



When the Ice Melts

Developing Proactive American
Strategy for the Eurasian Arctic

Jason A. Turner

Lieutenant Colonel, USAF

Air Command and Staff College

Wright Flyer Paper No. 51



Air University

Steven L. Kwast, Lieutenant General, Commander and President

Air Command and Staff College

Thomas H. Deale, Brigadier General, Commandant

Bart R. Kessler, PhD, Dean of Distance Learning

Robert J. Smith, Jr., Colonel, PhD, Dean of Resident Programs

Michelle E. Ewy, Lieutenant Colonel, PhD, Director of Research

Thomas E. Kiesling, Major, Series Editor

Richard Smith, PhD, Essay Advisor

Selection Committee

Anthony Branick, Major

Carrie E. Chappell, Major

Liza D. Dillard, Major

Aaron P. Doriani, Major

Michelle E. Ewy, Lieutenant Colonel, PhD

Kevin S. Groff, Major

Thomas E. Kiesling, Major

Edward G. Ouellette, Major, PhD

Ryan D. Wadle, PhD

Please send inquiries or comments to

Editor

The Wright Flyer Papers

Department of Research and Publications (ACSC/DER)

Air Command and Staff College

225 Chennault Circle, Bldg. 1402

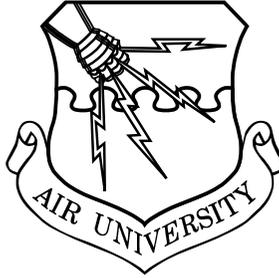
Maxwell AFB AL 36112-6426

Tel: (334) 953-3558

Fax: (334) 953-2269

E-mail: acsc.der.researchorgmailbox@us.af.mil

**AIR UNIVERSITY
AIR COMMAND AND STAFF COLLEGE**



When the Ice Melts
Developing Proactive American Strategy
for the Eurasian Arctic

JASON A. TURNER
Lieutenant Colonel, USAF

Wright Flyer No. 51

Air University Press
Air Force Research Institute
Maxwell Air Force Base, Alabama 36112-6026

Project Editor
Belinda Bazinet

Copy Editor
Sandi Davis

Cover Art, Book Design, and Illustrations
Daniel Armstrong

Composition and Prepress Production
Vivian D. O'Neal

Print Preparation and Distribution
Diane Clark

AIR FORCE RESEARCH INSTITUTE

AIR UNIVERSITY PRESS

Director and Publisher
Allen G. Peck

Editor in Chief
Oreste M. Johnson

Managing Editor
Demorah Hayes

Design and Production Manager
Cheryl King

Air University Press
155 N. Twining St., Bldg. 693
Maxwell AFB, AL 36112-6026
afri.aupress@us.af.mil

<http://aupress.au.af.mil/>
<http://afri.au.af.mil/>

AFRI 
AIR FORCE RESEARCH INSTITUTE

Published by Air University Press in December 2015

Disclaimer

Opinions, conclusions, and recommendations expressed or implied within are solely those of the author and do not necessarily represent the views of the Air Command and Staff College, the Air Force Research Institute, Air University, the United States Air Force, the Department of Defense, or any other US government agency. Cleared for public release: distribution unlimited.

This Wright Flyer Paper and others in the series are available electronically at the AU Press website: <http://aupress.au.af.mil>.

Contents

List of Illustrations	<i>v</i>
Foreword	<i>vii</i>
About the Author	<i>ix</i>
Acknowledgments	<i>xi</i>
Abstract	<i>xiii</i>
Introduction	1
Time Frames for Arctic Ice Reduction	3
Access to Oil and Gas Resources	5
Utility of the Northern Sea Route	8
Hazards to Arctic Operations	10
Russian Federation Policy in the Arctic	13
The Norwegian Government's High North Strategy	16
American Arctic Region Policy	19
Recommendations	21
Abbreviations	31
Bibliography	33

Illustrations

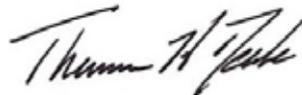
1	The Arctic marine sea	2
2	Minimum Arctic sea ice extent, 21 September 1979	4
3	Minimum Arctic sea ice extent, 16 September 2012	5
4	Maritime jurisdiction and boundaries in the Arctic	7
5	Maritime zones per United Nations Convention on the Law of the Sea	23

Foreword

It is my great pleasure to present another issue of *The Wright Flyer Papers*. Through this series, Air Command and Staff College presents a sampling of exemplary research produced by our residence and distance-learning students. This series has long showcased the kind of visionary thinking that drove the aspirations and activities of the earliest aviation pioneers. This year's selection of essays admirably extends that tradition. As the series title indicates, these papers aim to present cutting-edge, actionable knowledge—research that addresses some of the most complex security and defense challenges facing us today.

Recently, *The Wright Flyer Papers* transitioned to an exclusively electronic publication format. It is our hope that our migration from print editions to an electronic-only format will fire even greater intellectual debate among Airmen and fellow members of the profession of arms as the series reaches a growing global audience. By publishing these papers via the Air University Press website, ACSC hopes not only to reach more readers, but also to support Air Force-wide efforts to conserve resources. In this spirit, we invite you to peruse past and current issues of *The Wright Flyer Papers* at http://aupress.maxwell.af.mil/papers_all.asp?cat=wright.

Thank you for supporting *The Wright Flyer Papers* and our efforts to disseminate outstanding ACSC student research for the benefit of our Air Force and war fighters everywhere. We trust that what follows will stimulate thinking, invite debate, and further encourage today's air, space, and cyber war fighters in their continuing search for innovative and improved ways to defend our nation and way of life.



THOMAS H. DEALE
Brigadier General, USAF
Commandant

About the Author

Lt Col Jason A. Turner earned his commission in June 1999. After completing pilot training at Vance AFB, Oklahoma, he began his aviation career as a T-37 first-assignment instructor pilot, teaching basic flying skills to the newest pilot candidates from the US Air Force, Navy, and Marine Corps.

Colonel Turner went on to fly the F-15C at Kadena AB, Japan, where he participated in numerous exercises with regional partners in the Pacific and facilitated the integration of active electronically scanned array-equipped F-15Cs into the 67th Fighter Squadron. In 2008 he was reassigned to Laughlin AFB, Texas, where he instructed the Introduction to Fighter Fundamentals course in the T-38C. During this time, Colonel Turner held several positions including operations officer for the 434th Fighter Training Squadron and director of staff for the 47th Flying Training Wing. In 2013 he served as chief, Air Warfare Division at the Allied Forces Central Europe Air Warfare Center, where he fostered air combat interoperability among partner nations by instructing participants and supporting the execution of multinational, large-force employment exercises.

Presently, Colonel Turner supports Euro-NATO Joint Jet Pilot Training as chief of the Standardization and Evaluation Division at Sheppard AFB, Texas. In this capacity, he develops and refines procedures and guidance, validates the quality of instruction delivered by over 300 international instructor pilots, and hones future NATO fighter pilots by teaching Introduction to Fighter Fundamentals in the T-38C.

Colonel Turner holds a bachelor of science degree in electrical engineering from Rensselaer Polytechnic Institute and is a distinguished graduate of the Air Command and Staff College, from which he earned a master of science degree in military operational art and science.

Acknowledgments

I would like to thank my research advisor, Lt Col Eugene Moore III, for the assistance and guidance provided during the conceptual development of this research. Vectoring a career pilot on the nuance of political-military affairs required special patience, for which I am most grateful. Most importantly, I must recognize the support and encouragement provided by my wife and our daughters throughout the creation of this document; you provide the sturdy foundation upon which all my endeavors are built.

Abstract

The confluence of environmental, energy, and economic issues associated with Arctic ice recession warrants proactive American strategy to account for increased human activity within the Eurasian Arctic region. This paper examines the time frame associated with sea ice recession, the availability of oil and gas resources shared by Norway and Russia, the potential time and cost savings associated with utilization of the Northern Sea Route (NSR), and the hazards induced by Arctic operations. The paper considers Norwegian and Russian Arctic strategies and juxtaposes them with current American policy to derive recommendations for American strategy pertaining to the Eurasian Arctic. To envision the Eurasian Arctic in 2025, America should seek a free flow of global trade along the NSR, a minimal international military presence in the Arctic, an economically stable Russia, a strong Norwegian partner, and an improved international cooperation on environmental and maritime safety issues. Recommendations include accession to the United Nations Convention on the Law of the Sea, modified engagement with Russia, support for Norwegian regional leadership, and increased utilization of multi-lateral forums to address environmental, safety, and security concerns.

Introduction

Trends in global weather patterns are expected to open unprecedented access to the Arctic in the coming century. Warming has resulted in an increasing seasonal recession of Arctic ice that exposes previously inaccessible resources and waterways. This development has the potential to fundamentally shift the geopolitical landscape across the Arctic with particular influence on areas rich in oil and gas deposits lying submerged beneath continental shelves. The confluence of environmental, energy, and economic issues associated with Arctic ice recession warrants proactive policy by Arctic nations in anticipation of increased human activity within the Arctic region.

America's Arctic interests exist along two fronts. While America's focus is largely on its northern frontier and in the oil and gas deposits located near Alaska, it must also remain cognizant of another emerging front—the Eurasian Arctic. The Eurasian Arctic, dominated by Russian waters, spans over 3,500 nautical miles (nm) ranging from the western entrance above Norway to the eastern outlet through the Bering Strait. The Northern Sea Route (NSR), which traverses the Eurasian Arctic, is enshrouded by sea ice during winter months; however, warming has opened the route to maritime traffic during summer months offering the potential to transit goods between Europe and Asia (fig. 1). The strategic value of the NSR has the potential to explode if newfound oil and gas deposits, controlled by Norway and Russia in the Barents and Kara Seas, can be linked to booming markets in Asia. America must carefully consider how developments in the Eurasian Arctic will drive broader American Arctic strategy and likely inform choices made in the North American Arctic.

To explore these issues, this paper addresses four key areas that are tied to the strategic value of the NSR: the time frame associated with sea ice recession, the availability of oil and gas resources shared by Norway and Russia, the potential time and cost savings associated with utilization of the NSR, and the hazards induced by Arctic operations. Next, the policies of Russia, Norway, and the United States, with respect to the Eurasian Arctic, will be examined to determine how these nations' interests are influenced by ice recession in the region. Finally, the amalgamation of these considerations will yield recommendations for American strategy to proactively address interests in the Eurasian Arctic.



