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ASW TACTICS AND DOCTRINE OBSOLESENCE:
How Advances in Technology are Reshaping the Future ASW Battlespace

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JCSP 44

SERVICE PAPER

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PCEMI 44

ÉTUDE MILITAIRE

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CANADIAN FORCES COLLEGE – COLLÈGE DES FORCES CANADIENNES
JCSP 44 – PCEMI 44
2017 – 2018

SERVICE PAPER - ÉTUDE MILITAIRE

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Word Count: 2313

Compte de mots: 2313

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AIM

1. The aim of this service paper is to recommend that the Royal Canadian Navy (RCN) thoroughly review and update ASW doctrine and tactics to exploit and defend against new and emerging technology. Both the RCN and Royal Canadian Airforce (RCAF) are in the midst of upgrading their Anti-Submarine Warfare (ASW) systems to include multi-static acoustics. This new capability, coupled with the emergence of unmanned systems, underwater networks, improved signature management, submarine air-defence, and more sophisticated torpedoes, represent a paradigm shift in how warfare will be conducted in the future underwater domain.

INTRODUCTION

2. The evolving ASW environment provides both significant challenges and opportunities for the future of the RCN. In order to effectively maintain sea control or exercise sea denial, the RCN must be proactive in combating these challenges and harnessing the opportunities to exploit them to their full potential. Given the long lead times for procurement, and the significant price tag that comes along with capital projects to outfit the Fleet, the RCN needs a clear vision on how it will fight in the future to ensure all efforts are working towards the same end state. While the RCN Concept for ASW discusses the future ASW focus, it does not specifically outline how these concepts will

be integrated. Furthermore the concept does not take into account how new tactics and doctrine will impact other areas of warfare.[1]

3. While the developments in ASW capabilities over the past century are vast, this paper will highlight three of the most significant areas. The focus will be on sensors, unmanned systems, and improved weapon systems. Understanding how these rapidly evolving areas will impact the future ASW environment will show that current doctrine cannot just be added on to, rather it must be re-designed from the ocean floor up. Only through a complete revisit of tactics, techniques, and procedures will the RCN be able to meet the objectives set out by the Commander of the RCN and ensure excellence in operations at sea with a particular focus on war-fighting skills.[2]

DISCUSSION

4. ASW weaponry continues to evolve as technology becomes readily available at a more affordable cost. Both in terms of offensive as well as defensive capabilities, new underwater weapons will change the way the ASW battle is conducted. To put this concept into perspective, from the offensive side the SeaHake Mod 4 Extended Range (ER) torpedo will be highlighted, and on the defensive side, the Seaspider Anti-Torpedo

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[1] Department of National Defence, "Concept for Anti-Submarine Warfare", Accessed 24 January 2018, http://collaboration navy.forces.mil.ca/sites/DNavStrat/Concepts/SitePages/Home.aspx, 16.

[2] Department of National Defence, "RCN Strategic Direction and Intent 2016-2019 ", Accessed 24 January 2018, RDMIS# 358445, 2.

Torpedo will be used along with the Interactive Defence and Attack System for Submarines (IDAS).

5. With an unclassified maximum range of 140km, the German SeaHake Mod 4 ER heavyweight torpedo (HWT) redefines how engagements may occur in future naval operations.[3] No longer will the delivery vessel need to be anywhere near detection range to conduct an engagement. With the option of satellite guidance via a mast on the torpedo, the SeaHake Mod 4 ER can be guided towards its target by operators at a safe distance from the engagement.[4] As stated by VADM Connor (USN), with expected ranges of over 100NM, "the torpedo will come to be considered along the line of slow moving missiles, with the advantage that it is more difficult to detect, carries a much larger explosive charge, and strikes the enemy beneath the waterline, where impact is the most severe."[5] VADM Connor further defines these ultra long range torpedos as "golden bullets", capable of targeting vessels in port, or striking submarines hidden in tunnels, providing a significant challenge for the enemy to defend against.[6] Not only does this capability present the RCN with the opportunity to conduct over-the-horizon underwater engagements, it also presents the problem of how the Task Group will defend itself from an ultra quiet electric torpedo fired from a vessel outside of detection range. Further

[3] Thorsten Bochentin, "SeaHake Mod4 ER - The New Long-Range Heavyweight Torpedo." Presentation, Undersea Defence Technology 2013, Hamburg.

