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## PREPARING FOR THE FUTURE: WHY THE RCN SHOULD SPECIALIZE IN ASW

LCdr C.J. Forsberg

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## **PREPARING FOR THE FUTURE: WHY THE RCN SHOULD SPECIALIZE IN ASW**

### **AIM**

1. The aim of this service paper is to recommend a focus area for the Royal Canadian Navy (RCN) when considering modernization of current fleet and when building the future fleet. The navy is currently planning for the next fleet of warships in a fiscally constrained environment, one way to maximize effectiveness and ensure value added to future CAF and Coalition operations at sea is to specialize in ASW operations, particularly in the littoral zone.

### **INTRODUCTION**

2. This service paper will reflect on future operating environment, increase sub surface threats, operational weakness identified by the United States Navy and how they addressed future ASW capabilities and why the RCN should specialize in ASW operations, particularly in littoral ASW when planning the future fleet. For the purposes of this service paper the littoral area can be considered the following: a coastal region consisting of the coastal sea areas and that portion of the land that is susceptible to influence or support from the sea<sup>1</sup>. Given that Canada borders on three oceans, the maritime security of Canada's approached in the littoral zone will undoubtedly be one of the core missions for the RCN in the upcoming defence white paper and the littoral zone is a major consideration when planning for future expeditionary operations. Furthermore, Canada's global interest could be threatened if there is a conflict overseas given the reliance on international trade which fuels Canada's economy. More than 80 percent of the world's urban centres are located in the littoral zone, 75 percent of the world's energy travels

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<sup>1</sup> Department of National Defence, "Concept for Anti-Submarine Warfare", last modified 19 August 2014, 7. <http://collaboration-navy.forces.mil.ca/sites/DNavStrat/Concepts/SitePages/Home.aspx>

through maritime chokepoints in the littoral zone making the littoral maritime domain a strategic security concern for Canada's future economic security<sup>2</sup>.

3. Canada, through the RCN, has been able to maintain a solid reputation in ASW operations through involvement in multinational exercises such as RIMPAC and Trident JUNCTURE where the RCN had command roles in leading the ASW battle. Also, the RCN's continued involvement in the sea phase of the United States Navy (USN) Submarine Commanders Course has allowed the RCN to continually evolve its tactics against state of the art nuclear submarines. This involvement has allowed the RCN to develop, evaluate and test layered ASW tactics and equipment in open ocean. However, there has been little focus on the littoral. The lessons learned from open ocean operations can be applied to littoral operations but without modernized equipment our current suite of sensors will be ineffective due to the lack of modern sensors and the ability to process large volumes of acoustic data. The ability to differentiate between discrete noises from a submarine contact and the background noise from a high traffic inshore zone is essential for littoral operations to provide target cueing prior to the sub surface contact entering engagement range of the ship. This is a capability gap that needs to be rectified in future ships to remain seen as a relevant contributor to Coalition operations. If the Canadian Surface Combatant (CSC) project is further delayed, an ASW modernization package for the current fleet should be re-invigorated to replace the legacy sensors that were not replaced as part of the Halifax Class Modernization program (HCM).

## **DISCUSSION**

4. The operating environment is changing as technology becomes increasingly affordable. Diesel electric submarines are becoming a cost effective solution for third world nations to

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<sup>2</sup> Department of National Defence, *The Future Security Environment 2008-2030 Part One: Current and Emerging Trends* (Ottawa: DND Canada, 2009), 17.

possess a sea denial capability within their territorial waters and economic exclusion zone (littoral waters)<sup>3</sup>. Although the overall number of submarines operating throughout the world has decreased since the cold war, the number of countries possessing submarines has increased greatly, with approximately 40 states currently operating submarines<sup>4</sup>. To add further instability and uncertainty to the current balance of power, Russian sub-surface naval activity has recently increased to levels not seen since the height of the cold war<sup>5</sup>. Due to lack of transparency in Russian foreign policy and recent Russian activities in Ukraine, and Syria, it is unknown what Russia intends to accomplish with increased submarine presence. Also, with their mix of nuclear and diesel electric submarines that have been re-furbished or newly built, their fleet has a diverse array of capability in open ocean and the littorals.