Figure 1. The Arctic marine sea. (Reprinted from the Protection of the Arctic Marine Environment Working Group Arctic Council, *Arctic Marine Shipping Assessment 2009 Report*, April 2009, http://www.pame.is/images/stories/AMSA_2009_Report/AMSA_2009_Report_2nd_print.pdf.)

Factors worthy of consideration have been intentionally omitted to constrain the focus of the research. First, the link between human activity and global warming has received extensive study by the scientific community. It may be possible, through aggressive global environmental reforms, to slow or reverse warming trends by reducing greenhouse gas emissions produced by the burning of fossil fuels. While environmental considerations are a key aspect of Arctic strategy, the ability to influence climate change through policy is not addressed. Also, many nations have a stake in Arctic outcomes. With global interest in the Arctic on the rise, several nations' strategy and policy will influence the geopolitical situation in the region. However, this study will emphasize the official policy of Russia and Norway over other Arctic nations because their geographical position and access to resources grant them greater relative influence on American interests in the Eurasian Arctic. Finally, development of America's Arctic resources in Alaska and the influence that the North-

west Passage, the sea route that straddles the North American Arctic, will have on American trade may rightfully dominate the United States' Arctic focus. Considerations for policy in the North American Arctic will comingle with those in the Eurasian Arctic. However, evidence suggests that ice recession will impact resource access and the viability of seaways in the Eurasian Arctic before the North American Arctic. While events occurring in the Eurasian Arctic may serve as valuable indicators of future changes in North America, emphasis is intentionally placed on the Eurasian Arctic to constrain the scope of recommendations.

The Arctic frontier offers untold potential shrouded by daunting obstacles. The recession of Arctic sea ice has led Adm Gary Roughead, chief of Naval Operations, to proclaim, "There is a phenomenal event taking place on the planet today, and that is what I call the opening of the Fifth Ocean; that's the Arctic Ocean. We haven't had an ocean open on this planet since the end of the Ice Age. So if this is not a significant change that requires new, and I would submit, brave thinking on the topic, I don't know what other sort of physical event could produce that."¹

In order to meet this challenge, the United States needs to understand the complex factors of environment, energy, and economics that influence the geopolitical landscape of the Arctic. Subsequently, the United States must apply this knowledge to adopt policy and pursue enhanced partnerships with other Arctic nations to promote stability and further the interests of America and its allies in the Eurasian Arctic.

Time frames for Arctic Ice Reduction

Many variables factor into the models of global climate systems, leading to a great deal of uncertainty regarding exactly when, and to what extent, Arctic sea ice reduction will unveil the NSR and facilitate access to oil and gas resources. In 2004 the entire NSR's navigation season was only 20 to 30 days.² While the portion of the NSR within the Barents Sea is commonly open year-round, eastern sections are usually open for only 60 to 90 days.³ In 2011 the route was open for five months and was transited by 34 ships with the assistance of a Russian icebreaker.⁴ Arctic ice flows are highly seasonal and variable from year to year, which increases uncertainty and costs associated with the NSR. However, it is expected that the navigable window will increase as the Arctic ice cap continues to melt. Accessibility hinges on many factors. Foremost among them may be the occurrence of an ice-free summer in the Arctic Ocean, a phenomenon that some models project may happen as early as 2015.⁵

The Arctic's ice cover is diverse, consisting of multiyear ice, first-year ice, and young ice.⁶ At higher latitudes, ice cover has remained perma-

nent throughout recorded history. Multiyear ice is “harder than concrete,” typically one to five meters thick, and capable of stopping the most powerful ice breakers.⁷ Conversely, young ice forms in autumn and is less than 30 centimeters thick and does not pose a safety hazard for most Arctic vessels.⁸ First-year ice ranges from one to two meters by the end of winter but can be traversed, with caution, by ice-strengthened vessels.⁹ This realization portends that even a brief period of an ice-free summer has the potential to significantly open the Arctic Ocean and the NSR for an extended navigational window by decreasing not only the extent but also the strength of ice impinging upon sea routes.

“Observed sea ice extents derived from satellite passive microwave data for 1979–2006 indicate a decrease or annual loss of 45,000 km² (kilometer squared) of ice (3.7 percent decrease per decade),” the *Arctic Marine Shipping Assessment 2009 Report* claims (fig. 2). Given these models, it is plausible that an ice-free summer may occur around 2040.¹⁰ In 2007 and again in 2012, summer Arctic sea ice cover reached its lowest extent in recorded history (fig. 3). These observations represent a rate of ice reduction three times greater than the average of commonly accepted models.¹¹ “Mark Serreze from the National Snow and Ice Data Center (NSIDC) in Boulder, Colorado, is on record saying the Arctic’s summer sea ice will fully melt around 2030,” the Arctic Institute report stated.¹² However, multiple models show the potential for an ice-free summer occurring between 2015 and 2017.¹³



Figure 2. Minimum Arctic sea ice extent, 21 September 1979. (Courtesy of National Aeronautics and Space Administration [NASA]/Goddard Space Flight Center Scientific [GSFC] Visualization Studio, Greenbelt, MD: NASA/GFSC, <http://svs.gsfc.nasa.gov/cgi-bin/details.cgi?aid=3998>.)

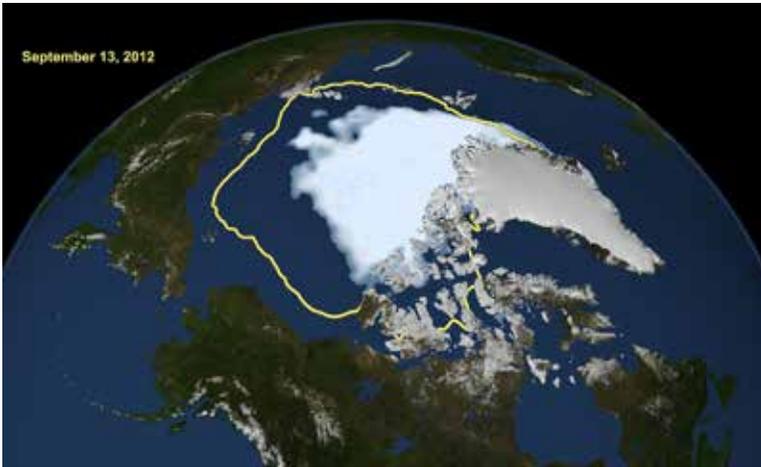


Figure 3. Minimum Arctic sea ice extent, 16 September 2012 and average minimum sea ice extent 1979–2010. The yellow outline shows the average sea ice minimum from 1979 through 2010. The sea ice is shown with a blue tint. (Courtesy of NASA/GSFC Scientific Visualization Studio, Greenbelt, MD: NASA/GSFC, <http://svs.gsfc.nasa.gov/cgi-bin/details.cgi?aid=3998>.)

It is scientifically challenging to develop precise models of complex nonlinear systems such as global weather. It is important to recognize that no climate model suggests that winter ice sea cover will disappear during this century.¹⁴ Operations in the Arctic will contend with seasonal ice formation for the foreseeable future. The Northern Research Forum, a Norwegian think tank, suggests, “Our knowledge of the relationship between global warming and climate change will remain somewhat simplified and limited, leaving room for scientific uncertainties, doubts and even controversies.”¹⁵ Still, overwhelming evidence suggests that the NSR will be increasingly available for shipping as the twenty-first century progresses, with the strong potential for an ice-free summer to facilitate access prior to 2040.

Access to Oil and Gas Resources

Access to inexpensive and stable sources of energy has been a catalyst for economic growth worldwide. Growing global demand for fossil fuels has driven steadily increasing energy prices. Global dependence on fossil fuels cedes disproportionate international influence to an increasingly small number of energy-rich nations. With fossil fuels currently providing 85 percent of the world’s energy needs, control of continuously dwindle-

ding known reserves has opened interest in deposits found in remote regions that were previously economically unviable for development and production.¹⁶ A 2008 US Geological Survey discovered that Arctic oil and gas deposits are concentrated in two regions, one capping northern Alaska and a larger region spanning the Barents and Kara Seas north of Norway and Russia.¹⁷ It is estimated that as much as 90 billion barrels of oil, 1.669 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids may be found in the Arctic region, accounting for as much as 25 percent of the world's undiscovered fossil fuel reserves.¹⁸ Of those, approximately 84 percent will be found in offshore areas.¹⁹

The survey measures only those reserves that can be recovered by using existing technology; it also makes no claim as to the profitability of extracting those reserves. As the cost of fossil fuels increases, remote reserves become more attractive to oil companies. In order to capitalize on access to these resources, many Arctic nations have used articles of the United Nations Convention on the Law of the Sea (UNCLOS) to make geographic claims to portions of the ocean's floor in an effort to gain sovereignty over potentially lucrative resources. Today, more than 80 percent of the world's fossil fuel reserves are state controlled, and an increasingly large number of oil and gas companies are partly or wholly owned by exporting governments.²⁰ For Russia and Norway, this reality makes investments in oil and gas exploration and infrastructure a central piece of governmental policy. For over 40 years, Norway and Russia have peacefully contested the boundary of their maritime border, in effect halting the area's exploration and development. In an unprecedented agreement made in September 2010 and ratified in July 2011, Russia and Norway agreed to split the difference on their claim to over 175,000 km² of sea floor.²¹ Remarkably, in February 2013 the results of a Norwegian survey mapping the Norwegian-controlled ocean floor determined that existing resources in the disputed area were at least one-third more than previously predicted.²²

While Russian prime minister Dmitri Medvedev has been sharply rebuked for conceding as much as €30 billion in oil and gas, Russian experts claim the potential on the Russian side may be three times higher than that of the Norwegians.²³ Prof. Vasily Bogoyavlensky at the Gubkin Russian State University of Oil and Gas pronounced, "Of course we do not gain anything by ceding territory, but we are given the possibility to work in an area that used to be blocked, and we are improving relations to our neighbors."²⁴ The previously contested area between the Russian and Norwegian borders represents only a fraction of the entirety of the resources available to each nation (fig. 4).

