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CANADA FIRST, ALLIANCE ALWAYS: THE FUTURE MARITIME OPERATING ENVIRONMENT AND ITS INFLUENCES ON THE FUTURE RCN FLEET

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The Maritime Operating Environment and the Future RCN Fleet

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INTRODUCTION

Future threats have delineated the necessities of military capability from the dawn of conflict. While the ships and capabilities have changed, the purpose of a naval fleet has fundamentally stayed the same. To project power, promote diplomacy, deter inter-state conflict, and protect government interests from sea-based threats.[1] Great power competition, inter-state conflicts, climate change, and technological advances will be drivers that influence national perceptions of not only what a navy is used for, but the capabilities in terms of ships required in its future fleet mix.

Once a tremendous naval powerhouse, the Royal Navy (RN) is amidst a transformation and restructuring to meet a new demand signal. After years of a declining fleet mix, the RN is embracing change in the form of a renewed perspective of the future. With the resurgence of state and non-state actors, The UK's Future Operating Environment (FOE) highlights the necessity for a force mix that focuses on greater strategic deterrence and power projection.

Similarly driven by the rapidly developing nexus of the Pacific's geopolitical, economic and technological environments, Australia's Future Security Environment (FSE) emphasizes and empowers the importance for the Royal Australian Navy (RAN) to evolve from a smaller force to a robust multi-domain capable regional player.

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[1] Ben Lombardi, 'The Future Maritime Operating Environment and the Role of Naval Power', Scientific (Defence Research and Development Canada – CORA 101 Colonel By Drive Ottawa, Ontario K1A 0K2: Defence Research and Development Canada, May 2016), 71.

Like the UK and Australia, Canada is a maritime nation. The Canadian Future Maritime Operating Environment (FMOE) is perpetually ambiguous and rapidly changing due to influences like climate change and technological advancements. Albeit unique in its geographical and geopolitical isolation, Canada's prosperity relies upon a secure maritime commons. However, the approaches used within the construct of the Canadian future fleet mix to addresses the threats and challenges emanating from the maritime domain are very different from its Allies.

This paper examines the FMOE from the perspectives of the United Kingdom, Australia and Canada. Using the UK and Australia as comparative examples, this paper will analyze if and how the RCN is prepared to meet the demand. Is the Canadian Surface Combatant (CSC) enough capability to meet the challenges of the Canadian FMOE? This paper will argue that CSC alone does not enable the RCN to meet the demands of the future maritime operating environment to the same effect as the fleets of its UK and Australian Allies.

UNITED KINGDOM

The maritime domain has always had strategic importance to the United Kingdom (UK). As an island nation, the sea offers it both prosperity and trade. However, within the realm of UK strategy, the maritime environment is fraught with "increasingly complex, dynamic and competitive" threats.[2] The UK can describe its future operating environment (FOE) as interconnected characteristics shaping and influencing future

[2] Director Development, Concepts and Doctrine Centre, 'Integrated Operating Concept 2025' (London: UK Ministry of Defence, August 2021), 5, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1014659/Integrated_Operating_Concept_2025.pdf.

operations.[3] In particular, the following influence the FOE: State and Non-State Actors, Institutions, Culture and Identity, Technology, Cyberspace, The Physical Environment, and Future Legal Aspects.[4] This section will focus on the FOE characteristics of Actors, Institutions, the Physical Environment and Technology as they pertain to the RN.

ACTORS

Trade and open access to sea-based resources such as oil and gas, minerals, and food are critical to the UK.[5] Competition between states and, sometimes, non-state actors for access and influence over limited resources is growing. In time, this may force the UK to fight and deny access to its waters and resources.[6] As such, a resurgence of potential conventional threats like state-on-state warfare within the Maritime, Air and Land domains is increasingly possible; however, not likely.[7] Instead, state and non-state actors will pursue alternate means short of war to fulfill their resource requirements. UK Strategic Command describes this 'grey zone' in the following way:

> *"The grey zone is a murky area, consisting of everything which isn't full-on conflict, but isn't exactly an innocent act either."*[8]

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[3] Ministry of Defence, 'Strategic Trends Programme - Future Operating Environment 2035' (London: UK Ministry of Defence), 11, accessed 27 May 2022, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1076877/FOE.pdf.

[4] Ministry of Defence, 11.

[5] Royal Navy, 'Future Navy Vision - The Royal Navy Today, Tomorrow and Towards 2025' (UK Ministry of Defence, 2013), 2–3, https://www.royalnavy.mod.uk/About-the-Royal-Navy/~/media/Files/Navy-PDFs/About-the-Royal-Navy/Future%20Navy%20Vision.pdf.

[6] Ministry of Defence, 'FOE 2035', 26; House of Commons and Defence Committee, 'We're Going to Need a Bigger Navy' (London: Parliamentary Copyright House of Commons 2021, 2021), 8, https://committees.parliament.uk/publications/8205/documents/85026/default/.

[7] First Sea Lord Admiral Sir Ben Key, Center for Strategic and International Studies Online Event - The Future of the Royal Navy: A Conversation with First Sea Lord Admiral Sir Ben Key, interview by Seth G. Jones, Online Event, 16 February 2022, https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/220216_Jones_Royal_Navy.pdf?q3RUhFtTpanShq9vWCveCEYPBnFYrTSQ.

[8] 'Getting to Grips with Grey Zone Conflict - Strategic Command', accessed 30 May 2022, https://stratcommand.blog.gov.uk/2021/04/26/getting-to-grips-with-grey-zone-conflict/.

