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Phase Zero Contracting for U.S. Arctic National Security

June 2017

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Prepared for the Naval Postgraduate School, Monterey, CA 93943.

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ABSTRACT

Arctic ice is receding and creating increased activity. A navigable Arctic poses security concerns, but also represents accessible resources and reduced shipping costs. This research investigates the following questions: Does the Department of Defense (DOD) have the capabilities to meet U.S. security objectives in the Arctic? What are the DOD's related national strategy responsibilities? What opportunities exist to minimize cost while providing capability? What contract actions are appropriate for Phase Zero of Arctic planning?

Included is a literature review of national strategy and international policies, limited to specific research areas. Analysis of procurement stakeholder integration uses Yoder's Three-Tier Model. Examination of successful integration uses Yoder's Three Integrated Pillars. The agility, discipline, and risk pillars are used to determine contract considerations.

This research found that the DOD is not prepared to conduct military operations in the Arctic, and has deficiencies in equipment and training for national defense roles. Also, the DOD lacks trained personnel capable in the immersive interagency, international, and non-governmental integration necessary for procurement efforts. There are several tasks the DOD is charged with supporting; only one task was specified. Joint interagency integration and selection of an appropriate contract type are key to meeting U.S. national security objectives in the Arctic.

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ABOUT THE AUTHOR

CPT Ricky A. Grant, USA, was born in Flint, Michigan and enlisted in the Army in 1998 as a Military Police Officer. He received an ROTC commission as a Transportation Corps Officer, earning a BS from Middle Tennessee State University in 2007.

From 2007 until 2010 he was assigned to the 6th Squadron 17th Cavalry, 16th Combat Aviation Brigade, Ft Wainwright Alaska where he served as a Distribution Platoon Leader and as the Forward Support Troop Executive Officer. In 2011 CPT Grant arrived at Ft Drum, NY where he commanded D Troop 1/89 Cavalry and then commanded A Company of 210 Brigade Support Battalion. In 2013 CPT Grant served as the Company Grade Logistics assignments Officer at Human Resources Command in Ft Knox, KY. Upon completion of the tour in 2015 he was selected for attendance at the Naval Postgraduate School for studies in the MBA program. Upon graduation in 2017 CPT Grant assumed duties at the Assistant Product Manager for the Aviation Combined Arms Tactical Trainer in Orlando, FL.

CPT Grant's deployments include Tazar, Hungary (1999) in support of the NATO Kosovo Campaign, Mosul, Iraq (2008-2009) in support of OIF, and Patika province Afghanistan (2013).

CPT Grant's military education includes the Basic Officer Leaders Course, Transportation Officer Basic Course, Logistics Captains Career Course, Unit Movement Planning Course, Personal Security Course, and the Naval War College's Joint Professional Military Education Phase I.

CPT Grant's awards and decorations include: the Parachutist Badge, Air Assault Badge, Bronze Star (2OLC), Meritorious Service Medal (2OLC), Army Commendation Medal, Army Achievement Medal (3OLC), Kosovo Campaign Medal, Global War on Terrorism Medal, Iraqi Campaign Medal, Army Service Medal, Overseas Service Medal, NATO Campaign Medal, National Defense Service Medal and the Meritorious Unit Citation.

CPT Grant is married to Dawn Grant and has three children, Fiona, Nicole, and Emily Grant.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACAP	Arctic Contaminants Program
ADRP	Agility, Discipline, and Risk Pillars
AMAP	Arctic Monitoring and Assessment Program
AOR	Area of Responsibility
APEX	Adaptive Planning and Execution System
C or CS	Cost or Cost Sharing
CAFF	Conservation of Arctic Flora and Fauna Working Group
CCIF	Combatant Commanders Initiative Fund
CERP	Commanders Emergency Response Program Funds
CNO	Chief of Naval Operations
CPAF	Cost Plus Award Fee
CPFF	Cost Plus Fixed Fee
CPIF	Cost Plus Incentive Fee
CRADA	Cooperative Research and Development Agreement
CTC	Combat Training Center
DBO	Distributed Biological Observatory
DHS	Department of Homeland Security
DOC	Department of Commerce
DOE	Department of Energy
DOI	Department of Interior
DOT	Department of Transportation
E&EE	Emergency and Extraordinary Expenses
EBM	Ecosystem Based Management
EPA	Environmental Protection Agency
EPPR	Emergency Prevention, Preparedness, and Response Working Group

EU	European Union
FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulation
FCC	Federal Communications Commission
FFP	Firm Fixed Price
FP3P	Fixed Price Perspective Price Redetermination
FPAF	Fixed Price Award Fee
FPEPA	Fixed Price Economic Price Adjustment
FPI	Fixed Price Incentive
FPIF	Fixed Price Incentive Firm Target
FYDP	Future Years Defense Program
GDP	Gross Domestic Product
IAM	Integrated Arctic Management
IARPC	Interagency Arctic Research Policy Committee
ICD	Initial Capabilities Document
ICEEX	U.S. Arctic submarine exercise
IDIQ	Indefinite Delivery Indefinite Quantity
IPE	Integrated Planner Executer
JCIDS	Joint Capabilities Integration and Development System
JP	Joint Publication
JPMRC	Joint Pacific Multinational Readiness Capability
JROC	Joint Requirements Oversight Council
LNG	Liquefied Natural Gas
MILCON	Military Construction
NAF	Non-appropriated Funds
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic Atmospheric Administration

NSF	National Science Foundation
OHDACA	Overseas Humanitarian, Disaster, and Civic Assistance
O&M	Operations and Maintenance
OPLAN	Operations Plan
ORF	Official Representation Funds
PAME	Protection of the Arctic Maritime Environment Working Group
PPBE	Planning, Programming, Budgeting, & Execution
SAREX	Search and Rescue Exercise
SDWG	Sustainable Development Working Group
TIPS	Three Integrated Pillars
T&M	Time and Materials
UCP	Unified Command Plan
UN	United Nations
U.S.	United States
USAFMC	United States Air Force Materiel Command
USARAK	U.S. Army Alaska
USCG	United States Coast Guard
USNORTHCOM	United States Northern Command
YTTM	Yoder's Three-Tier Model

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I. INTRODUCTION AND OBJECTIVES

A. RESEARCH PURPOSE AND OBJECTIVES

As the polar ice in the Arctic melts, conditions are set for increased naval traffic and natural resource exploration and exploitation. The United States Energy Information Administration estimates that 13% of the world's oil reserves and 30% of the world's natural gas reserves rest in the undiscovered areas of the Arctic (United States Energy information Administration, 2012). In addition to oil and gas, the Arctic is home to an estimated one trillion dollars' worth of minerals, such as zinc and nickel. There has also been a 118% increase in maritime traffic between 2008 and 2012, a trend that will continue to grow as resources and resource-extracting technology becomes more available (National Oceanic Atmospheric Administration [NOAA], 2014). This increase of availability of resources will undoubtedly create competition for these resources from both Arctic and non-Arctic states. As a nation with Arctic interest, it is prudent that U.S. planning and forecasting efforts focus on nonaggressive development with the intent of forging cooperative partnerships in the interest of Arctic stability and prosperity. This research explores the feasible options and the strategic contracting considerations to facilitate U.S. Arctic strategic objectives, given the unique operating environment of the Arctic's geopolitical and geographical constraints and capability gaps. The intent of this research is to identify the specific contracting considerations critical to the achievement of U.S. Arctic strategic objectives, develop those considerations, and then provide recommendations for contract types based on appropriate levels of risk and maturity of technology.

B. RESEARCH QUESTIONS

The following are specific research questions addressed in this report:

- Does the DOD have the appropriate capabilities to meet Arctic responsibilities?
- What are the Department of Defense's (DOD's) responsibilities in the National Strategy for the Arctic?
- Are there opportunities to capitalize on existing networks to minimize cost while providing capability?

- What contract actions are appropriate for Phase Zero of Arctic planning?

C. METHODOLOGY AND SCOPE

This research includes a literature review of applicable domestic and international policy documents in an effort to develop an understanding of the political policies and constraints that apply to the Arctic operations, international cooperation, and strategy. This research further investigates and identifies efficiencies with existing military and civilian efforts, Phase Zero Arctic requirements, and contracting structures that are needed to facilitate success in the Arctic region. Gross capability requirements are analyzed, and contracting practices are contrasted to identify which approach would best meet the governmental needs based on acceptable levels of risk, discipline, and agility. Ideal governance rules to incentivize consummate behavior in meeting cost, schedule, and performance objectives are examined. Specific sources of this research include, but are not limited to, the following:

- National Strategy for the Arctic, 2013 (White House, 2013)
- Implementation Plan of the National Security Strategy for the Arctic Region, 2014 (White House, 2014)
- Department of Defense Arctic Strategy, 2013 (DOD, 2013)
- U.S. Navy Arctic Roadmap 2014–2030 (Chief of Naval Operations [CNO], 2014)
- United States Coast Guard Arctic Strategy, 2013 (United States Coast Guard [USCG], 2013)

Using publicly available political policy, military operating guidance, and other U.S. governmental organizations' strategic guidance, a system of constraints is examined. Then international policy will be analyzed to develop a system of considerations to be applied to the analysis of infrastructure, personnel, and platforms to be planned and contracted for during Phase Zero of Joint Theater Planning (Yoder, Long, & Nix, 2012). All information considered for this research is publicly available and unclassified. As a result of the public availability of resources for the full spectrum of considerations for this research, personnel interviews will not be conducted. This research is not subject to IRB protocol. The "Arctic Heat" scenario developed by senior lecturer Cory Yoder, Naval Postgraduate School, will serve as a guideline to focus the efforts of this research.