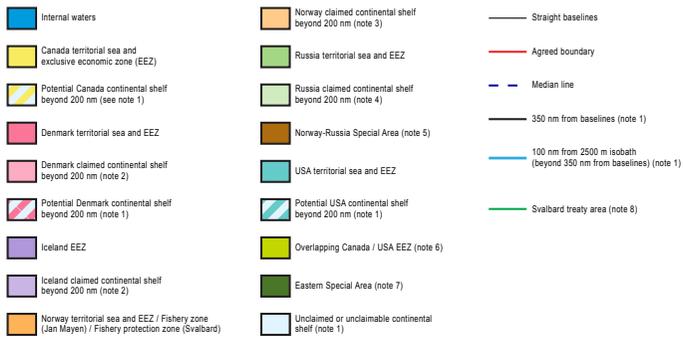
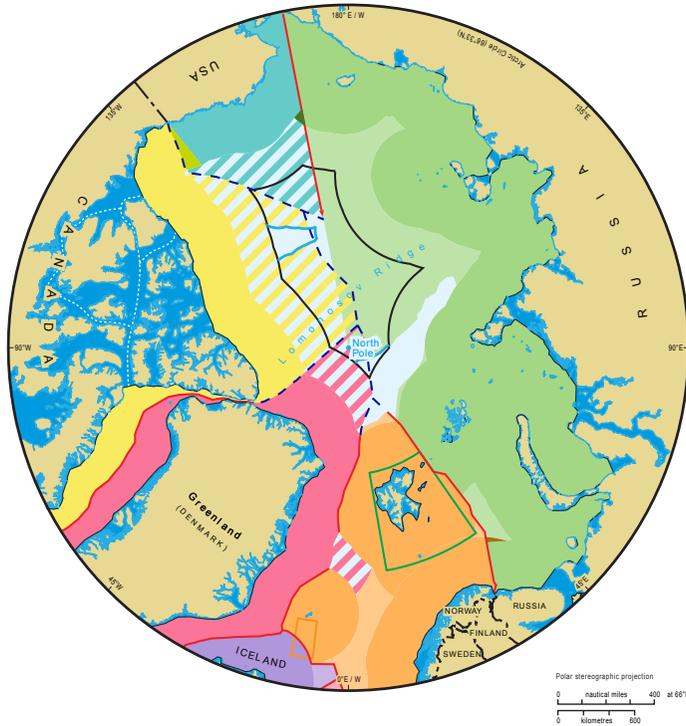


Figure 4. Maritime jurisdiction and boundaries in the Arctic. (Courtesy of International Boundaries Research Unit, Durham University, <http://www.durham.ac.uk/ibru/resources/arctic.>)

Experts on Arctic oil extraction at “The Future of Arctic Marine Navigation in Mid-21st Century” symposium were interviewed regarding their expectations of timelines for resources development in the Arctic. Many experts claim that a decade will be required to develop technology

and infrastructure to support extraction in the Barents and Kara Seas.²⁵ However, after 2025 rapid development will likely occur with it being possible within 30 to 40 years to have “the whole region open to production.”²⁶ Clearly, the profitability of such ventures will be tied to access to and the continued increase of demand for oil. One expert concerned with NSR access clarified, “No one wants to build infrastructure for only 6-months of the year.”²⁷ However, another member claimed that Russia is actively pursuing technology that might render sea ice less of an obstacle for production. “They are working on a significant icebreaker fleet and ice-proof hulls. They are preparing to do this in current conditions. They’re not going to let a little sea ice stop them.”²⁸ In 2006 the Norwegian public sector was spending over \$60 million annually on petroleum-related research.²⁹ Statoil, a Norwegian oil company, is currently in the process of researching “nanopaint” and closed-ventilation systems to reduce the impact of ice formation and extreme cold on offshore oil platforms.³⁰ The Russians and Norwegians are actively pursuing investments in the region with the expectation that oil prices will continue to rise, and ice will continue to melt.

Access to these resources makes the Eurasian Arctic, and particularly the Barents and Kara Seas, a lucrative and strategic region. In 2008 Russian and Norwegian oil fields shipped 6.7 million barrels per day through western routes, as compared to 17 million barrels flowing from the Middle East through the Strait of Hormuz.³¹ When asked about security in the Arctic, one expert at the symposium quipped, “You have little spats about borders now, but I can’t see that growing into a major conflict. But if it turns into an oil rush then friends quickly become enemies if there are trillions at stake.”³² If the price of fossil fuels continues to rise and technology related to petroleum recovery can be refined, the sea floors of Norway and Russia represent a trove of resources that can rival dwindling Middle Eastern supplies by midcentury. Increased petroleum resources, when extracted, fuel the economic strength of the nations who control them. They become even more valuable if they can be efficiently delivered to hungry markets in the East.

Utility of the Northern Sea Route

The NSR, when navigable, offers a passage between European markets and the Pacific Ocean. The route potentially can provide a seasonal link for oil production in the Barents and Kara Seas to vibrant markets in China and Japan. With an extended ice-free period and developed infrastructure, the NSR has the potential to serve as a major artery for global trade. The utility of the NSR is highly dependent upon the origin and

destination pairings. For example, traveling from Hamburg, Germany, to Yokohama, Japan, via the NSR is a journey of 6,600 nm; making the same connection through the Suez Canal requires an arduous 11,400 nm.³³ City pairings bridging Northern Europe to Northern China, Korea, and Japan have the largest benefit, often reducing travel distance by as much as 50 percent. Such routes can save as much as 15 days of transit time.

The ability to transit the NSR is notoriously unpredictable; the route has seen large variations in usage, a consideration that makes it less attractive to the container ship industry, which is modeled on prescheduled deliveries and uninterrupted service.³⁴ The western portion of the NSR covering the Kara Sea has been open for year-round navigation since 1978; this portion, serviced by icebreakers, routinely links the Russian ports of Murmansk and Dudinka.³⁵ The usage of the route as a national waterway by Russian vessels peaked in 1987 when 7 million tons were transported.³⁶ In 1991 Russia opened the entire NSR for international shipping. After the collapse of the Soviet Union, usage dwindled to between 1.5 and 2 million tons annually during the 1990s.³⁷ Since 2000 the entire route has been navigable for between 20 days to five months each year with only intermittent use during that time. In 2012 usage resurged, and 46 vessels—including those flying Norwegian, Finnish, Latvian, and Chinese flags—carried over 1.3 million tons along the route.³⁸ Russian officials anticipate that cargo volume along the NSR will increase to roughly 13 to 15 million tons by 2015.³⁹

Fuel savings for these journeys vary significantly based on the size of the vessel and the speed traveled. One Norwegian bulk carrier claimed a \$550,000 savings in fuel as compared to a journey using a route around the Cape of Good Hope.⁴⁰ Significant gains may be possible through economy of scale utilizing convoys of large ships. The Suez and Panama Canals are too narrow for “very large” and “ultra large” crude carriers to pass. Because ice routinely blocks more northern routings, the NSR favors passages along the Russian coast; these narrow passages also preclude safe passage for extremely large vessels. As the ice continues to recede, the NSR will become increasingly valuable to Norwegian and Russian oil and gas exporters as well as Chinese vessels carrying goods for European markets. Bin Yang of the Shanghai Maritime University sees a potential cost savings of \$60 to \$120 billion per year if China fully embraces Arctic shipping, diverting 5 to 15 percent of China’s international trade.⁴¹ In 2020, 10 percent of China’s projected trade would be valued at over \$650 billion dollars.⁴² Maritime experts in America predict that 2 percent of global shipping may transit the Arctic by 2030, and Arctic shipping may claim 5 percent of global shipping by 2050.⁴³

The utility of the NSR hinges upon many factors, but foremost is the consistency of ice-free passage. If ice recession continues along this trend, the route—largely controlled and heavily influenced by Russia—will become more attractive to international shipping, increasing its strategic value. Admiral Roughead recognized the impact this route may have during an address to the Active in the Arctic seminar, stating, “And then in about 20 years time, 25 years time, the Arctic becomes a profitable sea route from Asia to Europe over the top of the planet. If you look at some of the estimates from shippers, some may actually be here. That is about a million dollars a trip someone saves. That is not insignificant.”⁴⁴ As the timeline for ice recession is plotted over the potential for oil field development and profitability of the NSR, it becomes apparent that some nations are wagering vast amounts of wealth to capitalize on the opportunity in as soon as the next 10 years. Research and development projects undertaken by companies and nations today to facilitate resource extraction and transportation infrastructure will be reaching fruition as early as 2020. Awareness of the hazards of Arctic operations will be essential to reaping the dividends of these investments and creating policy, infrastructure, and cooperation to promote safety.

Hazards to Arctic Operations

Operating in the Arctic and navigating the NSR present significant challenges and risks. Unique difficulties in navigation and a remote location create a hostile environment that is largely incompatible with traditional maritime operations. Developing the capability to safely operate in the Arctic requires a comprehensive investment from the nations seeking access. The United States presently finds itself particularly ill-equipped for such a venture.

Maritime domain awareness is a comprehensive term that includes the knowledge of weather, terrain, sea depth, own-ship positioning, tracking of other vessels, and communications between vessels and land-based stations. These factors are made more difficult by the Arctic’s lack of infrastructure and relative absence of satellite coverage.

The Arctic is poorly mapped; land and sea charts of NSR areas lack the charting and hydrographic data necessary for the precise navigation of large vessels.⁴⁵ Furthermore, inertial and magnetic heading accuracy is confounded by the proximity of magnetic north and the rapid transit across longitudinal lines experienced at extremely high latitudes.⁴⁶ Land-based radio-navigation infrastructure for own-ship positioning, common to frequently traveled straits, is virtually nonexistent in the Arctic.⁴⁷ Inadequate weather monitoring in remote regions lacking radar and sat-

elite coverage yields unwelcome surprises. Ice flows are difficult to forecast and are rapidly variable. A vessel commencing a journey through the NSR may find its passage—once thought to be clear—quickly beset by advancing ice packs or potentially damaging flows.

These problems are multiplied by a lack of satellite coverage, which impacts global positioning and communications. Elevation angles of global positioning systems and the European Galileo positioning satellite constellations are optimized for coverage across sub-Arctic latitudes.⁴⁸ The Russian global navigation satellite system provides slightly better coverage at 65 degrees of elevation but is subjected to large ionospheric effects that result in gaps in coverage and reception.⁴⁹ Adequate satellite coverage and bandwidth exist for single vessels transiting the NSR; however, US defense analysts claim that “communications architecture is insufficient to support normal operational practices of a surface action group or any large-scale Joint Force operations.”⁵⁰

These factors, coupled with increased insurance costs and a requirement for icebreaking support, challenge the safety and profitability of Arctic operations.⁵¹ In 2010 icebreaking fees for a single vessel transiting the NSR amounted to over \$200,000, which is comparable to transit fees through the Panama or Suez Canal.⁵² Larger vessels would require two icebreakers to carve an adequately wide path in ice-contested waters.⁵³ In order to accept increased risk, there must be an adequate margin for profitability that may not be realized until infrastructure and ice recession mitigates uncertainty.

