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TECHNOLOGY WILL ELIMINATE THE ROYAL CANADIAN NAVY'S MINE COUNTERMEASURES VULNERABILITIES

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AIM

1. The aim of this paper is to examine whether the absence of dedicated Mine Counter Measure (MCM) vessels creates vulnerability in the Royal Canadian Navy (RCN) both at the tactical and operational levels. The paper is intended to be an informative piece regarding the current state of the RCN's MCM capabilities and future considerations.

INTRODUCTION

2. In recent years, there has been significant effort devoted in the RCN toward developing and maintaining a capacity to conduct MCM. However, over the last number of years, challenges including human resource limitations, financial restraints, and broadened operations in non-MCM areas have resulted in MCM activities becoming less of an emphasis. The above factors have generated gaps across capabilities and possibly vulnerabilities within the RCN.

3. Compared to an anti-ship missile that costs millions to produce, anti-ship mines are comparatively inexpensive, less technologically complex and as effective at denying access to the Sea Lines of Communication (SLOC) with less of a chance of detection. Over the past two decades, although the RCN's frigates have practiced minefield transits, the wealth of the knowledge in MCM has existed within Fleet Diving Units (FDUs) and the Naval Reserve community aboard the KINGSTON Class ships.

DISCUSSION

Present

4. Twelve KINGSTON Class Maritime Coastal Defence Vessels (MCDVs) were commissioned in between 1996 and 1999 and were designed for "coastal surveillance, naval reserve force training, mine countermeasures for route survey, minesweeping and mine inspection operations."[1] However, their steel construction and commercial design "have high magnetic and acoustic signatures and therefore ill-suited for employment in a mine threat area."[2] Of the twelve KINGSTON Class vessels, only the first three were supplied with the complete degaussing system, which reduces the magnetic signature of the ship, making the ship a valuable MCM asset. Since the commissioning of the first vessels twenty years ago, the equipment has deteriorated and is no longer supported by the original manufacturer, making the equipment obsolete and placing the ship in danger if it were to transit a mine threat area.

5. KINGSTON Class vessels are defined as minor warships within the RCN. According to Leadmark 2050, the RCN's vision of the future, a minor warship "is designed for a specific naval warfare function, such as mine countermeasures, but which is not capable of combat operations against an adversary's naval forces."[3] KINGSTON Class vessels have very limited self-defence capabilities. With the removal of the 40mm Bofors, weaponry is reduced to two .50 calibre Heavy Machine Guns (HMG) and small arms. In the history of the KINGSTON Class, they have never been deployed to an active mine threat area to perform MCM. Rather, the KINGSTON Class have proven "useful in a number of continental defence and security assignments, notably

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[1] Naval Technology, "Kingston Class Coastal Defence Vessels," last accessed 30 January 2018, https://www.naval-technology.com/projects/kingston/.

[2] Coastal Maritime Operational Group Five (CMOG5), Naval Mine Counter Measures (NMCM) Review, (13 October 2017), Annex G – 1/6.

[3] Department of National Defence, *Canada in a New Maritime World: Leadmark 2050* (Ottawa: DND Canada, 2017), 72.

in support of the hemispheric anti-drug effort and U.S.-sponsored regional exercises aimed at improving maritime security capacity in the Americas,"[4] in addition to domestic operations and sovereignty patrols.

6. Innovations have been made to try to improve the MCM capabilities of the KINGSTON Class vessels. Route survey systems such as Side Scan Sonar (SSS), both the Klein 5500 (requires a launch and recovery system from the KINGSTON Class and Klein 3000 (portable and can be operated from the KINGSTON Class or a vessel of opportunity) offer a peacetime capability to support domestic operations, but do not offer a viable option against a live threat. Bottom Object Inspection Vehicle (BOIV) is a Remote Operated Vehicle (ROV) that can be installed on, launched and recovered from the sweep deck of the KINGSTON Class. Like the SSS, the BOIV is not feasible in a live threat area. Both SSS and BOIV are tethered to the vessel and more importantly are passive tools, which "cannot measure the range of an object unless it is used in conjunction with other passive listening devices,"[5] therefore making it difficult to determine the distance to the object.

7. Up until recent years, the KINGSTON Class vessels were crewed mainly by naval reservists with the exception of two or three regular force members. Specific "NMCM training and knowledge is held almost exclusively within the Clearance Diving and Naval Reserve communities,"[6] thereby, limiting the knowledge of the importance of MCM warfare throughout the rest of the RCN. Unfortunately, due to the nature of the primary reserves, employment is

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[4] *Ibid*, 42-43.

[5] National Oceanic and Atmospheric Administration, "What is sonar?" last accessed 30 January 2018, https://oceanservice.noaa.gov/facts/sonar.html.

[6] CMOG5, 20/25.

usually short term, from a couple of weeks to two years in duration, depending on time of year and position. With the high turnover of personnel and specifically, the required MCM training, MCM "readiness in KINGSTON Class is lacking as it has been unnecessary to maintain individual or team training in ROV or Maritime Survey operations based on fleet employment of the class"[7] and lack of trained personnel. Training in the employment of equipment such as the BOIV is "currently disparate and largely ad-hoc"[8] with the absence of both individual and collective training.

