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DOES THE ROYAL CANADIAN NAVY NEED SUBMARINES? A SURFACE NAVAL WARFARE OFFICER'S WAVE-TOP PERSPECTIVE

Lieutenant-Commander Ryan DeForest

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By Lieutenant-Commander Ryan deForest

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AIM

1. Both the Government of Canada's (GC) *Strong Secure Engaged: Canada's Defence Policy* (SSE) and the Royal Canadian Navy's (RCN) *Leadmark 2050* (LM) make specific reference to robust submarine capabilities in the underwater domain. In the former, submarines "will play an important role in sovereignty operations and continental defence."[1] In the latter, submarines represent "the RCN's ultimate warfighting capability."[2] However, there is perpetual debate in government and military circles about whether Canada should maintain a submarine capability. This service paper will argue strongly for the maintenance of a crewed submarine capability beyond the *Victoria*-class submarine's operational life and will provide senior RCN leaders additional considerations when developing advice to government for the required capability in the future naval fleet.

INTRODUCTION

2. Canada's interpretation of the future security environment (FSE) is laid out in SSE, with Commander RCN providing his own vision in LM. The FSE will be "a more diffuse environment in which an increasing number of state and non-state actors exercise influence,"[3] but increased great power competition deserves particular attention, given the submarine nexus. The first case is Russia, who considers the Arctic as a national security bastion and is increasingly active in the North Atlantic.[4] Second, and more novel, is China. China is "seeking polar capabilities, including icebreakers and polar-capable submarines,"[5] and are already operating in the North Atlantic.[6] They are doing so with nuclear submarines and "[a] growing fleet of conventional and air independent propulsion-equipped diesel attack submarines [providing] additional potent capabilities."[7] As well, keeping apprised of China's "grey zone" coercion highlights the utility of covert intelligence, surveillance and reconnaissance (ISR). However, the growth of Anti-Access/Area-Denial (A2/AD) in China's near-abroad means stealth confers a significant advantage for keeping a commensurate ISR picture.[8] At the same time, non-state actors acting either on their own accord or as proxy for great powers could exert localized

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[1] Department of National Defence, *Strong Secure Engaged: Canada's Defence Policy* (Ottawa: Minister of National Defence, 2017), 65.

[2] Department of National Defence, *Canada in a New Maritime World: Leadmark 2050* (Ottawa: Commander, Royal Canadian Navy, 2016), 39.

[3] Department of National Defence, *Strong Secure Engaged . . .* , 50.

[4] Rebecca Pincus, "Three-Way Power Dynamics in the Arctic," *Strategic Studies Quarterly* 14, no. 1 (Spring 2020): section 4, paragraph 2, https://search-proquest-com.cfc.idm.oclc.org/docview/2393076781?pq-origsite=summon.

[5] *Ibid.*

[6] *Ibid.*, paragraph 4, section 5.

[7] D. Abenheim *et al*, "American sea power in the contemporary security environment," *Comparative Strategy* 37, no. 5 (2018): section 4, paragraph 16, https://www-tandfonline-com.cfc.idm.oclc.org/doi/full/10.1080/01495933.2018.1526566.

[8] *Ibid.*, section 4, paragraph 15.

influence in crucial locations. This geo-political characterization of the FSE frames the discussion in the service paper. The paper will first look at diesel-electric attack submarine (SSK) capabilities in the 21st century and how they form a unique component of a state's maritime power. International benefits and domestic operational readiness advantages of a crewed submarine force will be explored, as well as challenges to future acquisition and how emerging technologies will impact the undersea domain. Finally, a brief overview of similar, middle power approaches to SSKs will complete the discussion.

DISCUSSION

SSK capabilities in the 21st century

3. SSKs provide non-nuclear navies the opportunity to generate significant, and often disproportionate, effects within the maritime domain. These effects can be achieved alongside other above water assets, such as anti-submarine warfare (ASW) influence within a Task Group, or individually on a single task or operation. Underwriting these capacities is the stealth factor. The submarine offers a covert means to achieve national operational and strategic goals in ways that air and surface assets cannot.[9] A single submarine, particularly an SSK, can be positioned at strategic points to exercise sea denial to an adversary, or support friendly sea control. As "grey zone" operations increase in the FSE, maritime insertion of Special Operations Forces (SOF) elements will become an increasingly useful tool in the national or allied strategic toolbox.[10] The ability to discretely and persistently conduct maritime ISR, including signals intelligence (SIGINT), is unique to the submarine. This is especially so in an environment congested with air and surface A2/AD factors.[11] Improvements to submarine-launched weapons systems will permit surprise joint land attack options. While there are other capabilities an SSK can bring to a middle power navy, these are key elements that advisers and decision makers should keep in mind when discussing middle power naval capabilities.

