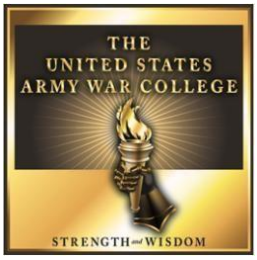
Strategy Research Project

Maritime Contribution to National Arctic Strategy

by

Commander Jeff Guerrero
United States Navy

Under the Direction of:
Professor Albert F. Lord Jr.



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Maritime Contribution to National Arctic Strategy

(5,268 words)

Abstract

2013 National Strategy for the Arctic Region establishes the line of effort, “advance United States Security interests in the Arctic”, and stipulates that we must "enable our vessels and aircraft to operate through, under, and over the airspace and waters of the Arctic." While U.S. submarines have a proven track record of under-ice capability, U.S. surface force has limited capability to operate in the Arctic region except for a few weeks in mid to late summer. Expanding U.S. surface force capability to support Joint, Coalition or Interagency operations for longer durations will require additional resources in order to increase maritime capability in the Arctic. This paper will explore U.S. National Objectives in the Arctic, Strategic Concepts and National Power, available through current surface force capabilities, and project whether future maritime force capabilities require adjustment or alignment to support the overall Arctic Strategy.

Maritime Contribution to National Arctic Strategy

Climate change is altering the Arctic environment allowing access to the region not possible in the previous century. Arctic ice has receded significantly in the past twenty years opening sea routes across the Arctic that reduce distances between global trading hubs by thousands of miles, beckoning shipping companies to alter customary routes and begin using Arctic passages. In addition to higher maritime traffic density, increased activities to tap natural resources including oil, natural gas and seabed mining exploration operations are expected. Additionally, historical fish habitats and migration patterns are also shifting; more species appear to be using Arctic waters as new habitat, drawing increased commercial fishing interest into higher latitudes adding to the overall density of maritime activity.

The combination of these increased resource driven interests, and the need for Arctic nations to exert sovereignty over the sea and landscapes that contain these resources, makes the Arctic region an area of competition and potential friction. As a result of this increased competition, security and safety in the region must be considered by any nation expecting to capitalize on the vast potentials of the Arctic. *U.S. National Strategy for the Arctic Region* identifies this increased competition for resources and access in the Arctic as a concern. The strategy's first line of effort, "advance U.S. security interests in the region", specifically stipulates we must "enable our vessels and aircraft to operate through, under and over the airspace and waters of the Arctic."[1] However, 'enabling' our vessels to operate in the Arctic may require more design and planning than policy makers in Washington realize. Careful consideration of competing interests in the region should be explored to best align future maritime

capabilities with expected requirements of joint commands and interagency organizations charged with providing safety and security in the Arctic region.

Climate Change Overview

The Arctic has seen significant climate change in the past twenty years; the National Snow and Ice Data Center (NSIDC) reported Arctic sea ice extent for March 2015 was the lowest on record since satellite records were initiated in 1979.[2] This trend will continue, with some research estimating the entire Arctic could be ice-free at the height of the summer within this century; certain models predicting it could occur within several decades.[3] The significant reduction in ice-coverage is contributing to acceleration in the warming trend of the Arctic. Large ice covered areas tend to reflect sun's energy back into the atmosphere, whereas open ocean areas tend to absorb energy into the water mass. Historically the Arctic tended to be more reflective, but recent indications show it becoming more heat absorbing, a phenomenon that accelerates the warming process and ice reduction.

While these predictions indicate ice-free conditions at the height of summer, the remaining months of the year will remain challenging for maritime access. The Northwest Passage across North America, which is now ice-free for portions of the summer months, remains a difficult and challenging passage due to the complexity of the route, shoal water, lack of navigation aids, and an increased potential for drifting ice. A phenomenon contributing to maritime risk is the increased wave and wind effects on Arctic seas due to ice-cap reduction. The large polar ice mass traditionally kept wave conditions relatively low in the Arctic seas, but the significant reduction in the ice-cap allows wind flow over open seas to generate much higher waves than previously encountered. Future scenarios suggest much larger wave action in the Arctic than ever

before due to wind effects unhindered by ice coverage.[4] The cumulative effect of ice-cap reduction - wave-height increase, feeds into the cycle of reduced ice-coverage and greater ocean water heat absorption.

