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Making the Case for the *Sōryū*-Class as a Canadian Procurement Option

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Credit: Mass Communications Specialist, 2nd Class Chase Stephens, US Navy

JS Ōryū, the eleventh Sōryū-class submarine and the first to be equipped with lithium ion batteries, moors alongside the submarine tender USS Frank Cable in Guam on 7 September 2021.

All three of Canada's maritime theatres have security issues that either already exist, like extreme weather events, or are emerging, such as the intensification of state-to-state competition. Russia's aggressive war on Ukraine has kickstarted Canada's North Atlantic allies to increase their respective military contributions. Canada continues to come under scrutiny for falling short of the North Atlantic Treaty Organization's (NATO) stated goal of 2% defence spending as a proportion of Gross Domestic Product (GDP).

This article will argue that the Royal Canadian Navy (RCN) needs new submarines. New submarines could be an upgrade that reassures allies about Canadian commitment to upholding the international security architecture. Canada's current submarines are ageing and lacking in capability compared to those possessed by some NATO counterparts with comparable GDPs. This article will make the case that *Sōryū*-class submarines are the best fit for Canada's needs because of their cost, ability to travel long distances and potential for operations in icy environments due to their air-independent propulsion (AIP) systems, or lithium-ion batteries in the case of the last two-issued *Sōryū*-class submarines.¹

The Situation

The Arctic will likely become rife with geopolitical competition as the climate crisis intensifies, and jurisdictional uncertainties on maritime claims and boundaries are exacerbated. Russian nuclear-powered ballistic missile submarines, the *Borei*-class, are increasingly active in the Arctic, and US officials seem confident that the People's Liberation Army Navy (PLAN) intends to patrol the Arctic with its respective nuclear submarines.² These developments make a strong Canadian naval presence necessary. Problematically, however, a November 2022 report from the Auditor-General's Office titled "Arctic Waters Surveillance" stated that Canadian agencies are not logistically up to the task of adequately monitoring the Arctic.³ New RCN submarines should be able to enhance Canadian deterrence and surveillance capabilities in Canada's North.

As well, there is the Indo-Pacific theatre, which is vast and maritime-centric, and it is undoubtedly where the most consequential issues of global security will exist in the future. These issues include threats to freedom of navigation, regional naval arms races, maritime disputes in the East and South China Seas, contestation over Taiwanese

sovereignty, and PLAN and Chinese Coast Guard aggression against Southeast Asian vessels.

Canada is increasingly acknowledging the strategic importance of the Indo-Pacific region, and the RCN will play an important role in enhancing Canadian engagement there. The RCN's submarine HMCS *Chicoutimi* spent six months in the region in 2017-2018 to carry out duties as part of *Operation Neon*, Canada's initiative to surveil and enforce UN-mandated sanctions on North Korea. This operation was a successful one for *Chicoutimi*, but all four *Victoria*-class submarines are getting old – they were built in the 1980s. Canadian operations in the Indo-Pacific will likely continue to be maritime-centric, thus conditioning the need for new submarines to cooperate with friends and compete with adversaries. The Indo-Pacific region is far from Canada's shores and would therefore require a large submarine suitable for extra long-range operations.

Ottawa has recognized that Canada is due for naval modernization across the board. The National Shipbuilding Strategy (NSS) released in 2010 was a first step toward this goal. The NSS sets out a plan for the construction of ships for the RCN (and Canadian Coast Guard). The RCN commissioned the first of six *Harry DeWolf*-class Arctic and Offshore Patrol Ships in June 2021. The second ship was commissioned in October 2022, and a third ship is undergoing trials with the RCN. Two Joint Support Ships will be built by Seaspan in British Columbia, and the Canadian Surface Combatant project will produce up to 15 new frigates in contract with Irving Shipbuilding and Lockheed Martin.⁴

While the NSS is a welcome program to recapitalize the RCN fleet, it does not include the construction of new

submarines. In 2017, Canada announced a plan for refurbishing and modernizing the *Victoria*-class submarines, with estimates ranging from \$1 billion to \$5 billion for carrying out this plan.⁵ Each *Victoria*-class submarine will receive a life-extension which is designed to allow the boats to last until roughly the early to mid-2030s. By this time, the need for new submarines will be urgent. It is also important to take into consideration that, as we have seen with the ongoing NSS projects, most defence procurement projects are not delivered in the estimated time.⁶ Therefore, the time for making decisions on the future of Canada's submarine fleet is now.