5. Russia and China are not the only potential adversaries on the horizon: North Korea continues to act unpredictably through provocation and nuclear testing initiatives<sup>6</sup>. These and other states have large sub-surface forces which operate in littoral waters and are now expanding into the open ocean. Also, the current trend away from state on state conflict to adversaries that are non-state actors capable of increasingly complex asymmetric attacks are often not bound by the same moral, legal and regulatory obligations of western liberal democracies<sup>7</sup>. This allows them to conduct asymmetric engagement at a point of perceived weakness<sup>8</sup>, in this case, taking advantage of the stealth offered by submarines. There is a possibility that a non-state actor could acquire a submarine from a supportive or failing state. Recently a threat assessment produced by

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<sup>3</sup> Department of National Defence, *The Future Security...*, 17.

<sup>4</sup> The Nuclear Threat Initiative (NTI), "Submarine Proliferation Resource Collection" last modified 24 July 2015, <http://www.nti.org/analysis/reports/submarine-proliferation-overview>.

<sup>5</sup> Thomas Gibbons-Neff, "Russian submarine activity hits levels not seen since the Cold War: report" Washington Post, 4 February 2016.

<sup>6</sup> United States Navy, Chief of Naval Operations, *A Design for Maintaining Maritime Superiority*, 3, [http://www.navy.mil/cno/docs/cno\\_stg.pdf](http://www.navy.mil/cno/docs/cno_stg.pdf).

<sup>7</sup> Department of National Defence, *The Future Security Environment...*, 88.

<sup>8</sup> Department of Defense, *Quadrennial Defence Review 2014*, (Washington D.C.: Department of Defense, 2014), 6.

NATO has surmised that the Islamic State in Iraq and Levant (ISIL) has aspirations to acquire a naval capability to attack ships in the Mediterranean<sup>9</sup>. The worst possible scenario would be an acquisition of a submarine which could engage civilian shipping with impunity. Although unlikely to occur, this cannot be discounted in the future due to financial hardship faced by some states and those states that are sympathetic to their cause. The littorals zone would be the preferred place to conceal an inexperienced submarine crew, be it a state or non-state actor crew, due to the challenge of detection in that environment. Ships are most vulnerable when entering and leaving port due to limitations on manoeuvring in confined waters, participating in traffic separation scheme where a speed is limitation imposed due to proximity to dangers or a vessel being under tug assistance.

6. Adversaries are exploiting the advantages of the low cost and easy access to continuously evolving technologies, and they are constantly developing new tactics that outpace traditional military responses or render them obsolete<sup>10</sup>. The availability of new technology such as Air Independent Propulsion (AIP), new material for sound absorption and new fitted equipment are making submarines quieter and much more difficult to detect. When located in high traffic littoral environment, these submarines are extremely difficult to locate, and unlike with diesel electric models that need to surface for air or run a diesel engine when their batteries are low, an AIP submarine can stay submerged for a week. By staying submerged they can discreetly build their target plot and not expose their mast to detection until attempting to positively identify their target, if that is even a requirement for their engagement. Also, the new materials which are being employed to coat submarines to prevent active sonar detection are becoming more

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<sup>9</sup> Ben Farmer, "Isil 'wants its own navy for attacks on cruise ships in the Mediterranean'", The Telegraph, 28 January 2016.