With the seascape of the Arctic changing rapidly, routes traditionally ice-covered year-round may be ice-free for several months each year. Figure 1 shows three projected routes across the Arctic that will become more accessible as the century progresses, the Northern Sea Route, the Transpolar Route and the Northwest Passage. The Northern Sea route that tracks along Russia and Norway's extensive coastline has the best prospect for commercial use in the near term. The Northern Sea route saves more than 4,000 nautical miles off transit distances from East Asia to Northern Europe versus the traditional Panama or Suez Canal routes. The Arctic Institute reported 71 ships used the Northern Sea Route in 2014, up from 46 ships the previous year.[5] The Northwest Passage along Alaska's coast and inside Canada's numerous northern islands represents a much more difficult navigation problem for ships due to narrow channels, dangerous shoal water and limited navigation aids to mark the route. Although Canada uses portions of the Northwest Passage to extract iron ore deposits from major mining operations in the Hudson Bay region, it does not utilize the entire transit route for trans-ocean shipments. The Transpolar Route, the most direct of the three, will not be viable until mid-century and even then only for a few weeks at the end of summer.

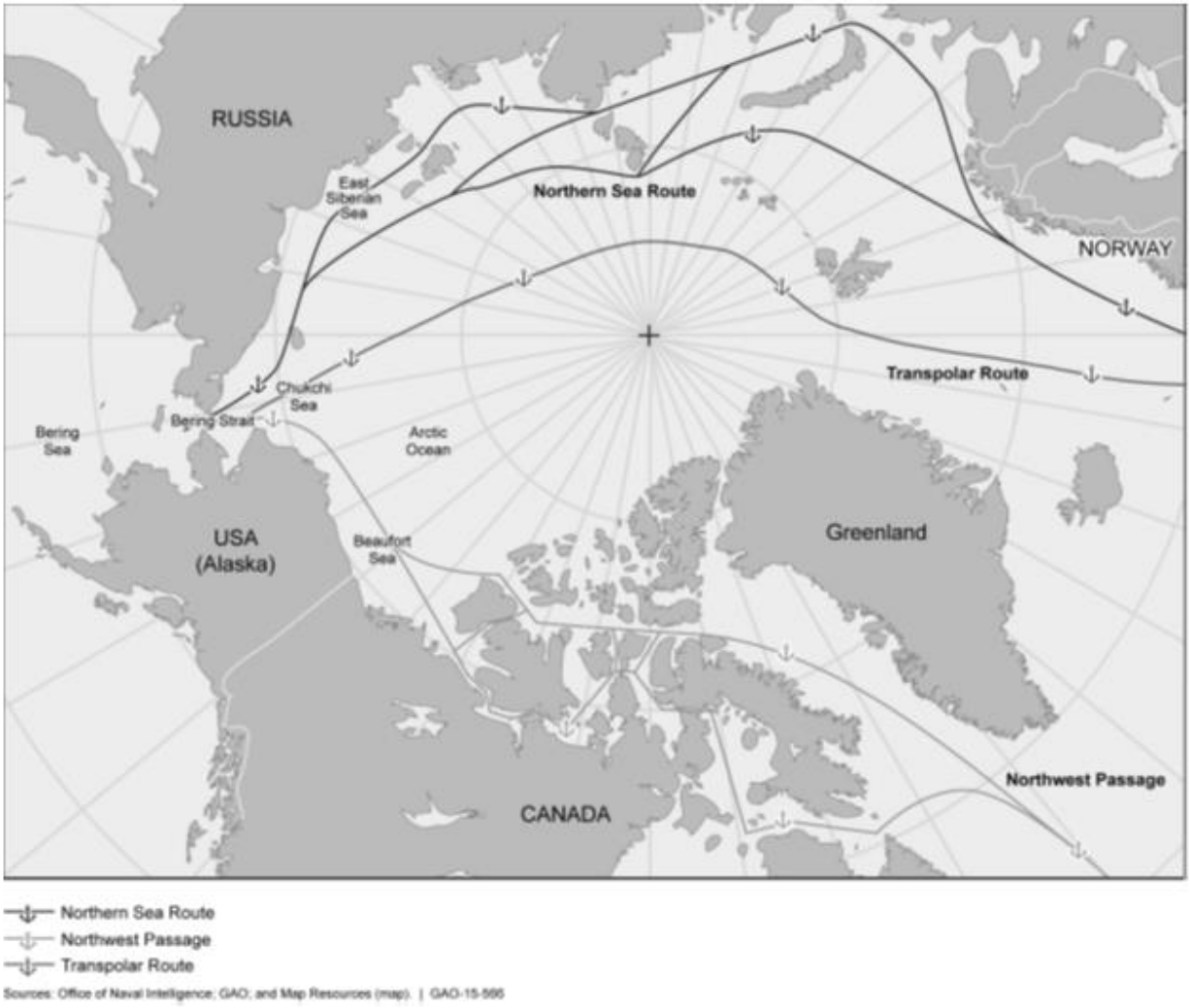

Figure 1: International Governance and Interests

Five countries have littoral interests within the Arctic region, the Russian Federation, Canada, Norway, Denmark (Greenland) and the United States. The interests for each nation revolve around the issues previously highlighted: oil and natural gas exploration and extraction, earth mineral mining and commercial fishing operations as well as territorial and sovereignty claims that justify their nations' access to these resources. Each nation has its own set of priorities regarding its approach to the Arctic based on national agenda and strategy. Two important international bodies

provide the framework for cooperation and coordination among Arctic states: the Arctic Council and the United Nations (UN), through the UN Convention on the Law of the Sea (UNCLOS). The Arctic Council, established in 1996 under the Ottawa Agreement, includes the five littoral Arctic nations and three others with continental boundaries and is the principle forum for regional coordination.

The Arctic Council provides an inter-governmental forum for promoting cooperation and coordination among the Arctic states on important issues related to the Arctic. The Arctic Council has developed several important comprehensive environmental, ecological and social assessments through its working groups. The Council has also provided a forum for the negotiation of two important legally binding agreements among the eight Arctic states. The first, the *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic*, was signed in Nuuk, Greenland, at the 2011 Ministerial Meeting. The second, the *Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic*, was signed in Kiruna, Sweden, at the 2013 Ministerial Meeting.[6] These two agreements provide needed maritime coordination standards for nations operating both commercially and militarily in the Arctic.