Buying, Not Building

At the time of the First World War, Canadian Vickers Co., in consortium with a US counterpart, built submarines for the UK, Italy and imperial Russia. However, Canadian Vickers stopped building submarines, and hasn't built any since 1918.⁷ Thus, Canada has not had the domestic shipbuilding capacity for submarine construction for a long time.

In 1957, under Chief of the Naval Staff Harry DeWolf, Canadian naval officials became supportive of an indigenously-built nuclear-attack submarine. However,

support began to wane as the huge cost of a nuclear programme became apparent. In February 1959, the first interim report identified massive infrastructure requirements including the provision of shore facilities for refit and refuelling as well as large shore-based Very Low Frequency (VLF) facilities necessary to communicate with a submerged submarine. In March 1959, the *Ottawa Journal* reported comments by Defence Minister George Pearkes stating that the huge cost was the biggest obstacle to building nuclear submarines for the Royal Canadian Navy.⁸

Canada still does not have the wherewithal domestically to develop and build a submarine whether it is nuclear-powered or diesel-electric. (This is not unique to Canada since most non-great powers lack this capability.) Domestic shipyards like Irving in Halifax could provide lucrative in-service support for modernizing the existing submarines, but Canadian shipyards cannot build new submarines from scratch. Collaborative builds are increasingly the favoured approach, as we can see in the Australia-UK-US (AUKUS) agreement to build nuclear-powered submarines for the Royal Australian Navy – and even this program will be tremendously complicated.

For these reasons, military-off-the-shelf (MOTS) procurement may be the route the Department of National Defence (DND) will take in acquiring new submarines for the RCN. If MOTS is indeed the route for procurement,



Credit: Sailor 1st Class Mike Goluboff,
MARPAAC Imaging Services

The *Victoria*-class submarine HMCS *Corner Brook* begins the undocking process following its Extended Docking Work Period at Esquimalt, BC, in June 2021.



HMCS *Chicoutimi* prepares to moor at Yokosuka, Japan, on 27 November 2017.

the question of *how* becomes a question of *what*. What submarine would be a viable option for procurement? In the Arctic Ocean's icy waters, nuclear-propulsion submarines may be technologically advantageous to procure. However, this is unlikely to gain acceptance in Canada because of a lack of experience in this field (Australia's experience will be educational in this), and the reluctance of the Canadian public to adopt nuclear technology despite the critical distinction between nuclear-*powered* and nuclear-*armed* vessels. So, if we set aside nuclear-propelled submarines, what are the options? This article examines the option of procuring the *Sōryū*-class submarine, sometimes referred to as the 16SS, from Canada's Indo-Pacific partner, Japan.

The article will not be so ambitious as to propose that the *Sōryū*-class is necessarily the best procurement option. A final decision would take years and require committees of technocrats, engineers and military officials for proper evaluation. Moreover, rigorous technical verification is required in terms of assessing the compatibility of the *Sōryū*-class with the RCN. The goal of this article is preliminary – it argues that the cost-effective and technologically advanced *Sōryū*-class should receive serious deliberation by those experts tasked with naval procurement.