For analysis of successful procurement integration within the military and acquisition framework, Yoder's Three Integrated Pillars of Success (TIPS) model will be used. Yoder's TIPS, model personnel, platforms, and protocols are examined and integrated in the acquisitions process. Personnel needs are examined using Yoder's Three-Tier Model (YTTM) as required. Platforms are analyzed for the integration of contracting throughout all phases of the operation. Protocols are rooted in the existing set of rules and procedures that govern the execution of the contracting plan within the operation plan. The Agility, Discipline, and Risk Pillar (ADRP) model is used as the analysis framework that will be used to determine appropriate contract types. Under this framework, acceptable levels of agility, discipline, and risk are analyzed and applied to the characteristics of major contract types to determine the optimal contract type for the specified action.

D. CHAPTER SUMMARY

The following section, Chapter II, develops an understanding of the unique geographical area of interest and an overview of the national policy objectives, the implementation plan for those policy objectives, political and environmental constraints, and ongoing military and civilian exercises. Chapter III examines appropriate frameworks for analysis of Arctic requirements and contracting options for meeting national initiatives in the Arctic. In Chapter IV, findings and recommendations are provided. Chapter V includes a summary, conclusion, and recommendations for further research.

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II. BACKGROUND

A. INTRODUCTION

The Arctic represents a region that is diverse in culture, resources, and influences. In this chapter, I provide an overview of the unique geographic nature of the Arctic and the state and non-state actors that influence the region. I also examine the national strategy documents, opportunities in international cooperation, and the military process for meeting, identifying, and filling capability gaps.

B. GEOGRAPHIC AREA OF INTEREST

Title 15 of U.S. Code 4111 defines the Arctic as

> all United States and foreign territory north of the Arctic circle and all United States territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering, and Chukchi Seas; and the Aleutian Chain. (Title 15 U.S. Code Chapter 67 § 4111)

This definition is represented graphically in Figure 1.

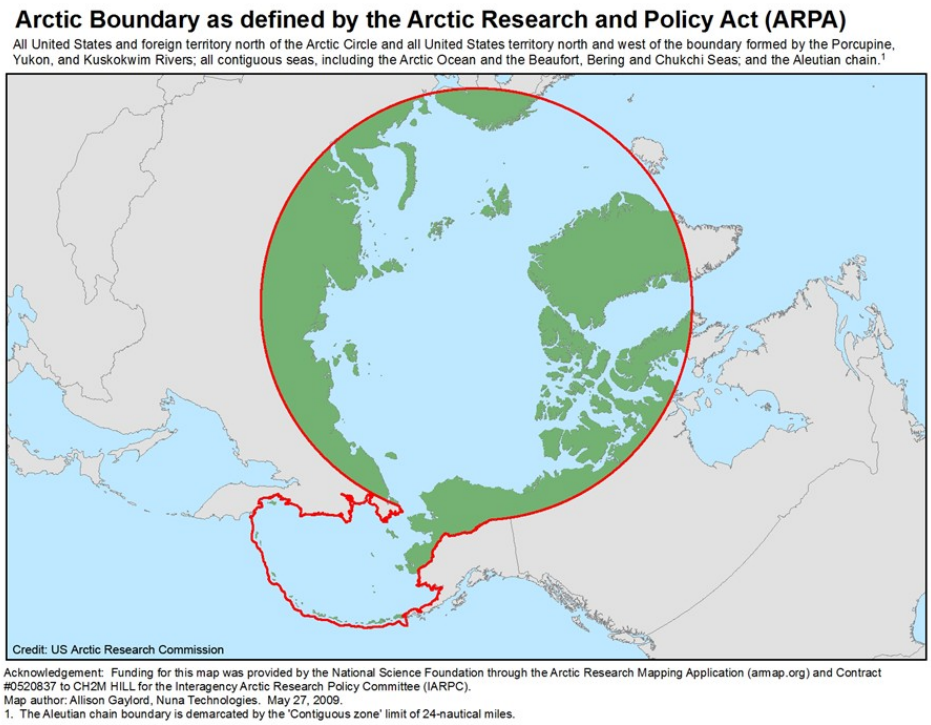

Figure 1: Graphic Representation of Arctic Area of Interest. Source: CNO (2014)

There are currently three established routes to navigate the Arctic Ocean: the Northern Sea Route, Trans-Polar Route, and the Northwest Passage. The Northern Sea Route is 4740 nautical miles long and stretches from the Bering Strait to Norway by way of the Russian coast. The Trans-Polar Route encompasses 4,170 nautical miles and follows similar points of entrance and exit of the Arctic region as the Northern Sea Route; however, the Trans-Polar Route is routed near the North Pole and the coast of Greenland (Chief of Naval Operations [CNO], 2014, p. 14). The Northwest Passage stretches from the Bering Strait, like the Northern Sea Route and the Trans-Polar Route, and follows the Alaskan and Canadian borders until it ends between Canada and Greenland. The Northwest Passage is the longest of the routes, at 5,225 nautical miles (CNO, 2014, p. 14). This can be seen in Figure 2.

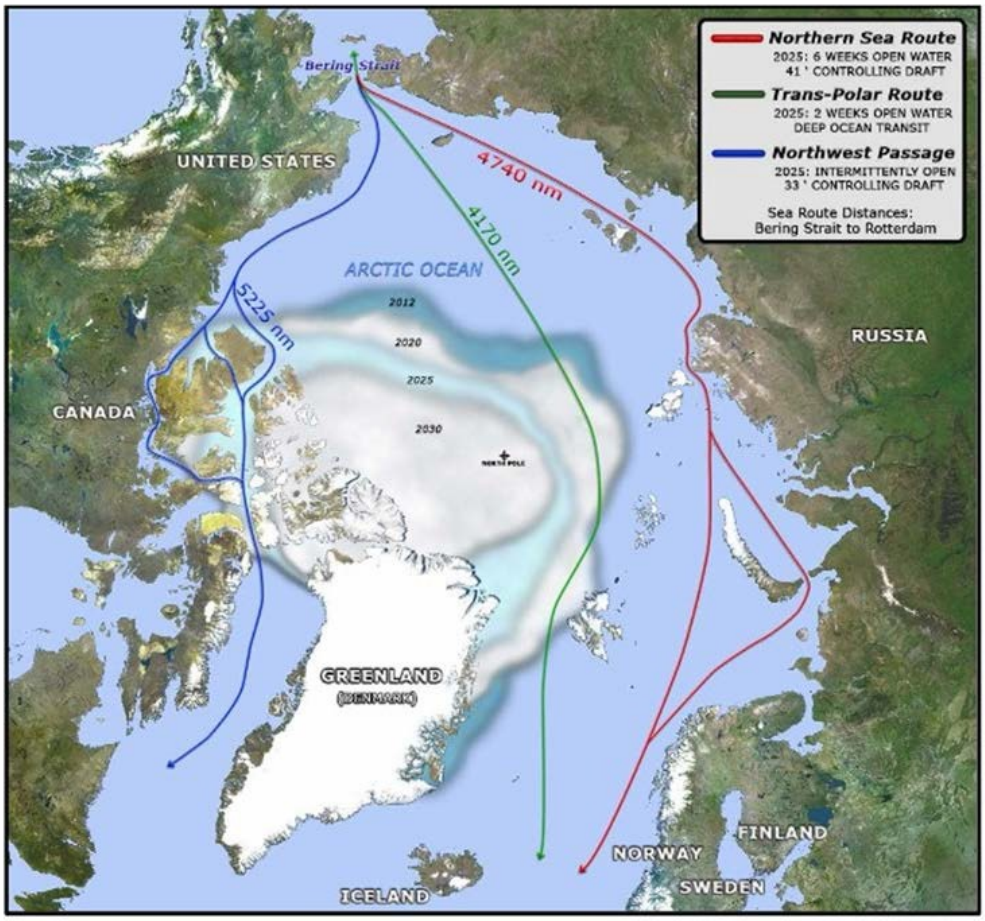

Figure 2: Anticipated Future Arctic Routes. Source: CNO (2015).

As the Arctic Circle warms, an unprecedented amount of Arctic ice melts, creating new challenges and opportunities in the region. In 2012, the Arctic ice had melted to a point that the Northwest Passage was navigable for approximately two weeks of the year. The U.S. Navy estimates that by the year 2025, the Northwest Passage will be intermittently open and the Northern Sea Route will have six weeks of open water, while the Trans-Polar Route will have open water conditions for two weeks of the year (CNO, 2014, p. 12). The National Oceanic and Atmospheric Administration (NOAA) estimated that by 2040, the Arctic will be ice free during the summer months (NOAA, 2012). The estimated recession of ice in the Arctic can be seen in Figure 2.