Remoteness is another significant barrier to Arctic operation. The NSR traces over 2,500 nm of nearly uninhabited tundra and has few suitable ports. Ships experiencing accidents or mechanical failures have few viable safe havens, and search and rescue capabilities are significantly lacking. The Russians established the Northern Sea Route Administration in 2013 and have allocated the equivalent of \$16 million to establish 10 search and rescue centers spanning the route.⁵⁴ However, this endeavor is only in the initial phases of development, and the investment appears meager to meet future demand.

Growth in petroleum production and shipping yields increased fears of an ecological disaster resulting from an oil spill in the region. Responders would have longer distances to travel, resulting in an increased radius of damage. However, recovering petroleum from waters mixed with ice poses an even greater challenge in responding to an Arctic oil spill.⁵⁵ Technologies that are effective in open waters are ill-suited for an icy environment.

In 2009 a group of 40 experts assembled to consider several scenarios related to Arctic search and rescue and oil-spill response.⁵⁶ The experts

concluded that present capabilities are entirely inadequate to provide a timely and meaningful response. They recommended identifying ports of refuge, improving maritime vessel tracking, creating mandatory safety regulations for Arctic operations, improving weather data and navigational charts, developing technologies to improve oil spill response, expanding communication capabilities, and strengthening multinational plans and agreements for all types of responses.⁵⁷ While the experts accurately identified the hazards of operating in the Arctic, their analysis was not focused on developing capability. Such efforts necessitate large investments and international cooperation to ensure a comprehensive capability. Presently, the United States, despite its aspirations for global reach, has few assets to contribute toward such endeavors in the Eurasian Arctic or in its own hemisphere.

America possesses an unmatched blue-water Navy. However, aside from decades of Arctic submarine operations, it is a fleet ill-prepared for Arctic surface operations. In war games conducted in 2011 to test Arctic scenarios ranging from disaster response to security issues, the US Navy discovered that it lacked “everything from bases and Arctic-capable ships to reliable communications and cold-weather clothing. . . . To operate in the Arctic, the Navy will need to lean on the U.S. Coast Guard, countries like Russia or Canada, or tribal and industrial partners.”⁵⁸

The Coast Guard’s fleet of icebreakers is currently in “woeful condition,” according to Adm Robert Papp, the Coast Guard commandant.⁵⁹ The Coast Guard is currently operating two icebreakers—one heavy icebreaker, CGC *Polar Star*, that has exceeded its 30-year service life and one new medium icebreaker, CGC *Healy*.⁶⁰ While the Coast Guard’s fiscal year 2013 budget includes \$8 million in acquisition funding earmarked for “survey and design activities” for a new heavy icebreaker, such a vessel will not be delivered for another 10 years.⁶¹ In the meantime, the Coast Guard’s projection for icebreaker requirements to support its internal homeland defense mission and the Navy’s operational needs stands at four heavy and two medium icebreakers.⁶²

While leasing icebreaker capability may provide a Band-Aid fix in an emergency, a commercially leased vessel might not be legally usable for law enforcement or defense operations.⁶³ Admiral Papp testified before the Senate in 2011: “And right now we’ve got zero capability to respond in the Arctic right now. And we’ve got to do better than that. That, when people ask me, what keeps me awake at night—an oil spill, a collision. A ship sinking in the Arctic keeps me awake at night, because we have nothing to respond. Or, if we respond, it’s going to take us weeks to get there.”⁶⁴ US Navy commander Blake McBride, Arctic affairs officer for

Task Force Climate Change, explains, “We don’t foresee a military threat in the Arctic, but it doesn’t mean we will not need to operate there.”⁶⁵

Ice recession may help alleviate some of the challenges of Arctic operations, but militaries must consider other side effects resulting from warming. While reductions of ice formations may facilitate access from surface vessels, it may compromise a strategic safe haven for submarine operations. The Arctic has long served as a valuable refuge for American and Russian ballistic missile submarines whose nuclear payloads are hidden physically and acoustically by ice formations.⁶⁶ The prospect of an ice-free summer may reduce the effectiveness of submarine forces as an effective nuclear deterrent during these periods.

The confluence of ice recession, resource development, and the opening of the NSR portend the growing strategic value of the Eurasian Arctic. These factors, when placed in the context of the challenges of operating in the Arctic, present an imposing problem for nations poised to capitalize on the region’s value. In order to plot a course for the future, the governments of Russia, Norway, and the United States have published strategy or policy for the Arctic to outline their interests, priorities, and intent for the region. A more comprehensive strategy can be derived to address America’s Arctic interests by reviewing and contrasting the tenets espoused in the strategies of regional powers against the stated goals of US policy.

Russian Federation Policy in the Arctic

Russia released its Arctic strategy in March 2009.⁶⁷ The document clearly outlines what Russia perceives as its interests, outlines its plans for development, and provides a three-phase timeline that guides activities through 2020. Dr. Katarzyna Zysk, a senior fellow at the Norwegian Institute for Defence Studies, characterizes the document as “abstain[ing] from the assertive, belligerent rhetoric frequently used by Moscow in recent years.”⁶⁸ Rather than focusing on security concerns, the strategy clearly recognizes the significance of the Arctic region to Russia’s economy as well as the need for international cooperation to ensure stability in the region.

Russia defines its main national interests in the Arctic as

1. the utilization of the Russian Federation’s Arctic zone as a national strategic resource base capable of fulfilling the socioeconomic tasks associated with national growth;
2. the preservation of the Arctic as a zone of peace and cooperation;

3. the protection of the Arctic's unique ecological system; and
4. the use of the North Sea passage as a unified transportation link connecting Russia to the Arctic.⁶⁹

The world looks to Russia with caution, wary of a predilection for realpolitik, but is optimistic for peaceful collaboration as the Arctic continues to thaw.

In order to understand Russia's intent, it is valuable to assess Russia's motivations and goals; economic motivation is foremost. Norwegian analyst Julia Loe assesses the two driving forces in Russian Arctic policy as "extraction of hydrocarbons and development of the Northern Sea Route . . . because they represent the most likely sources of Russian economic opportunities in the Arctic toward 2030."⁷⁰ Currently, 20 percent of Russia's gross domestic product and 22 percent of Russian exports are generated north of the Arctic Circle.⁷¹ It is likely that this percentage will increase for the foreseeable future with continued ice recession.

With deposits in western Siberia dwindling over the next 20 years, new prospects in the Barents and Kara Seas seem to offer a newfound source of resources to serve as the backbone of the Russian economy. Furthermore, as thawing permafrost threatens the stability of onshore oil production infrastructure, offshore oil extraction appears to offer Russia a viable and lucrative alternative. One of the key questions surrounding Russia's economy is whether it will attempt to unshackle itself from raw material dependency.

Oil price fluctuations have historically resulted in massive swings in the Russian economy. When oil prices dropped from \$140 a barrel in the summer of 2008 to \$40 in January 2009, Russia's stock market fell by 75 percent in less than a year.⁷² Russia's strategy proposes heavy investment in technology and infrastructure to support hydrocarbon extraction and increased operations along the NSR, including icebreaking, search and rescue, navigation, communications, and environmental and disaster response. While nothing in the Arctic policy suggests a retreat from raw material dependence, Russia's insistence on maintaining jurisdiction on international shipping transiting the North Sea passage alludes to the intent to capitalize on revenue from the new trade route.

The legal status of the NSR will likely be an issue of international contention. Russia's jurisdiction claim is loosely based on Article 234 of the UNCLOS because portions of the route, when under ice cover, transit Russian territorial waters, despite the fact that other portions of the route pass into the high seas.⁷³ By requiring vessels to notify Russian authorities of their intent to enter and to submit an application for guiding implies paying a fee for the usage of the route.⁷⁴ Outside of its Arctic strategy,

Russia has asserted that an attempt by other countries to alter the NSR's legal status would "conflict with Russia's national interests."⁷⁵

Russian Arctic strategy does view sovereignty as a main goal and strategic priority. The Russian Federation's official policy in the Arctic states that "in the sphere of national security, the protection and defense of the national boundary of the Russian Federation, which lies in the Arctic zone of the Russian Federation" is very important. The Russians seek a favorable operating environment in the Arctic zone for the Russian Federation, which includes the preservation of a basic fighting capability of general purpose units of the Armed Forces of the Russian Federation, as well as other troops and military formations in that region.⁷⁶ Such a declaration is consistent with any nation's defense of its sovereignty; however, Russia has utilized the flow of resources backed up with military might to influence political behavior in the past.

Russia's natural gas pipelines provide critical energy resources to a large portion of Europe. Between 2006 and 2008, Russia reduced or threatened to reduce gas supplies to Ukraine, Belarus, and Georgia during periods of hostilities or political conflict.⁷⁷ Many European countries have chosen to negotiate with Russia bilaterally rather than risk the supply of resources and compromise their relationship with the region's largest supplier.⁷⁸ Control of the NSR could be utilized to halt the flow of goods and resources on a larger scale if a nation's policies oppose those of the Russian government. Clearly, Russian acquiescence is presently required for access to the route, and active support from Russia's expanding fleet of nuclear-powered icebreakers is frequently needed outside of summer months. Along with its icebreakers, Russia is growing its naval military capacity. Russia has eight fourth-generation *Borei*-class ballistic missile submarines slated for completion by 2015.⁷⁹ These submarines may be augmented by as many as 40 additional surface vessels and six aircraft carrier squadrons.⁸⁰

Concerns over Russia's naval recapitalization must be balanced with Russia's stated intent to pursue the Arctic as a region of peaceful cooperation. Russia is betting on the economic viability of Arctic resources and the NSR and is obligated to protect these interests. The North Atlantic Treaty Organization (NATO) has been a historical power balance to Russia's military strength. "Fifty percent of the circumpolar region is the territory of a NATO member, and four out of five Arctic coastal states are NATO members," said analyst Heather Conley of the Center for Strategic and International Studies.⁸¹ Russia owns the other 50 percent.

A careful balance must be struck to avoid a provocative militarization of the Arctic region. "Canada strongly opposes any NATO involvement on sovereignty grounds and other NATO members are concerned with

negative Russian reaction,” Conley continued.⁸² Russia’s reaction to NATO posturing has been telling. In March 2009 Russia’s NATO ambassador stated that Moscow would not cooperate with the alliance on Arctic matters.⁸³ In September 2010 Medvedev reportedly observed that “the Arctic can do fine without NATO.”⁸⁴ Clearly, NATO is not the preferred forum to engage Russia on collaboration in the Arctic.