Given the unknown potential for conflict, the grey zone demands a combat capable force that is also applicable in terms of preserving diplomacy through a relevant and persistent presence. Technology, however, enables state political and cyber warfare attacks on maritime infrastructure in ways designed to win without conventional fighting.[9] Further complicating the grey zone is the use of state-sponsored terror attacks, proxies and cyber-attacks, which will necessitate advancement in technology and capability skill sets the RN may not yet fully account for.[10] Operating in this environment is likely the biggest challenge for the RN.

Driven by the effects of climate change, mass migration to coastal areas in search of food, shelter, and water will challenge developing states.[11] Given the immature nature of new seafaring areas adjacent to developing states, the lack of local governance creates opportunities for non-state actors like "smugglers, criminals, pirates and terrorists [to] take sanctuary and disrupt trade."[12] Furthermore, human trafficking and the transportation of illegal weapons and drugs serve to self-finance criminal acts that can have domestic consequences within the UK.[13] After years of battling extremist ideologies, the apparent differences have atrophied "between 'peace' and 'war', 'public' and 'private', 'foreign' and 'domestic' and 'state' and 'non-state'."[14] With the proliferation of technology, non-state extremist actors can use a broad range of military capabilities and tactics to exploit

[9] Director Development, Concepts and Doctrine Centre, 'Integrated Operating Concept 2025', 5.
[10] House of Commons and Defence Committee, 'We're Going to Need a Bigger Navy', 9; Great Britain, Ministry of Defence, and Stationery Office (Great Britain), *The UK National Strategy for Maritime Security*, 2014, 33; Ministry of Defence, 'FOE 2035', 26.
[11] Ministry of Defence, 'FOE 2035', 3.
[12] Royal Navy, 'Future Navy Vision', 3.
[13] Great Britain, Ministry of Defence, and Stationery Office (Great Britain), *The UK National Strategy for Maritime Security*, 19.
[14] Director Development, Concepts and Doctrine Centre, 'Integrated Operating Concept 2025', 5.

weaknesses and increase lethality in support of their objectives. [15] Criminality and extremism are pervasive threats that stretch far beyond the military realm. Nevertheless, the RN and its Allies must continue adapting and innovating to counter these issues.

INSTITUTIONS

Institutionally, multitudes of venues align with and promote similar value sets as in the UK. Alliances like the UN and NATO are vital for promoting a rules-based world system. However, to the UK, NATO is the best defence alliance to promote rule enforcement, given its operational defence capabilities. [16] The NATO preference does not discount the importance of smaller partnerships like the Australia - United Kingdom - United States partnership (AUKUS) or the Pacific's Five Power Defence Arrangement (FPDA) given their regional focus. The RN establishes partnerships with regional navies to promote the sharing information and best practices to solve localized problems like the effects of climate change. These regional problem sets are approached from the perspective of a support entity to its partners, by providing skills and capabilities that would otherwise be lacking in the area.[17] To the UK, global diversity in operating partners enables both opportunities and potential coalitions of the willing. It sets the foundations for future operational capabilities abroad, akin to capabilities resident in NATO.[18] However, the challenges further afield, such as those in the Pacific, often

[15] House of Commons and Defence Committee, 'We're Going to Need a Bigger Navy', 14; Director Development, Concepts and Doctrine Centre, 'Integrated Operating Concept 2025', 5; Ministry of Defence, 'FOE 2035', 26.
[16] House of Commons and Defence Committee, 'We're Going to Need a Bigger Navy', 18; Ministry of Defence, 'FOE 2035', 12.
[17] House of Commons and Defence Committee, 'We're Going to Need a Bigger Navy', 16.
[18] Ministry of Defence, 'FOE 2035', 12–13; Director Development, Concepts and Doctrine Centre, 'Integrated Operating Concept 2025', 9; First Sea Lord Admiral Sir Ben Key, The Future of the Royal Navy.

conflict with those localized to the UK, regarding vessel availability for domestic missions.[19] These conflicts may have a technological nexus in their solution, however sometime a physical presence is required.

THE PHYSICAL SPACE

As a state with dependent overseas territories, the UK's interests stretch far beyond its North Atlantic home. Among many growing sovereignty claims, exclusive economic zones and shipping routes may pose the most severe threat to maritime security.[20] Despite being increasingly linked technologically and physically, variants of security standards and practice of jurisdictional enforcement by some state actors will increase the risk of conflict.[21] For instance, the rise of China has pressed the RN to reaffirm its role of protecting its interests with warfighting capability in the Pacific. With forty percent of international trade traversing the South China Sea, the economic security and success of the UK are reliant on the messaging that a persistent presence of a combat-capable military force sends to regional influencers.[22] However, there may be a technological nexus to overcoming the physical space.

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[19] First Sea Lord Admiral Sir Ben Key, The Future of the Royal Navy.
[20] Ministry of Defence, 'FOE 2035', 22–23; House of Commons and Defence Committee, 'We're Going to Need a Bigger Navy', 19; Great Britain, Ministry of Defence, and Stationery Office (Great Britain), *The UK National Strategy for Maritime Security*, 27.
[21] House of Commons and Defence Committee, 'We're Going to Need a Bigger Navy', 10; First Sea Lord Admiral Sir Ben Key, The Future of the Royal Navy; Ministry of Defence, 'FOE 2035', 21–22.
[22] First Sea Lord Admiral Sir Ben Key, The Future of the Royal Navy.