8. Developing an effective Mine Counter Measures Tasking Authority (MCMTA) requires specialized Mine Warfare training and is currently conducted haphazardly. MCMTA is the "specialized command and control (C2) structure that conducts planning, coordination, evaluation and command of NMCM operations."[9] A MCMTA comprises of a Commander, Naval Mine Warfare (NMW) Officer, two Watch Officers, a coordinator and two operators/ information managers. As a prerequisite, MCMTA staff members are required to take both the Canadian Standard and Intermediate Mine Warfare courses, however, due to lack of qualified personnel, these courses have been sporadically ran, therefore creating a shortage of qualified personnel to fill the MCMTA billets. Furthermore, the MCMTA is rarely exercised thereby exacerbating the inexperience and lack of mine warfare knowledge. The inexperience and lack of the prerequisite coursing could limit members of the RCN from participating at the operational level in coalition Task Forces or Task Groups.

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7 *Ibid*, Annex D - 3/3.
8 *Ibid*, 9/25.
9 *Ibid*, 3/25.

9. An essential element of Clearance Diving activity involves MCM. MCM diving "is an organic tactical component of Mine Warfare. It comprises the countering of enemy-laid mines to permit friendly manoeuvre or use of selected sea lanes through the use of Clearance Divers."[10] The two Fleet Diving Units (FDUs), located in Esquimalt, British Columbia and Halifax, Nova Scotia, utilize specialized equipment for the "detection, classification, identification and disposal of sea mines . . . provide the only capability for active NMCM and are the only asset to dispose of sea mines in both peace and wartime environments"[11] in the Canadian Armed Forces (CAF).

10. FDUs have access to SSS, the Klein 3000 model, as well as ROVs. The coordination and maintenance of the equipment currently exists in three different organizations within the formation. The ROVs have been consolidated at the FDUs while the route survey equipment (SSS) are under the coordination of two organizations, Maritime Survey and Mine Warfare cells of the Coastal Divisions on each coast. Being spread amongst three different organizations, visibility is loss on the status of scheduled and preventative maintenance of the equipment, risking equipment not being ready to deploy.

11. Mine warfare is a core capability for Clearance Diver Officers (CLDO) and the Clearance Diver occupation. The training that CLDOs and Clearance Divers must undertake can take up to two years and is known to be one of the most intensive and physically demanding courses in the entire CAF. Since the Clearance Diving occupation is so specialized, re-certification is required every two to three years in order to remain current in the specifics of their job. Also, due to the intensity of the training, the Clearance Diver occupation usually graduates less than a dozen

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[10] Department of National Defence, *Naval Diving Operational Concept of Employment (OCE)* (Ottawa: Canada Communications Group, 2004), 15-16.

[11] CMOG5, 5/25.

divers and even fewer CLDO annually. Fortunate for the trade, numerous diving exercises are held around the world annually, side by side with the RCN's allies to assist in remaining current in both Canadian and NATO doctrine. However, with the long training cycle, re-certifications and numerous exercises, CLDO and Clearance Divers, by the nature of their trade, are segregated from the fleet, which unfortunately leads to less emphasis and even less breadth of knowledge in the MCM aspect of warfare.

Future

12. The strategic vision provided in the Concept for Naval Mine Countermeasures, dated 12 Sep 2011 calls for "stand-off autonomous surface and underwater systems capable of being operated from any maritime platform."[12] This strategy aims to remove personnel and large assets from the minefield, which is consistent with the research and development that the United States Navy (USN), the Royal Navy (RN) and Royal Australian Navy (RAN), some of Canada's allies are focussing on. Strong, Secure, Engaged (SSE), the most recent defence policy, iterates the importance to "keep pace with the rapid evolution of technology to ensure continued operational relevance, both to address threats from potential adversaries and to maintain our ability to operate alongside key allies."[13] A category of capability that has gained momentum over recent years is the development and use of remotely piloted systems such as improved ROVs, Autonomous Underwater Vehicles (AUVs), and Unmanned Underwater Vehicles (UUVs).

13. The partnership between the RCN and Defence Research and Development Canada (DRDC) is important, leading to several innovations in MCM. DRDC is conducting extensive

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[12] *Ibid*, 1.