UNCLOS establishes the framework for Arctic nations to formally establish their 200 nautical mile Exclusive Economic Zone (EEZ) and to submit further claim extensions to seabed resources.[7] Nations are allowed to file for an extension of their EEZ rights to seabed minerals if sufficient scientific data shows geological structure continuity with their continental landmass. Once a nation becomes party to the UNCLOS treaty, the country has ten years to file the appropriate scientific data to

extend their seabed claim. As of 2016 Canada, Denmark, the Russian Federation and Norway have submitted seabed claims, the U.N. Commission on the Limits of the Continental Shelf has affirmed only Norway's claim thus far. The U.S, who has not yet ratified the UNCLOS agreement, has not yet filed a seabed extension claim.[8]

Russian Interests

Russia's interests in the Arctic are significant. Their Arctic coastline is ten times longer than Alaska's northern coastline and with increasing ability to operate in the Chukchi, Laptev and Kara Seas due to receding summer ice; Russia is gaining more access to the global maritime common via its northern coast. Russia depends on the extraction and sale of hydrocarbons – oil and natural gas.[9] Much of their efforts are now shifting to the Arctic where their estimated oil and natural gas reserves exceed 100 billion tons.[10] The increased accessibility into the Arctic, with its energy and mineral resources, new fisheries, shortened sea routes, and access to rivers flowing north, is pushing Russia to become a maritime state focusing on its tremendous Arctic frontier.[11]

Russia is developing important infrastructure along its Arctic coast including port facilities, railways and airfields. According to Defense News, "a new Russian Arctic command will include four new Arctic brigades, 50 airfields by 2020, increased long-range air patrols by Russian bombers and a total of 40 conventional and nuclear ice-breakers, with 11 more planned."[12] In addition to this military effort, the Russian Federation has established a new government department named, "The Administration of the Northern Sea Route." This administrative branch began overseeing the Northern Sea Route under Federal Law in January 2013.[13] The new law establishes the licensing, oversight and tracking of all commercial and military vessels using the route. The Administration provides comprehensive weather and ice flow tracking data, piloting

and ice-breaker services along the 3,500 nautical mile passage. Transit procedures are similar to those of the Suez Canal, whereby shipping companies register with the Administration, provide crew and cargo manifest and insurance documentation and pay the nearly $400,000 USD equivalent fee to use the transit passage route. Russia is clearly extending its sovereignty and control over these waters, firmly exerting their governance in the region.