TECHNOLOGY

The FOE is rife with technological challenges, from proliferation, to tempo of change, to adaptability.[23] The superiority of Western technology is no longer a guarantee, and a wide range of state and non-state actors will use it to continue to gain access to overwhelming military capability.[24] Where conventional warfare is possible, the proliferation of Anti-Access and Area Denial (A2/AD) technology will allow many potential adversaries the opportunity to deter Western powers.[25] This technology includes but is not limited to: guided and kinetic munitions, anti-ship and ballistic missiles, loiter-capable automated systems, target-specific mines, and weapons of mass effect.[26] Exacerbating the A2/AD challenge, state and non-state actors can easily access persistent, multi-sensor real-time surveillance, offering considerable advantages.[27] The oceans around the globe are substantial in terms of breadth and depth, yet open access to information is making them much smaller and more transparent.

UK FOE SUMMARY

The FOE for the RN demands a series of capabilities that must be able to address threats on a global scale, including the traditional conventional threats posed by state and non-state actors. However, the FOE also highlights the importance of international engagement in preserving diplomacy. Scalability will be vital in addressing the

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[23] House of Commons and Defence Committee, 'We're Going to Need a Bigger Navy', 10; Director Development, Concepts and Doctrine Centre, 'Integrated Operating Concept 2025', 7; Ministry of Defence, 'FOE 2035', 14.
[24] Ministry of Defence, 'FOE 2035', 14.
[25] Ministry of Defence, 15.
[26] Ministry of Defence, 15–18; Director Development, Concepts and Doctrine Centre, 'Integrated Operating Concept 2025', 7; House of Commons and Defence Committee, 'We're Going to Need a Bigger Navy', 10.
[27] Ministry of Defence, 'FOE 2035', 21.

institutional demands ranging from Allied organizations to new defence partnerships. Cyber and space capability roles can affect change in A2/AD environments. Likewise, power projection capabilities inherent to the RN can influence and assist partners and Allies in the form of humanitarian assistance in the wake of climate change events. To that end, technology will help close the gaps between these divergent strategic objectives.

AUSTRALIA

Like the UK, Australia's Future Security Environment (FSE) assessment is vital to shaping Australia's approach to its safety and economic prosperity. Despite being on opposite sides of the globe, Australia's interpretations of the FSE have similarities to the UK's FOE in themes and outcome.

Australia evaluates the FSE as a series of potential threats to the national interest and their implications for operations.[28] Probable drivers in the realms of Political/Diplomatic, Economic, Environmental/Societal, and Technological/Military factors help delineate potential missions the future maritime force of the RAN must undertake. [29] Once assessed solely within the military capability domain, defence and security of Australia and its interest is broadening.

POLITICAL/DIPLOMATIC

The defence of Australia is the prime objective of Australia's security enterprise. The whole of government cooperation between government departments, defence

[28] James Goldrick, 'The Future for Maritime Forces', *Security Challenges* 9, no. 2 (2013): 76.
[29] Australian Defence Force, 'Future Maritime Operating Concept - 2025 Maritime Force Projection and Control' (Canberra, ACT: Australian Defence Force, 2008), 7, https://www.navy.gov.au/sites/default/files/documents/FMOC_2025_Unclassified.pdf.

organizations, and industry work to ensure there is no compromise of Australian prosperity by hostile attack or coercion.[30]

While Australia's remote location provides it with a sanctuary from the likelihood of direct state-on-state conflict, political drivers that contest Australia's access to prosperity are vast. [31] In recent years, climate change and the global pandemic have tested and will continue to test the viability of uncontested resource access. Australia's integration within the global market and international political system, helps assure that any attack on Australia's interests is mutually disadvantageous. [32] However, the pressures of resource competition contribute to the growing potential for state and non-state actors to utilize increasingly lethal means to meet their resource goals. [33] As such, United Nations Security Council Resolution (UNSCR) enforcement and Non-Combatant Evacuation Operations (NEO) are likely to persist.[34] The enormous size of Australia's strategic interest at sea spans from the Middle East to the South Pacific and from Antarctica to Northern Asia.[35] Despite contributing to and operating with Allies for decades, this is an immense challenge for the RAN and its relatively small fleet.[36] As a means of deterrence, it is in Australia's best interest that rogue states, non-state and even state actors comprehend that Australia will not hesitate to use force to support the international good.

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[30] Australian Defence Force, 10.
[31] Gregory P. Gilbert, 'The Navy as a Force for Good: A Future Force Structure for the Australian Navy', *Security Challenges* 4, no. 3 (2008): 63.
[32] Australian Defence Force, 'FMOC 2025', 7.
[33] Australian Defence Force, 7; Gilbert, 'The Navy as a Force for Good', 64.
[34] Australian Defence Force, 'FMOC 2025', 7.
[35] Gilbert, 'The Navy as a Force for Good', 69.
[36] Australian Defence Force, 'FMOC 2025', 7; Gilbert, 'The Navy as a Force for Good', 76; Royal Australian Navy, 'Plan Pelorus Navy Strategy 2022' (Royal Australian Navy, 2022), 1, https://www.navy.gov.au/sites/default/files/documents/PLAN_PELORUS_Navy_Strategy_2022_1.pdf.

