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## STRATEGIC DEATH: HOW SSE HAS JEOPARDIZED THE CANADIAN SUBMARINE PROGRAMME

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**JCSP 44**

***Exercise Solo Flight***

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## **STRATEGIC DEATH: HOW SSE HAS JEOPARDIZED THE CANADIAN SUBMARINE PROGRAMME**

*The only thing that ever really frightened me during the war was the U-boat peril. ... our life line, even across the broad oceans, and especially in the entrances to the Island, was endangered.*

- Winston Churchill, *The Second World War, Vol II*

### **INTRODUCTION**

The beginning of the twentieth century saw the effective employment of the first modern maritime anti-access/area-denial (A2/AD) weapon system; the submarine.<sup>1</sup> The German navy successfully employed this strategic asset to great effect in both World Wars, wreaking havoc to shipping lanes between North America and European Allied nations. Today, submarines are operated by 41 states to protect strategic interests by denying potential adversaries access to domestic or critical water space.<sup>2</sup>

Canada operates four VICTORIA Class Submarines, which are a British designed, 2400 tonne, long range patrol submarine. Originally built for the Royal Navy in the late 1980s and early 1990s, these conventional diesel electric attack submarines were intended to patrol the North Atlantic between Great Britain, Iceland and Greenland during the Cold War. Following a Ministry of Defence review in the United Kingdom, the class was sold to Canada in 1998, and Her Majesty's Canadian Submarine (HMCS) VICTORIA was the first to enter Canadian service in October 2000.

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<sup>1</sup> Andrew F. Krepinevich, *Maritime Competition, In a mature precision-strike regime*, (Washington: Center for Strategic and Budgetary Assessments, 2014), 2.

<sup>2</sup> Global Fire Power, *Total Submarine Strength by Country, 2018*, <https://www.globalfirepower.com/navy-submarines.asp>, accessed 27 April 2018.

Strong, Secure, Engaged (SSE), Canada's defence policy released in June 2017, announced significant investments in the Royal Canadian Navy (RCN) to fill critical capability gaps and recapitalize the surface fleet. These investments include two Joint Support Ships (JSS), five to six Arctic Offshore Patrol Vessels, and 15 Canadian Surface Combatants (CSC) to replace the current HALIFAX Class Canadian Patrol Frigate (CPF) and the recently decommissioned IROQUOIS Class destroyers.<sup>3</sup> SSE further states that Canada will invest to "modernize the four VICTORIA Class submarines"<sup>4</sup> and that the "VICTORIA class submarines will undergo incremental modernization in the mid-2020s, which will ensure their continued effectiveness out to the mid 2030s."<sup>5</sup>

The VICTORIA Class hull is of a similar age as the CPF hull; both classes should be replaced around the same time. SSE announced the CPF will be replaced by the CSC to coincide with the CPF decommissioning plan, with the first CSC delivery expected in 2026.<sup>6</sup> While SSE's investments to modernize and extend the life of the VICTORIA Class throughout the 2020s to extend the life until the mid-2030s is warranted, SSE did not announce a replacement project for the VICTORIA Class submarine. Failing to plan for the replacement of the VICTORIA Class submarine is a national strategic oversight that requires immediate rectification. This oversight will be discussed within three broad areas. Submarines are strategically important for Canada's national defence and force projection and they will continue to be important beyond 2050. SSE missed an opportunity to announce the procurement of a submarine capable of patrolling under Canada's multiyear ice to deter threats to Canadian Arctic sovereignty utilising technological advancements in Air Independent Propulsion (AIP) systems. Finally, submarine procurements

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<sup>3</sup> Government of Canada, *Strong, Secure, Engaged, Canada's Defence Policy*, (Ottawa: 2017), 35.

<sup>4</sup> *Ibid.*, 35.

<sup>5</sup> *Ibid.*, 65.

<sup>6</sup> *Ibid.*, 101.

are complex and take approximately 20 years to complete. This timeline will result in a significant capability gap for Canada by mid-2030 when the VICTORIA class should be retired. SSE's failure to announce a replacement project puts Canada's submarine program, and the inherent strategic capabilities it provides, in jeopardy.

## **CANADIAN SUBMARINES: RELEVANT TODAY AND THE FUTURE**

Submarines are a valuable tactical and strategic asset to any maritime nation. In Canada, submarines play a critical role in the RCN as part of a Naval Task Group<sup>7</sup> or by operating independently to provide strategic effect for the Government of Canada. The RCN projects submarine requirements beyond the current VICTORIA class with a myriad of additional capabilities. A recent report from the Senate of Canada argues the importance of this capability for national interests and that Canada needs to immediately commence a submarine replacement project to prevent a critical gap upon decommissioning the VICTORIA Class submarines and expand on their current capabilities.

Submarines are stealth, lethal, and a persistent weapon that creates a concealed and covert capability for a state and are ideal for surveillance and intelligence gathering. Given their stealth and lethality, the sheer presence of a submarine can alter regional dynamics and the actions of an adversary. Should deterrence fail, submarines enjoy significant freedom of action to act independently during crisis to contribute decisively in combat or in defence of other strategic surface assets.<sup>8</sup> Canada's closest ally, the United States of America, considers underwater

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<sup>7</sup> Canadian Naval Task Group: Consists of up to four surface combatants, a joint support ship, and supplemented where warranted by a submarine. Canada, *Strong, Secure, Engaged*,...35.