The ice creates a significant obstacle to naval exploration and commercial interest in the region. As the ice melts the sea begins to open, but the dangers from the Arctic ice do not completely diminish. In some cases, the danger to navigation may increase. As a result of the ice melting, large independently floating pieces of ice constantly change the navigable landscape and routes. In addition to the ice, there is a significant deficit in the quality and quantity of available hydrographic surveys. Most charts of the 426,000 square nautical miles of the Arctic were charted and surveyed by the likes of Captain James Cook in the 1800s using the technology of the age (NOAA, 2012). Although there have been efforts to update and modernize the nautical charts, it has been completely inadequate thus far. The inadequacy is not derelict in nature, but more of a testament to the vastness of the Arctic and the lack of capacity in the area to meet the requirement.

NOAA has made significant strides to rectify the deficiency in an effort to restore the mariner's faith in the nautical charts, as well as to provide essential tide, depth, current, and water level data. NOAA has established that of the 426,000 square nautical miles, only 242,000 square nautical miles are navigationally significant (NOAA, 2016). Even by reducing the area that needs to be surveyed, the resources needed to acquire the necessary information to create the charts is significant. To meet the requirement, NOAA is working to partner with other governmental and non-governmental organizations while taking advantage of emerging technologies. These partnerships and other diplomatic agreements will prove to be pivotal in correcting the navigational issues associated with the Arctic.

The sea is not the only hazardous environment in the Arctic. Extreme temperature changes, accessibility, and a complete lack of infrastructure in the Arctic make the establishment of land-based Arctic governmental installations problematic. It is economically infeasible to develop land-based transit routes to be used for the construction of installations and ports. As a result of the infeasibility, naval resupply of land-based activities will be necessary. Air resupply may be an option once land-based support structures are developed, but care must be taken as to the temperature that the aircraft flies in. Aviation fuel freezes at -58 degrees Fahrenheit (ExxonMobil, 2017), a temperature often achieved in some areas of Arctic during the winter months, which may cause times of limited sustainability. The Arctic is a harsh and unforgiving environment of which we know little about beyond the potential for economic windfall and ecological disaster. As a result of the significant hazards and benefits, the Arctic has gained attention from both private and public entities that are both geographically located in the Arctic and abroad.

C. STATE AND NON-GOVERNMENTAL ORGANIZATIONS OF INTEREST

There are eight nations that have lands in the Arctic. Those nations are the United States, Canada, Finland, Denmark (Greenland), Iceland, Norway, and Russia. The nations that have lands in the Arctic, however, are not the only nations with Arctic interest. There are 17 countries with vessels that have the capability to break through the ice. These vessels are commonly referred to as ice breakers and are capable of navigating the Arctic Sea at varying levels of ice thickness. Ice breakers, although not a requirement of Arctic travel at all times and certainly as time moves forward may be less prevalent, is proof of a significant investment in the Arctic and should be seen as validation of suspected interest for Arctic ventures. There are several nations that have policies for Arctic travel even without the capabilities associated with ice breakers. Russia, by far, has the most assets in the Arctic, followed by Sweden, Finland, Canada, and then the United States. A complete list of ice-breaking vessels can be seen in Figure 3. For this analysis, Arctic actors have been grouped into the geographic categories of Asia, Europe, indigenous peoples, and North America.

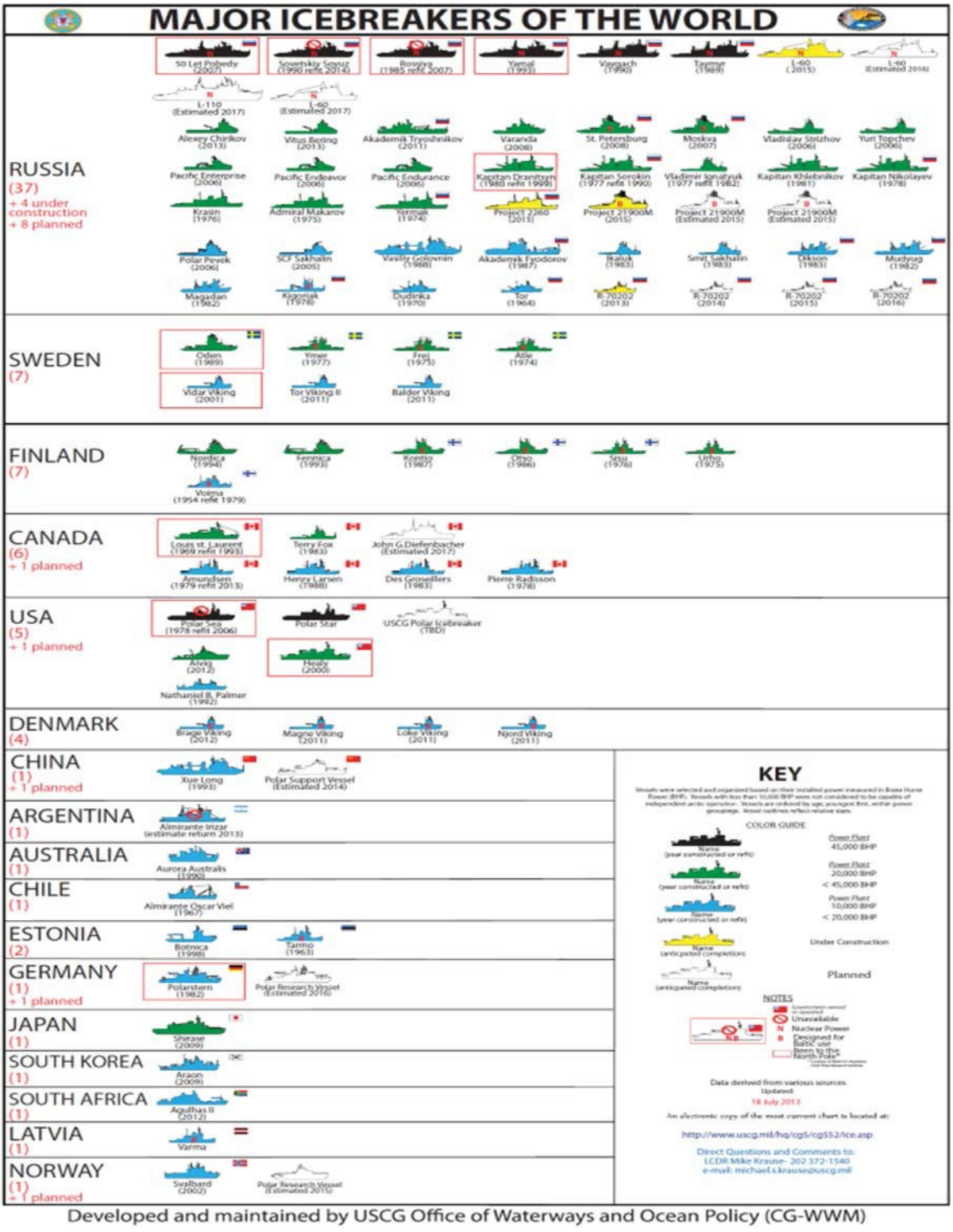

Figure 3: Icebreaking Vessels of the World. Source: USCG (2014).

1. Asia

In 2007, Russia made the world aware of its intentions and interest in the Arctic by posting a Russian flag on the Arctic seafloor under the North Pole. This was a precursor to the nation's claim on that land under the 1982 Law of the Sea, where a nation can claim an exclusive economic zone over the continental shelf that connect to their shores. Russia claims that the continental shelf extends to the North Pole (Chivers, 2007). Russia has the most capable Arctic Navy and is in a position to provide the most necessary services to vessels traveling the Arctic. Russia's interest in the Arctic is divided into two camps. One is security, which is championed by the Russian military, and the other is its economy, led by the nation's economic and business professionals. The military is skeptical of foreign involvement in the Arctic, while the government economic circles believe that foreign technology and investment are the key to developing and exploiting the Arctic's resources (Walter & Duncan Gordon Foundation [Foundation], 2011). The views of the divided Russian politics on the strategic objectives of their Arctic policy seem appropriately logical and mirror our own society in that the nature of the military is to fret over defense of the homeland and the nature of politics is to support economic prosperity.

China, although not an Arctic state, has economic interest in the Arctic. China's shipping-related exports account for 22% of its gross domestic product (GDP; World Bank, 2017). Shipping those exports through the Arctic on the Northern Sea Route would bring goods to market in Europe by expediting the route by 5,000 nautical miles as opposed to traveling the Indian Ocean. China also has the ability to escort its own shipments by use of its 10,000-horsepower icebreaker. China also has a strong interest in Arctic oil drilling as well. Eighty five percent of China's oil is imported. Nearly 50% of Canada's mineral demand is produced by China (Foundation, 2011, p. 4).