[37] The ability to present Australian capability against adversarial forces and infrastructure, in isolation, or if available in the company of Allies, is the deterrent enabler.[38]

ECONOMIC

Globalization and the diplomatic driver of international cooperation directly influence Australia's economic well-being.[39] Over 99 percent of Australia's imports and exports transit via the sea.[40] To that end, transnational crime threats fueled by global economic indifferences add weight to the defence and security nexus of assuring open and secure Sea Lines of Communication (SLOC). [41]

Two of the World's major SLOCs, the Middle East and Southeast Asia, fall within Australia's strategic interest zone.[42] While both have been areas of Australian defence interest, the geographic area defined by the South China Sea (SCS) highlights two economic challenges for Australia. First, the bulk of maritime trade and the internet infrastructure Australia relies on, transits this region. Second, the consistently disputed resource boundaries affect Exclusive Economic Zone (EEZ) interpretations.

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[37] Gilbert, 'The Navy as a Force for Good', 73.
[38] Dr. Marcus Hellyer, 'Delivering a Stronger Navy, Faster' (Australia: Australian Strategic Policy Institute, November 2021), 7, https://ad-aspi.s3.ap-southeast-2.amazonaws.com/2021-10/SR%20177%20Delivering%20a%20stronger%20Navy%20faster.pdf?VersionId=VZdnt7kECa.2vI.w4mS1eeM2ij0CK7tb.
[39] Australian Defence Force, 'FMOC 2025', 7.
[40] Transport Department of Infrastructure, 'Maritime', Department of Infrastructure, Transport, Regional Development and Communications, Australian Government (Department of Infrastructure, Transport, Regional Development and Communications, 10 March 2022), https://www.infrastructure.gov.au/infrastructure-transport-vehicles/maritime; Gilbert, 'The Navy as a Force for Good', 75.
[41] Australian Defence Force, 'FMOC 2025', 7.
[42] Gilbert, 'The Navy as a Force for Good', 64.

As resource competition increases, unequal access to minerals, oil and gas, and food stocks oppose global stability.[43] Local states defending EEZs they deem their own, have the potential to influence the free movement of goods within the SCS. The potential for physical conflict in this region necessitates regular RAN presence via naval patrols to ensure and protect access to this strategic SLOC. Even though the SCS is not currently an active combat area, there is still risk. The possibility of flaring tensions requires that the RAN be prepared for the spectrum of all possible threats that may exist between peacetime and total war.[44]

ENVIRONMENTAL/SOCIETAL

Contrary to the buildup of reefs in the SCS to promote the expansion of the state EEZs, climate change threatens to submerge islands and reduce the legitimate EEZ available to Australia. [45] To that end, rising sea levels have the potential to displace entire populations that Australia currently protects.

The mass migrations of people driven by rising sea levels, extreme weather events and natural disasters attributed to climate change will be in search of food, shelter, water, and protection. Populations within this zone will need humanitarian assistance and disaster relief support from the sea, independent of port facilities and infrastructure that may not exist or is compromised.[46] Furthermore, these already stressed populations may harbour the potential for extremist ideology. Specifically, youth population spikes within these populations could result in unemployed or disaffected individuals, creating a recruiting

[43] Australian Defence Force, 'FMOC 2025', 7.
[44] Gilbert, 'The Navy as a Force for Good', 68; Australian Defence Force, 'FMOC 2025', 7.
[45] Australian Defence Force, 'FMOC 2025', 8.
[46] Gilbert, 'The Navy as a Force for Good', 65; Goldrick, 'The Future of Maritime Forces', 81.

pool for disenfranchised populations and potentially increasing the possibility of state-on-state tensions. [47]

TECHNOLOGICAL/MILITARY

Over the next two decades, technology will become more powerful, complex, and broadly available to the RAN and its adversaries. [48] Like conventional warfare threats, technology itself is now a weapon. Even smaller groups will now achieve lethal effects of greater magnitudes with fewer weapons, which may or may not include military capabilities. Submarines, mines, fighter aircraft, and missiles will remain critical areas of concern. However, expeditious availability of persistent surveillance, fast response times, and reliable information transmission become even more crucial as warning times shorten.[49] Furthermore, the future maritime battlespace will become more transparent as state and non-state actors have greater access to space.[50]

Space enables the abilities like real-time tracking without the risk to personnel. As a theatre problem, anti-submarine warfare relies on intelligence analysis and environmental assessment to develop overall force dispositions and tactical strategies.[51] Allies and adversaries alike will wish to pursue space-based methods of detailed submarine tracking. However, the RAN has a continued strategic interest in preventing the disposition of its submarine fleet from being known.

[47] Gilbert, 'The Navy as a Force for Good', 65; Australian Defence Force, 'FMOC 2025', 8.
[48] Australian Defence Force, 'FMOC 2025', 8.
[49] Dr. Marcus Hellyer, 'Delivering a Stronger Navy, Faster', 5.
[50] Australian Defence Force, 'FMOC 2025', 8–9.
[51] Goldrick, 'The Future of Maritime Forces', 77.

AUSTRALIA FSE SUMMARY

While Australia's area of strategic interest is vast, Australia's military maritime presence is small yet capable. The contrast of responsibility versus scope in the FSE reinforces the necessity for continued political and defence engagement with Allies and smaller, less capable regional partners to build capacity. Given its reliance on sea-based trade, preserving SLOCs is of strategic importance to Australia's continued viability. Primarily this is the unrestricted access and security of the Australian EEZ. Climate change poses a significant risk to this nexus as mass migration of displaces persons stress regional capacities and potentially flare state-on-state tensions. In this sense, power projection capabilities like those used in amphibious operations become increasingly valuable enablers on both attending to humanitarian aid, as well as, politically posturing as a deterrent. Technological advancement will be paramount in closing these gaps. However, western technological superiority can no longer be assumed.