<sup>8</sup> Royal Canadian Navy, *Royal Canadian Navy Submarines: Fleet Status*, <http://www.navy-marine.forces.gc.ca/en/news-operations/news-media-submarine-fleet-status.page> , accessed 27 April 2018.

superiority a critical component of their national defence strategy. They, and many of Canada's Allies, use submarines to gather intelligence, project power, and present an A2/AD weapon system.<sup>9</sup> Submarines are also extremely effective against adversary or enemy submarines and protect friendly strategic maritime assets, such as a Naval Task Group, from enemy submarines.

As a maritime nation, Canada needs to exercise control above and below the surface and requires to maintain maritime domain awareness of its national waters. To do this successfully, Canada needs a balanced force of surface and submarine assets. Without submarines, Canada's effectiveness and credibility with their maritime allies is severely diminished. Canadian submarines enhance strategic relationship with the United States and other Canadian Allies. By virtue of having submarines, Canada is able to participate in an Allied "global water space management" system to prevent mutual interference with their Allies.<sup>10</sup> Not only does Canada contribute intelligence to this system, but by being involved, Canada gains access to privileged information on international submarine operations and shared intelligence.

Throughout SSE, the Canadian government identified the importance of submarines to the defence of a nation, sovereignty enhancements and the force projection capabilities they possess. In SSE, Canada states its intent to prioritise joint intelligence, surveillance and reconnaissance capabilities, and specifically notes the VICTORIA class submarines as "a key element of the system-of-systems approach to maritime domain awareness."<sup>11</sup> As a Blue Water Navy,<sup>12</sup> SSE states that the RCN requires a mix of platforms, which includes submarines, in sufficient quantities to meet domestic and international requirements. SSE aspires to build and

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<sup>9</sup> Bryan Clark, *The Emerging Era in Undersea Warfare*, (Washington: Center for Strategic and Budgetary Assessments, 2015), 1.

<sup>10</sup> Royal Canadian Navy, *Royal Canadian Navy Submarines: Fleet Status*, <http://www.navy-marine.forces.gc.ca/en/news-operations/news-media-submarine-fleet-status.page>, updated 30 November 2017.

<sup>11</sup> Canada, *Strong, Secure, Engaged ...*, 65.

<sup>12</sup> Blue Water Navy: A Navy that is organized and sized to project power responsively and effectively far from a nation's shore. Canada, *Strong, Secure, Engaged, ...*34.

maintain two naval task groups to “establish persistent presence, self-sufficient at sea, refocus rapidly from one type of mission to another and interdict threats far from national territory ...”<sup>13</sup>

The Naval Task Group concept in SSE structures the RCN to sustain a major international operation while ensuring sufficient Naval resources at home for emergent international operations. This surge capability will also be employed for a response to domestic maritime security tasks and provide assets for the defence of North America.<sup>14</sup> In order to do this, SSE provides the RCN with two JSSs and 15 CSCs by the mid-2020s, however, in spite of SSE’s recognition of the importance of submarines to a nation, it does not provide a subsurface capability beyond the mid-2030s when SSE projects the retirement of the VICTORIA class submarine.

*Leadmark 2050*, the RCN’s force development and Maritime strategic planning document, predicts submarines will remain the dominant naval platform in the future. It specifically states that the VICTORIA class will need replacement before 2035, recommending that a replacement project be established prior to 2025 to allow for enough time for procurement.<sup>15</sup> This future Canadian submarine should be equipped to conduct joint operations in the littoral waters and have similar capabilities resident in the VICTORIA Class such as strike weapons, ISR and self-defence. As technology advancements are being made, the next class of Canadian submarines should incorporate: the ability to launch, operate and recover unmanned autonomous underwater vehicles; support to special forces including insertion, transportation and extraction; remain fully connected to naval operational networks at depth and speed; and, the ability for extended under water operations through the use of AIP systems. AIP will enable the next class of submarines to operate in all three Canadian oceans, with the possibility of arctic

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<sup>13</sup> Canada, *Strong, Secure, Engaged ...*, 34.

<sup>14</sup> *Ibid.*, 35

<sup>15</sup> Royal Canadian Navy, *Canada in a New Maritime World, Leadmark 2050*, (Ottawa: 2015), 50.

multiyear ice operations.<sup>16</sup> There are many other subsurface technology advancements available today that could provide future Canadian submarines with significant tactical and operational capabilities. These include: advancements in submarine battery technology such as a Lithium Ion battery that is able to store four to five times more electrical capacity than a traditional Lead Acid battery of the same volume and weight;<sup>17</sup> subsurface-to-air missiles that will be able to attack maritime anti-submarine aircraft prosecuting the submarine;<sup>18</sup> and submarine torpedo tube launched land-attack cruise missiles that can be used in support of the Canadian joint targeting process.<sup>19</sup> Enhancements like these will increase the strategic effect of the RCN's submarine force for the Government of Canada and further advance Canada's ability to project force against our adversaries.

In May 2017, one month prior to the release of SSE, the Canadian Senate released a report titled "*Reinvesting in the Canadian Armed Forces: A plan for the future*". It advises how the government should address Canadian strategic challenges of the 21<sup>st</sup> century.<sup>20</sup> The report highlights the submarine threat to Canada, specifically noting that there are over 200 operational submarines in the Indian and Pacific oceans with "virtually every country [in the region] getting into the submarine game."<sup>21</sup> It also notes that circumpolar states are expanding their nuclear submarine capabilities, namely the United States and Russia, and highlights the potential of

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<sup>16</sup> *Ibid.*, 50.