Realizing that Russia’s economic prosperity hinges upon continued access to natural resources and global markets provides a foundation for understanding Russia’s Arctic strategy. Russia’s commitment to the peaceful development of the Arctic region is critical as instability could unhinge the viability of international investment in the NSR or the resources transported upon it. However, because of Russia’s resource-driven economy, stability may rely on increasingly high petroleum prices. Loe contends that an economically strong Russia is likely to drive the government toward increased participation in the United Nations, G20, and other supranational institutions. This may result in a more authoritarian Russian government but may also foster a renewed democratization within the nation.⁸⁵

Resolving the 40-year-old border dispute with Norway may foreshadow a more compromising foreign policy where the economic needs of both parties can be met. Furthermore, Northern Eagle 2012, a joint Russian-US-Norwegian naval exercise, brought military forces from each nation to the Barents Sea to carry out diverse scenarios ranging from search and rescue to antipiracy engagements and air defense drills.⁸⁶ The exercise, which took place outside the auspices of NATO, was a promising signpost for the potential of combined security operations in the future. However, other nations should remain wary. If a low-cost alternative to oil and natural gas was developed, resource-driven economies in Russia and the Middle East have the most to lose.⁸⁷ If Russia retains an economy based on raw materials, it may be left with few options to regain economic and political stability if its gamble for Arctic fossil fuels does not pay out.

The Norwegian Government’s High North Strategy

The Norwegian Government’s High North Strategy was published in December 2006. Since that time, Norway has been so successful in achieving the objectives outlined in its strategy that it published an updated document, *New Building Blocks in the North: The Next Step in the Government’s High North Strategy*, in March 2009. Norway’s revised strategy is detailed and comprehensive. Due to the nation’s relative size and location, far greater attention is focused on the development of the Arc-

tic, and Norway recognizes that it plays a unique role in this endeavor. Norway cites seven main political priorities that are echoed in its strategy documents:

1. We will exercise our authority in the High North in a credible, consistent and predictable way.
2. We will be at the forefront of international efforts to develop knowledge in and about the High North.
3. We intend to be the best steward of the environment and natural resources in the High North.
4. We will provide a suitable framework for further development of petroleum activities in the Barents Sea, and will seek to ensure that these activities boost competence in Norway in general and in North Norway in particular, and foster local and regional business development.
5. We intend the High North policy to play a role in safeguarding the livelihoods, traditions and cultures of indigenous peoples in the High North.
6. We will further develop people-to-people cooperation in the High North.
7. We will strengthen our cooperation with Russia.⁸⁸

As a global leader in Arctic maritime operations and petroleum production, Norway offers knowledge, technical expertise, and a stable supply of energy resources. Investments in technology and infrastructure to support this capability are central to the government's action plans. Norway's long-term relationship with both Russia and NATO grants the nation a unique security position and an active role and balanced perspective in international forums. Norway's strategy deftly capitalizes on its strengths and serves as a model for other nations.

Norway sees itself as a knowledge leader and seeks to stay ahead of competitors. The nation is pursuing national projects on the cutting edge of technology to support climate research, maritime safety, ship tracking, and oil spill response while integrating with the International Maritime Organization to establish safety and environmental standards for maritime transport.⁸⁹ Norway sees its space industry and space infrastructure as an area for future expansion. It is partnering with the European Union to make the Galileo satellite navigation system more effective in the High North and with the European Space Agency to participate in the Global Monitoring for Environment and Security program to enhance climate

monitoring and research.⁹⁰ Norway is actively utilizing its knowledge base to gain influence and cooperation in international forums to mold a policy that meets the nation's future business and security needs.

A key component of Norway's strategy is the development of the petroleum industry and associated infrastructure to capitalize on recent discoveries of oil and natural gas in the Barents Sea. Norway views these resources as an opportunity to create "positive, regional and national ripple effects" associated with petroleum activities.⁹¹ Rather than seeing petroleum production as a singular goal, Norway recognizes that technology, business development, northern infrastructure, and employment are all intertwined. Norwegians see their resource wealth as an opportunity to draw business and talent to the nation. Norway's government has embarked upon a national transport plan that spans 2010–19.⁹² This "extraordinary strategic effort" will link road, rail, air, and sea networks to northern Norway and the Barents Sea and power them with a secure and robust electric transmission infrastructure.⁹³ Norway may face a downside risk of a growth in international maritime traffic, creating a commensurate risk of an ecological incident. However, the nation is attempting to capitalize on the upside of increased traffic by providing a favorable business model as a logistics provider by providing supplies and port facilities to serve as transportation hubs. By straddling the western outlet of the NSR, Norway may be able to serve as a nexus for the transfer of cargo from slower ice-capable vessels to conventional ships to help minimize operating costs to shippers.

As a member of NATO and a primary partner with Russia, Norway stands in a unique security position. The first priority for Norway in its High North strategy is to "exercise [its] authority in a credible, consistent and predictable way."⁹⁴ While assuring sovereignty of its land and maritime borders is a cornerstone of policy, Norway sees the majority of its security challenges as cross-sectorial, requiring cooperation between civilian and military authorities.⁹⁵ Norway views combining the effectiveness of its armed forces, coast guard, and police force as central to meeting both its national and international obligations.⁹⁶ Protection of natural resources and emergency response are identified as central mission sets for these forces.

A political priority for Norway is cooperation with Russia. It has developed a program administered by the Ministry of Foreign Affairs and allocated \$22.5 million in 2009 to foster civil, academic, medical, environmental, and cultural connections between the two nations.⁹⁷ According to Norway's strategy, "relations with Russia form the central bilateral dimension of Norway's High North policy."⁹⁸ Furthermore, "Norway's policy toward Russia is based on pragmatism, interests and cooperation."⁹⁹

Norway's relations with Russia have a history of being peaceful. In fact, Norway is the only country sharing a border with Russia that has never been at war with Russia. Russian concession over ownership of a significant portion of the resource-rich Barents Sea in 2010 only serves to further cement the relationship between the two nations. NATO, in comparison, receives only scant acknowledgement in Norway's strategy for playing an ongoing role "in maintaining stability and predictability and to preserve a low level of tension that has traditionally characterized the region."¹⁰⁰ Norway understands that NATO provides the necessary military might to counterbalance possible aggression from its Russian neighbors but also realizes that its economic prosperity is enabled and bolstered by the support and stability of Russia.

American Arctic Region Policy

The United States has a strategy deficit in the Arctic. America's capstone strategy document, the 2010 *National Security Strategy*, offers only one sentence on the Arctic: "The United States is an Arctic Nation with broad and fundamental interests in the Arctic region, where we seek to meet our national security needs, protect the environment, responsibly manage resources, account for indigenous communities, support scientific research, and strengthen international cooperation on a wide range of issues."¹⁰¹ In January 2009, less than two weeks before Barack Obama was sworn in as the 44th president of the United States, the Bush administration published National Security Presidential Directive 66 (NSPD-66), *Arctic Region Policy*. This concise document contains guidance on US interests in the Arctic and how those interests influence policy. Quite disparate from the strategies articulated by Russia and Norway, the American document is far more general, focusing on broad objectives rather than highlighting specific goals or identifying programs or initiatives designed to achieve them. Six policy points are outlined in the document:

1. Meet national security and homeland security needs relevant to the Arctic region;
2. Protect the Arctic environment and conserve its biological resources;
3. Ensure that natural resource management and economic development in the region are environmentally sustainable;
4. Strengthen institutions for cooperation among the eight Arctic nations (United States, Canada, Denmark, Finland, Iceland, Norway, Russian Federation, and Sweden);

5. Involve the Arctic's indigenous communities in decisions that affect them; and
6. Enhance scientific monitoring and research into local, regional, and global environmental issues.¹⁰²

While these policy points mirror issues addressed in the strategies of Norway and Russia, the vagueness in how they will be achieved demonstrates the lack of a comprehensive strategy for the region. Perhaps this was done to allow President Obama the opportunity of clarifying how America would move forward in the Arctic. Yet, as of April 2013, a comprehensive Arctic strategy for the United States has yet to be released.* A review of NSPD-66 reveals that the United States is still developing its vision for how to address concerns in its own portion of the Arctic with only scant consideration for how developments in the Eurasian Arctic may influence America's interests at home and abroad.

NSPD-66 advocates for broad international cooperation on climate research, maritime safety, and environmental protection—all worthy goals. American policy advocates acting through agencies such as the Arctic Council, the IMO, and the United Nations as key vehicles toward advancing these objectives. Engaging on these common and unifying interests through international institutions is a sentiment shared by all Arctic nations. However, America's hesitance to ratify UNCLOS or endorse the Kyoto Protocol sends mixed signals to the international community. If supposed unifying issues are to be addressed in a more extensive and meaningful way, it will require consensus, resources, and coordinated action from all Arctic nations.

America realizes that the Arctic may be an emerging arena for national security concerns. NSPD-66 identifies key security interests including “missile defense and early warning; deployment of sea and air systems for strategic sealift, strategic deterrence, maritime presence, and maritime security operations; and ensuring freedom of navigation and overflight.”¹⁰³ Of these, the most contentious issue for the United States in the Eurasian Arctic will likely involve ensuring freedom of the seas. The document states that “freedom of the seas is a top national priority. . . . The Northern Sea Route includes straits used for international navigation; the regime of transit passage applies to passage through those straits. Preserving the rights and duties relating to navigation and overflight in the Arctic region supports our ability to exercise these rights throughout

*This statement was current when the paper was written; however, in May 2013, National Strategy for the Arctic Region was released by the White House, http://www.whitehouse.gov/sites/default/files/docs/nat_arctic_strategy.pdf

the world, including those strategic straits.”¹⁰⁴ This position puts the United States at odds with Russia’s claims to jurisdiction over the NSR. Access to the route has not been contested by anything other than ice since it was opened to international traffic in 1991; however, rights to international transit of the NSR is one area likely to invoke tension as traffic along the route increases.

Resource development in the Arctic is also important to the United States, but, unlike Russia and Norway, the economics associated with resource development do not dominate national interests. Regions in Alaska offer the opportunity for resource collection, but NSPD-66 acknowledges that “most known Arctic oil and gas resources are located outside of United States jurisdiction.”¹⁰⁵ Like all nations, the United States seeks to ensure its sovereignty over its Arctic territory. NSPD-66 calls specific attention to the importance of legally defining areas of the seabed and continental shelf that are subject to resource development. These concerns are focused on Alaskan resources, but it is an issue that legally parallels Norway’s and Russia’s claims in the Eurasian Arctic. Ensuring the legal basis for resource claims is a critical enabler for business investment and development.