CANADA

The Canadian characteristics of the Future Maritime Operating Environment (FMOE) are not that different from that of the UK and Australia. In fact there are very few differences. All tend to agree that the modern maritime commons is a complex network of politics, trade, ecosystems, technology and military capability.[52] What seems to differ is the interpretation of scope. This section will focus on how Geopolitics, Climate Change, Economics and Technology variables set the stage for the RCN.[53]

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[52] Ben Lombardi, 'Maritime Operating Environment'.

[53] Ben Lombardi; Royal Canadian Navy, 'Leadmark 2050 Canada in a New Maritime World' (Department of National Defence, May 2016), https://www.navalassoc.ca/wp-content/uploads/2019/05/Leadmark-2050-13-May-2016.pdf.

GEOPOLITICS

Engagement with the global community serves as the cornerstone of conflict prevention. It involves activities that build security and defence relationships.[54] From the Canadian perspective, Alliances like NATO and organizations like the UN are essential to providing the capabilities that maintain diplomacy between states. Until recently, traditional state actors like Russia have been unprovocative in the years of peace that consumed the years post the Cold War. Concurrently, there has been significant technological development of smaller coastal state navies around the globe. Typically not involved in larger defence alliances like NATO, engagement with these smaller states will be challenging yet meaningful. These coastal states face constant demands and social problems as their urban populations explode from migrations. Early and consistent engagement as a means of capacity building is likely to be beneficial in the future.[55]

CLIMATE CHANGE

Climate change is influencing the mass migration of people towards the sea around the globe. Changes in weather patterns have affected crop production, creating food shortages through floods and drought. [56] The economic and cultural pressures associated with the mass migration of people seeking basic needs are affecting the viability of some states. [57] In turn, some of these states are failing. Criminal behaviour and piracy bring additional challenges to these failing and failed states, including the potential loss of the

[54] Royal Canadian Navy, 'Leadmark 2050', 18.
[55] Royal Canadian Navy, 58.
[56] Royal Canadian Navy, 7–8.
[57] Royal Canadian Navy, 9.

ability to enforce governance within their territories.[58] Failing states are known to enable extremist activities, highlighting the challenges associated with state-sponsored terrorist organizations, proxies and non-state extremist actors.[59] Primarily assisted by the ease of access to modern technology, non-state actors now possess military capabilities that are equal to or overmatched to state forces.[60] This loss of control to criminal and non-state actors will likely result in the increased cost of goods and the Alliance requirement to fill the policing and enforcement capability gaps. [61]

Closer to home, Canada's own Arctic is melting, changing the salinity levels affecting human and animal populations.[62] From an economic standpoint, the potential for the Northwest Passage (NWP) and the Northern Sea Route (NSR) to be permanent ice-free shipping routes is gaining popularity.[63] While potentially economically beneficial, increased access and habitability of the Arctic also bring challenges of potential resource competition. [64]

ECONOMICS

Despite attempts to switch to more renewable resources, hydrocarbon energy demand will continue for at least the near future. Resource competition for oil, minerals and food will continue to promote territorial disputes among coastal states, which may give way to conflict. [65] Furthermore, resource demands will be exceptionally high in states

[58] Ben Lombardi, 'Maritime Operating Environment', 29.
[59] Royal Canadian Navy, 'Leadmark 2050', 7.
[60] Ben Lombardi, 'Maritime Operating Environment', 81.
[61] Royal Canadian Navy, 'Leadmark 2050', 10.
[62] Sarah Stanley, 'Capturing How Fast the Arctic Ocean Is Gaining Fresh Water', Eos, 8 December 2021, http://eos.org/research-spotlights/capturing-how-fast-the-arctic-ocean-is-gaining-fresh-water.
[63] Ben Lombardi, 'Maritime Operating Environment', 56.
[64] Ben Lombardi, 55.
[65] Royal Canadian Navy, 'Leadmark 2050', 8.

experiencing mass migration. [66] This is largely attributable to the necessity to build infrastructure.

Interdependences among states have grown increasingly complex with globalization. Vulnerabilities to global supply chains like maritime chokepoints will be increasingly evident. [67] For instance, *Ever Given* blocked the Suez Canal for six days, yet the global markets felt the pressure months after.[68] While this was an unfortunate accident, the impact of compromising sea trade, highlights its applicability to potential challenges in Canada. While unlikely but not implausible, state or non-state actors have the ability to target any major ports or maritime infrastructure within Canada with economically crippling results.[69]

TECHNOLOGY

Technology is getting smaller, faster and wiser, allowing state-sponsored extremists and terrorist organizations to fight with military capability. The cyber domain will be enticing as a stage for both state and non-state actors to unleash disruptive action. [70] The asymmetric deployment of cyber capabilities can significantly disrupt the effectiveness of naval platforms or networked fleets, even if they cannot directly apply lethal force.[71] This includes the degradation of maritime infrastructure like port facilities and logistical supply chains that enable fleets to proceed to sea.

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[66] Ben Lombardi, 'Maritime Operating Environment', 39.
[67] Royal Canadian Navy, 'Leadmark 2050', 8.
[68] Elisabeth Braw, 'What the Ever Given Taught the World', *Foreign Policy* (blog), accessed 29 May 2022, https://foreignpolicy.com/2021/11/10/what-the-ever-given-taught-the-world/.
[69] Royal Canadian Navy, 'Leadmark 2050', 8.
[70] Royal Canadian Navy, 9.
[71] Ben Lombardi, 'Maritime Operating Environment', 83.