Japan and South Korea have interest in the Arctic shipping routes and natural resources. Both countries are behind China as the second and third in Asian exports, respectively. Japan has also been supplied with Liquefied Natural Gas (LNG) from the North Slope of Alaska for nearly 30 years. Russia, China, Japan, and South Korea all have current and active Arctic scientific research programs (Foundation, 2011, pp. 3–4).

2. Europe

Europe has three Arctic nations in Norway, Denmark, and Sweden. All of them have a national strategy for the Arctic in addition to the European Union (EU) publication of the Union's Arctic strategy in 2016 (European Parliament, 2016). Non-Arctic states— such as the United Kingdom, Germany, France, and the Netherlands—also have a national strategy for the Arctic. The theme for the individual strategies that support the EU strategy is that they address the need for cooperative research, commerce, and resource exploitation and conservation. Security is addressed in some, but not emphasized in others. The EU is the leading contributor to Arctic research, spending an estimated 120 billion Euros between 2014 and 2020 (Frenk, Hunt, Partridge, Thornton, & Wyatt, 2015). EU nations also obtain 44% of their oil and 58% of their natural gas from Russia and Norway (Foundation, 2012, pp. 2–3). This signals that although not completely Arctic, the EU has a significant economic interest in the Arctic region.

3. Indigenous Peoples

An estimated 10% of the four million people in the Arctic are thought to be indigenous, and they encompass over 40 ethnic groups (Le Mière & Mazo, 2013, p. 4). These groups have an emotional and spiritual connection with the Arctic. Their importance in the region and their unique connection with the Arctic is recognized by the United Nations (UN) in its "Declaration of Right of the Indigenous Peoples." Their primary interest in the region is the preservation of the Arctic's natural resources. The Arctic indigenous peoples have an international voice as a permanent participant on the Arctic Council (AC). The native Arctic population also has a significant voice in the nations where they reside. In the Northwest Territories of Canada, for example, half of the population is native (Statistics Canada, 2016). Economic development of the Arctic is seen as a challenge and an opportunity for the indigenous peoples of the Arctic..

4. North America

Canada and the United States share the borders of the Arctic that follow the Northwest Passage and have shared security interest in the region. In recent history, Canada has been one of the more prominent allies of the United States. However, in the

Arctic there are territorial issues that are unresolved that threaten to fray ties. Canada has made small strides, beginning in 1922, to position itself to claim the Arctic as Canadian territory (Caldwell, 1990, pp. 9–17). Canada has claimed that the Northwest Passage is Canadian territorial waters, a stance that the United States refutes. The United States and much of the world claims that the Northwest Passage is an international strait and as such is not subject to Canadian approval for navigation of the sea. There is still a disputed border in the Beaufort Sea in which the United States and Canada do not agree on the geography used to extend one's land border. This disagreement leaves approximately 22,000 square kilometers in dispute (Rothwell, 1993). These disagreements withstanding, the United States and Canada have had signed a diplomatic agreement for cooperation in the Arctic since 1988.

5. Political and Environmental Constraints

The National Arctic Strategy was clear in U.S. policy objectives as laid out in the strategic lines of effort. Those were to advance the nation's security interest, pursue responsible stewardship of the Arctic region, and to strengthen international cooperation in the Arctic. Those policy objectives are supported throughout the DOD's Arctic strategy and the Navy's roadmap to the Arctic, and several specified constraints are stated while some constraints are implied by the nature of the stated objective.

The maintenance and preservation the Arctic region as an area free of conflict is a specified national objective for the region (White House, 2013). This specified national objective has a specific implied constraint that has far-reaching impact on the DOD's positioning and planning for the region. This specified non-aggression assumes that there will be no build-up of military forces nor implementation of policies or protocols that would be detrimental to relations with nations in the region. As such, it is unlikely that a course of action that involves construction of mass military facilities or ice-hardened naval strike vessels would be considered viable. Therefore, facilities in the Arctic are likely to be civilian in nature and are built to facilitate an increase in economic expansion and an increase in emergency vessel support in the region. Military use as an instrument of national power in the Arctic will be less prevalent than diplomatic, information, and economic activities (Government Accountability Office, 2015).

The support of international legal principles of freedom of navigation as well as the Navy's objective of preserving the freedom of the seas in the Arctic in an effort to deter excessive claims indicates that the Navy plans to sail the Arctic. In an effort to maintain the Arctic's peaceful state, much of that sailing will likely be subsurface with occasional surface fleet presence in areas that are free of ice. Current naval doctrine is not conducive to surface sailing the Arctic behind icebreakers. In the shaping phase of the operation, there is little strategic value to a surface naval presence at times that ice covers the sea lines of communication, and our current capabilities prohibit it.

Decisions must be based on the most current science and traditional knowledge. There may be times that traditional knowledge may conflict with current scientific beliefs. Much of the national objectives for the Arctic revolve around the safe economic development of the region while observing and preserving the unique Arctic ecosystems.

D. NATIONAL ARCTIC STRATEGY

The *National Strategy for the Arctic Region*, published by the executive branch of the U.S. government, is a holistic governmental approach that was established with three main strategic efforts for the United States (White House, 2013). Those lines of effort are to advance U.S. security interests, pursue responsible Arctic region stewardship, and strengthen international cooperation. The goal of this strategic policy and successful end state was defined as

> An Arctic region that is stable and free of conflict, where nations act responsibly in a spirit or trust and cooperation, and where economic and energy resources are developed in a sustainable manner that also respects the fragile environment and the interests and cultures of the indigenous peoples. (CNO, 2014, p 3)

From the lines of effort and the goal of the national policy, subordinate organizations can derive their strategic and operational objectives. From these objectives specified tasks can be traced back to higher guidance and implied tasks can be assigned to more subordinate organizations. The policy also states that the approach will be informed by following these guiding principles: safeguard peace and stability, make decisions using the best available information, pursue innovative arrangements, and consult and coordinate with Alaskan natives (White House, 2013, pp 2–3). These guiding principles serve to better

align efforts in developing constraints for planning in the Arctic region. The following section describes the specified tasks for each governmental organization in the Arctic and the agencies responsible for supporting the lead agency's efforts. Many efforts develop information or services that are nested within other objectives; as such, most objectives are complementary and promote a holistic governmental approach. A crosswalk of each department's associated lead and supporting tasks can been seen in the Appendix.

1. Advance U.S. Security Interest

The Department of Transportation (DOT) is the lead agency in preparing for increased activity in the maritime domain. Specifically, the DOT will engineer a system to facilitate the development, construction, and maintenance of ports and supporting infrastructure that is required to ensure freedom of mobility and safe navigation in the Arctic region. To support the DOT in their efforts, the Committee on the Marine Transportation System will provide support and council. The Federal Aviation Administration (FAA) as a component of the DOT is the government component charged with supporting and sustaining the evolving aviation requirements in the region. Preserving, maintaining, and developing the aviation infrastructure plays a pivotal role in the viability of government land-based support facilities and ports. In the short- and long-term, there are seasons of the year when the Northwest Passage will be ice-locked and dangerous for maritime transit. During this time, due to the lack and feasibility of resupply by road networks, aviation support may be the only mode of transportation available for resupply to these remote areas in the Arctic. In addition to the responsibility of assessing and improving the aviation infrastructure, the FAA will work to improve and maintain navigation systems and weather reporting for the region. In their efforts, the DOD, Department of Homeland Security (DHS), and Department of the Interior (DOI) have specified supporting roles to assist the FAA in meeting these objectives (White House, 2014).

As a member of the Department of Commerce (DOC), the National Telecommunications and Information Administration is the lead agency tasked with assessing the communication infrastructure in the Arctic. This task is especially challenging given the sparse populations, harsh terrain, and inaccessibility of some areas to develop infrastructure to create a reliable communications network that can be used for

emergency services and routine communications. These communication systems would need to incorporate emerging innovative technologies in order to meet the terrestrial and maritime requirements. The supporting agencies for this specified objective are DOD, DHS, DOT, and the Federal Communications Commission (FCC).

Arctic domain awareness as defined by the U.S. Navy is the capacity to understand the Arctic domain. This includes factors and trends that are related to the Arctic's physical environment and the native cultures, resources, and commercial interests and endeavors (DOD, 2013, p. 9). The success of managing domain awareness hinges on the ability to collect a wide array of information from state, federal, tribal, and scientific communities and to disseminate that information. The government agency charged with this objective is the U.S. Coast Guard (USCG) as a component of the DHS. NOAA as a component of the DOC, the FAA, the DOD, National Aeronautics and Space Administration (NASA), and the National Maritime Intelligence-Integration Offices serve as the supporting organizations to assist the USCG in meeting this complex task. In meeting the information awareness and collection aspects of developing an enhanced domain awareness of the Arctic region, the incorporation and development of relationships with non-governmental organizations and commercial partners will be a key task and will go far to eliminate the duplication of efforts. In addition to domain awareness, the USCG is charged with preserving freedom of the seas within the Arctic region. This objective primarily revolves around establishing the requirements for platforms that are needed to navigate ice-covered seaways. The platforms already in the service of the USCG were commissioned in the 1970s and have now well outlived their designed and expected lifespan (Ahlers, 2011). They are now in service due to a capability deficiency and an intensive fleet maintenance plan. Supporting the USCG in this endeavor is NOAA, DOD, Department of State (DOS), DOT, and the National Science Foundation (NSF).