Built by Kobe's Kawasaki Shipbuilding Corporation and Mitsubishi Heavy Industries, *Sōryū*-class submarines are diesel-electric attack submarines, much like the *Victoria*-class submarines Canada already has. The two classes have roughly the same speed submerged (20 knots), but a *Sōryū*-class submarine's systems are superior in many areas. This is to be expected given that the submarines are much newer than the *Victoria*-class.⁹ The first *Sōryū*-class submarine entered into service for the Japan Maritime Self-Defense Force (JMSDF) in 2009, and the last was procured in 2021. There are 12 in the JMSDF fleet. Submerged, a *Sōryū*-class submarine is 4,200 tons, making it around 42 per cent heavier than Canada's *Victoria*-class submarines. They are 84 metres (m) long with a beam of

9.1m. Their estimated range is 6,100 nautical miles at 6.5 knots.¹⁰ Their maximum depth of diving is 650m. The boats operate with a crew of 65, including nine officers.

The *Sōryū*-class submarines are widely recognized as being among the stealthiest in the world, owing in part to their anechoic exterior (i.e., they feature material that deadens sound emissions) and hydrodynamic design which allows for evasion of sonars. Contributing to their undetectability, the submarines are equipped with two Kawasaki 12V 25/25 SB-type diesel engines, and most have four V4-275R Stirling engines that are Air Independent Propulsion (AIP) systems produced by Malmö Sweden's Saab Kockums shipyard.¹¹ The newest two variants of the *Sōryū*-class – JS *Ōryū* commissioned in March 2020 and JS *Tōryū* commissioned in March 2021 – are equipped with lithium-ion batteries. They are not installed with AIP. While AIP systems are impressive in their own right, lithium-ion batteries are a global first for submarines and enhance an already stealthy submarine through improved durability when submerged.

The main weapons of the *Sōryū*-class are UGM-84 Harpoon anti-ship missiles and the Mitsubishi-produced Type 89 torpedoes. Fixed on the bow and flank, all *Sōryū*-class boats feature Hughes/Oki ZQQ-7 Sonar suite and ZPS-6F surface/low-level air search radars for the detection of adversarial vessels and equipment.

Depending on what weapons and technology are fitted to a particular submarine, the cost of the *Sōryū*-class for Japan ranged from around (USD) \$540 million to (USD) \$635 million for the final and most advanced edition of the



The *Sōryū*-class submarine JS *Hakuryū* arrives at Joint Base Pearl Harbor-Hickam on 6 February 2018.



Credit: Cpl Carbe Orellana, MARPAC Imaging Services

HMCS *Chicoutimi* escorts a People's Liberation Army (Navy) Type 054A frigate during a Chinese naval visit to Victoria, BC, on 13 December 2016.

class, *Tōryū*.¹² In comparison, the Australian *Collins*-class diesel-electric submarines cost around \$850 million in 1999, which in 2022 real dollars comes to (AUS) \$1.5 billion. The US Navy *Virginia*-class submarines, the base model of the AUKUS pact, costs around (USD) \$3.6 billion per unit when equipped with the Virginia Payload Module.¹³

Several countries have shown interest in procuring *Sōryū*-class submarines and this should encourage Canadian policy-makers likewise to make inquiries. In 2014 Tokyo ended its export-ban on weapons. A year later, Australia and Japan were deep in talks about Australia procuring submarines. Japan, however, lost this bid to France. Naval Group, then called Direction des Constructions Navales Services (DCNS), received a contract to construct 12 *Shortfin Barracuda* submarines, beating out Japan's bid to produce the *Sōryū*-class. The dramatic ending to that story is well-known – Australia later cancelled the deal with the French in favour of the trilateral AUKUS deal announced in September 2021. While Japan's export endeavour ultimately failed with Australia, the *Sōryū*-class nonetheless received very serious interest in Canberra.