Maritime operations have become more technologically challenging since the Cold War's end. For years, Western navies have operated in environments where their technology is superior.[72] However, this will likely be less and less the case in the future. Also complicating Western capability planning, is the attempt to maintain interoperability with the innovative and potentially revolutionary naval technologies of their principal partner in defence, the US.[73] Future successes will rely on interoperability between Allies and trusted international partners.[74] Should Canada not maintain a similar pace of technological advancement, its capability could risk non-interoperability.

CANADA FMOE SUMMARY

Much like the UK and Australia, Canada's strategic interests are vast. Being located between Europe and Asia, the globalization of economies has ensured that Canada has an interest in every corner of the globe. This connectivity becomes paramount in the view of not only the economy, but in terms of a responsibility to act on the events precipitated by climate change. Climate change will ensure open access to the Canadian Arctic and present economic growth opportunities and defence challenges. However, climate change will be a persistent factor that has the ability to destabilize world peace as sea levels rise and extreme weather events destroy infrastructure. With the opening of the Arctic, future periods of resource competition will see Canada's freshwater becoming an increasingly appealing commodity. While not presently threatened by state and non-state actors, Canada has limited its power projection capabilities. As a means of mitigation, Canada leverages its Allies and Defence partners in a series of technological trade-offs that

[72] Ben Lombardi, 81.
[73] Royal Canadian Navy, 'Leadmark 2050', 9.
[74] Ben Lombardi, 'Maritime Operating Environment', 85.

promote capacity building. Canada, which already has a large area to cover, will be further pressured leverage Allied capability to maintain a persistent presence at sea with its small fleet.

UK, AUSTRALIA, CANADA - FLEET MIX COMPARATIVE ANALYSIS

As discussed in the earlier sections of this paper, the UK, Australia and Canada all derived remarkably similar assessments of the influencing factors within the future operating environment. Namely, international engagement, climate change and the economy are significant variables in shaping the necessary capability within a nation's maritime fleet mix. The respective future fleet mixes are as follows:[75] [76]

- The RN plans for a future fleet of 73 vessels which will consist of two aircraft carriers, six destroyers, 18 frigates, eight offshore patrol vessels, 13 mine countermeasures ships, four ballistic missile submarines, seven attack submarines, nine ammunition and multi-role support ships, and six oiler replenishment ships.[77]
- The RAN future fleet will have a combination of 44 vessels consisting of two large amphibious assault ships, three destroyers, nine frigates, 12 offshore patrol vessels, four mine countermeasures ships, 12 attack submarines and two oil replenishment ships.[78]
- The RCN future fleet will be comprised of 27 vessels, consisting of 15 Canadian Surface Combatants (CSC), six Arctic and Offshore Patrol Vessels, four patrol submarines, and two Joint Support Ships.[79]

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[75] For this paper, fleet mix totals were calculated based on planned procurement and divestment through the 2030s

[76] For an accurate comparison of the number of vessels operated, Royal Fleet Auxiliary solid support and replenishment ships were included in the numbers of Royal Navy ships to match the operations model used by both the RAN and RCN. The total number of vessels does not include training vessels and small craft.

[77] House of Commons and Defence Committee, 'We're Going to Need a Bigger Navy', 49.

[78] Department of Defence, '2016 Defence White Paper' (Australian Government; Department of Defence, 2016), 90–100, https://www.defence.gov.au/about/publications/2016-defence-white-paper; Department of Defence, '2020 Defence Strategic Update' (Australian Government; Department of Defence, 2020), 36–37, https://www.defence.gov.au/about/publications/2020-defence-strategic-update; Department of Defence, '2020 Force Structure Plan' (Australian Government; Department of Defence, 2020), https://www.defence.gov.au/about/publications/2020-force-structure-plan.

[79] Royal Canadian Navy, 'Leadmark 2050', 44–50; National Defence, 'Strong, Secure, Engaged: Canada's Defence Policy', navigation page - audience page, 31 May 2019, 35,

In this instance, Canada's approach is much less ambitious regarding the various ship types. There are two possible reasons why Canada came to a different approach to fleet mix than the UK and Australia. Mainly, Canadian defence policy definitions of critical operational capabilities and the UK and Australian approaches to applying risk versus threat in future capability planning.

Canada's Defence Policy (SSE) expresses that the Canadian Armed Forces (CAF) need to be Strong at Home, Secure in North America, and Engaged in the World.[80] Subsequently, the RCN's fundamental purpose: "To defend the global system at sea and from the sea, both at home and abroad," aligns.[81] However, compared to the RN and RAN, Canada's fleet mix variance may be attributable to the lack of definition in parts of SSE and the overly prescriptive definitions in others. Broad statements like, "Canada requires a Navy that is organized and sized to project power responsively and effectively far from Canada's shores," [82] are not precise enough to highlight the specifics of what power projection means in the FMOE. In contrast, the UK FOE and Australian FSE explicitly stated that power projection is the ability to project force from the sea in support of the joint force.[83]Future force planners then have definitive requirements to create a fleet mix that will fulfill the capability demand.

Canadian force developers, however, are constrained by the limitations imposed by the approved policy. As such, SSE statements like, "This Blue Water Navy requires a

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https://www.canada.ca/en/department-national-defence/corporate/reports-publications/canada-defence-policy.html.