Another important aspect to Russian interest in the Arctic is the exploration, data collection and subsequent formal claim to extended continental shelf and associated seabed-mining rights. Russia's first submission to extend its seabed claim was denied due to insufficient geological and technical data, it submitted an updated claim in August 2015 which overlaps with Denmark's already submitted data package and potentially overlaps Canada's sea floor claims.[14] The UN Commission on the Limits of the Continental Shelf is a 21 member technical panel, charged with evaluating and substantiating these claims. It remains to be seen if Arctic nations will respect the finding of this Commission.

Canada's Interests

According to Ottawa's Northern Strategy published in 2009, Canada's first and most important pillar towards recognizing the potential of Canada's Arctic is the exercise of [their] sovereignty over the Far North.[15] Ottawa stresses the importance of security presence, but also focusses on environmental stewardship as it seeks economic development the region, in stark contrast to Russian approach to environmental impacts of its operations. In fact, Canada is undertaking one of the most ambitious mining projects in the Arctic region, The Mary River mine, an effort that posed daunting engineering challenges, including building a 149-kilometre, $2-billion railway across

environmentally sensitive and unstable permafrost to a port facility on the Foxe Basin. The parent company, Baffinland shipped its first load to European markets in July 2015 from the shipping terminal and will have near year round production capability. Early estimates indicated the ore deposits are so plentiful mining operations will be sustained for at least twenty five years.[16]

To compliment Canada's increased commercial activity in the far North, their 2009 Northern Strategy proposes increases in ice breaker and ice strengthened naval ships in order to support their primary strategic pillar. However, budget reality appears to have pushed back ship building production timelines. A recent report indicates the government has scaled back its original plan to buy between six and eight ice strengthened patrol vessels, choosing instead to "buy five with an option for a sixth," while their ice breaker fleet is "old and underpowered".[17] While the Northern Strategy calls for increased exertion of maritime sovereignty, the reality is Canada will continue to lag behind Russia in ability to exert governance in their Arctic domain.

Denmark (Greenland)

Denmark's security policy in the Arctic is "based on an overall goal of preventing conflicts and avoiding the militarization of the Arctic and actively helping to preserve the Arctic as a region characterized by trust, cooperation and mutually beneficial partnerships."[18] Denmark's Arctic Strategy further highlights the need for peaceful cooperation under internationally recognized fora, specifically naming the UNCLOS and the Arctic Council. The strategy also seeks to develop Arctic resources consistent with environmental best practices and for the mutual benefit of indigenous peoples.

A 2008 U.S. Geological Survey report on Greenland documented the potential for more than 50 Billion BOE (barrel of oil equivalent) in the region, initiating political

support for gas and oil mining operations. Additionally, Denmark submitted its seabed extension claim to the UNCLOS Commission in 2014, claiming almost 350,000 square miles of the continental shelf overlapping the North Pole, an area slightly larger than the size of Texas and Oklahoma combined.[19] Indications are that Denmark, and it autonomous territory Greenland, have tremendous fossil fuel reserves in their Arctic holdings. The Royal Danish Navy has built two new Arctic-class patrol vessels with a third currently under construction. The vessel, built to more demanding cold weather design specifications than traditional navy ships, will be able to break first year ice, and will have capability to operate independent of an ice-breaker under certain Arctic conditions. These vessels are well suited for maritime security patrols, search and rescue, fisheries protection.[20]

Norway's Interests

Norway's declared strategy in the Arctic focuses on several priority areas: international cooperation, a knowledge-based business sector, broad-based knowledge development, more reliable infrastructure, better preparedness and environmental protection.[21] Norway highlights the region they call North Norway as an area of great potential and emphasize the many generations of experience they have in managing resources in their far north, experience and knowledge they contend can contribute to international cooperation. Norway is showing a trend of increasing population in North Norway, and is committed to expanding its infrastructure and opportunities for its growing population. Norway's declared strategy keys on their desire to be a responsible actor and partner in the Arctic.