While NSPD-66 highlights some of America’s interests in the Arctic, it fails to provide a comprehensive road map for how to achieve national interests in the Arctic. America’s Arctic policy lacks the international engagement and the specificity to spur the programs and to capitalize on the unique opportunities that the “the opening of the fifth ocean” may provide. Receding Arctic ice will influence global resource flows and economies. Naturally, such shifts may influence security establishments in North America as well as the Eurasian Arctic. In a constrained resource environment, it will be difficult to divert adequate resources to develop hard power solutions in anticipation of an uncertain Arctic future. A strategy for the Eurasian Arctic must include a thorough understanding of desired end states and match those to the ways and means to achieve them. The strategy must also strongly consider how an evolving Arctic will impact America at home and abroad.

Recommendations

The United States must identify a desired end state across a given time frame and align elements of national power in arenas that it can positively influence to develop an effective strategy for the Eurasian Arctic. Determining a suitable time frame is a critical task, and America is behind its Arctic peers. Russia and Norway have used 2020 as a milestone for Arctic development in their strategies. Environmental and economic

developments taking place over this period will be critical to the region. America should consider 2025 as a viable time frame to account for these developments and ensure an adequate time horizon for policy and programs identified in strategy to reach fruition. America should seek a free flow of global trade along the NSR, a minimal international military presence in the Arctic, an economically stable Russia, a strong Norwegian partner, and improved international cooperation on environmental and maritime safety issues. In a resource-constrained environment, the Eurasian Arctic offers America the opportunity to adapt to an evolving geopolitical situation rather than attempting to control or exploit it with hard power. A targeted American strategy potentially can decrease global reliance on Middle Eastern petroleum, improve market access and energy security for European allies, and reduce tension by deepening the economic interdependence between China and the West.

Freedom of navigation and rights to offshore resource development must remain central elements of American Arctic policy; convincing the US Congress to ratify UNCLOS should be central to Arctic strategy. UNCLOS, the international treaty that governs both freedom of navigation and claims to offshore continental shelves, establishes guidelines for utilization of the world's oceans.¹⁰⁶ Put into force in 1994, 164 countries and the European Union have acceded to it. As part of policy implementation, NSPD-66 calls for the US Senate to agree to UNCLOS.¹⁰⁷ America's ability to influence the international community on freedom of the seas is significantly hindered by nonaccession. By not signing, America has lost its seat at the table in discussions concerning interpretation of the treaty.

UNCLOS can solidify the legal status of the NSR as an international trade route. Russia makes the valid claim that portions of the NSR currently transit territorial waters within 12 nm of its coast. As such, Russia has the right to maintain jurisdiction over these areas and administer them as it sees fit. For transit considerations, areas beyond the 12 nm boundary are considered international waters (fig. 5). It is to Russia's advantage to encourage global access rather than imposing extraneous fees or restricting access. Profitability of the route hinges upon consistent access, and Russia stands to benefit from operating its icebreakers to facilitate access with the lowest possible cost to shippers. As ice recedes, vessels transiting the NSR will be able to utilize passages that never enter Russian territorial seas. Freedom of shipping can be gained through international agreement and economic imperative rather than increased military presence.

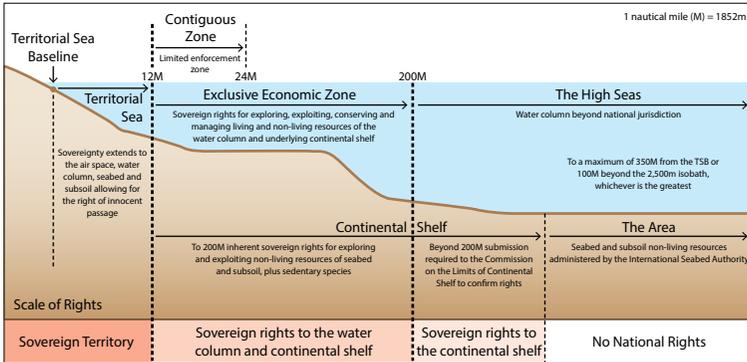


Figure 5. Maritime zones per United Nations Convention on the Law of the Sea. (Courtesy of PAME Arctic Council, *Arctic Marine Shipping Assessment 2009 Report*, April 2009, 52, http://www.pame.is/images/03_Projects/AMSA/AMSA_2009_report/AMSA_2009_Report_2nd_print.pdf.)

UNCLOS also serves as the vehicle to formally define national exclusive economic zones (EEZ) for resource development. This provides an internationally sanctioned means of exercising sovereignty over offshore resources. American accession to the treaty not only has the potential to secure access and encourage investment in Alaskan oil resources but also has the added benefit of reducing tension over resource claims in the Eurasian Arctic that have the greatest potential to spark conflict. These reasons have led the Department of Defense to actively advocate for accession to UNCLOS in the 2010 *Quadrennial Defense Review Report*.¹⁰⁸ Admiral Roughead also recognized the importance of participating in UNCLOS. “Many of my colleagues and foreign navies, and my counterparts, will come to me and say, ‘we need your leadership at the table,’ because there are other countries that are using the challenges, particularly as it applies in the EEZs, to drive a change in that customary law and I believe that we as a nation are at a significant disadvantage if we are not there,” he said.¹⁰⁹

Support for UNCLOS is far from unanimous. Primary opposition to UNCLOS resides in a Republican Senate minority. They contend that the treaty opens the door for environmental litigation and yields excessive arbitration power to the United Nations. Furthermore, the treaty calls for a royalty of as much as 7 percent levied against profits derived from offshore production to be redistributed to landlocked nations.¹¹⁰ Donald Rumsfeld argued against ratification, citing these royalties as “a new idea of enormous consequence.” He added that such a construct “could become a

precedent for the resources of outer space.”¹¹¹ Military support for the treaty is strong; however, a 33-star letter signed by retired flag officers contends the treaty limits military activities and hinders force projection.¹¹² Despite these objections, UNCLOS serves as a foundation upon which other elements of American Arctic strategy must be built. As such, compromise is warranted. America should choose to join a vast majority of nations and assume a role in administration of UNCLOS to protect its greater Arctic interests. This will demonstrate the value of freedom of access, global trade, and international cooperation in the Eurasian Arctic.

Engagement with Russia must evolve in order for America to achieve strategic goals in the Eurasian Arctic. Rather than resorting to a Cold War-era ideology of power balancing and containment, America must recognize that an economically strong Russia is a stable Russia. Russia traditionally pursues foreign policy along a heavily interest-driven agenda with independence, sovereignty, territorial integrity, and international influence at the forefront.¹¹³ Russia’s interests and those of the world are conveniently aligned in the Eurasian Arctic. Russia’s muted rhetoric and embrace of international institutions in its Arctic strategy are indicative of a new direction for its foreign policy. Russia’s economic development depends on the export of resources and the routes linking them to the outside world. Russia eventually needs to shift its nation’s economy away from a resource-driven economy. Ice recession extends the viability of Russia’s petroleum economy but also connects to Asian markets that promote a more balanced economy with new emphasis on manufacturing. The route itself offers opportunity for capital investments in icebreaking and logistical services supporting increased shipping traffic. Stable and unrestricted trade along the NSR is in the mutual economic interest of both Russia and the world, offering a far greater benefit than the short-term political leverage achieved by restricting the flow of energy resources.

Reducing Russia’s urge to increase military presence in the Arctic should be a key element to American strategy. If Russia’s primary concern is securing economic stability, then it will choose to develop military capacity commensurate to threats perceived. The decision to compromise with Norway over sovereignty of historically contested resources strongly indicates that Russia’s actions will be aligned with the tone and methods espoused in its Arctic strategy. Russia’s near-term acquisition of eight ballistic missile submarines may appear aggressive; however, it should be seen as a low-cost hedge against NATO’s superior conventional forces. Defense minister Sergei Ivanov warns, “If NATO remains a military alliance with an offensive military doctrine, Russia will have to adequately revise its military planning and principles regarding the develop-

ment of its armed forces, including its nuclear forces.”¹¹⁴ With a credible nuclear deterrent in place on both sides, reduced military expenditures could reduce tensions and facilitate reinvestment in the economic recovery of both Russia and America.

America’s Arctic military capabilities may lag behind regional competitors. Rather than increasing military presence, America should engage in continued cooperation with regional partners including Russia to enhance the Navy’s ability to respond to cross-sectorial concerns including antipiracy, disaster, and emergency response. These contingencies are far more likely than large conventional military conflicts. Identifying support and coordination shortfalls in such endeavors provides a more comprehensive emergency response capacity through enhanced relations among participants. Investing in the US Coast Guard’s icebreaking capacity is an important aspect of this requirement that must not be forgotten in shrinking defense budgets.

In the 2011 Unified Command Plan, US Northern Command was given advocacy for Arctic capabilities, while the US European Command retained responsibility for operations in the Eurasian Arctic.¹¹⁵ While this construct is valuable for coordination between the Department of Homeland Security and the Coast Guard, the US European Command must remain actively involved in advocating for Arctic capabilities to support allies in the region. The United States should fund acquisition to achieve an end strength of four heavy and two medium icebreakers within the 2025 time frame to provide credible access for global Arctic operations. Perhaps Russian nuclear-powered icebreaking technologies could provide a valuable blueprint.

American strategy should include a strengthened partnership with Norway. Norway’s maritime expertise and relationships with both Russia and NATO make it an invaluable interlocutor and regional leader. Instead of attempting to outspend Norway in Arctic and maritime research, America should look to take a supporting role in the development of mutually beneficial technologies supporting surveillance, maritime safety, environmental protection, and emergency response. The investments that Norway is making today in these technologies and the infrastructure that supports them chart a cost-effective road map for American corporations to follow as they seek to develop Alaskan resources. Keeping Norway at the forefront of maritime technology and as a supplier to global shipping helps guard its economy should the petroleum market falter. Norway’s petroleum resources provide a hedge for Europe against Russian control of the flow of oil and gas. Norway will likely want to sell petroleum in Asia; its NATO link should keep Russia from getting aggressive with the country’s shipping, resources, or sovereignty. Fur-

thermore, because of its location, Norway maintains a military force optimized for Arctic operations. America can learn from Norway's experience and enhance interoperability by expanding participation in joint military exercises. America can benefit from Norway's development of maritime surveillance and satellite utilization through information-sharing agreements. Finally, when engaging Russia, Norway's support in multilateral institutions will have greater influence than bilateral negotiations alone. Modeling aspects of America's Arctic strategy utilizing Norway's example provides a valuable starting place for strengthening the bonds between America and a vital ally.