4. The future appears bright for the relevance of SSKs. They will retain these core capabilities and with improvements in stealth and under water endurance will remain "a key underwater sensor for the near to medium future."[12] As pointed out by Abenheim *et al*, "[t]he ideal warship is the least expensive one that can carry out its strategic role while maintaining a degree of tactical independence in modest threat environments."[13] Uncrewed underwater vehicles (UUV) represent an option to achieve similar effects at much less cost and risk, however that technology, representing a replacement of crewed submarines, remains nascent. Others argue that technological advances will render the crewed submarine obsolete by negating its stealth advantage, but that evolution is still a

[9] Geoffrey Till, *Seapower: A Guide for the Twenty-First Century* (New York: Routledge, 2018), 158.

[10] *Ibid.*

[11] Jeffrey F. Collins, "Towards a Renewed Canadian Submarine Capability," *Niobe Papers*, no. 4 (2019): 4.

[12] Till, 162.

[13] Abenheim *et al*, section 2, paragraph 10.

long way off.[14] Crewed submarines, including SSKs, will remain the option of choice to achieve these strategic effects.

International benefits to maintaining a submarine capability

5. One of the key benefits to possessing a submarine capability within the NATO / partner community is that of access. Being part of the "sub club" grants "decision-makers access to information on allied submarine operations necessary to avoid mutual interference."[15] Losing this critical intelligence link would jeopardize an important node by which the Canadian Armed Forces (CAF) shapes operations and provides military advice to the GC.

6. Secondly, by possessing an SSK capability, Canada is in a unique position to reinforce its maritime defence partnership with its most important ally- the United States (US). Indeed, this defence relationship is essential. Canada, relying heavily on the international rules-based order, finds its own maritime security underwritten by the US Navy, which is "the glue for this vast and unprecedented system of global maritime security."[16] The US itself does not possess SSKs, but finds itself facing adversaries with growing fleets of them. The US has sought to leverage RCN skill and geographic proximity for their own training purposes in the past and is likely to continue to do so in the future.[17] Canada should embrace opportunities to be that sparring partner.

7. Thirdly, and although submarines tend not to be viewed as platforms for defence diplomacy due to their inherently covert nature, being able to field an SSK abroad furthers the defence engagement goals laid out in SSE. As a member of NATO, being able to provide an SSK capability to key regions abroad demonstrates an ability and willingness to contribute to the alliance's strategic goals, such as HMCS *Windsor*'s participation in Operation SEA GUARDIAN in the Mediterranean.[18] In a separate theatre, HMCS *Chicoutimi* completed a lengthy deployment to the Asia Pacific region, demonstrating the reach the RCN is capable of projecting with its SSK force.[19] This demonstrates to allies in the Indo-Asia Pacific (IAP) region that Canada is poised to complement their SSK capabilities in ensuring stability and lawfulness in the region.

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[14] Real Clear Defense, "The Strategic Role of Submarines in the 21st Century," last accessed 29 January 2021, https://www.realcleardefense.com/articles/2017/10/26/the_strategic_role_of_submarines_in_the_21st_century_112537.html.

[15] Collins, 4.

[16] Abenheim *et al*, section 3, paragraph 1.

[17] Collins, 4.

[18] Naval Today, "Canadian submarine HMCS Windsor returns from Mediterranean deployment," last accessed 29 January 2021, https://www.navaltoday.com/2018/06/21/canadian-submarine-hmcs-windsor-returns-from-mediterranean-deployment/.

[19] Canadian Broadcasting Corporation, "Sub culture: Aboard a Canadian submarine prowling the Pacific," last accessed 29 January 2021, https://www.cbc.ca/news/thenational/sub-culture-aboard-a-canadian-submarine-prowling-the-pacific-1.4512960.