Economically the Arctic is extremely significant for Norway, according to recent figures Norwegian gas production from the Barents Sea accounted for the "lion's share"

of production versus its more southerly Norwegian Sea gas fields.[22] The Barents Sea gas field is expansive crossing both Norwegian and Russian internationally claimed boundaries, experts estimate that “resources are likely to be even more abundant just across the border, in the Russian part of the formerly disputed Arctic waters.”[23] In 2010, Russia and Norway signed a bilateral treaty peacefully resolving this decades old boundary dispute, but Norway remains cautious in approach to its Arctic neighbor, specifically concerned by the significant increase in Russian military activity in the Arctic region.

Militarily Norway is focusing on what it terms the “High North” or the portion of its country that lies near or above the Arctic Circle. Norwegian Defense Forces have named their recent strategy the “Smart Defense Strategy”, which comprises a strong Arctic-focused dimension in funding and resource allocation. The Smart Defense approach to High North military reinforcement has placed higher priority on Arctic-class specialized equipment and more intensive training for High North-deployed units. The goal is to produce combat-ready units that can fight independently or alongside NATO forces.[24] The scaling-up of Norway's defense capabilities in the High North is happening while military intelligence services are urging the government to adopt a more cautious posture toward Russia's increasing militarization in the region.[25] Although Norway has openly declared its ‘cooperative approach’ toward Arctic development, it must also continue to take precautions against potential aggression in order to protect its interests in the region.

U.S. National Strategy

Declared U.S. interests in the Arctic region are broadly defined by the *U.S. National Strategy for the Arctic Region*, further refined by the Departments of Defense

and Homeland Security under their respective strategies. The U.S. Arctic Strategy broadly identifies three key lines of effort: advance U.S. security interests in the region, pursue responsible Arctic region stewardship, and strengthen international cooperation. The *Implementation Plan* for the *U.S. National Strategy for the Arctic Region*, signed in January 2014, provides more focused guidance to the Departments for implementing the overall strategy. The plan addresses five key efforts that must be undertaken in the near term:

1. Prepared for increased activity in the Maritime Domain
2. Sustain and Support Evolving Aviation Requirements
3. Develop Communication Infrastructure in the Arctic
4. Sustain Capability to Conduct Maritime Operations in Ice-Impacted waters
5. Promote International Law and Freedom of the Seas

Three of these key efforts are directly related to the maritime domain, and the remaining two have significant cross-domain application into maritime operations, specifically communications and aviation capability development. Key efforts (1) and (4) task the maritime services specifically to ‘prepare’ and ‘sustain’ their ability to operate in the Arctic maritime domain. However, the ability of our maritime services to implement these two key tasks requires closer examination to ensure decision makers understand potential gaps in both U.S. Navy and Coast Guard capability to operate in the Arctic.

The Department of Defense Arctic Strategy, issued in November 2013, seeks a “secure and stable region where U.S. national interests are safeguarded, the U.S. homeland is protected and nations work cooperatively to address challenges.” The guidance further instructs the services to: ensure security, support safety and promote

defense cooperation, as well as prepare for a wide range of challenges and contingencies. The execution of this strategy will predominantly fall on U.S. Northern Command (NORTHCOM), with support from the service components. NORTHCOM's 2014 Commander's estimate briefing illuminated the following: the need to start building more defense force capability, questions the lack of U.S. presence in the region and what implications this has on the perception of sovereignty, and finally, asserts that competition for resources among Arctic states is growing.[26] The question regarding exercising sovereignty is especially important in light of Russia's active exertion of its right to enforce transit passage along the Northern Sea Route. The U.S. has no equivalent control structure to overtly manage sovereignty of its seas north of the Bering Strait, while Russia daily exercises its sovereignty across its vast Arctic littoral. The U.S. does conduct a few Coast Guard patrols and short duration Navy exercises, mostly in late summer when Arctic conditions allow non-ice strengthened ships to operate north of the Bering Strait, but nothing that could be considered persistent presence.