[4] *Ibib.*

[5] United States Congress. Committee on Armed Services. *Game changers: undersea warfare: hearing before the Subcommittee on Seapower and Projection Forces of the Committee on Armed Services, House of Representatives October 27, 2015.* Accessed 2 February 2018, https://www.gpo.gov/fdsys/pkg/CHRG-114hhrg97495/pdf/CHRG-114hhrg97495.pdf, 37-38.

[6] VADM Michael Connor, "VADM Mike Connor, USN Remarks." *The Submarine Review*, June 2015. Accessed January 30, 2018, http://www.navalsubleague.com/assets/tsrjune2015web.30final.pdf , 43-44.

compounding the threat, the SeaHake Mod 4 ER has been designed to operate in very shallow water, allowing for the weapon to be fired from a truck-based launcher ashore.[7] This capability increases the ASW battlespace to not only what is under, on, and above the water, but also now what is located on land. Maritime chokepoints in the future could be potentially closed off, even to submarines, from shore based torpedo capabilities. How this capability will both be exploited and defended against is one that cannot be ignored as this capability has already begun production and sold to at least one undisclosed country.[8]

6. The US Navy with their Countermeasure Anti-Torpedo (CAT)[9], and Atlas Elektronik with Seapsider,[10] are both nearing operational capability of an Anti-Torpedo Torpedo (ATT). The ability to conduct a hardkill engagement versus an incoming torpedo represents a tremendous leap forward in anti-torpedo defence. However, in order to exploit the full capability of an ATT, the RCN will need to revisit current tactics employed. In order to engage the incoming torpedo, the ATT uses its own sensors to search for and destroy the incoming threat.[11] The employment of friendly decoys therefore may hinder the effective use of an ATT without proper mutual interference

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[7] Thorsten Bochentin, "SeaHake Mod4 ER - The New Long-Range Heavyweight Torpedo." Presentation, Undersea Defence Technology 2013, Hamburg.

[8] *Ibid.*

[9] Cherie Winner, "Fire and Forget" *Penn State University News,* 22 August 2017, Accessed 28 January 2018, http://news.psu.edu/story/477927/2017/08/22/research/fire-and-forget

[10] Thorsten Bochentin, "Seaspider Anti-Torpedo Torpedo." *Naval Forces 32-33. Military & Government Collection,* September 2015. Accessed 28 January 2018, http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=1&sid=a9e070d6-6fd6-4679-bf5a-a8f1941d93cd%40sessionmgr4010

[11] Cherie Winner, "Fire and Forget" *Penn State University News,* 22 August 2017, Accessed 28 January

considerations. How exactly an ATT will be best employed will not be addressed in this service paper due to classification and length. However, based on the characteristics of how the ATT will operate, it can be assumed that a noisy environment cluttered with towed and expendable decoys is likely not an optimal solution. Furthermore, allied nations are not the only ones exploring this new technology, highlighted by the Russian development of the Packet E anti-torpedo.[12] As adversaries harness this capability, the RCN will need to determine new tactics to maintain the effectiveness of HWT attacks conducted from RCN submarines.

7. Once immune to the submarine threat, airborne assets are now themselves becoming targets. The submarine launched IDAS missile system developed by Diehl BGT Defense and ThyssenKrupp Marine Systems enables submerged submarines to engage threats from ASW helicopters.13 This new capability presents a significant challenge to the employment of ASW helicopters, an asset that surface forces rely upon to close in on the submarines position as a weapon carrying platform. With surface vessels not able to close due to the threat of a HWT attack, and helicopters becoming more vulnerable, the weapons delivery tactics will need to be re-addressed. At the moment, maritime patrol aircrafts (MPA) are not listed as targets of IDAS. However, as technology improves, they too may become vulnerable to submarine defense systems. To counter this threat, the USN has begun development on systems such as the High Altitude Anti-

[12] Interfax, "Russia Developing Unique-in-World Anti-Torpedo", *Russia & CIS Military Newswire*, 24 January 2017, Accessed 30 Jan 2018, https://search.proquest.com/docview/1861312076?accountid=9867