The DOS is the lead agency in promoting international law and freedom of the seas. This will be accomplished through international coordination and coordination with non-governmental organizations as well as tribal organizations to ensure that maritime interest and aviation interest of all nations observes international law. In support of this objective, the DOD and USCG are charged with conducting routine maritime and aviation passage on routes that support internationally recognized law.

In order to provide for U.S. energy security in the future, the Department of Energy (DOE) has been given the daunting task of pursuing the development of renewable energy resources in the Arctic region. Due in large part to the lack of logistical networks to remote areas and sparse populations, the use of fossil fuels, at times, is not realistic for sustained life. The DOE will partner with the scientific community and indigenous community as well as leverage existing efforts at the state and federal levels to develop sustainable best practices and deploy small-scale capabilities to remote communities. To assist in these efforts the DHS, DOI, and NSF will support the DOE. Although a supporting agency in the development of renewable resources, the DOI is the lead agency in the development of non-renewable resources (White House, 2014, p. 18). The safe and responsible exploration of non-renewable Arctic resources in a manner that is environmentally sound is the goal of the DOI in this objective. NOAA and the DOE will support their efforts.

2. Pursue Responsible Arctic Region Stewardship

People living in the Arctic and the near-Arctic regions rely on the natural resources available to sustain life. This is due in part to necessity in the remoteness and scarcity of the population, but also to the traditional indigenous lifestyle. Coordinated conservation and responsible actors in the Arctic are paramount to preserving this way of life. Extensive scientific research and model development are necessary for trend analysis and predictions of future Arctic conditions. In that effort, the Department of Commerce (DoC) will work to preserve the Arctic ecosystem by creating baseline conditions to monitor changes from the baseline and develop systems to correct and manage deviations from that baseline (White House, 2014, p. 12). The DoC, which supports the USCG in enhancing Arctic domain awareness, will be the lead agency in this objective. Supporting the DOC is the DOD, USCG, DOI, DOT, and the Environmental Protection Agency (EPA). Hazardous material prevention, containment, and response in the Arctic is a task that the USCG and the EPA currently conduct. Improving the current strategies for the prevention, containment, and response to the adverse environmental conditions that are created by hazardous material spills both at sea and inland in the Arctic will be pivotal in the preservation of the Arctic ecosystem. The strategy and implementation of that strategy for

the seaways falls on the USCG, and any inland spill responsibility will lie with the EPA. The member departments of the U.S. National Response Team, an interagency team that is composed of participants from 15 federal agencies, will support both the USCG and the EPA (both of which are represented on the U.S. National Response Team) in the development of strategies and response for hazardous material spills and prevention (White House, 2014, p. 13).

The Integrated Arctic Management (IAM) is a science-based holistic governmental approach that uses the Ecosystem Based Management (EBM) System as a means for accounting for science, economic growth, and a healthy ecosystem with government decision-making process (White House, 2014, p. 14). The intent of the management process is to provide ethical governance that provides long-term sustained economies that capitalize on the benefits of a healthy ecosystem, preserved traditional cultural activities, and economic growth (White House, 2014, p.14). The DOI is the lead agency that is charged with incorporating the efforts of each governmental agency operating in the Arctic into the IAM system. The IAM is executed under already established laws and regulations, but duplication of efforts in conservation is a concern. The DOI reviews interagency efforts in natural resource conservation in the Arctic in order to further clarify roles and responsibilities in the region. The NOAA, DOD, USCG, DOT, and the EPA are identified as supporting agencies for this objective.

As the maritime service component of the DOD, the U.S. Navy conducts scientific marine research in the Arctic in an attempt to develop reliable models for predicting sea ice thickness and the rate that it is receding. This research assists in the Navy's planning efforts in the Arctic sea when routes will be navigable and under what conditions and times of the year that navigation will be possible. The Interagency Arctic Research Policy Committee (IARPC), a subcommittee of National Science and Technology Council, is responsible for coordinating all Arctic research, while the DOD is charged with conducting this research and developing an accurate model while supported by NOAA, DOE, USCG, DOI, NASA, and the NSF (White House, 2013, p. 15).

Still in line with pursuing Arctic stewardship, NOAA continues to implement the Distributed Biological Observatory (DBO) pilot program to research the rapid changes in the Arctic ecosystem. The DBO is a foundational program that provides research products

and models that tie into the USCG's Arctic domain awareness objective, as well as provides critical information requirements for the DOI's implementation of an IAM system. The observatory collects and analyzes sea ice, sea water color, and sea surface temperature analysis that assist the U.S. Navy in development of sea ice prediction models (Comiso, Frey, Stock, Gersten & Mitchell, 2017). The DOI is also tasked with coordinating and integrating terrestrial ecosystem research to increase the domain understanding of the terrestrial geophysical environment. In addition to terrestrial ecosystem studies, the DOI will also investigate the impact of wildfires on the Arctic ecosystem. In 2015, 10.1 million acres of land burned in wildfires in Alaska and Canada (Dickie, 2016). This research will build systems to mitigate the damaging outcomes and build prediction models to determine when and how the ecosystem will recover from an Arctic fire. They will be supported by the DOE and the NSF. In an effort to protect the unique ecosystems in the Beaufort and Chuchi Seas, the IARPC Chukchi Beaufort ecosystem implementation team will develop area-specific ecosystem modeling and improvement strategy to be integrated into the IARPC annual reports. This research lead by NSF is supported by NOAA, DOI, and NASA.

The NSF is the lead agency in conducting glacial dynamics studies and long-term monitoring of tidewater glaciers and key outlet glaciers. These studies and the corresponding products nest with reseeding sea ice studies conducted by the Navy and domain awareness efforts from the USCG. The NSF will also create a system of observing in the circumpolar Arctic. This system will be designed to remotely sense and observe sea ice as well as incorporate and observe indigenous knowledge at the local level.

Improving the community stability, well-being, heritage, and sustainability in the Arctic is an important element of the IAM system. In line with that effort, the Smithsonian Institute is charged with improving the capability of Arctic communities to adapt to the changes in their physical environment as well as identifying stress factors that may impact the community due to social and economic conditions. The Smithsonian Institute will be supported by the DOI and the NSF. In line with the effort to improve human health in the Arctic, the Department of Health and Human Services will create a better understanding of the well-being and survival rates of the indigenous population in the Arctic in an effort to improve their overall health (White House, 2014, p. 22).

For the purpose of maritime commerce and travel in the Arctic, there is no more critical an objective than the charting of the Arctic region. The NOAA will systematically increase the percentage of the Arctic region that is surveyed using modern survey methods. This effort will not only focus on the sea, but the deep draft ports and harbors of refuge.

3. Strengthen International Cooperation

The National Strategy for the Arctic Region (2013) acknowledges that an increase in activity in the Arctic could be viewed by neighboring Arctic nations as an aggressive stance on Arctic policies and provide a level of tension that would be detrimental to international interest as well as U.S. strategic interest. To that end, the *Implementation Plan for the National Strategy of the Arctic Region* (White House, 2014) addresses key tasks that must be accomplished to preserve shared interest in the Arctic as well as to keep the region free of aggression by any nation.

As the volume of maritime traffic increases, there is an increasing likelihood of oil pollution, spills at sea, or circumstances that may require search and rescue efforts. The USCG is charged with implementation of international agreements and capitalizing on existing agreements to enhance the preparedness, prevention, and spill or pollution response in the Arctic region. It is also responsible for the enhancement of search and rescue capabilities and mitigating the search and rescue vulnerabilities through international agreements, training, and building of capacity. The USCG is supported in this task by the DOD, DOS, and DOT.

The DOS will create international agreements to ensure the fisheries in the Arctic high seas are regulated in a manner that promote cooperative scientific research and prolonged sustainability of commercial fishing. Also, to support the long-term sustainability of native marine species the DOI will develop and implement an international program for the prevention of invasive species and the destruction of the Arctic ecosystem.

Although the USCG has responsibility for the response and mitigation efforts for hazardous material spills at sea, the EPA will strive to reduce the amount of hazardous materials and persistent contaminants that are transported within and through the Arctic region.

Incorporation of coordinated efforts into a unified plan that is worked through the Arctic Council (AC) and supported internationally is the ultimate goal of the Implementation Plan for the National Strategy for the Arctic Region. Several of the objectives initially may seem to be duplication of efforts, but when looking at the whole approach, the implementation plan takes advantage of departmental efficiencies and expertise while creating a network of interdependence on other agencies for information requirements. Management of this massive amount of information will be critical to the overall efficiency of the organizations and their ability to meet their assigned policy objectives.