Operational readiness benefits to the CAF

8. Not widely written about are the significant operational readiness benefits the CAF enjoys by having an operational submarine force. RCN and Royal Canadian Air Force (RCAF) assets are the prime beneficiaries of this symbiotic relationship. Surface ship's ASW teams have multiple underwater sensors to manage, both active and passive. Live training against a submarine yields results that extant autonomous drones, such as the expendable mobile ASW training target (EMATT), cannot. RCAF assets, both maritime helicopter and long-range patrol, similarly benefit. The effect is enhanced when air and surface assets operate together, providing training within the command and control domain as well. At the same time, submariners hone their track, attack, and evasion skills against a variety of adaptive and reactive above water assets.[20] Somewhat less frequently, RCN submarines provide operational readiness opportunities to other domain operators such as the Canadian Army Patrol Pathfinders and Canadian SOF Command. The operational readiness value is truly pan-domain.

9. Regardless of the participants, CAF control of all assets provides independence from allied availability and schedules, and service branches can directly control the level of training and target specific skill sets. Having such a robust domestic force generation ability cannot be overstated given the resurgence of Russia in the Atlantic, China's increasingly assertive posture in the Pacific, and SOF relevance in grey zone operations.

Evolving the RCNs underwater domain capability

10. As the CAF and RCN look to the future in SSE and LM, it is notable that little is mentioned on the replacement plan for the *Victoria*-class submarines. Indeed, reference is made only to modernizing the *Victoria*-class, with the extant modernization plan intended to keep the boats operational "through the mid-2030s."[21] While the topic of an appropriate replacement is worthy of its own service paper, the point of this paper is to argue the capability should be maintained. Considering the Australian and Spanish experiences, particularly in the domain of domestic production, the CAF must soon decide on a replacement to meet the 2035 timeline.[22] It is almost inconceivable to consider divestment of submarine capability as an appropriate post-*Victoria*-class option. While this may appear attractive given the looming post-COVID fiscal environment, such a decision would nullify strategic options for the GC. Additionally, such a niche capability is lengthy to develop and force generate and would not be easy to "get back" following a decision to divest.

11. UUVs represent an opportunity for the CAF to enhance its undersea presence by complementing, rather than replacing, the crewed submarine. As noted in Forbes

[20] To fully realize the benefits of these valuable interactions, ASW exercise planners are recommended to implement formalized, yet simple, after-action feedback mechanisms. Operations teams should generate detailed post-exercise messages to be shared among all participants, containing timestamps of assessments and/or actions taken, to aid evaluation of ASW effectiveness.

[21] Department of National Defence, "Victoria-class Modernization (VCM)," last accessed 29 January 2021, http://dgpaapp.forces.gc.ca/en/defence-capabilities-blueprint/project-details.asp?id=943.

[22] Collins, 9.

magazine, UUVs "could complement manned warships in conducting tactical reconnaissance, mine countermeasures, anti-submarine warfare, strike missions and a variety of other critical activities."[23] Other observers note UUVs could "extend sensor coverage/abilities, decoy, generate clutter to confuse adversaries, and push into littorals on behalf of the expensive submarine."[24] This sentiment is shared by the US Director of Unmanned Vessels, who in early 2020 stated the goal "isn't to replace manned warships but to augment them so that the fleet has more firepower, more awareness, and more flexibility to disrupt enemy war plans."[25] However, she also notes that "none of the unmanned vessels currently under development is ready to join the fleet. A lot more research and prototyping lie ahead."[26] Indeed, significant challenges exist in the areas of battery capacity, control algorithms, and communications with the "mothership". Despite this, Canada is making strides to incorporate UUVs into achieving maritime effects. Recently, Commander Mark O'Donohue outlined significant steps the RCN has made in initiating UUV projects within Force Development and specific projects in the seafloor mapping domain.[27] In November 2020, Canada joined the NATO Maritime Unmanned Systems Initiative, which promotes collaboration on "operational experimentations, exchanges with the private sector on innovation and initial efforts to develop specific capabilities."[28] Canada should continue seeking similar opportunities to work with defence partners to smartly invest in a technology area that will inevitably impact the conduct of undersea military operations.

Other middle power approaches to submarines

12. There is value in considering how other middle power navies who share similar geopolitical outlooks and challenges are approaching the role of submarines within the context of the FSE. A brief examination of Norway, Spain, Australia and Denmark provides context in framing how Canada should value an SSK capability.