[80] Defence, 'Strong, Secure, Engaged', 17.

[81] Royal Canadian Navy, 'Leadmark 2050', 1.

[82] Defence, 'Strong, Secure, Engaged', 34.

[83] Royal Navy, 'Future Navy Vision', 10; Australian Defence Force, 'FMOC 2025', 9.

balanced mix of platforms, including submarines, surface combatants, support ships and patrol vessels, in sufficient quantities to meet our domestic and international needs," limit the potential of the RCN's future fleet mix to only those platforms listed.[84] What exactly a surface combatant is may be open to the capability developer's interpretation. However, what it is not, is very reflective in Canada's fleet mix of submarines, CSC, JSS, and AOPV. While this does not prevent future fleet mix composition changes, it slows the process, as the policy must first be reviewed and then amended. Since the pace of technological change is a driver within the FMOE, impediments to the speed of policy that can adapt future fleet mixes may affect operational viability.

However, not all hope is lost for Canada to meet its future operational demands. Nestled within SSE states, "a fleet built around an ability to deploy and sustain two naval task groups, each composed of up to four combatants and a joint support ship, provides Canada with a relevant contribution to any international mission." [85] The FMOE driver of international engagement supports the interoperability and, in some cases, the interchangeability between ships of different nations. Based on the planned capabilities for CSC, it will complement Allied fleet operations by design.[86] However, when employed in the isolation of Canadian-only operations, it may be challenged to meet FMOE needs traditionally fulfilled by other nations.

Contrary to Canadian planning practices, the UK and Australian methodology for developing fleet mixes promote independent national capability. In turn, this capability

[84] Defence, 'Strong, Secure, Engaged', 34.
[85] Defence, 34.
[86] National Defence Government of Canada, 'Canadian Surface Combatant | The Fleet | Royal Canadian Navy', 19 April 2013, http://www.navy-marine.forces.gc.ca/en/fleet-units/csc-home.page.

may contribute to alliances, coalitions, and partners vice, a generalized Allied capability that can also fulfill national needs.[87] As such, assessing FMOE drivers in terms of the capability values of risk versus threat becomes increasingly essential. In this model, the likelihood of events occurring across the full spectrum of operations (Figure 1) is compared to the consequences of failure.

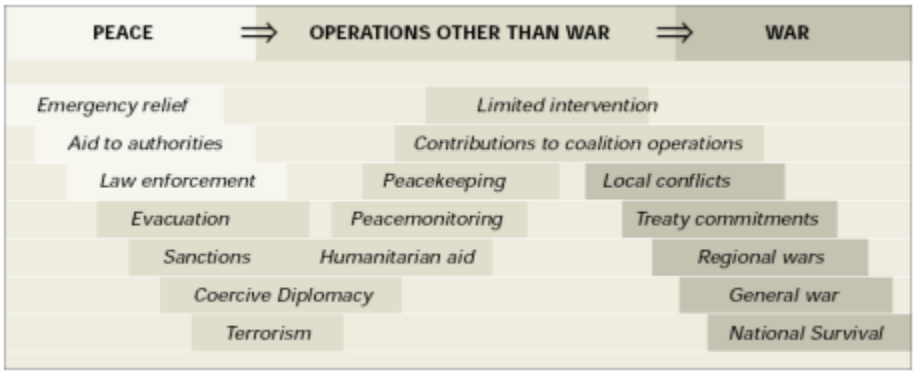

Figure 1: Spectrum of Operations

Source: Gilbert, *The Navy as a Force for Good: A Future Force Structure for the Australian Navy*, 68.

Both the UK and Australia mitigate fleet mix risk by addressing threats through a means of prioritization. One method of identifying priorities is to evaluate FMOE factors by the degree of force required to mitigate the risk. Gilbert suggests the following categories in which the degree of force applied decreases from 0 to 4: [88]

- Series 0 – Strategic non-conventional attacks.
- Series 1 – Major wars at the high-end of the spectrum of operations, Allies committed elsewhere.
- Series 2 – Conflicts and limited wars at medium to high-end of the spectrum of operations, working independently or with coalition partners.

[87] Royal Navy, 'Future Navy Vision', 3; Royal Australian Navy, 'MERCATOR Maritime Domain Strategy 2040' (Royal Australian Navy, 2021), 3, https://www.navy.gov.au/sites/default/files/documents/MERCATOR_2040.pdf.
[88] Gilbert, 'The Navy as a Force for Good', 69.

- Series 3 – Constabulary and peace operations at the low to medium-end of the spectrum of operations, working independently or with coalition partners.
- Series 4 – Diplomatic and humanitarian operations at the low-end of the spectrum of operations, working independently or with coalition partners.

While the FMOE suggests that the probability is low for series 0 and 1, the consequences are drastically high. However, moving into series 2, 3, and 4, the probability significantly increases with considerably high consequences. Capability planners could refer to this as a risk assessment of most dangerous versus most likely. However, within the specific drivers within the FMOE, consequences for even series 4 events remain high.