In this strategy, the DOD was firmly established as a supporting organization to other governmental organizations operating in the development of the Arctic. The DOD was only the lead organization for one objective of the 36 identified, development of a framework for the prediction of forecasting of sea ice, but was given responsibility as a supporting organization in 18 objectives as seen in the appendix.

From the lone specification as a lead agency and the 18 specified supporting tasks, the DOD established two objectives to support the holistic governmental approach. The first of those objectives is to ensure security, support, safety, and promote defense cooperation. The second is much more broad and vague. It is to "prepare for a wide range of challenges and contingencies in the Arctic" (CNO, 2014, p. 9). Challenges and contingencies can be stated exclusively of each other, but when planning for the latter the DOD can mitigate the former. It is fair to assume that while not all aspects of the DOD Arctic strategy can be traced to the national strategy, core defense competencies, although not specified, are implied as required.

In the Unified Command Plan (UCP) the Commander of the U.S. Northern Command (USNORTHCOM) is charged with the responsibility of advocating for capabilities in the Arctic by coordinating with combatant commands, defense agencies, the Joint Staff, and all DOD component services to identify and set priorities for defining capability gaps in the Arctic. As a geographic combatant command, USNORTHCOM has organic assets and capabilities across all branches of the DOD. Those assets are spread from Alaska to Mexico in support of homeland defense. Several of these units are suited for

the unique and unforgiving environment of the extreme north and are already stationed in Alaska. These forces are ground and aviation assets. Both have their limitations in the Arctic. Much of the NORTHCOM organic assets are focused on personnel and policies, but do not have many Earth-based platforms that are of use in the Arctic or are of use on a limited basis. In fact, the U.S. is under-equipped and ill-trained for surface operations to support the National Arctic Strategy (Naval War College, 2011).

Considering the overwhelming international consensus that commerce routes, essential services associated with Arctic Sea transit, and natural resources all belong in the maritime realm, it is only logical that the U.S. Navy will be the most prevalent branch of the DOD in the region. Support for the Navy would come from the Army and Air Force as required. The Specified Tasks from the National Strategy for the Arctic Region support this assumption.

In an effort to align and nest its Strategy for the Arctic Region with that of the DOD and the National Strategy, the Navy offered four strategic objectives (CNO, 2014, 15) for the Arctic region:

- *Ensure U.S. Arctic sovereignty and provide homeland defense.* While this line of effort in the Navy's Arctic strategy is not traceable to the National Arctic Strategy, nor is it specified in the strategic implementation strategy, it is the most prevalent core competency of any maritime force.
- *Provide ready naval forces to respond to crisis and contingencies.* This line of effort is directly traceable to the national implantation strategy. The DOD, and the Navy as the maritime component, are in a supporting role to the USCG in improving the emergency response capabilities in the region.
- *Preserve freedom of the seas*. The preservation of the freedom of the seas is a core naval function that, while not explicitly detailed in the Implementation Plan for The National Strategy for the Arctic Region, is directly traceable to it.
- *Promote partnerships within the U.S. government and with international allies.* This is traceable under the same national line of effort as responding to crisis and contingencies. The DOD is identified as a supporting role to the USCG in strengthening international, non-governmental, and inter-departmental cooperation and partnerships.

International naval cooperation has always been a key component of the National Arctic Strategy, and as the DOD maritime component, the Navy has established short-term, mid-term, and far-term views for building the internal capacity in personnel, skills, and platforms to create the capability needed to support sustained operations in support of the national policy objectives in the Arctic.

E. INTERNATIONAL ORGANIZATIONS, AGREEMENTS, AND COOPERATION

Internationalization of the Arctic is unavoidable due to the geographic nature of the area of interest and the impact that the region has on the ecosystems, economies, and for some the livelihood of a nation or community. The interests of state and non-state actors in the Arctic are generally expressed by the participation in organizations, agreements, and by cooperation between groups. This internationalization serves to allow all interested parties the opportunity or a voice to express their intent and wishes in the region.

1. Organizations

There are several organizations in the Arctic representing nations, peoples, research, and specific interest. The Arctic Council is the most prevalent and best represented organization that mediates the widest array of interest. It is an inter-governmental organization that

> promotes cooperation, coordination and interaction among Arctic states, Arctic indigenous communities and other Arctic inhabitants on common Arctic issues, in particular on issues of sustainable development and environmental protection in the Arctic. (AC, 2015, p. 1)

The AC was established in the Ottawa Declaration in 1996 with Canada, Denmark, Iceland, Finland, Norway, Russia, Sweden, and the United States established as states with permanent member status. As well as the eight permanent states, six organizations were granted permanent member status to represent the Arctic peoples and facilitate active integration of the indigenous population. Those organizations are the Aleut Association, the Arctic Athabaskan Council, the Gwich'in Council, the Inuit Circumpolar Council, Russian Association of Indigenous Peoples of the North, and the Saami Council. Non-Arctic state and non-state organizations with interests in the Arctic

have the ability to apply for observer status in the Arctic Council if the AC determines that the organization can contribute to the council's work. There are currently twelve non-arctic nations that have approved Arctic observer status, including India, the United Kingdom, Germany, and China (AC, 2015). The work of the council is executed by six working groups as stated by the AC Backgrounder (2015):

- The Arctic Contaminants Action Program (ACAP) acts as a strengthening and supporting mechanism to encourage national actions to reduce emissions and other releases of pollutants.
- The Arctic Monitoring and Assessment Program (AMAP) monitors the Arctic environment, ecosystems and human populations, and provides scientific advice to support governments as they tackle pollution and adverse effects of climate change.
- The Conservation of Arctic Flora and Fauna Working Group (CAFF) addresses the conservation of Arctic biodiversity, working to ensure the sustainability of the Arctic's living resources.
- The Emergency Prevention, Preparedness and Response Working Group (EPPR) works to protect the Arctic environment from the threat or impact of an accidental release of pollutants or radionuclides.
- The Protection of the Arctic Marine Environment (PAME) Working Group is the focal point of the Arctic Council's activities related to the protection and sustainable use of the Arctic marine environment.
- The Sustainable Development Working Group (SDWG) works to advance sustainable development in the Arctic and to improve the conditions of Arctic communities as a whole. (AC, 2015, pp. 1–2)

The AC is only a forum for research and discussion. It has no permanent national leadership, but rotates every two years among the Arctic states. The council also has no programmed budget and is reliant on the member organizations to fund research and outreach programs. The United States held the chairmanship from 2015 to 2017, when it was relieved by Finland. The AC is the premier organization for international cooperation in the Arctic. It is not happenstance that the U.S. National Strategy for the Arctic Region's lines of effort are in many ways synchronized with the efforts of the AC..

2. Military and Civilian Exercises

There are opportunities to capitalize on current civil and military relationships through joint exercises that are already being conducted across the spectrum of organizations. Organizations and businesses already have efforts underway that highlight vested interest in the cooperation and development of a common picture of the maritime domain. These activities include accident avoidance, search and rescue, research, hazardous materials containment, and prevention.

The following military exercises represent opportunities for our defense capabilities in the Arctic to continue to be strengthened while fostering international awareness and partnerships:

- Arctic SAREX is an international search and rescue exercise that aims to test the interoperability of both the United States and the Canadian capabilities. In these exercises, air and ground assets are deployed to remote areas to assist simulated crashed aircraft (Gordinier, 2013).
- COLD RESPONSE is an exercise that is facilitated by and executed in Norway. This exercise is held every other year and features assets from 12 allied nations and two partnered nations. The exercise is two weeks long and focuses on defensive operations in a high intensity conflict (SHAPE, 2016).
- ICEEX is a U.S. military submarine exercise in which submariners break through the ice and set up a camp. This highlights the U.S. Navy's ability to provide commanders with battlefield effects and capabilities in Arctic conditions. ICEEX represents an opportunity to capitalize on a current capability exercise by incorporating international military or maritime research capabilities into the exercise (SFPA, 2016).
- ARCTIC ANVIL is a joint multinational exercise that most recently included soldiers from U.S. Army Alaska (USARAK), the Iowa National Guard, and the First Battalion of Princess Patricia's Canadian Light Infantry. This exercise was facilitated by the Joint Pacific Multinational Readiness Capability (JPMRC) that serves to meet training requirements as a mobile Combat Training Center (CTC) (Olson, 2016).

Military exercises like those just listed are phenomenal tools for both honing the Arctic warrior and fostering international cooperation and understanding among partners. The exercises when incorporating civil structures can better prepare our soldiers and our systems for Arctic conflict. In order to maximize the benefit of these exercises and to maintain the U.S. policy of non-aggression in the Arctic, increased multinational involvement is necessary. The benefits from robust international military coordination will permeate to the civilian and political sectors.

F. DEPARTMENT OF DEFENSE CAPABILITY GAP PLANNING

The U.S. Navy is the logical lead DOD component given the maritime-centric nature of the Arctic theater, but the Arctic remains in the NORTHCOM Area of Responsibility (AOR). Any operations in the Arctic will be inherently joint in their nature, both within the DOD as well as with other governmental or non-governmental organizations and councils.