NORTHCOM centers its effort on three key tasks; defense, security and safety, with a desired end state, "Where the U.S. and its allies contribute to the peaceful opening of the Arctic in a manner which strengthens international coordination."[27] While all three of these key tasks require the maritime services to contribute resources to accomplish, defense may be the most challenging. NORTHCOM expands the key task 'defense' into sub-component missions including: power projection, sea control, strategic deterrence, air and missile defense; specifically identifying the need to "deploy U.S. Navy vessels to support both power projection and sea control." Power projection, according to the Commander's Estimate, will require the Commander to "deploy and

sustain forces in response to crisis, to contribute to deterrence, and enhance regional stability." Accordingly, sea control requires protection of vital sea-lanes, destruction of enemy naval forces, and establishing military superiority in areas of naval operations. While the U.S. Navy is well suited to accomplish these missions and tasks in temperate waters, it is not optimized to perform them under the harsh conditions it will face in the Arctic seas. Special design standards are required for vessels expected to perform missions in the high latitudes, these standards while similar to those associated with ice-breaker class ships, are not necessarily the same. Better understanding these design requirements will foster more awareness among decision makers regarding the ability to "enable our vessels to operate on, over and under the Arctic waters" as the National Strategy casually stipulates in its first line of effort.

The Department of Homeland Security (DHS) recognizes the implications of climate change to the Arctic and uses its 2014 *DHS Climate Action Plan Addendum* to acknowledge its role in supporting the National Arctic Strategy. Within its action plan DHS directs the U.S. Coast Guard to "implement the *2013 U.S. Coast Guard Arctic Strategy* and lead interagency implementation of the seven actions assigned to DHS in the *Implementation Plan for the National Strategy for the Arctic Region*."[28] The U.S. Coast Guard Strategy is built on three broad objectives; improving awareness, modernizing governance, broadening partnerships. The Coast Guard clearly recognizes the need for better maritime domain awareness and the implications of the nearly non-existent U.S. governance of maritime activity north of the Bering Strait. The Coast Guard strategy identifies the need to apply better, more recognizable oversight techniques, specifically stating, "…limited awareness and oversight (capability)

challenges (our) maritime sovereignty, including the protection of natural resources and control of maritime borders."[29] The document further reveals growing maritime safety concerns, exacerbated by the lack of U.S. oversight. Noting, "from 2008 to 2012, traffic through the Bering Strait increased by 118 percent," and observed that this "increased traffic, accompanied by polar weather, ice conditions, and a limited area to safely navigate, are factors that make the Bering Strait increasingly vulnerable to maritime casualties and a priority for future traffic management services."[30] Providing the persistent coverage to manage the Arctic maritime environment and secure U.S. interests in the region will require a mix of Coast Guard and Navy assets that are properly suited to operate in the Arctic environment.

While U.S. economic interest in the Arctic is not as significant as Russia's, substantial mining operations and fisheries are present. U.S. mining interests along Alaska's Arctic coast consist of the expansive Red Dog iron and open-pit zinc mines. Red Dog produces nearly 10% of the world's zinc, and produces a significant amount of lead.[31] In addition to mining, the rich waters off Alaska's northern coast have been a recent area of concern. In December 2015, the U.S. Department of State hosted a meeting on fisheries in international waters of the Arctic, which included Arctic nations Russia, Norway, Iceland, Denmark and Canada, as well as China, the European Union, Japan and South Korea. The five nations with Arctic Ocean coastlines signed an agreement to keep their fishing fleets out of the central Arctic Ocean's so-called "donut hole." The U.S. also presented a proposal for an internationally binding agreement that would, "establish management organizations to manage Arctic fishing in accordance

with modern international standards."[32] These initiatives are noteworthy; however, the U.S. will need the capability to enforce these regulations once enacted.

Related to U.S. security and economic interests in the Arctic is the fact that Congress has not ratified the UNCLOS Treaty. This complicates several important aspects of Arctic sovereignty issues, first is U.S. ability to arbitrate a modest sized disputed area of EEZ with Canada, and the ability to claim potential extensions to the EEZ for seabed mining rights. The extension of the seabed claim can be submitted to the UN Board once the U.S. signs UNCLOS, but also requires extensive sea floor mapping and geological data to support the extension claim.