13. Norway, a NATO member, possesses a coastline that borders a strategic route for Russian naval access to the Atlantic Ocean. Indeed, Russia is noted to pose a strategic threat in their latest defence policy.[29] The 2014 Russian incursion into Norwegian

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[23] Forbes, "Biden Defense Team Inherits Navy Robotic Warship Research Aimed At Deterring And Defeating China," last accessed 29 January 2021, https://www.forbes.com/sites/lorenthompson/2020/12/23/biden-defense-team-inherits-navy-robotic-warship-research-aimed-at-deterringdefeating-china/?sh=3bfd7c8f75f9.

[24] Real Clear Defence, "The Strategic Role of Submarines . . ."

[25] Forbes, "U.S. Navy Mounts Campaign To Convince Congress That Unmanned Vessels Are Critical To Winning Future Wars," last accessed 29 January 2021, https://www.forbes.com/sites/lorenthompson/2020/08/17/us-navy-mounts-campaign-to-convince-congress-that-unmanned-vessels-are-critical-to-winning-future-wars/?sh=23a1c9012619.

[26] Forbes, "Biden Defense Team . . ."

[27] Mark O'Donohue, "Autonomous Underwater Vehicles: Future Capability for the RCN," *Niobe Papers* no. 11 (March 2020).

[28] NATO, "Two Allies and one partner join the Maritime Unmanned Systems (MUS) Initiative," last accessed 29 January 2021, https://www.nato.int/cps/en/natohq/news_179602.htm?selectedLocale=en.

[29] Norwegian Ministry of Defence, *The defence of Norway: Capability and Readiness* (Oslo: Ministry of Defence, 2020), 8.

territorial waters is a reminder that this threat is not simply theoretical.[30] At present, Norway intends to keep their six *Ula*-class SSK submarines in service until replacement by four German-designed 1800-ton Type 212 SSKs, which feature air-independent propulsion (AIP).[31]

14. Spain, another NATO member, remains committed to an SSK fleet. At present, it possesses two *Galerna*-class SSKs, having retired two already. These are due to be replaced by four *Isaac Peral* (S-80) class SSKs through 2024, which also feature AIP. At 3400 tons, these boats are notably larger than the Type 212s and are designed for long range oceanic missions.[32] Such is the potential of this platform that is has drawn the attention of India.[33] The production delays experienced by Spain pursuing a domestic build policy are worthy to note should Canada consider a similar plan.[34]

15. Australia, a NATO ally, shares maritime defence concerns similar to Canada, with the exception of their relationship with China. They possess a vast coastline, much of it remote from population centers, and have an economy that faces similar fiscal constraints amid an ambitious military recapitalization plan.[35] Keeping their six *Collins*-class SSK submarines active has remained a priority, going so far as to attract RCN officers to mitigate crewing shortfalls.[36] Replacement with twelve French designed *Barracuda*-class SSKs is intended to double extant capacity, which will see the native nuclear plant replaced with conventional diesel-electric to allay the financial and political costs associated with maintaining a nuclear capability. At nearly 4000 tons and capable of long ocean deployment, it will be the largest conventional submarine in the world.[37]

16. NATO member Denmark is included because its divestment of submarine capability in 2004 helps shape a holistic international view. After the Cold War, Denmark assessed a reduction in submarine activity in its near-abroad justified divestment of its

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[30] Nina Græger, "Illiberalism, geopolitics, and middle power security: Lessons from the Norwegian case," *International Journal* 74, no. 1 (2019): section 5, paragraph 5, https://journals.sagepub.com/doi/10.1177/0020702019834982.

[31] Defpost, "Norway Starts Formal Negotiations with Thyssenkrupp Marine Systems for New Submarines," last accessed 29 January 2021, https://defpost.com/norway-starts-formal-negotiations-thyssenkrupp-marine-systems-for-new-submarines/.

[32] Naval News, "Navantia: Development of S-80 Submarine's AIP System Completed," last accessed 29 January 2021, https://www.navalnews.com/naval-news/2020/03/navantia-development-of-s80-submarines-aip-system-completed/.

[33] Navy Recognition, "Navantia S-80 Plus submarine one of the candidates for the Indian MoD P75I program," last accessed 29 January 2021, https://www.navyrecognition.com/index.php/focus-analysis/naval-technology/9250-navantia-s-80-plus-submarine-one-of-the-candidates-for-the-indian-mod-p75i-program.html.