1. Joint Operations Planning

The authoritative guide for joint operations planning is Joint Publication (JP) 5-0 (DOD, 2011). This publication details the planning process for dynamic action, crisis action planning, and multinational planning. All three follow a similar path from understanding the strategic direction and what ways, ends, and means are appropriate to meet the policy objective. Then JP 5-0 develops these ways, ends, and means into the elements of operational design. This occurs in six phases. Phase Zero is the shaping stage where the groundwork or foundation is set for future phases to build and develop upon. This phase is the stage in which this research is played. Phase 1 is considered the deter phase. In this stage positioning, demonstrating the resolute nature of the joint force, and pre-deployment activities are conducted in concert with other aspects of national power to persuade our adversaries to succumb to the policy objective. The next phase, Phase 2, is to seize the initiative. As the name suggests, in this phase the appropriate capabilities of the joint force are projected or deployed forward in preparation for domination of the enemy. Phase 3, dominate, focuses on removing the opposing force's will to resist or in a static non-combat environment to simply take operational control of a specified environment

(geographic, special, or cyber). Stabilize, Phase 4, plans for contingencies in which there is no legitimate civil government established and operating in a geographic area. In this case, plans must be made to perform limited governmental actions until local entities are functioning. The last phase of joint planning, Phase 5, is to enable civil authority. This phase is centered on the joint force supporting the civil government enabling the establishment of essential services (DOD, 2011, pp. 38–44).

The six-phase model is used as a planning template for the full spectrum of joint operations and is not prescriptive. As such, not all six phases are necessarily planned for or may be planned and coordinated concurrently. For the current situation in the Arctic, the joint planning community is in the shaping phase of this planning. It is in this phase that this research is focused. In the shaping phase, requirements of the joint, interagency, or multinational environment may be ill-defined or defined in general terms. This presents a unique problem in the defense contracting community, where business cases are made in order to meet the DOD's requirements.

2. Military Contract Planning and Funding Cycle

Contract planning and funding cycle synchronization is a critical element of successful contract strategy and contract management. Acknowledging funding, requirement, and product availability limitations early in the procurement process allows for adequate risk reduction and facilitate a greater likelihood of a successful procurement.

a. Requirements Identification

Capability analysis for the DOD is accomplished by the use of the Joint Capabilities Integration and Development System (JCIDS). The capabilities-based assessment is where the mission is identified and current operational capabilities are assessed. Once a capability gap has been identified, an assessment of the feasibility or viability of non-materiel solution is completed. If a materiel solution is required, an Initial Capabilities Document (ICD) is developed. It is the responsibility of the Joint Requirements Oversight Council (JROC) to validate the requirements identified by JCIDS. Once a materiel solution is approved and the ICD is approved by the JROC, the Defense Acquisition System works to fill that requirement. Once a validated requirement is brought

into the Defense Acquisition System, it will become a program of record. This process applies to systems acquisitions. The scope of this research limits the requirements analysis to shaping functions and is limited to actions that meet the current objectives while setting the stage for future success. It will limit systems acquisitions to the overt and, due to the overwhelming amount of research requirements, will focus on contingency contracting to meet the national objectives.

b. Military Funding

The DOD funding cycle is a constantly revolving reiterative process that begins with the DOD's Planning, Programming, Budgeting, & Execution (PPBE) of the budget. This budget requirement is forwarded to Congress for congressional enactment. After the Appropriation Act is signed into law,, the president begins apportionment of the budget. Once the DOD receives the apportionment it begins the allotment to the military departments. The military departments receive funding for budget execution. This cycle occurs annually. The Future Years Defense Program (FYDP) budget is an extension of the budget process that considers requirements of the current budget year as well as four years in advance. An additional three years in advance can be considered for force structure.

Contracting for contingency operations using appropriated funds must follow three fiscal constraints. The first is that the current fiscal year's funds must be spent on the current fiscal year's needs. That is to say those funds from this year cannot be used for next year's requirements. Second, the funds that are used must be used for their intended purpose as defined by Congress. Lastly, the Anti-Deficiency Act (1982) does not allow the spending or obligating funds that are appropriated or surplus in a specific appropriation (31 U.S.C. § 1341(a)(1)(A)), accepting voluntary services (31 U.S.C. § 1342), or employing personal services in excess of authorized amount (31 U.S.C. § 1517(a)).

There are nine types of DOD funding: Operation and Maintenance (O&M); Military Construction (MILCON); Procurement; Non-Appropriated Funds (NAF); Commanders Emergency Response Program Funds (CERP); Official Representation Funds (ORF);

Combatant Commander Initiative Fund (CCIF); Emergency and Extraordinary Expenses (E&EE); and Overseas Humanitarian, Disaster, and Civic Assistance (OHDACA). In the Arctic, there is a high probability that in the future most funding types will be used; however, in the shaping phase of the joint planning process MILCON funding will likely be used for construction projects to better develop U.S.- based deep-water ports and Arctic flight lines. This type of appropriation has a five-year term to be spent and amounts over 1.5 million dollars must be approved by Congress. O&M funding will be used to facilitate Arctic training and the maintenance of Arctic installations. O&M appropriations have a one-year term to be spent (AcqNotes, n.d.).

3. Acquisitions to Fill Capability Gaps

a. Acquisitions as a Mean to Fill a Capability Gap

There are two categories of acquisitions that we can consider for Phase Zero in Arctic planning. These are programs of record and contingency contracting. A program of record is a systems acquisitions approach to meeting a capability gap as identified by the JCIDS process. This uses the full spectrum of the defense acquisitions process that includes milestones that are designed to keep the program on schedule, within the programs budget, and at the necessary performance specifications. Contingency contracting meets the customers' needs on a smaller monetary scale and procures already available items or technology in support of current operational needs. Contingency contracting has the ability to provide capabilities to required departments nearly immediately, whereas a program acquisition approach has a significantly longer lead time, providing capability to the customer in an average of nine years depending on the complexity of the program and the maturity of the technology, according to Frank Kendell, the Undersecretary of Defense for Acquisition, Technology and Logistics in his April 2015 brief on Better Buying Power 3.0 (Kendell, 2015). Contracting actions occur often and are linked to key program decisions in systems acquisitions while in contingency contracting contracts are executed as capability gaps are identified.

b. Introduction to Contract Types

There are ten major contract types that fall into three contract categories that can be used to support the acquisition strategy as identified in the Federal Acquisition Regulation (FAR). These categories are Fixed Price, Cost, and Time and Materials contracts. With the goal of the negotiation being the agreement of a party to complete the required work under a contract that provides appropriate risk to the government and the contractor dependent on the work performed under a contract that incentivizes the contractor to provide economical and efficient work in the delivery of a product. Fixed Price, Cost, and Time and Materials contracts give the Contracting Officer a menu of actions that, when appropriately selected and managed, provide the government with a fair and reasonable price for the efficient and economical work of its contractors. Fixed- price contracts represent the least amount of financial or cost risk to the government, while Cost-type contracts represent the most amount of financial or cost risk, as seen in Figure 4.

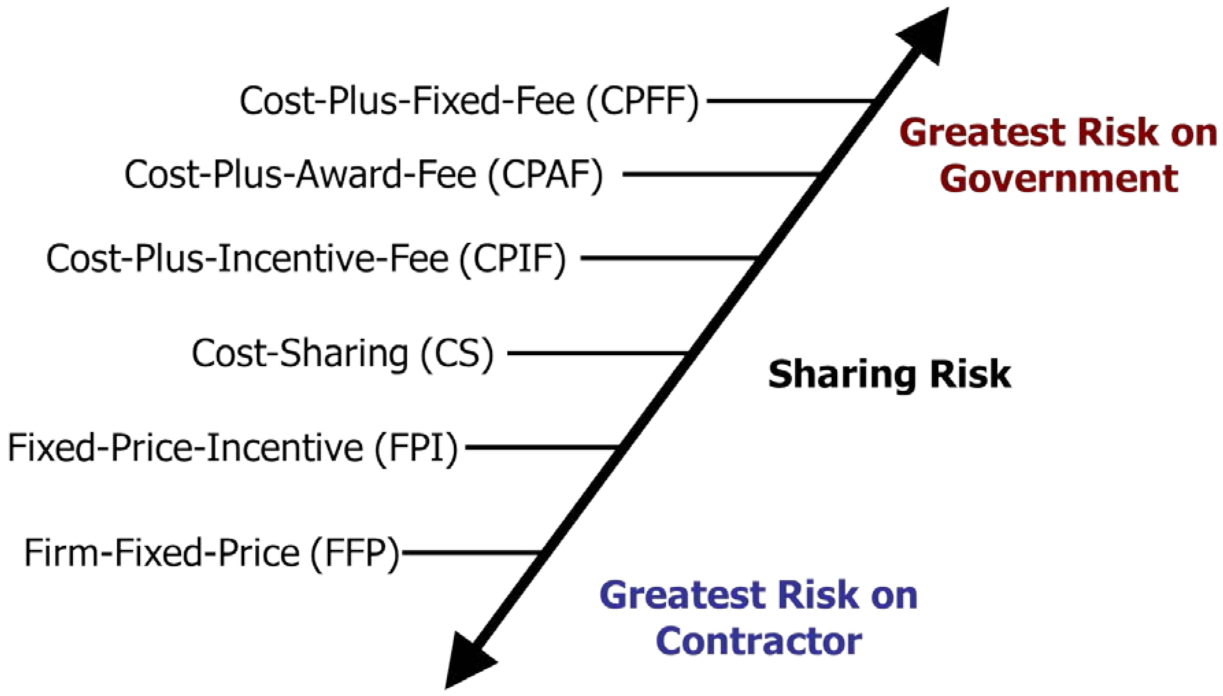

Figure 4: Contract Type and Risk Scale. Source: USAFMC (2007).