<sup>17</sup> Joseph P. O'Connor, Battery Showdown: Lead-Acid vs. Lithium-Ion, *an excerpt from: Off Grid Solar: A handbook for Photovoltaics with Lead-Acid or Lithium-Ion batteries*, <https://medium.com/solar-microgrid/battery-showdown-lead-acid-vs-lithium-ion-1d37a1998287>, 22 January 2017; Relion Battery, *7 Facts Comparing Lithium-ion With Lead Acid Batteries*, <https://relionbattery.com/blog/7-facts-comparing-lithium-ion-with-lead-acid-batteries>, posted 29 August 2015.

<sup>18</sup> Defense Update, *IDAS Submarine Launched Surface to Air Missile System* [http://defense-update.com/20120214\\_idas-submarine-launched-surface-to-air-missile-system.html](http://defense-update.com/20120214_idas-submarine-launched-surface-to-air-missile-system.html), updated 14 February, 2012.

<sup>19</sup> United States Navy, *Tomahawk Cruise Missile*, [http://www.navy.mil/navydata/fact\\_display.asp?cid=2200&tid=1300&ct=2](http://www.navy.mil/navydata/fact_display.asp?cid=2200&tid=1300&ct=2), Updated 26 April 2018.

<sup>20</sup> Daniel Lang, and Mobina Jaffer, *Reinvesting in the Canadian Armed Forces, A plan for the future*, (Ottawa: 2017), V.

<sup>21</sup> *Ibid.*, 36.

conventional submarines operating under the ice by insinuating that Norway's recent purchase of the German Type 214 submarine with AIP may result in this capability.<sup>22</sup>

In its report the Senate was critical of Canada's limited submarine capability as the RCN only has four submarines. The report argues that four submarines are insufficient to execute the mandate of patrolling Canada's three oceans, while simultaneously projecting force abroad, and noting that at any given time one submarine is in deep maintenance. Furthermore, as the VICTORIA Class is not under-ice capable, it is an ineffective asset to patrol the Arctic.<sup>23</sup> The report recommends that Canada commence the procurement process before the end of 2018 for 12 new submarines with AIP to enable patrols under the Arctic ice.<sup>24</sup> This will provide Canada with a strategic subsurface capability to simultaneously meet their domestic requirements, continental defence obligations, and engage in world.

SSE recognises the requirements of a strong submarine force that are articulated by the RCN in *Leadmark 2050*. SSE further understands the requirements to modernise and extend the life of the VICTORIA Class throughout the 2020s with new and future capabilities to ensure that the class remains a relevant and strategic asset to Canada until the mid-2030s. However, SSE was either naïve in its procurement ability to recapitalise this capability preventing a strategic gap or it was insincere in its recognition of the importance of the capability. Failing to announce a replacement project for the VICTORIA Class submarine in SSE indicated the Government of Canada's willingness to accept a significant capability gap. This is a strategic error that requires attention and rectification for Canada to defend its waters, secure North America, and engage in the world beyond the mid-2030s.

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<sup>22</sup> *Ibid.*, 36.

<sup>23</sup> *Ibid.*, 37.

<sup>24</sup> *Ibid.*, 38.

## A SUBSURFACE CAPABILITY FOR CANADA'S ARCTIC

Canada claims to be an Arctic nation capable of patrolling its arctic territory to exert its sovereignty in the air, overland and in the maritime domain. Canada participates in the Arctic Council and works with other Arctic nations and observer nations in the protection and security of the Arctic, as well as for the sustainable development and extraction of the Arctic's natural resources.<sup>25</sup> At present, Canada has no way of operating in the waters under the Arctic ice, while Canada's adversaries and Allies can, and do, operate under Canadian ice with impunity. In failing to announce a VICTORIA Class replacement submarine with under ice capability, the Government of Canada has signaled to our Allies, adversaries, and other members of the Arctic Council that Canada is content with not fully exercising its sovereignty in the Arctic and that Canada will not deter any incursions with an indigenous subsurface capability.

Canada is one of eight states that make up the members of the Arctic Council, an international collaborative organisation in where Canada promotes "...addressing climate change, renewing relations with Indigenous Peoples, management of the Arctic Ocean, and supporting sustainable economic and social development ...".<sup>26</sup> Canada, through the Arctic Council, has extended their Arctic relationships to non-Arctic Observer states such as China due to their shared interests in the area.<sup>27</sup> Canada uses the Arctic Council to advance their international interests in the region and to demonstrate leadership at this Arctic multilateral forum by assuming the position of Chair of the Council at its foundation in 1996, and again in 2013-2015. In spite of this leadership, the potential exists for submarine incursions into the

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<sup>25</sup> Arctic Council, *Member States*, <https://www.arctic-council.org/index.php/en/about-us/member-states/34-about-us/member-states>, updated 6 July 2015.

<sup>26</sup> *Ibid.*

<sup>27</sup> Arctic Council, *Observers*, <https://www.arctic-council.org/index.php/en/about-us/arctic-council/observers>, updated 17 January 2018.

Canadian Arctic multiyear ice areas and Canada lacks the ability to adequately prove these incursions, deter them from occurring, or effectively patrol these strategically important areas.