The class has also received interest from Taiwan, Norway, Morocco, the Netherlands and India. India was once in serious consultations with Japan, issuing a Request for Information (RFI) for the *Sōryū*-class.¹⁴ The deal with India did not, however, come to fruition for several reasons. There were incompatibilities on weapons systems and complications relating to President Narendra Modi's 'Make in India' initiative. Some of these obstacles are India-specific rather than issues with the *Sōryū*-class itself. Moreover, when India initially tendered a proposal to Japan in 2015, the institution of Japanese defence exports was still young, meaning that many of the legal intricacies and procedural rules for defence exports had not been hashed out in Japan, and Japanese negotiators were not experienced in military export deals.¹⁵ Finally, it is important to emphasize that it was ultimately the Japanese who lacked interest in selling to India. Mitsubishi Heavy Industries did not meet the deadline

to respond to the Indian RFI, and Tokyo was uneasy about the transfer of Japanese technology to domestic Indian shipyards as a byproduct of Modi government policies. In sum, Canada will likely not encounter the same obstacles as New Delhi did in its preliminary consultations with Tokyo and Japanese firms over the *Sōryū*-class.

Japan's defence industry has real potential and is located in a region where Canada needs to step up its presence.¹⁶ In the past, Canadian naval procurement has been oriented on UK and US industries and, while these American and British industries should remain central partners, Canada should seek diversification with Japan's growing defence industry. Establishing deeper ties with Japanese firms such as Mitsubishi and Kawasaki (the manufacturers of the *Sōryū*-class) is an excellent step in that direction. It could be a mutually beneficial relationship as the JSDF could benefit from procuring the Canadian LAV III, a light-armoured vehicle with several customers worldwide.¹⁷ Overall, Canada-Japan defence industry engagement has the potential to grow and benefit both countries.

There is a tertiary benefit to Canada initiating serious consultations with Japan over the *Sōryū*-class submarines. On a political level, Canada has sustained criticism for perceived inactivity in the Indo-Pacific security architecture, while allies and partners are steaming ahead on strategies, deployments and concerted diplomatic initiatives in the region. By consulting Japan on the *Sōryū*-class, Canada would be double-tasking – exploring procurement options while simultaneously making political inroads with a key Indo-Pacific power, like-minded liberal democracy, and capable defence industry that is due to make a splash on international markets.

Moreover, procuring a military-off-the-shelf submarine is not a one-time purchase but requires consistent engagement regarding maintenance, technology and diagnostics for



Credit: Mass Communications Specialist 3rd Class Henry X. Liu, US Navy

JS *Ōryū* moors alongside the submarine tender USS *Frank Cable* in Guam on 7 September 2021.



A pair of *Victoria*-class submarines sit in the water at Esquimalt on 15 November 2022.

in-service support. This is because submarines have different specifications that are particular to the manufacturer. So, if Canada were to procure the *Sōryū*-class, such a decision would effectively be a business commitment to the Pacific companies Mitsubishi and Kawasaki for decades to come. This business relationship would promote professional development on project management skills, technical knowledge and generally cultivate much-needed know-how on the submarine industry, that would in turn benefit Canadian shipyards. Procuring the *Sōryū*-class would also promote Canadian and Japanese interoperability and joint training. Canada and Japan are already undertaking more joint drills including: the anti-submarine warfare Exercise SeaDragon that takes place off Guam; the JMSDF-hosted ANNUALEX that takes place either in the Philippine Sea or the Sea of Japan; and Indo-Pacific Deployment 2022 which is a cooperative trilateral exercise involving the JMSDF, the RCN and the Royal New Zealand Navy (RNZN).

Conclusion

In conclusion, the *Sōryū*-class has the following redeeming qualities. First, it is cost-effective compared to continuing refurbishment of the *Victoria*-class and other off-the-shelf options, particularly if those options are nuclear. Second, since the Japanese have already constructed the submarines, there will be no need to wait for plans and processes to be developed. This means that Canada could get submarines in a time-frame to avoid a gap between the ageing *Victoria*-class and a new class of submarines. Third, naval experts widely recognize the *Sōryū*-class to be exceptional diesel-electric submarines, with systems that can offset the shortcomings of being non-nuclear. Fourth, the *Sōryū*-class would be suitable for Canadian operations in the Indo-Pacific since it is designed for long-range operations. Canadian naval operations in the Indo-Pacific are likely to increase due to the uncertain state of international security and the acknowledged desire for consistent Canadian presence in the region, which should be made clear in the government's Indo-Pacific Strategy. Fifth, AIP technology and lithium-ion batteries should be workable alternatives to nuclear-propulsion in terms of operability in the Arctic (more experimentation and research is required to gauge viability). Sixth, even though the Japanese

defence export sector is young, the *Sōryū*-class has received interest from a variety of countries. There is a good case for RCN procurement of *Sōryū*-class submarines. 🇨🇦