Supporting expansion of global trade through the NSR warrants consideration for how the United States should interface with the international community. Canada, Denmark, Finland, Iceland, and Sweden join Norway, Russia, and the United States as active members of the Arctic Council. The Arctic Council was chartered as "a high-level intergovernmental forum to promote cooperation, coordination and interaction among the Arctic States."¹¹⁶ It provides a forum for the Arctic nations to address issues of mutual concern in the arenas of maritime safety, resource development, and environmental protection. All eight Arctic Council nations have explicitly endorsed the council as their preferred forum for such discussions in their published strategies or policies.¹¹⁷ Increasingly, other nations, recognizing the Arctic's growing importance, have sought to participate on the council. France, Germany, the Netherlands, Poland, Spain, and the United Kingdom have been granted observer status. Furthermore, 17 other nations and organizations will be considered for observer status between 2013 and 2015 including China, Japan, India, and the European Union.¹¹⁸ America should encourage observer status for China and India. These nations have growing industrial economies with a massive demand for petroleum. Actively involving them in environmental reform potentially can improve the global environmental concerns resulting from warming trends influenced by increased carbon emissions.

International participation through the council should be encouraged; however, voting power should remain solely in the hands of the Arctic nations. The Arctic nations will bear the financial burden for providing the majority of vessel monitoring, emergency response, and environmental clean up capability. By encouraging the world to utilize the Arctic in both an economically profitable and environmentally sustainable way, the Arctic nations have the potential to reap great dividends while minimizing the downside risks associated with increased human activity.

The Arctic Council was not chartered to manage security-related concerns in the Arctic. As NATO activity excludes Russian participation, America should advocate for a multilateral forum to manage collective security concerns. Collective Arctic security has the potential to enhance information sharing and diffuse the costs associated with domain awareness and emergency response. Conley advocates for an Arctic coast guard forum to enhance enforcement of drug and migrant trafficking and vessel monitoring.¹¹⁹ Oldin Strader of the Arctic Institute recommends an Arctic Council security agreement and a multilateral Arctic response force.¹²⁰ He advocates that such a structure enhances transparency and cooperation while avoiding a military buildup in the Arctic.¹²¹ A forum—separate from the Arctic Council—dedicated to addressing security concerns brings America much needed Arctic access at a significantly lower buy-in cost than developing indigenous assets. While America loses some flexibility in this structure, deemphasizing American unilateral capacity in the Eurasian Arctic will likely serve as a stabilizing influence in the region.

The Arctic presents a harsh and rapidly changing environment. American strategy must adapt to capitalize on the unique and imminent opportunities manifest within these challenges. Given the necessary emphasis placed on other regions of the world, the Arctic is an often forgotten realm. While the threat of conflict in the High North may appear remote, the growth of strategic importance in the Eurasian Arctic is tied irrevocably to the receding ice that currently shrouds the NSR and the oil fields of the Barents and Kara Seas. America cannot afford to neglect its strategy in the Eurasian Arctic with the uncertainty associated with petroleum markets and global shipping. In order for such a strategy to be successful, America must make some near-term investments in technology and capability. But it need not do so blindly or alone. Investment in relationships with international partners must be the central component of America's strategy in the Eurasian Arctic.

Notes

(All notes appear in shortened form. For full details, see the appropriate entry in the bibliography.)

1. Roughead, address.
2. Brigham and McCalla, "Arctic Marine Geography," 28.
3. O'Rourke, *Changes in the Arctic*, 16.
4. Ibid.
5. Brigham, "Introduction," 4.
6. Ibid., 22.
7. Ibid.

8. Ibid.
9. Ibid.
10. Ibid., 25.
11. Ibid., 30.
12. Humpert, *Future of the Northern Sea Route*.
13. Ibid. Humpert claims that “other scientists do not expect the summer ice to survive beyond 2013.” *Arctic Marine Shipping Assessment 2009 Report*, 4. The council makes the assertion that “there is a possibility of an ice-free Arctic Ocean for a short period in summer perhaps as early as 2015.”
14. Brigham and McCalla, “Arctic Marine Geography,” 25.
15. Þórsteinsdóttir and Oddsdóttir, *Politics of the Eurasian Arctic*, 21.
16. Cronin, *Global Strategic Assessment 2009*, 81.
17. Bird et al., *Circum-Arctic Resource Appraisal*, 2–4.
18. Ibid., 4.
19. Ibid.
20. Cronin, *Global Strategic Assessment 2009*, 71.
21. “Russia and Norway Sign Maritime Border Agreement,” *BBC News*, 15 September 2010, <http://www.bbc.co.uk/news/business-11316430>.
22. Thomas Nielsen, “Smiles for Big Arctic Oil,” *Barents Observer*, 6 March 2013, <http://barentsobserver.com/en/energy/2013/02/smiles-big-arctic-oil-27-02>.
23. Trude Pettersen, “No Need for Panic over Norwegian Oil Survey,” *Barents Observer*, 6 March 2013, <http://barentsobserver.com/en/energy/2013/03/no-need-panic-over-norwegian-oil-survey-06-03>.
24. Ibid.
25. Protection of the Arctic Marine Environment, “Future of Arctic Marine Navigation,” 5.
26. Ibid., 7.
27. Ibid., 9.
28. Ibid., 7.
29. *Norwegian Government’s High North Strategy*, 28.
30. Trude Pettersen, “New Technologies for Arctic Oil,” *Barents Observer*, 8 March 2013, <http://barentsobserver.com/en/energy/2013/03/new-technologies-arctic-oil-08-03>.
31. Cronin, *Global Strategic Assessment 2009*, 78–79.
32. Protection of the Arctic Marine Environment, “Future of Arctic Marine Navigation,” 14.
33. Þórsteinsdóttir and Oddsdóttir, *Politics of the Eurasian Arctic*, 23–24.
34. Humpert, *Future of the Northern Sea Route*.
35. Cunningham, Brigham, and Barr, “History of Arctic Transport,” 44.
36. Zysk, “Russia’s Arctic Strategy,” 106.
37. Ibid.
38. Atle Staalesen, “Opening the Northern Sea Route Administration,” *Barents Observer*, 21 March 2013, <http://barentsobserver.com/en/arctic/2013/03/opening-northern-sea-route-administration-21-03>.
39. Zysk, “Russia’s Arctic Strategy,” 105.
40. Humpert, *Future of the Northern Sea Route*.
41. Ibid.
42. Trude Pettersen, “China Starts Commercial Use of Northern Sea Route,” *Barents Observer*, 14 March 2013, <http://barentsobserver.com/en/arctic/2013/03/china-starts-commercial-use-northern-sea-route-14-03>.
43. Ibid.
44. Roughead, address.
45. Conley, *A New Security Architecture for the Arctic*, 12.

46. Jensen and Sicard, "Arctic Navigation Issues."
47. Ibid.
48. Ibid.
49. Ibid.
50. Conley, *A New Security Architecture for the Arctic*, 12.
51. Humpert, *Future of the Northern Sea Route*.
52. Ibid.
53. O'Rourke, *Changes in the Arctic*, 17.
54. Staalesen, "Opening the Northern Sea Route Administration."
55. Williams, Wojhan, and Falkingham, "Arctic Marine Infrastructure," 170.
56. Coastal Response Research Center, "Opening the Arctic Seas," 5–6.
57. Ibid., 32–36.
58. Nicole Klaus, "War Games Finds U.S. Navy Ability Lacking in Arctic," *Kodiak Daily Mirror Fairbanks Daily News-Miner*, 28 April 2012, http://www.newsminer.com/article_d66f70ab-0999-54f9-bb8b-b94f46610e2c.html.
59. Zach Rausnitz, "Papp: The Coast Guard Can't Lease All Its Icebreakers," *Fierce Homeland Security*, 9 August 2012, <http://www.fiercephomelandsecurity.com/story/papp-coast-guard-cant-lease-all-its-icebreakers/2012-08-09>.
60. US Senate, *US Coast Guard Budget and Oversight Hearing*.
61. O'Rourke, *Changes in the Arctic*, 36.
62. Ibid.
63. Rausnitz, "Papp."
64. US Senate, *US Coast Guard Budget and Oversight Hearing*.
65. Klaus, "War Games Find U.S. Navy Ability Lacking"
66. Þórsteinsdóttir and Oddsdóttir, *Politics of the Eurasian Arctic*, 25.
67. "Foundations of Russian Federation Policy," 97.
68. Zysk, "Russia's Arctic Strategy," 104.
69. "Foundations of Russian Federation Policy," 98.
70. Loe, *Driving Forces in Russian Arctic Policy*, 1.
71. Zysk, "Russia's Arctic Strategy," 105.
72. Loe, *Driving Forces in Russian Arctic Policy*, 17.
73. Zysk, "Russia's Arctic Strategy," 107.
74. Ibid.
75. Ibid.
76. "Foundations of Russian Federation Policy," 99.
77. Cronin, *Global Strategic Assessment 2009*, 70.
78. Protection of the Arctic Marine Environment, "Future of Arctic Marine Navigation,"
16.
 79. Zysk, "Russia's Arctic Strategy," 108.
 80. Ibid.
 81. Conley, *A New Security Architecture for the Arctic*, 30.
 82. Ibid.
 83. O'Rourke, *Changes in the Arctic*, 49.
 84. Ibid.
 85. Loe, *Driving Forces in Russian Arctic Policy*, 27.
 86. Gerald O'Dwyer, "Norway Hails Northern Eagle as Bridge-Builder," *DefenseNews*, 24 August 2012, <http://www.defensenews.com/article/20120824/DEFREG01/308240002/Norway-Hails-Northern-Eagle-Bridge-builder>.
 87. National Intelligence Council, *Global Trends 2025*, 46.
 88. *New Building Blocks in the North*, 6.