Throughout the Cold War era, there was a perception that Soviet Union submarines were operating with impunity in the Canadian Arctic. This perceived Soviet submarine threat was later validated in 2011, when Soviet Union era nautical charts of Canadian under ice Arctic areas were discovered by The Canadian Press. The number of depth soundings on the Soviet charts were greater than the number of known Canadian soundings, suggesting that Soviet submarines were operating in the Canadian Arctic, collecting valuable data on Arctic strategic waterways such as the Barrow Strait and Nares Strait.<sup>28</sup> More recently, Canadian Political Scientist Robert Huebert notes that Russia is devoting significant financial capital to modernise their fleet of nuclear powered submarines. Huebert states that this “spending affirms the priority that the Russian government places on this arm of its military, one which has a history of operating in the Arctic Ocean...”<sup>29</sup> Russia has invested significantly in their older fleet of under ice capable submarines,<sup>30</sup> and in 2008 launched the Borey Class<sup>31</sup> ballistic submarine that operates in Russia’s Northern Fleet.<sup>32</sup> This new Russian threat to Canadian sovereignty is validated when Canada receives credible information that foreign submarines are operating in Canadian Arctic waters.<sup>33</sup> Furthermore, open source information reports that Russia has used an unmanned submersible to plant a Russian flag at the bottom of the ocean at the North Pole, further

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<sup>28</sup> Bob Weber, “Russian maps suggest Soviet subs cruised Canadian Arctic”, The Canadian Press, <http://byers.typepad.com/arctic/2011/12/russian-maps-suggest-soviet-subs-cruised-canadian-arctic.html>, 6 December, 2011.

<sup>29</sup> Lackenbauer, Lajeunesse, “The Canadian Armed Forces in the Arctic: ...”, 20.

<sup>30</sup> Thomas Nilsen, *World’s largest nuclear submarine breaks the ice*, <https://thebarentsobserver.com/en/security/2017/12/worlds-largest-nuclear-sub-sets-sail-new-years-voyage>, 28 December, 2017.

<sup>31</sup> Also known as the Dolgoruky Class.

<sup>32</sup> Jane’s, Jane’s Fighting Ships, [http://janes.ihs.com/Janes/Display/jfs\\_a857-jfs\\_](http://janes.ihs.com/Janes/Display/jfs_a857-jfs_), Dolgoruky (Borey) Class, accessed 7 May 2018.

<sup>33</sup> Lackenbauer, *The Canadian Armed Forces in the Arctic* ... 35.

demonstrating their capability to encroach on Canadian sovereignty.<sup>34</sup> Russia continues to challenge Canadian sovereignty in the under ice areas of Canada's arctic, and the RCN lacks the capability to deter these incursions from happening.

The Peoples Republic of China is also showing great interest in the Arctic by participating in the Arctic Council as an "Observer State"<sup>35</sup> and in January 2018 issued its Arctic Policy claiming its participation in Arctic affairs as a "near-Arctic State" to "facilitate connectivity and sustainable economic and social development of the Arctic."<sup>36</sup> China, like Russia, is also investing heavily in the production of nuclear attack and ballistic submarines. According to Jane's Fighting Ships, China has two classes of nuclear powered ballistic submarines (SSBN) consisting of five boats in active service with a third class in development. China also has six nuclear powered attack submarines (SSN). They currently have five known additional SSBNs and SSNs under construction, with an unknown number of additional boats to be built in the future.<sup>37</sup> Due to their range, all these nuclear submarines are capable of operating under the Arctic ice. Furthermore, China has a recent history of unpredictable military actions in strategically important areas such as the South and East China Sea.<sup>38</sup> Therefore, Canada requires military assets, including submarines, to deter future potential Chinese sovereignty incursions in the resource rich areas of the Arctic, especially as resources dwindle that China requires to support their rapidly developing society.

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<sup>34</sup> CBC, *Russia plants flag staking claim to Arctic region*, <http://www.cbc.ca/news/world/russia-plants-flag-staking-claim-to-arctic-region-1.679445>, updated 2 August 2007.

<sup>35</sup> Arctic Council, *Observers*, <https://www.arctic-council.org/index.php/en/about-us/arctic-council/observers>, updated 17 January 2018.

<sup>36</sup> The Diplomat, *China Issues Its Arctic Policy*, <https://thediplomat.com/2018/01/china-issues-its-arctic-policy/>, updated 26 January 2018, and Xinhua, *Full text: China's Arctic Policy*, [http://www.xinhuanet.com/english/2018-01/26/c\\_136926498.htm](http://www.xinhuanet.com/english/2018-01/26/c_136926498.htm), updated 26 January 2018.

<sup>37</sup> Jane's, *Jane's Fighting Ships*, <https://janes.ihs.com>, Jin Class, Xia Class, Shang Class, Han Class and the Type 095 Class, accessed 7 May 2018.

<sup>38</sup> Council on Foreign Relations, *China's Maritime Disputes*, [https://www.cfr.org/interactives/chinas-maritime-disputes?cid=otr-marketing\\_use-china\\_sea\\_InfoGuide#!/chinas-maritime-disputes?cid=otr-marketing\\_use-china\\_sea\\_InfoGuide](https://www.cfr.org/interactives/chinas-maritime-disputes?cid=otr-marketing_use-china_sea_InfoGuide#!/chinas-maritime-disputes?cid=otr-marketing_use-china_sea_InfoGuide), January 2017.