Notes

1. More research is needed to conclude that AIP systems are Arctic-compatible, although the impressive durability of the systems indicate good promise for under-ice operations. See Timothy Choi and Adam Lajeunesse, "Some Design Considerations for Arctic-Capable Submarines," North American and Arctic Defence and Security Network, 16 November 2020, p. 2; Lieutenant-Commander Iain Meredith, "Canada's Under-Ice Options: Submarine Air-Independent Propulsion," Canadian Forces College, JCSP 44, pp. 9-10.
2. Adam Lajeunesse and Timothy Choi, "Are Chinese Submarines Coming to the Arctic?" North American and Arctic Defence and Security Network, 19 July 2020.
3. Office of the Auditor General of Canada, *Arctic Waters Surveillance*, Ottawa, 2022.
4. The Standing Committee on Government Operations and Estimates put the project cost at \$56 to \$60 billion, and the Office of the Parliamentary Budget Officer estimates it will cost over \$77 billion. "The Cost of Canada's Surface Combatants: 2021 Update and Options Analysis," Office of the Parliamentary Budget Officer, 24 February 2021, p. 6; Public Services and Procurement Canada, "Defence and Marine Procurement: Standing Committee on Government Operations and Estimates," 24 March 2021.
5. Jeffrey F. Collins, "Deadline 2036," Macdonald-Laurier Institute, September 2021, p. 11.
6. See Jeffrey Collins, "Defence Procurement Canada: Opportunities and Constraints," Canadian Global Affairs Institute, December 2019, p. 1.
7. See "Canadian Vickers," 14 July 2021, available at <http://shipbuildinghistory.com/canadayards/vickers.htm>.
8. Jason Delaney, "The One Class of Vessel that is Impossible to Build in Australia [sic] Canada," *Canadian Military History*, Vol. 23, Nos. 3 and 4 (2014), p. 262.
9. Note that official sources only provide limited information on the *Sōryū*-class. See Meredith, "Canada's Under-Ice Options," p. 9.
10. *Ibid.*
11. See "Submarine Toryu Launched," Kawasaki, 6 November 2019; "Commission of JS Oryu and DDG Maya," Ministry of Defense and Self-Defense Forces, May 2020; Franz-Stefan Gady, "Japan Launches 10th Advanced High-Tech Attack Sub," *The Diplomat*, 9 November 2017.
12. Kosuke Takahashi, "Japan Commissions 12th and Final Soryu-class Diesel-Electric Attack Submarine," *Janes*, 24 March 2021.
13. US Congressional Research Service, "Navy Virginia (SSN-774) Class Attack Submarine Procurement: Background and Issues for Congress," 28 April 2022, p. 6.
14. Ankit Panda, "Will Japan's Mitsubishi and Kawasaki Build India's Next Project 75(I) AIP Submarine?" *The Diplomat*, 24 July 2017.
15. Paul Kallender-Umezu and Vivek Raghuvanshi, "Japan Unlikely to Join Indian Sub Tender," *Defense News*, 11 April 2015.
16. Japan has increasingly been focusing on defence because of concerns about China, Russia and North Korea. The defence spending of the country increased by about 1.2% to reach USD \$49.1 billion in 2020. See "Japan Defense Market: Growth, Trends, Covid-19 Impact, and Forecasts (2022-2027)," Mordor Intelligence, 2022.
17. David Welch, "It's Time to Think Boldly about Canada-Japan Security Cooperation," *International Journal*, Vol. 74, No. 3 (2019), p. 451.

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