89. Ibid., 9–16.
90. Ibid., 36.
91. Ibid., 67.
92. Ibid., 64.
93. Ibid., 33, 35.
94. *Norwegian Government's High North Strategy*, 7.
95. Ibid., 19.
96. Ibid., 7.
97. *New Building Blocks in the North*, 40.
98. *Norwegian Government's High North Strategy*, 17.
99. Ibid., 18.
100. *New Building Blocks in the North*, 52.
101. *National Security Strategy*, 50.
102. Bush, *Arctic Region Policy*, 2.
103. Ibid.
104. Ibid.
105. Ibid., 7.
106. United Nations, *United Nations Convention on the Law of the Sea*, 25.
107. Bush, *Arctic Region Policy*, 4.
108. US Department of Defense, *Quadrennial Defense Review Report*, 86.
109. Roughead, address.
110. *Summary of Hearings on Water and Oceans Policy*.
111. Kristina Wong, "Rumsfeld Still Opposes Law of Sea Treaty, Admirals See It as Way to Settle Maritime Claims," *Washington Times*, 14 June 2012, <http://www.washingtontimes.com/news/2012/jun/14/rumsfeld-hits-law-of-sea-treaty/?page=all>.
112. *Summary of Hearings on Water and Oceans Policy*.
113. Igumnova, "Russia's Strategic Culture," 262.
114. Ibid., 265.
115. Jim Garamone, "Unified Command Plan Reflects Arctic's Importance," *American Forces Press Service*, 7 April 2011, <http://www.defense.gov/News/NewsArticle.aspx?ID=63467>.
116. Secretariat, Arctic Council, "About the Arctic Council."
117. Heininen, *Arctic Strategies and Policies*, 80.
118. Secretariat, Arctic Council, "About the Arctic Council."
119. Conley, *A New Security Architecture for the Arctic*, 38.
120. Strader, "An Arctic Council Security Agreement."
121. Ibid.

Abbreviations

CSIS	Center for Strategic and International Studies
EEZ	exclusive economic zone
GSFC	Goddard Space Flight Center
km ²	kilometer squared
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
nm	nautical mile
NSIDC	National Snow and Ice Data Center
NSPD	National Security Presidential Directive
NSR	Northern Sea Route
UNCLOS	United Nations Convention on the Law of the Sea
USGS	US Geological Survey

Bibliography

- Bird, Kenneth J., Ronald R. Charpentier, Donald L. Gautier, David W. Houseknecht, Timothy R. Klett, Janet K. Pitman, Thomas E. Moore, Christopher J. Schenk, Marilyn E. Tennyson, and Craig J. Wandrey. *Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle*. US Geological Survey (USGS) Fact Sheet. Menlo Park, CA: USGS, 2008. <http://pubs.usgs.gov/fs/2008/3049/fs/2008-3049.pdf>.
- Brigham, Lawson. "Introduction," in *Arctic Marine Shipping Assessment 2009 Report*, ed. B. Ellis and L. Brigham. (Borgir, Nordurlod, Iceland: Protection of the Arctic Marine Environment, April 2009), 8–15. http://www.pame.is/images/stories/AMSA_2009_Report/AMSA_2009_Report_2nd_print.pdf.
- Brigham, Lawson, and R. McCalla. "Arctic Marine Geography, Climate and Sea Ice," in *Arctic Marine Shipping Assessment 2009 Report*, ed. B. Ellis and L. Brigham. (Borgir, Nordurlod, Iceland: Protection of the Arctic Marine Environment, April 2009), 16–35. http://www.pame.is/images/stories/AMSA_2009_Report/AMSA_2009_Report_2nd_print.pdf.
- Bush, George W. *Arctic Region Policy*. National Security Presidential Directive 66 (NSPD-66). Washington, DC: The White House, 9 January 2009.
- Coastal Response Research Center. "Opening the Arctic Seas: Envisioning Disasters and Framing Solutions." Durham, NH: University of New Hampshire, January 2009. http://www.crrc.unh.edu/workshops/arctic_spill_summit/arctic_summit_report_final.pdf.
- Conley, Heather A. *A New Security Architecture for the Arctic: An American Perspective*. Center for Strategic and International Studies (CSIS) Europe Report. Washington, DC: CSIS, January 2012. http://csis.org/files/publication/120117_Conley_ArcticSecurity_Web.pdf.
- Cronin, Patrick. *Global Strategic Assessment 2009: America's Security Role in a Changing World*. Institute for National Security Studies Report. Washington, DC: National Defense University Press, 2009.
- Ellis, Ben, and Lawson Brigham, eds. Protection of the Arctic Marine Environment Working Group (PAME), Arctic Council. *Arctic Marine Shipping Assessment 2009 Report*. http://www.pame.is/images/stories/AMSA_2009_Report/AMSA_2009_Report_2nd_print.pdf.
- "The Foundations of Russian Federation Policy in the Arctic until 2020 and Beyond." *Journal of International Security Affairs*, no. 18 (Spring

- 2010). http://www.securityaffairs.org/issues/2010/18/russia's_new_arctic_strategy.pdf.
- Hanssens, Olav. "New Resource Figures for the Southeastern Barents Sea and Jan Mayen." *Norwegian Petroleum Directorate*, 27 February 2013. <http://www.npd.no/en/news/News/2013/New-resource-figures-for-the-southeastern-Barents-Sea-and-Jan-Mayen/>.
- Heininen, Lassi. *Arctic Strategies and Policies: Inventory and Comparative Study*. Northern Research Forum Report. Stell, Akureyri, Iceland: University of Lapland Press, April 2012. http://www.nrf.is/images/stories/Hveragerdi/Arctic_strategies_7th_draft_New_20120428.pdf.
- Humpert, Malte. *The Future of the Northern Sea Route: A "Golden Waterway" or Niche Trade Route*. Washington, DC: The Arctic Institute Center for Circumpolar Security Studies, 15 September 2011. http://www.thearcticinstitute.org/2011/10/future-of-northern-sea-route-golden_13.html.
- Igumnova, Lyudmila. "Russia's Strategic Culture between American and European Worldviews." *Journal of Slavic Military Studies* 24, no. 2 (2011): 253–73.
- International Boundaries Research Unit. *Maritime Jurisdiction and Boundaries in the Arctic Region*. Durham University, United Kingdom, 20 December 2011. <http://www.dur.ac.uk/resources/ibru/arctic.pdf>.
- Jensen, Anna, and Jean-Paul Sicard. "Arctic Navigation Issues." Presentation. e-NAV Conference, Nordic Institute of Navigation, Bergen, Norway, 5 March 2009.
- Loe, Julia S. P. *Driving Forces in Russian Arctic Policy*. Oslo, Norway: Pöyry Management Consulting, 13 January 2011. http://www.geo-politicsnorth.org/images/stories/attachments/econ_2011.pdf.
- Miller, Hugo. "BHP Billiton Leads Arctic Gold Hunt in Global Warming Bonanza." *Bloomberg.com*, 16 April 2008. <http://www.bloomberg.com/apps/news?pid=20601081&sid=ag.kQZln.mFg&refer=australia>.
- Mullen, Adm Michael G. *The National Military Strategy of the United States of America*. Washington, DC: US Government Printing Office, 8 February 2011.
- National Aeronautics and Space Administration (NASA). "September Arctic Minimum Arctic Sea Ice 2012." NASA/Goddard Space Flight Center Scientific Visualization Studio. <http://svs.gsfc.nasa.gov/vis/a000000/a003900/a003998/index.html>.
- National Intelligence Council. *Global Trends 2025: A Transformed World*. Washington, DC: US Government Printing Office, November 2008.

- The National Security Strategy of the United States of America*. Washington, DC: The White House, May 2010.
- New Building Blocks in the North: The Next Step in the Government's High North Strategy*. Oslo, Norway: Norwegian Ministry of Foreign Affairs, 12 March 2009. <http://www.arctic-council.org/index.php/en/about/documents/category/12-arctic-strategies?download=129:new-building-blocks-north>.
- The Norwegian Government's High North Strategy*. Oslo, Norway: Norwegian Ministry of Foreign Affairs, 1 December 2006. <http://www.arctic-council.org/index.php/en/about/documents/category/12-arctic-strategies?download=128:norwegian-government-high-north-strategy>.
- O'Rourke, Ronald. *Changes in the Arctic: Background and Issues for Congress*. Washington, DC: Congressional Research Service, 2 January 2013. <http://www.fas.org/sgp/crs/misc/R41153.pdf>.
- Protection of the Arctic Marine Environment Working Group (PAME), Arctic Council. "The Future of Arctic Marine Navigation in Mid-21st Century: Interview Highlights." Compiled by Global Business Network. Presentation, Scenario Creation Workshop, San Francisco, CA, April 2007. http://www.institutenorth.org/assets/images/uploads/articles/AMSA_Interview_Highlights.pdf.
- Roughead, Adm. Gary, chief of Naval Operations. Address. Active in the Arctic Seminar, Washington, DC, 16 June 2011. <http://www.navy.mil/navydata/people/cno/Roughead/Speech/110616%20Arctic%20Capitol%20Hill.pdf>.
- Secretariat, Arctic Council. "About the Arctic Council." Tromsø, Norway: Arctic Council, 2007–13. <http://www.arctic-council.org/index.php/en/about>.
- Strader, Oldin. "An Arctic Council Security Agreement: Preventing Militarization and Ensuring Stability and Security of the Arctic (Part II)." The Arctic Institute Center for Circumpolar Security Studies, Washington, DC, 18 January 2012. <http://www.thearcticinstitute.org/2012/01/12234-arctic-council-security-agreement.html>.
- Summary of Hearings on Water and Oceans Policy*. American Geosciences Institute Summary. Alexandria, VA: American Geosciences Institute, 5 July 2012. http://www.agiweb.org/gap/legis112/wateroceans_hearings.html#jun28.
- Þórsteinsdóttir, Guðrún Rósa, and Embla Eir Oddsdóttir, eds. *The Politics of the Eurasian Arctic: National Interests and International Challenges*. Ásprent, Akureyri, Iceland: Northern Research Forum, 2008.

- United Nations. *United Nations Convention on the Law of the Sea*, 10 December 1982. http://www.un.org/Depts/los/convention_agreements/texts/unclos/unclos_e.pdf.
- US Department of Defense. *Quadrennial Defense Review Report*. Washington, DC: Office of the Secretary of Defense, February 2010.
- US Senate. *The US Coast Guard Budget and Oversight Hearing before the Subcommittee on Oceans, Atmosphere, Fisheries, and Coast Guard of the Committee on Commerce, Science, and Transportation United States Senate*. 112th Cong., 1st sess., 23 June 2011. <http://www.gpo.gov/fdsys/pkg/CHRG-112shrg72563/html/CHRG-112shrg72563.pdf>.
- Williams, M., T. Wojhan, and J. Falkingham. "Arctic Marine Infrastructure," in *Arctic Marine Shipping Assessment 2009 Report*, ed. B. Ellis and L. Brigham. (Borgir, Nordurland, Iceland: Protection of the Arctic Marine Environment, April 2009), 154–87. http://www.pame.is/images/stories/AMSA_2009_Report/AMSA_2009_Report_2nd_print.pdf.
- Zysk, Katarzyna. "Russia's Arctic Strategy: Ambitions and Constraints." *Joint Force Quarterly* 57 (2d quarter 2010). <http://www.ndu.edu/press/lib/images/jfq-57/zysk.pdf>.