Canada's Arctic sovereignty is not only threatened by its adversaries but may also be impacted by their Allies. The United States and the United Kingdom recently participated in Arctic under ice exercises with their nuclear-powered submarines. ICEX is a biennial exercise in the Arctic's Beaufort Sea led by the United States Navy and includes over 200 participants from 30 different organisations in four countries: United States; United Kingdom; Canada; and Norway.<sup>39</sup> In March 2016, the United States nuclear attack submarines USS Hampton and Hartford participated and remained in the Arctic until early April.<sup>40</sup> The following exercise, ICEX 2018, witnessed two USN nuclear attack submarines, USS Connecticut and Hartford, and one Royal Navy nuclear attack submarine, HMS Trenchant, surface through the Arctic ice.<sup>41</sup> While Canada was a participant in these exercises and had knowledge of the submarines operating there, the potential exists for Canadian Allies to ignore Canada's sovereignty and operate their submarines in the Canadian Arctic without permission. According to the United States Navy, submarines have conducted more than 120 Arctic exercises since 1958.<sup>42</sup> Due to the secrecy of submarine movements, it is unknown if Canada had knowledge of these exercises or gave permission to operate in Canadian Arctic waters. Had SSE announced a VICTORIA Class successor with an under ice capability, Canada would be able to participate to a greater extent in future ICEXs and contribute to the collective defence of the Arctic area. Furthermore, a Canadian under ice capable submarine would "...force Allied navies to establish an underwater management scheme when operating in Canadian [Arctic] waters in order to avoid collision"<sup>43</sup> similar to the global water space management system employed by NATO, enabling Canada to

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<sup>39</sup> United States Navy, *ICEX 2016 Camp Operations Conclude Successfully; Submarine Ops Continue* [http://www.navy.mil/submit/display.asp?story\\_id=93833](http://www.navy.mil/submit/display.asp?story_id=93833), updated 25 March 2016.

<sup>40</sup> *Ibid.*

<sup>41</sup> United States Navy, *Navy Kicks Off ICEX 2018*, [http://www.navy.mil/submit/display.asp?story\\_id=104633](http://www.navy.mil/submit/display.asp?story_id=104633), 7 March 2018.

<sup>42</sup> *Ibid.*

<sup>43</sup> Robert Huebert, "Renaissance in Canadian Arctic Security?", *Canadian Military Journal*, Vol 6 No. 4, (Kingston: N.P., 2005)

have knowledge of all Allied submarine activity in the Canadian Arctic. While our Allies don't pose a direct challenge to Canadian sovereignty, knowledge of Arctic under ice activity and "a say" on who can operate there increases Canadian control in their Arctic waters.

Russia, China, the United States, and the United Kingdom all possess the ability to operate in Arctic waters under the ice. While Canada has the ability to work with, cooperate and coordinate with all these nations at the Arctic Council, they are all able to operate their submarines in the Canadian Arctic with impunity given the stealth capabilities of these highly sophisticated machines. As SSE failed to announce a new class of under ice capable submarines following the retirement of the VICTORIA Class, Canada will not be able to credibly challenge or deter any nation from operating submarines in the Canadian Arctic for many decades. This nationally strategic capability gap, with international relations and security implications, will exist until Canada invests in an under ice capable submarine.

## **IMPROBABLE TIMELINES**

Submarine design and build projects are extremely complex and requires highly skilled knowledge and labour, beyond what is currently available in Canada. It is unlikely that Canada will be able to procure an operational submarine within the next 20 years, before 2038, given recent Canadian capital procurement timelines and equivalent comparable submarine procurement timelines from our Allies. Compounding the procurement timeline are the operational risks with operating the VICTORIA Class until the mid-2030s which will involve significant capital investments required to maintain them fit for purpose. The time between the end of the VICTORIA Class service and when the RCN can be expected to receive its next class of submarine presents a capability gap that can be measured in years. This capability gap has

strategic implications and poses a threat to the submarine service in Canada and Canada's ability to patrol and defend its waters.

In 2005, the Chief of Maritime Staff published *Securing Canada's Ocean Frontiers, Charting the Course from Leadmark*, a document intended to compliment the original "Leadmark" publication of 2001. *Securing Canada's Ocean Frontiers* understood the limits of warship design when it stated RCN assets "... will be nearing the end of their service lives in 2025 and in need of replacement (e.g., the CPF and submarines)"<sup>44</sup> as both these classes of ships will be approximately 35 years old by 2025 and require replacement. SSE acted on the replacement requirement of the CPF with the announcement to fund and build 15 CSCs. For submarines, SSE only stated that Canada will "modernise and operate the VICTORIA class until the mid-2030s". This decision poses strategic risk as attempting to extend the life of the submarines until the mid-2030s may have consequences. The oldest VICTORIA class is HMCS CHICOUTIMI, built and launched as HMS UPHOLDER in 1986, while the youngest is HMCS WINDSOR, built and launched HMS UNICORN in 1992.<sup>45</sup> This means that by 2035, the hulls will be between 43 and 49 years old and will require more capital investments at the end of their service life to sustain operations and to manage system obsolescence issues associated with aging equipment. The RCN will also have to manage the challenging technical risks associated with the structural integrity of an aging submarine pressure hull. Submarines experience significant cyclical pressure differences; high pressure at depth which is then released when they surface. As the VICTORIA class requires to go near the surface regularly on a patrol to charge

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<sup>44</sup> Canadian Navy, *Securing Canada's Ocean Frontiers, Charting the Course from Leadmark*, (Ottawa: 2005), 45.

<sup>45</sup> Royal Canadian Navy, *Her Majesty's Canadian Ship Chicoutimi*, <http://www.navy-marine.forces.gc.ca/en/fleet-units/chicoutimi-history.page>, updated 30 July 2014; Royal Canadian Navy, *Her Majesty's Canadian Ship Windsor*, <http://www.navy-marine.forces.gc.ca/en/fleet-units/windsor-history.page>, updated 4 November 2014.

their batteries, the pressure hull experiences several cycles of pressure changes throughout a routine patrol. Over time, this causes cyclical metal fatigue on the hull, making it vulnerable and susceptible to failure. Even with investments in life cycling the equipment, operating the VICTORIA class until the mid-2030s will result in significant technical and operational risks that the Government of Canada cannot afford due to the potential risk to life from malfunction.