[13] Richard Scott, "IDAS partners look to re-plan submarine development firing", *Janes's 360*, 27 June 2017, Accessed 2 February 2018, https://www.naval-technology.com/projects/idas-missile-system/

Submarine Warfare Capability (HAAWC) which allows MPAs to remain at a high-altitude (approx. 20,000ft) and launch their torpedos using GPS guided gliders.14 As an MPA may not be available, or in a position to conduct an engagement, the USN has developed a vertical launch capability for their Lightweight Torpedos (LWT).[15] The Vertical Launch Anti-Submarine Rocket (ASROC)(VLA) provides the USN surface combatants equipped with Mk 41 VLS launchers the capability of engaging ASW targets at ranges of over 10NM.[16] With RCN surface combatants not able to close within range of a submarine to conduct an attack without themselves being put in danger, coupled with the introduction of new submarine defence systems capable of targeting low flying weapons carrying ASW assets, careful thought will need to be given as to how the RCN plans on getting weapons on top of threat submarines, and the tactics to achieve this increasingly dangerous task.

8. From multi-static acoustics, to the proliferation of civilian and military ocean-observing arrays, the ability to make the oceans more transparent has never been greater. The expansion of undersea arrays to support commercial endeavours are becoming more common, and the undersea warfare realm will need to take account of this capability both to exploit its potential, and defend against inadvertent detection of friendly forces by non-

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[14] Andrew Drwiega, "Changing the Game in ASW Key Role for Lightweight Torpedoes", *Naval Forces 38, no 2.*, March 2017, Access 1 February 2018, http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=1&sid=e35f475a-89ec-4e8c-8caa-a6c20a34d76b%40sessionmgr104, 16.

[15] Department of the Navy, "Vertical Launch Anti-Submarine Rocket", *United States Navy Fact File.* 6 December 2013, Accessed 2 February 2018, http://www.navy.mil/navydata/fact_display.asp?cid=2200&tid=1500&ct=2

[16] *Ibid.*

military sensors.[17] In a networked environment, acoustic sensors of surface ships, submarines, ASW aircraft, and fixed or mobile off-board sensors, have the capability to operate as a cohesive system dispersed over a large geographical area.[18] An operational issue not germane to the RCN, even the USN have raised the concern that although tactics have been created for ASW platforms and sensors, "none of them provides an overall concept of employing subsurface, surface and airborne ASW forces in combination."[19] One area in particular where this issue can be seen within the RCN and RCAF is with the introduction of Low Frequency Active (LFA) sonar. Although the Helicopter Long Range Active Sonar (HELRAS) is a new capability being introduced on the Cyclone helicopter, the Italian Navy has been using this system since 2007 and reporting ranges of up to 50NM, significantly greater than what has been seen before on ASW helicopter sonars.[20] The RCN on the verge of introducing LFA through the Underwater Suite Upgrade (UWSU) project will also see greatly improved detection ranges from surface combatants. With these extended acoustic ranges, the days of relying on ATP-28 to generate a tactically effective close support screen will no longer be viable. ASW planners will have to relook at how assets are dispersed to exploit the full coverage offered by new technology, while ensuring units are still within mutual support range for other areas of warfare.

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[17] Bryan Clark, "The Emerging Era in Undersea Warfare", *Center for Strategic and Budgetary Assessments,* January 22, 2015, Accessed 26 January 2018, http://csbaonline.org/research/publications/undersea-warfare, 17.

[18] Vego, Milan N. "Patrolling The Deep." *Armed Forces Journal*, January 1, 2008. Accessed February 2, 2018, http://armedforcesjournal.com/patroling-the-deep/, 6.

[19] *Ibid*., 6.

[20] Luca Peruzzi, "NH90 Sonar System Tests nearly Complete", *Flight International* 171, no. 5092 (Jun, 2007): 34, Accessed 2 February 2018, https://search.proquest.com/docview/225079949?accountid=9867.