<sup>10</sup> Department of National Defence, "Concept for Maritime Unmanned Systems (MUS)", last updated 15 November 2015, 7. <http://collaboration-navy.forces.mil.ca/sites/DNavStrat/Concepts/SitePages/Home.aspx>

advanced to defeat a broader frequency spectrum. Another major development in submarine technology which diminishes the surface fleet final advantage is a sub launched anti-aircraft missile. This takes away the last advantage of layered ASW where aircraft had previously been the best way to detect a submarine at a safe range from the screening ship of a formation, so as to not enter the maximum effective torpedo firing range with little to no risk from a submerged submarine. To highlight the sub surface threat, in 2007, a Chinese submarine penetrated a screen of 12 ships to surface beside a USN aircraft carrier, USS KITTY HAWK if this had been a time of conflict, the aircraft carrier or any of the screening units could have been irreparably damaged or sunk<sup>11</sup>. This demonstrates a submarine's stealth when approaching superior force and the consequence of complacency of a surface fleet when in a perceived area of sea dominance.

7. Pervasive awareness is a growing trend on the battlefield of the 21st century, knowing where the enemy is at all times and having the ability to choose where to engage and destroy is a key tenet of the USN ASW concept of operations<sup>12</sup>. Pervasive awareness is much simpler when tracking surface or air contacts, however the task of knowing where all subsurface contacts are at all times. It is a difficult undertaking given current technological limitations on sub surface detection due to reliance on active or passive acoustic detection sources for area search which can be affected by temperature salinity and depth of the water column, or the aspect and hull material of the sub surface contact. Other means of finding sub surface contacts are magnetic anomaly detection for aircraft when over top of a contact, but this limits the area coverage to point detection. Pervasive awareness is much simpler when submarines are surfaced since the full spectrum of intelligence, surveillance and reconnaissance (ISR) assets could detect a

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<sup>11</sup> Matthew Hickley, "The uninvited guest: Chinese sub pops up in middle of U.S. Navy exercise, leaving military chiefs red-faced", The Daily Mail, 10 November 2007.

<sup>12</sup> Department of the Navy, *Anti-Submarine Warfare Concept of Operations for the 21<sup>st</sup> Century*, 4, <http://www.navy.mil/navydata/policy/asw/asw-conops.pdf>.

surfaced vessel through radar, communications intercept or imagery. Allied forces, particularly the USN, are currently developing capabilities that will enable pervasive awareness through the use of deployable static arrays for submarine detection and that will create a sensor rich environment versus a platform rich environment that is required to insonify and effectively search an ASW threat area today<sup>13</sup>. To achieve a functional capability, there are a number of challenges that have to be overcome to be able to effectively communicate and integrate that data into a network centric battlespace. Technology has not advanced to a point where unmanned underwater vehicles (UUVs) can be controlled in real time and underwater non-acoustic communications are not currently developed<sup>14</sup>.

8. To be prepared for near future battles the RCN should continue to work with industry and defence scientists to develop (UUVs) but in the meantime updating current sensors should be a priority. The RCN legacy hull mounted sonar and towed array system are based on technology that is 40 years old and does not have the processing power to be able to discern contacts in a congested acoustic environment. Updating to current commercial off the shelf (COTS) such as active passive multi-functional towed array (MFTA) systems with accompanying hull mounted sonar would renew RCN capability to equal that of the USN and Royal Navy (RN). An MFTA would allow for active passive sonar search in the same water column as the submarine, greatly increasing probability of detection. This would be similar to a capability that was divested with the Iroquois class, variable depth sonar (VDS), but the newer version of MFTA has a passive towed array cable for acoustic detection with an active sonar module at the end of the acoustic array. The active sonar module also includes a torpedo detection system which would provide

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<sup>13</sup> Ibid, 4.

<sup>14</sup> Antoine Martin, "Unmanned Maritime Systems: Global Review of technology, Roadmaps, Roles, Challenges & Opportunities, and Predictions", 14. <http://www.uvs-consulting.com/wp-content/uploads/2014/01/AUVSI-Aug-13-UMS-Global-Review-UVSC.pdf>



early warning of an inbound torpedo and increase the probability of ship survival with earlier torpedo detection allowing the ship to commence evasion tactics sooner. When considering equipment for the CSC a COTS solution that is integrated with the command and control system would immediately enhance RCN capability to integrate with USN and allied forces and share combat information in real time. This would enable the pervasive awareness tenet USN ASW concept and maintain Canada as a relevant partner by contributing information to the common operating plot.