Canada has a recent history of operating naval warships for more than 40 years, and suffered consequences as a result. When ships are that old their systems become obsolete and are no longer supportable by the original manufacturer, and the hull itself becomes “tired” and requires significant capital in order to maintain its Statement of Structural Integrity (SSI).<sup>46</sup> Examples of RCN age-related issues can be found in the recently retired Auxiliary Oiler Replenishment (AOR) ships and IROQUOIS Class destroyers. HMCS PROTECTEUR, an AOR built in 1968, suffered a catastrophic engine room fire in February 2014 at 46 years of service that was most likely caused by obsolete and unsupportable equipment.<sup>47</sup> PROTECTEUR’s fire resulted in a review of the other AOR, HMCS PRESERVER, built in 1970. PRESERVER’s review assessed that the risk of continued operation was too high given the age, supportability of the systems, and severe corrosion, and the vessel was subsequently decommissioned at 44 years of service.<sup>48</sup> HMCS IROQUOIS, a destroyer commissioned in 1970, was decommissioned in

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<sup>46</sup> The SSI is the quality assurance document that states “a ship is structurally capable of completing the operational task for which it was designed.” Structural surveys are conducted every five years during docking work periods and the SSI is reviewed and reissued if there are no issues that require repair.” LCdr Paul Brinkhurst, “The Structural Maintenance of Warships”, *Maritime Engineering Journal*, (Ottawa: June 1992).

<sup>47</sup> CBC, *HMCS Protecteur's electrical system flagged as 'dangerous and unsafe'*, <http://www.cbc.ca/news/politics/hmcs-protecteur-s-electrical-system-flagged-as-dangerous-and-unsafe-1.2724443>, updated 31 July 2014.

<sup>48</sup> CTV News, *Navy sending four Cold War era ships into retirement* <https://www.ctvnews.ca/canada/navy-sending-four-cold-war-era-ships-into-retirement-1.2014607>, updated 19 September 2014.

2015 at 45 years of service due to corrosion and structural related issues found during surveys that were assessed as cost prohibitive to repair in order to maintain the SSI.<sup>49</sup>

Compounding the risk of attempting to prolong the life of the VICTORIA class submarine is the long and tumultuous warship procurement process in Canada. The Arctic Offshore Patrol Vessel, currently under construction in Halifax, can be argued as one of the most expeditious recent procurements of a Canadian warship at over 14 years. The project was first announced in 2006 and first of class is due to be launched in 2018 and should enter service by 2020, 14 years from conception.<sup>50</sup> On the other end of the warship procurement spectrum, the JSS has been plagued by several disruptions. Its current design is scheduled to be launched in 2021, however, this will be postponed by an unknown timeline due to contractor/builder delays to the commencement of construction.<sup>51</sup> Previous versions of this project were announced in April 2004 and subsequently cancelled in 2008 when the bidders were found “non-compliant.”<sup>52</sup> As a result of all these complications and delays, the project will be over 17 years old before the first vessel is even launched and it will not enter service until a year or two later. Finally, assuming the CSC is built as scheduled, it too will be over 16 years from project conception in

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<sup>49</sup> CBC, *HMCS Iroquois sidelined indefinitely after rust found in hull*, <http://www.cbc.ca/news/canada/nova-scotia/hmcs-iroquois-sidelined-indefinitely-after-rust-found-in-hull-1.2635322>, updated 7 May 2014.

<sup>50</sup> Public Services and Procurement Canada, *Shipbuilding projects to equip the Royal Canadian Navy and the Canadian Coast Guard*, <http://www.tpsgc-pwgsc.gc.ca/app-acq/amd-dp/mer-sea/sncn-nss/projets-projects-eng.html#s1>, updated 22 November 2017.

<sup>51</sup> National Post, *Supply ship project delay means DND postpones \$20-million payment*, <http://nationalpost.com/news/politics/supply-ship-project-delay-means-dnd-postpones-20-million-payment>, 8 January 2018.

<sup>52</sup> Vanguard, *The RCN's Joint Support Ship Disaster*, <https://vanguardcanada.com/2015/08/12/the-joint-support-ship-debacle/>, 12 August 2015; CBC, *New Navy Supply Ships too costly, Government says*, <http://www.cbc.ca/news/canada/new-navy-supply-ships-too-costly-government-says-1.708567>, 23 August 2015.

2010 until the RCN receives its first operational vessel in 2026.<sup>53</sup> More complex design and build projects such as a submarine require longer procurement timelines.

Submarines are far more complex to design and build than their surface counterparts due to rigorous design specifications, small tolerances and specialised labour. The Royal Navy's newest class of nuclear attack submarines, the Astute class, was first conceived in 1991, design/build contract awarded in 1997, with HMS ASTUTE launched in 2007 and commissioned into service 2010,<sup>54</sup> 19 years after initial project conception. Australia, a comparable nation to Canada in GDP, work force, and military procurement capacity, announced in their 2009 Defence White Paper that they were going to purchase 12 new conventional submarines to replace their COLLINS Class submarines. In 2016, the Australian government awarded a contract to design and build their replacement submarines to DNCS, a French consortium, with a design based on the French Shortfin Barracuda submarine. The first submarine is expected to enter service in the early 2030s, over 21 years after announcing the project in their Defence White Paper.<sup>55</sup>

Canada's recent procurement history for warship design and build is over 15 years from announcement until the first vessel enters service. The United Kingdom's and Australia's experience demonstrates that a submarine design and build for Canada will most likely be over 20 years before a submarine first enters service. Even if SSE announced a replacement submarine project, which it did not, it would be beyond 2037 until Canada would receive its first

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<sup>53</sup> National Defence and the Canadian Armed Forces, *Canadian Surface Combatant*, <http://www.forces.gc.ca/en/business-equipment/canadian-surface-combatant.page>, 1 December 2017; Canada, *Strong, Secure, Engaged ...*, 101.