Applying this model to the Canadian practice of force development would highlight some of the shortcomings of the Canadian fleet mix. In particular, the significant dependence upon allies. Multiple sources stress the importance of interoperability and commitments to support allies like NATO.[89] It is now a force development requirement across the entire spectrum of CAF operations, superseding operating as a singular Canadian force.[90] An ever more likely Canadian domestic climate change scenario may best highlight this impact. [91]

Imagine the following. Extreme weather events and rising sea levels have isolated entire communities and decimated the maritime infrastructure along Canada's vast coastline. In this scenario, the Humanitarian Assistance and Disaster Relief (HA/DR) efforts necessitate the capability to force project aid ashore in mass, consisting of personnel,

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[89] Defence, 'Strong, Secure, Engaged', 17; Royal Canadian Navy, 'Leadmark 2050', 18–20; Ben Lombardi, 'Maritime Operating Environment', 85.
[90] Chief of Force Development, 'CBP Handbook' (Department of National Defence, 2019), 8, https://mars.cfc.forces.gc.ca/CFCLearn/pluginfile.php/35058/mod_folder/content/0/190906-UU-CFD-CBP%20Handbook.pdf?forcedownload=1.
[91] Ben Lombardi, 'Maritime Operating Environment', 36.

supplies and equipment. The RCN fleet mix, as planned, does not hold the organic amphibious capability to force project ashore with any volume.[92]

Albeit labelled as 'the right ship for the RCN and Canada,' CSC may have shortchanged the capabilities required to fulfill the requirements of the FMOE. As the workhorse of the RCN, CSC needs to deliver adequate capability across the full spectrum of operations without being reliant upon Allied support. Described as a warship at its core, CSC is designed to address the geopolitical FMOE drivers of Allied interoperability, promoting maritime security in support of global markets and the maintenance of the international rules-based order.[93] The majority of these objectives, however, rest within the middle of the spectrum of operations. Questions can then be broached about the ship's applicability to be viable for lesser or higher consequence scenarios. For instance, the presence of appropriate capabilities for emergency relief or capacity for non-combatant evacuations.[94] Since these ships will make up over half of the fleet in hulls and personnel, the loss of a CSC would be costly for Canada. Not only in the financial sense but also in terms of limiting fleet capacity, given there are only 15.

The underlying problem set of attrition beside the loss of a CSC, is that diminishes the RCN's ability to adapt to changing conditions and still achieve Canada's objectives.[95] This is exacerbated by the single surface combatant class structure that is the future RCN fleet, given that this ship class is designed to complement Allied capabilities. Canada has

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[92] Royal Canadian Navy, 'JSS Fact Sheet' (Department of National Defence, January 2020), https://www.navy-marine.forces.gc.ca/assets/NAVY_Internet/docs/en/jss_factsheet_8x11_eng.pdf; Royal Canadian Navy, 'CSC Fact Sheet' (Department of National Defence, October 2021), http://www.navy-marine.forces.gc.ca/assets/NAVY_Internet/docs/en/fleet/csc-fact-sheet-eng.pdf.
[93] Government of Canada, 'Canadian Surface Combatant | The Fleet | Royal Canadian Navy'.
[94] Royal Canadian Navy, 'CSC Fact Sheet'.
[95] Ben Lombardi, 87.

a choice when a single vessel represents so much of Canada's naval fleet and, by proxy, its capability. [96] Risk insurmountable attrition where other Allied force contributions are unavailable. Alternatively, risk mitigate by choosing to throttle RCN operations and prioritize operational areas where the risk of potential for loss or disability is lessened. The prospect of Canada not having or choosing not to send a ship overseas could unintentionally impact foreign policy and defence relations. Subsequently, it will have the broader strategic implications of Allies questioning Canada's commitment and resolve. [97] The fact that this choice must be contemplated indicates that CSC is not enough for Canada.

CONCLUSION

The UK's Future Operating Environment, Australia's Future Security Environment, and Canada's Future Maritime Operating Environment seem to differ only in name. All three dissect and then emphasize the importance of the myriad of influencing factors and trends on the many potential futures. Drivers like interoperability and international engagement become increasingly crucial as globalization of the economy is tested. The global economy is universally linked to the maintenance and availability of an open and accessible maritime commons. Should state, non-state, or state-sponsored actors act in contravention of the rules-based system, pressures from the international community will be swift and unrelenting.

Drivers like climate change and the rapid pace of technological growth in the military and defence sector, place relevancy challenges on doctrine and equipment. With the melting

[96] Ben Lombardi, 87.
[97] Ben Lombardi, 88.

of arctic ice, sea levels are rising and historical deep ocean currents are altering course. The outlying effect is progressively more devastating environmental and weather events. Due to this, whole communities are mass migrating in search of food, water and shelter near the world's oceans, either because they came to the sea, or the sea came to them. Climate change-induced poverty often leads to a rise in transnational crime like human trafficking, smuggling, drugs, weapons and piracy. Navies like the RN, RAN, and RCN will be challenged to address these issues with their relatively small fleets compared to the large areas of responsibility they oversee.

These future drivers enable the growth and evolution of the RN, RAN, and RCN fleet mixes as they embark on a recapitalization period. However, the RN and RAN have unique approaches to developing naval force structures. Both of these countries strive for both international engagement and interoperability with Allies. However, they function on a core tenet of self-reliance. The motto Si Vis Pacem, Para Bellum (if you wish for peace, prepare for war) comes to mind when observing their respective fleet mixes. Consisting of aircraft carriers through patrol vessels, submarines and supply ships, the RN and RAN are well-positioned. The Canadian approach to fleet mix concerning the same future environment is radically different. While also striving for international engagement and interoperability with the Allies, Canada has planned a future fleet the surface combatant class. As globalization focuses our allies' interests further and further abroad, their availability to support Canadian interests and ensure Canadian access to non-resident capability will become less and less reliable. Then and only then will Canada realize that the CSC alone is not enough.

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