9. The introduction of new capabilities also comes with a trade-off. In order to exploit the LFA capability in the deep sound channel, ASW helicopters will be required to dip deeper and longer, thereby extending their dip cycles. Adding to the equation is the extra weight the ASW helicopter would have to carry if continued to be employed as a weapons carrying platform. Although this problem existed in the traditional ASW realm, the increased dip cycles and increased capability as the primary detection asset compounds the planning problem for maritime helicopter employment. Even if the risk posed by IDAS as described above could be ignored, future ASW planners will have to consider weighing down their most capable detection asset with weapons, thereby reducing the amount of time they can remain on station. With longer detection ranges offered by low frequency transmissions and the potential greater dispersal of units, the ability to reposition air assets, or launch an alert weapons carrier, may no longer be a viable option. As noted by Milan Vego, the concentration of ones force to engage in combat at the right place at the right time is key to successful conduct of war at sea. However, he further notes that concentration of one's naval force may be one of calculated dispersal, but forces must not be extended beyond mutual assistance range.[21] The above factors highlight the fact that how the RCN gets an ASW weapon on top of a threat contact, while maximizing ASW coverage, will need to be considered as technology re-shapes the future ASW battlespace.

[21] Milan N. Vego, *Operational Warfare at Sea: Theory and Practice*, (London: Routledge, Taylor & Francis Group, 2017), 59.

10. Perhaps the most impactful change in emerging technology lies with maritime unmanned systems (MUS). Not constrained by human limitations such as mission duration or safety constraints, there is little debate on the importance of MUS in the future warfare environment; rather the focus should be on properly implementing MUS into the RCN to better meet the needs of the future fleet.[22] Although proper implementation is highlighted in the RCN MUS concept, with the ability to act as a sensor to expand coverage, or a weapons carrying platform to extend engagement ranges, current doctrine does not account for how MUS will be optimally implemented to enhance fleet capability. Conversely, how the RCN will defend itself when confronted with adversary MUS will also need to be addressed. Cheaper than manned submarines, adversary commanders may become bolder, using MUS for riskier operations.[23] Given the high cost of current LWT and HWT, the RCN will need to determine how engagements versus unmanned systems will be conducted. With an operating environment potentially littered with numerous relatively cheap unmanned foes, some for sensing, others for attacking, the current inventory of LWT and HWT may not be the best option for engaging these threats.

CONCLUSION

11. "It is not technology alone that leads to disruptive changes on the battlefield, but the incorporation of technologies into new concepts of operation and doctrine, along with

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[22] Department of National Defence, "Concept for Maritime Unmanned Systems", Accessed 25 January 2017, http://collaboration-navy.forces.mil.ca/sites/DNavStrat/Concepts/SitePages/Home.aspx, 8.

[23] Bryan Clark, "The Emerging Era in Undersea Warfare", *Center for Strategic and Budgetary Assessments,* January 22, 2015, Accessed 26 January 2018, http://csbaonline.org/research/publications/undersea-warfare, 17.

the training and organizational structures to capitalize on these advantages."[24] The plethora of new technology available to the RCN will not be fully exploited to their maximum potential merely by viewing them as additions to how we currently do business. Tactics and doctrine will need to be redesigned from the ground up taking into account the capabilities and limitations of new technology. Sailing around in as a concentrated Task Group, having the helicopter or MPA proceed to prosecute on-top of the submarine may no longer be the best tactic with the systems being introduced in the near future. As the World's oceans become more transparent through the use of networked sensors and unmanned systems, the side that can exploit new capabilities to their full potential will have a significant advantage. With the possibility of longer range detection and engagements, the future battlespace will look significantly different. What roles will remain manned and what can be replaced or augmented by unmanned systems will be another question that needs to be answered in order to determine how future ASW assets will be integrated and employed. The RCN needs to determine how it intends to fight in this re-shaped environment to ensure future procurement projects are all working towards supporting the same vision.

[24] Paul Scharre, "Swarming The Battlefield" , *Defence News,* 5 January 2015, Accessed 3 February 2018, https://www.defensenews.com/opinion/commentary/2015/01/05/commentary-swarming-the-battlefield/

RECOMMENDATION

12. Based on emerging technology in the ASW realm, the following recommendations will assist the RCN in harnessing their full potential:

a. The RCN in conjunction with the RCAF should conduct an analysis on current and emerging ASW technology to determine their impacts on current ASW tactics and doctrine both from a defensive as well as an offensive role.

b. A future battlespace section should be added to current tactics and doctrine to allow Force Development teams to tailor procurement roadmaps to support how the RCN intends to float, move, and fight in the future.

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