[34] Naval News, "Navantia: Development of S-80 . . ."

[35] Nikkei Asia, "Australian naval program sums up dilemmas for 'middle power' nations," last accessed 29 January 2021, section 1, paragraph 3, https://asia.nikkei.com/Politics/Australian-naval-program-sums-up-dilemmas-for-middle-power-nations2.

[36] Ipolitics, "Canadian submariners leaving fleet for Down Under," last accessed 29 January 2021, https://ipolitics.ca/2017/08/07/canadian-submariners-leaving-fleet-for-down-under/.

[37] Nikkei Asia, section 3, paragraph 5.

SSK submarines.[38] However a resurgent Russia has now become a national security priority.[39] In a clear shift to an ASW footing, Denmark has updated and reclassified "its *Absalon*-class ships from command and support vessels to the Anti-Submarine Warfare (ASW) role, a move that is a clear reflection of the changing priorities of many NATO navies . . ."[40] However, Denmark finds itself beholden to international partners for maintaining ASW proficiency, and the capability "deficit negatively affects Denmark's ability to enforce the sovereignty of its territorial waters and its ability to support NATO in ASW operations."[41] Clearly, the decision to divest has had serious repercussions for Denmark.

CONCLUSION

17. The debate about whether Canada should maintain a submarine capability seems as rote as tax season. It is indeed a significant expense to maintain the capability, but the level of maritime effect a single submarine at sea brings more than justifies the cost for a middle power navy such as the RCN. Largely out of sight and out of mind when operating effectively, it is easy to forget the ways in which a submarine capability enables the RCN to project military power on behalf of the GC. This paper sought to refocus attention to these core tasks, such as sea denial, sea control, SOF insertion, and ISR (including SIGINT).

18. Beyond those effects normally associated with the application of maritime power, allied SSK users reap additional benefits by maintaining a credible submarine force. Access to waterspace management intelligence and mutual training opportunities provide significant information and reinforce defence relationships. Domestic control of submarine training opportunities grants independence to the CAF pan-domain in achieving readiness goals. These additional benefits rarely receive attention, but they are significant and not easily available via other means.

19. The future of Canada's submarine capability could be positive, if given sufficient long-term investment. Noting that the CAF is fiscally constrained and suffers from a dearth of human resources, Canada must be realistic but thoughtful in selection of submarine fleet size and capabilities. Comparable navies are investing in modern SSK designs, including emergent AIP options, between four and twelve in number of hulls. In contrast, those that divested SSKs are increasingly challenged in the FSE. Canada should give long pause to why we would consider anything other than sustaining this capability, although there is room to enhance underwater domain presence through development of

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[38] Johannes F. Sender and Edward R. Lucas, "Danish-German Submarine Cooperation: Opportunities and Challenges" (Briefing Paper, Royal Danish Defence College, 2017), 7.

[39] Ministry of Foreign Affairs of Denmark, "New Danish Foreign and Security Policy Strategy," last accessed 4 February 2021, https://um.dk/en/news/newsdisplaypage/?newsid=01fc577b-6bf2-4fd7-8572-5af0534cf599.

[40] Systematic, "Changing tack: the Danish Navy's return to high-end warfighting presents an opportunity to benefit from advanced C2," last accessed 4 February 2021, https://systematic.com/defence/c4i-blog-system/changing-tack-the-danish-navy%E2%80%99s-return-to-high-end-warfighting-presents-an-opportunity-to-benefit-from-advanced-c2/.

[41] Sender and Lucas, 11.

UUVs integrated with future national C4ISR architecture. Crewed submarines, augmented by UUVs, represent a potent combination for long-term strategic RCN undersea awareness and control.

RECOMMENDATION

20. SUSTAIN crewed submarine fleet of at least four SSKs beyond 2035. This includes a commensurate investment in human resources.

21. PURSUE a crewed submarine replacement project that includes joint capabilities, seamless integration to evolving national C4ISR architecture, and the best non-nuclear under-ice capability.

22. DEVELOP UUV capability to complement crewed submarines and surface ships. Emphasis should be given to long-duration, persistent ISR abilities in strategic locations, such as chokepoints in the Arctic and elsewhere.

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