<sup>54</sup> John F. Schank, et al., *Learning from Experience, Volume III, Lessons from the United Kingdom's Astute Submarine Program*, (Santa Monica: RAND Cooperation, 2011), 17-18.

<sup>55</sup> Adelaide Now, The Advertiser, *\$50bn Future Submarines to be built at Osborne in Adelaide by French firm DCNS* <http://www.adelaidenow.com.au/news/south-australia/pm-malcolm-turnbull-on-50bn-future-submarines-project/news-story/be2a8da55f6066ba070454d667729c04>, updated 26 April 2016.

operational submarine. Every year the Government of Canada waits to announce a replacement project will inevitably result in a greater capability gap as it is unlikely the VICTORIA class will remain operational beyond the mid-2030s, assuming they are capable of staying in service that long.

It is unlikely that the RCN will be able to keep the VICTORIA class operational beyond the mid-2030s, as that will require a 49-year-old submarine functioning in 2035. Adding to the severity of the situation is the predicted procurement timeline of approximately 20 years for a replacement submarine project. As a result of these two factors, SSE has created a strategic capability gap that is currently around three years and will grow every year the Government delays announcing a project to replace the VICTORIA class.

## **CANADIAN SUBMARINES: MORE THAN JUST CLOCKWORK MICE**

Critics of the submarine program and those who oppose Canadian submarines in the Arctic may be pleased by SSE's strategic oversight, intentional or not.

Canadian submarine critics feel that Canada is a pacific nation and declare "...that submarines [are] an "un-Canadian" weapon system because of their supposedly offensive orientation"<sup>56</sup> highlighting their concerns about the aggressive nature of submarines. In the Byers and Webb article "*That sinking feeling*", they ask "Does Canada really need submarines?"<sup>57</sup> They argue that: Canada's submarine surveillance and law enforcement requirements can be met

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<sup>56</sup> Paul T. Mitchell, *Full of Holes: Byers and Webb on Canada's Submarine Programme*, (Calgary: Canadian Defence & Foreign Affairs Institute, 2013), 8.

<sup>57</sup> Michael Byers and Stewart Webb, *That Sinking Feeling, Canada's Submarine Program Springs as Leak*, (Ottawa: Canadian Centre for Policy Alternatives, 2013) 19.

by Unmanned Aerial Vehicles (UAVs);<sup>58</sup> Canada hasn't had an under ice capable submarine in the past so why start now?;<sup>59</sup> the United States/Canada relations in the Northwest Passage would be strained with the introduction of a Canadian submarine in the area;<sup>60</sup> the submarine risk in the Pacific is inflated given Chinese economic interests with the European Union and the United States;<sup>61</sup> and that "...[Canadian] submarines had been used only as "clockwork mice" in Anti-Submarine Warfare (ASW) exercises conducted by the navy"<sup>62</sup> for the United States and other Canadian Allies.<sup>63</sup> They even go as far as to suggest a "No submarine option", similar to what Denmark did in 2004.<sup>64</sup>

Opponents to Canadian submarines in the Arctic, such as Canadian political scientist and Arctic expert Whitney Lackenbauer, suggest that neither Russia nor China pose a threat to Canadian Arctic sovereignty. He writes that Russian activity in the Arctic is nothing more than "political sabre-rattling rhetoric" and that "...most commentators do not see a direct military nexus to this issue [military aggression against the other Arctic States]."<sup>65</sup> With respect to Chinese growing submarine capabilities, according to Lackenbauer, it is unlikely that China will risk advancing their military interests in the Arctic at the expense of upsetting the Arctic states of the United States, Russia and Canada, all of whom are major trading partners with China.<sup>66</sup> He notes that China's "nuclear fleet, while technically capable of under-ice travel, is small and ill-

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<sup>58</sup> *Ibid.*, 20-21.

<sup>59</sup> *Ibid.*, 21-23.

<sup>60</sup> *Ibid.*, 23-25.

<sup>61</sup> *Ibid.*, 25-27.

<sup>62</sup> Mitchell, *Full of Holes: ...*, 8.

<sup>63</sup> Byers and Webb, *That Sinking Feeling, ...* 21.

<sup>64</sup> *Ibid.*, 29-30.

<sup>65</sup> P. Whitney Lackenbauer, Adam Lajeunesse, "The Canadian Armed Forces in the Arctic: Building Appropriate Capabilities", *Journal of Military and Strategic Studies*, Vol 16, Issues 4, (Calgary: 2016), 21.