U.S. Maritime Capability

As previously noted in the *Implementation Plan for the Arctic Region*, performance in the maritime domain is a key component of the Nation's Arctic Strategy. However, current U.S. Navy and Coast Guard vessels do not have the capability to operate for long durations under normal Arctic conditions. Despite climate change in the Arctic and a significant reduction in ice coverage, the environment remains severe and volatile. Current design and engineering standards for Navy and Coast Guard ships do not provide the necessary capability to operate in extreme conditions found in the Arctic and may limit the ability to contribute to the overall security effort. 'Enabling' them to operate in the Arctic, as the National Strategy announces, will require significant engineering and design changes, a consideration that requires close examination in order to align strategic goals with means available to support those goals.

Ice Classifications for Commercial Ships

Examining maritime industry standards for building ice capable ships will help understand the complexities associated with building and operating ships in the high

northern or southern latitudes. The International Association of Classification Societies (IACS) recognizes several standard ice classifications, Baltic and Polar Class.

Table 1: Baltic versus Polar Class

Baltic		Polar Class	
		PC1	Year-round operation in all Polar waters
		PC2	Year-round operation in moderate multi-year ice conditions
		PC3	Year-round operation in second-year ice which may include multi-year inclusions
		PC4	Year-round operation in thick first-year ice which may include old ice inclusions
		PC5	Year-round operation in medium first-year ice which may include old ice inclusions
1.0 m first year ice	ICE-1A*	PC6	Summer/autumn operation in medium first-year ice which may include old ice inclusions
0.8 m first year ice	ICE-1A	PC7	Summer/autumn operation in thin first-year ice which may include old ice inclusions
0.6 m first year ice	ICE-1B	PC1 to PC6 may be assigned additional notation ICEBREAKER	
0.4 m first year ice	ICE-1C		

Table 1 provides a summary of these two ice classifications, providing the relative thickness of ice each class is designed to operate in or near. The Polar Class (PC) are the most ice capable ships, PC1 and PC2 are considered Heavy Ice-Breakers. PC3 and PC4 are considered Medium Ice-Breakers, with PC5 thru PC7 Light Ice-Breakers. The Baltic Ice (ICE-1A, B, C) classifications are normally associated with commercial vessels specifically designed to operate in the Arctic (or ice restricted waters). While a number of countries have developed their own Baltic equivalent codes, the most

recognized standard for ice design specifications is the Baltic Ice Code. These standards are used by national maritime enforcement agencies to ensure commercial carriers transiting within their maritime jurisdiction meet appropriate safety standards, and they are used by maritime insurance firms, such as Lloyd's of London, in order to insure cargo for specific Arctic (or Baltic) Sea routes. In some cases, local maritime regulations may require both a Baltic classified commercial vessel and a Polar Class (ice-breaker) escort at various times of year and specific portions of Arctic or Baltic Sea voyages.

While Polar and Baltic like standards have been used unilaterally by nations to license their own commercial fleets, in 2015 the International Maritime Organization (IMO) adopted the International Code for Ships Operating in Polar Waters (Polar Code). When enacted, it will standardize several regionally recognized codes, making it the standard under both the International Convention for the Safety of Life at Sea (SOLAS) and the International Convention for the Prevention of Pollution from Ships (MARPOL). The Polar Code is expected to enter into force on January 1 2017.[33] According to the IMO, "this marks an historic milestone in the Organization's work to protect ships and people aboard them, both seafarers and passengers, in the harsh environment of the waters surrounding the two poles."[34] Except for the U.S. Coast Guard's two aging ice-breakers, Healy and Polar Star, no other Navy or Coast Guard vessel meets even the lowest Baltic ice standard, Class ICE-1C. Military Sealift Command does maintain an ICE-1B commercial container ship, *Maersk Peary*, on retainer for critical resupply missions to Antarctica or north of the Bering Strait.

U.S. Navy / Coast Guard Standards

The Polar Classifications generally refer to hull, mechanical, electrical and safety equipment standards. U.S. Navy and Coast Guard surface ships have none of the enhanced capabilities to operate in or near ice to include; reinforced hull stringer and plate thickness along the waterline, reinforced propeller, propeller guard and rudder-post structures. Additionally, surface combatants do not have key engineering intake design features for both water and air intakes to guard against critical loss of fluid and air flow due to ice formation. Furthermore, most combatant ships rely on reverse osmosis units for water purification that do not function in the frigid Arctic waters without augmenting heater units. If the U.S. Navy desires the capability to access the northern latitudes, internationally recognized standards for Polar shipbuilding need to be applied to an arctic capable class of ship. Additionally, U.S. Department of Homeland Security should invest in a small but capable ice-breaker fleet to augment both Coast Guard and Navy sea control, but also to support commercial and scientific efforts in the Arctic. Realizing that true Arctic maritime access occurs when an Ice-Classified Navy or Coast Guard ship is joined with a Polar Class ice-breaker is an important distinction for leaders and decision makers to appreciate.

