDVs through innovative overseas deployments, their limited ability to operate in rough seas was a constant concern that reduced the effectiveness of the ships if they were rerouted for weather or less able to remain on station. In contrast, the larger size and greater capabilities of the MCDVs' replacements will also permit Canada to use them as a flexible forward presence that would be an eagerly welcomed contribution to a multinational force, operating alone or in a pair on tasks independent of a task group.

Such ships will be in high demand, and the RCN should develop a multiple-crew concept of operations that would see the ships forward deploying for extended periods, rotating crews.

Additional capabilities, not currently in the MCDVs, are required to realize the expeditionary potential of their replacements. These capabilities include links and communications to integrate into allied task groups, the ability to replenish at sea, and a flight deck capable of receiving – but not hosting – allied helicopters.

The ship that results from the points above would offer a balance of increased warfighting capability (to match the growing threat) and limited size (to cost-effectively increase the RCN's capability). It would be twice as large as the MCDV at about 100 metres and 2,000 tons in displacement. The crew size would be as limited as technology permits, probably between 60 and 70 sailors and officers. It would be significantly faster than an MCDV, with a top speed near 30 knots, and would have improved seakeeping characteristics. It would not be capable of icebreaking but would be able to operate in Canada's North in the navigable season. The vessel would be equipped with modern radars, sonars, and communication equipment. It would be armed for AAW point defence with short-range surface-to-air missiles and a rapid-fire gun, while it would be armed for ASUW with shorter-range surface-strike missiles and UAVs capable of delivering surface strikes. Meanwhile, it would be armed for ASW with shipborne light-weight torpedoes and would depend upon other units for the delivery of longer-range attacks. It would have the ability to conduct both minelaying and minehunting through a modular capability. It would be sustainably forward deployed with a replenishment-at-sea (RAS) capability and would have a limited interdiction capability with smaller boats and a smaller boarding party. The ship would not have a helicopter or command capability, and while it would not be gold plated in terms of sensors or weapons, it would be lethal and effective.

It is evident that Canada has disproportionately benefitted over the last 25 years from the acquisition of the MCDVs. While they bring much less capability than a Halifax-class frigate, they have conducted missions all over the world at a fraction of the cost of larger ships. Even more importantly, they have provided leadership opportunities to junior officers and sailors when frigates were less available. The continuing success of frigate deployers on Operation *Reassurance* (the RCN's contribution to NATO) and Operation *Projection* (the RCN's deployments in the Indo-Pacific region) are testament to the skills and experiences that commanding officers and senior ratings have acquired in the MCDVs. To ensure a steady supply of experienced officers and sailors for employment in the future River-class destroyers, and to provide sufficient platforms for sea-denial missions on all three of Canada's coasts, while also providing the option for cost-effective expeditionary operations, Canada should acquire a considerable number of these lower-cost platforms. The smaller MCDVs operated for 25 years with less intensive maintenance routines and were routinely able to keep four or five of the six ships on each coast operational – with the sixth in long-term maintenance. If such a maintenance concept of operations is possible with their replacements, a fleet of six ships on each coast would be capable of keeping one ship forward with rotating crews, three ships at normal readiness levels for domestic and North American operations, and two ships in either long-term maintenance or in reactivation activities.

Admiral Nelson would have undoubtedly agreed on the value of such ships. Can the RCN convince Canada's political decision-makers and the broader public?

Notes

[1] Patrick O'Brian, *Men-of-War: Life in Nelson's Navy* (London: HarperCollins Publishers, 2023), 7.
[2] Ken Macpherson and Ron Barrie, *The Ships of Canada's Naval Forces 1910–2002*, 3rd ed. (St. Catharines: Vanwell Publishing, 2002).

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