[13] Minister of National Defence, *Strong, Secure, Engaged Canada's Defence Policy* (Ottawa: Canada Communications Group, 2017), 70.

research on systems for the RCN to support Remote Naval MCM. Cooperating with Director Science and Technology (Land) and Heriot-Watt University in Scotland, by using the low frequency of the Hydrason's Biosonar broadband SSS from the UK, "buried Naval Mine shapes and targets in high clutter density areas where high resolution sonar generates too many returns for accurate assessment"[14] were detected. Further research and modeling is being conducted with hopes of collaborating with other nations. Along with the low frequency sonar, DRDC continues to develop and redefine an Automatic Target Recognition suite, which may be integrated into an AUV to assist with the automatic detection of mine shapes. Further to AUVs, DRDC continues to assess the utility of SeeByte's SeeTrack Neptune, which is software that "provides a payload control architecture and real time autonomy engine for unmanned systems."[15] Along with DRDC's involvement, the research and development agencies from the USN and RN have become involved in SeeByte's Neptune software, forming the basis "of the autonomy engine of the Maritime Architecture Framework (MAF) to facilitate autonomous collaboration between unmanned assets from multiple nations."[16]

14. In June 2017, Kraken Sonar Systems announced that it would be teaming with Germany's Atlas Elektronik to focus on the RCN's Remote Mine Disposal System (RMDS). With the assistance of the joint developers, the RCN is looking to develop "a modular stand-off mine countermeasure capability, which is able to detent, classify, localise, identify, and dispose of sea mines and underwater improvised explosive devices."[17] The project, which is expected to be

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[14] CMOG5, Annex I – 6/7.

[15] NavalDrones, "Exclusive Content on Unmanned Naval Systems: SeeByte Systems," last accessed 02 February 2018, http://www.navaldrones.com/Seebyte.html.

[16] *Ibid*

[17] Charles Forrester, "Kraken Announces Teaming Agreement With Atlas Elektronic," *Jane's Defence Industry*, 14 June 2017.

awarded to Kraken-Atlas in 2018, will be utilizing commercial-of-the-shelf (COTS) unmanned systems combined with portable and lightweight AUVs.

15. Further to the RMDS project that is expected to be awarded to the Kraken-Atlas Elektronik partnership, Deep Trekker is to supply the RCN with twelve of its latest DTG2 ROVs which have a "self-paying reel, diveable controller, and 4K camera . . . and can move an EOD diver further from danger as they will be able to take a unit down with a diver where it can go into a confined space or keep the diver off of a suspected mine."[18] Adding to the ability to work with our allies, Deep Trekker also has contracts with both the RN and USN.

16. Personnel and training are issues that both the KINGSTON Class and FDU communities have to contend with. Until recently, naval reservists were mostly employed in the KINGSTON Class vessels. With the "One Navy" concept introduced by Commander Royal Canadian Navy (CRCN) in 2016/17, both reservists and regular force personnel are being employed on both the MCDVs and the frigates within the RCN. This blended crewing is assisting with improving the knowledge and complexity of Mine Warfare. However due to the training lapses, designated warfare courses such as the Operations Room Officer (ORO) or Anti-Submarine Warfare (ASW) director level course should feature a more robust Mine Warfare component. Furthermore, Commanding Officers and Operations Officers of the KINGSTON Class ships and CLDO should attend more specialized courses in MCM Warfare. The benefits of exposing senior personnel to the intricacies of MCM Warfare are two-fold. It would assist in establishing a cadre of subject

[18] Ian Keddle, "RCN selects Deep Trekker ROVs," *Jane's International Defence Review*, 06 June 2017, http://www.janes.com/article/71142/rcn-selects-deep-trekker-rovs.

matter experts within all aspects of the RCN and there would be more people to draw from in the event that a MCMTA was to be stood up.

17. Even with the development of the new innovations, there will be a reliance on FDU personnel to operate the equipment in the event that a mine has to be detonated. In order to properly facilitate the coordination of the additional equipment, the operation and maintenance of all the equipment should be consolidated at the FDUs. This will provide the "potential for operators to cross train on all equipment with a centralized maintenance capability . . . also provide a one stop shop for all related equipment."[19]

CONCLUSION

18. With the KINGSTON Class ships being of metal construction and not provided with enough degaussing equipment to conduct proper MCM operations, the RCN has realistically been without a dedicated MCM platform since the inception of the KINGSTON Class ships. They have proven themselves to be effective ships for domestic operations, counter-drug operations in conjunction with the US Coast Guard and have even conducted trans-Atlantic passages. However, they have not transited to a mine threat area to conduct live MCM operations. In the past, the RCN has relied on allies, who have dedicated MCM ships, to clear the mine threat area while RCN ships provides protection.

19. With a procurement cycle that takes years if not decades to decide upon and build a dedicated platform, the RCN should focus on both COTS technology and new innovations that can be packaged or modularized and put onto vessels of opportunity. By modularizing and using

[19] CMOG5, 15/25.

vessels of opportunity, although the RCN would not have a dedicated MCM ship, all ships that carry the equipment would essentially become a dedicated MCM vessel. Even though major warships practice mine transits, they are not designed to enter a mine threat area. They are a massive national investment so by utilizing ROVs, UUVs, or AUVs, lives and money will be spared. The RCN is small relative to our allies like the USN or RN and will contribute to a coalition at both the tactical and operational level. By focusing on technology to keep on par with our allies, and bolstering our Mine Warfare training system to enable the insertion of knowledgeable personnel into coalition MCM Task Group or Task Force, the RCN will eliminate vulnerabilities, and remain progressive in the advancement of MCM with our allies.

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