In order to understand the engineering requirements for Arctic capable ships, the U.S. Navy chartered a Naval Surface Warfare Center study in 2012 to evaluate additional systems and enhancements required to boost Arleigh Burke Class guided missile destroyer (DDG-51) and San Antonio Class amphibious transports (LPD-17) to reach an ICE-1C equivalent capability. The report indicated research development testing and evaluation (RDT&E) for the upgrades would cost $12.9M and the shipyard retro-fit would cost approximately $22.4M per ship. The back fit package would “greatly

expand operational availability by protecting the hull, propeller and underwater appendages against surface ice, and give the ships and ship systems greater resistance to low temperatures."[35] The Navy Surface Warfare Center concluded its report by recommendations the Navy "adopt the American Bureau of Shipbuilding (ABS) Rules for Building and Classing Steel Vessels to meet the ICE-1C standard as much as practicable. The standard calls for ice belts around the bow of the ship only, and requires internal structural reinforcement to prepare the ship to operate in very open ice (less than 3/10). This Ice Class ship would be able operate in a fresh channel cleared by an ice-breaker through 6/10 or less of fast ice."[36] While these engineering considerations are required for hull and mechanical structure of the base ship class, additional considerations are required for communication and weapon systems in order for warships to be functional in the Arctic.

The report provided additional insight into communication system and weapons system design features required to facilitate operations in extreme cold weather conditions, specifically identifying rotating radar arrays and communication antenna systems. Another finding of the report revealed critical vulnerabilities of current small boat stowage and crane davit designs that are exposed to weather and icing. Polar Class design specifications require internal boat stowage bays to facilitate rapid launching during emergency situations and Search and Rescue operations. In addition, certain helicopter flight deck design considerations must also be addressed to facilitate helicopter operations in extreme cold weather conditions. While retro-fitting all these cold weather design features on existing Navy warships is an option, a more cost effect approach may be to procure a small combatant platform designed specifically for Arctic

operations. Several examples of ICE-1C capable patrol ships are available for U.S. Navy procurement planners to consider, including the Danish Navy's ice capable patrol vessel and Canada's new ice capable frigate. Potential to leverage these existing shipbuilding programs by NATO allies may be viable. However, until either option is undertaken, the U.S. Navy and Coast Guard have limited capability to support U.S. National Strategy in the Arctic.

Conclusion

Although the Arctic environment is changing rapidly, it remains an austere and challenging environment for sustained maritime operations. While the Arctic region remains peaceful and a spirit of cooperation exists among the Arctic nations today, the potential for competing interests remains, especially in EEZ sovereignty, seabed mining rights, and fisheries enforcement. Furthermore, increased maritime traffic through the region raises concerns regarding contamination and pollution due to unsafe maritime transport or unforeseen accidents. Most Arctic nations recognize the need to maintain the capability to exert their influence in the region, Russia being most notable, and many have initiated programs to build ice capable naval or coast guard ships as well as ice-breakers. While the *U.S. National Strategy for the Arctic Region* also recognizes the importance of the region, its cavalier assertion that we "enable our ships to operate on, over and under the Arctic," requires closer consideration in order to match current U.S. naval capabilities with this lofty objective. Realizing the long lead times associated with shipbuilding programs and the austere fiscal challenges currently facing DoD, investment in Arctic maritime capability must be balanced with our economic and security interests. The option to back-fit a few select ships currently in inventory has been documented and could provide a short-term solution. The option to partner with

Canada's or Denmark's ongoing shipbuilding efforts could also be explored as an economical approach to procuring a small but properly designed Ice Capable Arctic squadron. Regardless of the direction taken by leadership, Arctic ice will continue to recede; economic development and maritime traffic will continue to increase, and U.S. maritime forces will remain limited in their capability to safeguard U.S. interests in the Arctic.

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