<sup>66</sup> P. Whitney Lackenbauer, Adam Lajeunesse, James Manicom, and Frédéric Lasserre, *China's Arctic Ambitions and what they mean for Canada*, (Calgary: University of Calgary, 2018), 165.

equipped for arctic operations... China's ability to project military power into the [Arctic] region is minimal at best."<sup>67</sup>

In spite of the critics, as shown throughout this paper, submarines play a critical role in the defence of Canada at home, continentally, and globally. Although Canadian submarines have the power to project force to distant adversaries and may be argued as aggressive, submarines can also be utilised for United Nations (UN) peace support operations or domestic operations. During the winter of 2017/2018, HMCS CHICOUTIMI conducted surveillance and collected evidence on embargo avoidance operations by North Korea contrary to UN sanctions.<sup>68</sup> In 1995 “the RCN activated NATO safety protocols related to submarine operations...” in the Canadian Economic Exclusion Zone of the Grand Banks to subtly deter the Spanish Armada from deploying during the Turbot Wars.<sup>69</sup> Both of these stealth and secretive surveillance missions could not be accomplished by alternative assets such as UAVs. While some political scientists feel that the submarine threat in the Arctic is minimal, Canada requires an ability to defend its interests and respond to known and future threats in the area. An under-ice capable submarine will enhance Canada's Arctic position and provide it the capability to exercise its sovereignty to both friend and foe. Finally, stealth and capable Canadian conventional submarines are excellent “clockwork mice” during ASW exercises to train Canadian, American, and all of Canada's Allies to defend against the real and existential submarine threat.

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<sup>67</sup> *Ibid.*, 165.

<sup>68</sup> CBC, *Sub Culture aboard a Canadian Submarine Prowling the Pacific*, <http://www.cbc.ca/news/thenational/sub-culture-aboard-a-canadian-submarine-prowling-the-pacific-1.4512960>, updated 7 February 2018.

<sup>69</sup> Royal Canadian Navy, *Leadmark 2050 ...*, 15.

## CONCLUSION

The Canadian Government was faced with tough decisions as they wrote SSE, determining where best to reinvest in the Canadian Armed Forces. Several strategic and operational assets in the Canadian Armed Forces required substantial capital funds to recapitalise the capabilities and capacities required to support peace and security. Through SSE the Government has committed to invest an additional \$48.9 Billion of new funding over the next 20 years in defence.<sup>70</sup> For the RCN, this resulted in ensuring that five to six Arctic Offshore Patrol Vessels, two JSSs, and 15 CSCs that will be built in accordance with their project timelines. However, SSE failed to provide the RCN with the most important strategic asset to the Canadian Government; a submarine project to replace the VICTORIA class. Submarines continue to be a strategic asset for the Canadian Government, playing a significant role in Canada's sovereignty, defence of North America, and strategic force projection around the world. These assets will continue to be the dominant naval platform for the foreseeable future,<sup>71</sup> well beyond 2035, based on investments made by our Allies and adversaries. The Government has missed an opportunity to provide Canada with its first under ice capable submarine to patrol the multiyear ice areas of the Canadian Arctic. The geopolitical environment in the Arctic is dynamic and Canada needs to be able to know what is happening under the ice and have the capability to deter incursions. Finally, the Government of Canada has created a situation where Canada will have a capability gap between the VICTORIA Class and its successor by failing to announce a replacement submarine in SSE. Every year the Government delays the announcement of a submarine replacement project, the strategic capability gap will increase further.

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<sup>70</sup> Canada, *Strong, Secure, Engaged*, ..., 43.

<sup>71</sup> Royal Canadian Navy, *Leadmark 2050* ..., 50

While beyond the scope of this essay, as a final thought for further research, a replacement submarine project has the potential to increase defence security relationships with Canada's Allies. The specialised skillsets and labour required to build a submarine do not currently exist in Canada. Australia realised this problem, and as a result, their first submarine will be built in France with a mix of Australian and French labour to acquire the requisite skillsets in Australian workers in order to build the remainder of their fleet at home.<sup>72</sup> A Canadian submarine project can be structured in the same way with one of our defence partners, such as Japan. Japan's Mitsubishi-Kawasaki was one of the leading contenders for the Australian submarine, offering a variant of the Japanese Soryu class with AIP. The advantages of this type of relationship with Japan would be a partnership with an experienced submarine builder, acquisition of a highly rated submarine, a trusted partner with access to United States' protected technology, and as the Soryu class is AIP, it can be operated in the Arctic under the ice.<sup>73</sup> Japan is a regional power in the Asia/Pacific geopolitical sphere and a Canadian Ally with similar political, economic, security and defence interests in the area.<sup>74</sup> A submarine building partnership with Japan would further strengthen Canada's relationships and influence in the Asia/Pacific as they have done over the past 20 years with the 1999, 2005, and 2010 Canada-Japan Joint Declaration on Political, Peace and Security Cooperation agreements.<sup>75</sup>

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<sup>72</sup> Adelaide Now, The Advertiser, *\$50bn Future Submarines to be built at Osborne in Adelaide by French firm DCNS* <http://www.adelaidenow.com.au/news/south-australia/pm-malcolm-turnbull-on-50bn-future-submarines-project/news-story/be2a8da55f6066ba070454d667729c04>, updated 26 April 2016.

<sup>74</sup> Adelaide Now, The Advertiser, *\$50bn Future Submarines to be built at Osborne in Adelaide by French firm DCNS* <http://www.adelaidenow.com.au/news/south-australia/pm-malcolm-turnbull-on-50bn-future-submarines-project/news-story/be2a8da55f6066ba070454d667729c04>, updated 26 April 2016.

<sup>74</sup> Eye on the Arctic, *Japan looks to Canada to keep an eye on China's Arctic ambitions: expert* <http://www.rcinet.ca/eye-on-the-arctic/2017/09/27/japan-looks-to-canada-to-keep-an-eye-on-chinas-arctic-ambitions-expert/>, 27 September 2017.

<sup>75</sup> Canada, *2010 Canada-Japan Joint Declaration on Political, Peace and Security Cooperation*, <https://www.canada.ca/en/news/archive/2010/11/2010-canada-japan-joint-declaration-political-peace-security-cooperation.html>, released 14 November 2010.

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