9. The USN developed the Littoral Combat Ship (LCS) as a means to increase their littoral fighting capability and to create a ship that would allow their higher value destroyer and cruisers to remain in the open ocean to defend an aircraft carrier or other high value unit. The LCS was built to support three main roles, ASW, Anti-Surface warfare and Mine Countermeasures in the littoral zone while under the area air defence envelope of the larger capital ships operating further out at sea. The USN identified a threat to their line units and developed this class bridge the gap between the shore and open ocean to ensure total situational awareness. This class of ship has come under a great deal of criticism due to its lack of air defence and to engage over the horizon targets, but that is changing with an ongoing modernization program and development of Frigate to fill the gaps identified by this class. The RCN is well positioned to apply these lessons learned for the design of CSC and ensure that future ships will be able to contribute to a perceived area of weakness of our closest ally.

## **CONCLUSION**

10. Specialization in ASW operations in general and further development of littoral tactics and procedures is a way for the RCN to remain relevant in future operations. The aim of pervasive awareness is a growing requirement for operations to ensure ability to use precision guided munitions to quickly and effectively destroy the enemy while maintaining the advantage.

The underwater space is the final frontier that eludes pervasive awareness and the RCN should take measures to equip the current or next fleet with the sensors to contribute to the building of the underwater at a range beyond a submarine torpedo engagement range. To be able to build the underwater picture into sub launched anti-ship missile range, continued research in static array is required in conjunction with industries and our Five Eyes partners. Paragraph 6 highlights the requirement to maintain an ASW posture to locate subsurface threats at all times. An appropriate active posture will deter threat submarines from approaching your formation and maintain sea denial. Pervasive awareness should continue to develop in the underwater so that Allied forces can maintain the advantage and remove the stealth afforded to submarines. This is where the RCN has the ability to fill a gap in US and Allied forces capability by being able to detect subsurface threat at longer ranges and in the open ocean and littoral zone.

## BIBLIOGRAPHY

- Department of National Defence, “Concept for Anti-Submarine Warfare”, last modified 19 August 2014. <http://collaboration-navy.forces.mil.ca/sites/DNavStrat/Concepts/SitePages/Home.aspx>
- Department of National Defence, “Concept for Maritime Unmanned Systems (MUS)”, last updated 15 November 2015. <http://collaboration-navy.forces.mil.ca/sites/DNavStrat/Concepts/SitePages/Home.aspx>
- Department of National Defence, *The Future Security Environment 2008-2030 Part One: Current and Emerging Trends*. Ottawa: DND Canada, 2009.
- The Nuclear Threat Initiative (NTI), “Submarine Proliferation Resource Collection” last modified 24 July 2015. <http://www.nti.org/analysis/reports/submarine-proliferation-overview>.
- United States Navy, Chief of Naval Operations, *A Design for Maintaining Maritime Superiority*. [http://www.navy.mil/cno/docs/cno\\_stg.pdf](http://www.navy.mil/cno/docs/cno_stg.pdf).
- Department of the Navy, *Anti-Submarine Warfare Concept of Operations for the 21<sup>st</sup> Century*. <http://www.navy.mil/navydata/policy/asw/asw-conops.pdf>
- Department of Defense, *Quadrennial Defence Review 2014*. Washington D.C.: Department of Defense, 2014.
- Antoine Martin, “Unmanned Maritime Systems: Global Review of technology, Roadmaps, Roles, Challenges & Opportunities, and Predictions”, 14. <http://www.uvs-consulting.com/wp-content/uploads/2014/01/AUVSI-Aug-13-UMS-Global-Review-UVSC.pdf>