c. Fixed-Price Contracts

Fixed-price contracts are considered the industry standard business pricing arrangement (Garrett, 2007, p. 108). There are five varieties of fixed-price contracts that are widely used in government contracting. These are Firm-Fixed-Price (FFP), Fixed-Price Economic Price Adjustment (FPEPA), Fixed-Price Incentive Firm Target (FPIF), Fixed-Price Award Fee (FPAF), and Fixed-Price Prospective Price Redetermination (FP^3R) (Defense Acquisition University [DAU], 2014). The firm-fixed-price contract has the least amount of cost risk for the government while providing the most cost risk to the contractor. In this contract, a specific service or product is specified for a specific price. The firm fixed price contract is best used when acquiring a commercial product or a service or product that has very well-defined requirements. When there is a potential for unstable market prices for materials or labor over the term of the contract, FPEPA contracts are appropriate. These fluctuations in market prices normally occur over the course of long-term contracts or periods of inflation.

When requirements become less defined or innovation is needed, FPIF may be appropriate. The FPIF contract is typically used on the production of a major system that already has a prototype. This type of contract allows the contractor to realize additional profit by completing the product under a specified cost. This incentivized work provides a product below cost, on schedule, and at performance thresholds. It also allows the government to share the cost of an overrun by dis-incentivizing a contractor from allowing cost to slip. FPIF contracts must be justified and negotiated, and the contractor must have an approved cost accounting system as required by FAR 16.403-1. FPAF contracts are generally used for performance-based contracts where the objective standards can be communicated to the contractor and fairly applied by the fee determining official. There is more risk due to the objective nature of the requirements that the customer may not be fully satisfied.

Customer integration in the definition of the objective requirements is a critical component to the success of this type of contract. FP^3R carries a still higher associated risk to the government as well as a substantial administrative burden. In this contract type, the first period of the contract is firm-fixed price and subsequent periods of the

contract are renegotiated. This is only necessary when the government can shoulder the administrative burden to secure the contractor's future commitment. Fixed-price contracts provide a range of options to meet requirements while keeping risk relatively low for the government. However, there are inherent risks that need to be mitigated that are unique to each contract type seen in Figure 5.

Contract Type	Principle risk
Firm Fixed Price (FFP)	None.
Fixed Price Economic Price Adjustment FPEPA)	Unstable market prices for labor or material over the life of the contract
Fixed Price Incentive Firm Target (FPIF)	Moderately uncertain contract labor or material requirements
Fixed Price Award Fee (FPAF)	Risk that the user will not be fully satisfied because of judgmental acceptance criteria
Fixed Price Prospective Price Redetermination (FP3P)	Costs of performance after the first year because they cannot be estimated with confidence

Figure 5: Comparison of Major Fixed-Price Contract Types.

d. Cost Type Contracts

Cost type contracts are best employed when there is a significant degree of uncertainty in the cost associated with the contract. Cost contracts have developed the perception that they should be avoided due to difficulties in contract cost estimation, but in cases when there is a higher degree of uncertainty of the cost of completing the effort required, contractors may be reluctant to bid (Garrett, 2007, p. 110). Cost type contracts provide less risk to the contractor and more risk to the government. They require the contractor to provide a good faith effort to meet the requirements within cost, schedule, and performance. Cost contracts provide for reimbursement of a firm's cost that are reasonable and allocable to the specific contract, while providing for a fee that serves to compensate the firm for the risk associated with the effort. The four types of cost contracts are Cost-Plus-Incentive-Fee (CPIF), Cost-Plus-Award-Fee (CPAF), Cost-Plus- Fixed-Fee (CPFF), and Cost or Cost-Sharing (C or CS). The principle risk for the cost contract type

is the same among all four variants of the type. Uncertainty in the ability to develop a cost estimate for the work to be performed is the principle risk to be mitigated. This is seen in Figure 6.

Contract Type	Principle Risk
Cost-Plus-Incentive-Fee (CPIF)	Highly uncertain and speculative labor hours, labor mix, and/or material requirements necessary to perform the contract. The government assumes the risk in the contract, benefiting if the actual cost is lower than the expected cost, or losing if the work cannot be completed within the expected cost of performance.
Cost-Plus-Award-Fee (CPAF)	
Cost-Plus-Fixed-Fee CPFF)	
Cost or Cost-Sharing (C or CS)	

Figure 6: Comparison of Major Contract Types. Adapted from DAU (2014).

e. Other Common Contracting Actions

In addition to the cost and fixed price contracts, time and materials (T&M) contracts and indefinite-delivery/indefinite-quantity (IDIQ) contracts are common contracts to meet the government's needs. T&M contracts are kin to the cost type contract. However, the T&M contract is used when the contract cost is nominal and it would not be cost effective to audit the contractor's cost accounting system as is required of the cost type contracts. The work duration is normally short and is associated with emergency repair. The IDIQ contract is appropriate when the date that the delivery of the effort is needed is uncertain and/or the quantity that is needed cannot be specified at the time the contract is executed (Garrett, 2007, p. 398). These contracts are useful in contracting for crisis response. The Cooperative Research and Development Agreement (CRADA) is another tool that can be used between government agencies, allowing for a compensation of funding, and between government and non-government organizations, with no compensation of funding. These agreements allow organizations to work together to develop research and technologies. The use of a CRADA is appropriate when funding is restricted or not budgeted for specific research, the research or technology developed is for public release, and the government does not intend on retaining the research for exclusive government usage.

G. CHAPTER SUMMARY

This chapter provided an overview of the unique challenges and characteristics of the geographical area and geopolitical interest of the Arctic region, as well as an overview of the National Strategy for the Arctic Region, its implementation, and the DOD process and tools for meeting capability gaps. The following chapter examines the frameworks that are used in the analysis of Arctic capabilities, requirements, and appropriate contracting options for meeting capability gaps.

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III. FRAMEWORKS FOR ANALYSIS

A. INTRODUCTION

Three frameworks are used to address the research questions: The Three-Tier Model (YTTM), the TIPS model, and the ADRP model. The Three-Tier Model examines the challenges in personnel inherent in complex contracting. Yoder's TIPS model uses the insight from the personnel and credentials in the YTTM and further examines the platforms and protocols for effective integration for contracting success (Yoder et al., 2012). These models provide the foundation for the Agility, Discipline, and Risk Pillar (ADRP) model. Once ideal integrations are examined via the TIPS model, the ADRP model is used to balance the need for agility with discipline and risk to determine the appropriate contract type or acquisition strategy.

1. The Three-Tier Model (YTTM)

The YTTM is a credentials-based personnel hierarchy for planning staff and contracting officers (Yoder et al., 2012). The model works on two premises:

- Mission optimization occurs only with well-credentialed contracting planners and executers.
- Optimized stakeholder integration can only be accomplished by utilizing well-credentialed participants in the planning and executing phases (Yoder et al., 2012, p. 15).

Each of the three tiers of the model are described in terms of training and education, professional certification, and experience. The first tier is the widest and makes up the base of the model. At this level, the ordering officer is found at the tactical level of the military organizational structures. This is the most numerous personnel category in the contracting workforce and is generally junior civilians and military staff officers. Tier 1 personnel do not perform integrative planning at the operational and strategic levels and have minimal stakeholder integration or management capabilities. In this tier, personnel characterization in terms of training, certification, and experience is defined as having standardized training that emphasizes protocols, ethical conduct, management, control, and oversight with minimal experience in contracting.

Tier 2 personnel are considered leveraging contracting officers and are found at the operational level of the military organizational hierarchy. At tier 2, personnel require additional credentials that tier 1 personnel are not required to maintain. Although leveraging contracting officers may perform all the duties of an ordering officer, the leveraging contracting officer has additional scope and responsibilities that require additional credentials. These personnel are generally mid-level civilian, junior field grade officers, or senior enlisted. Their primary purpose is to create synergy between local operations and strategic guidance. The leveraging contracting officer exceeds tier 1 personnel in training, certification, and experience. Tier 2 requires personnel to have a mastery of protocols, ethical conduct, control, oversight, management, and complex contracting, as well as completion of Joint Professional Military Education (JPME 1).

Tier 3 is the pinnacle of the model (shown in Figure 7). It is the highest and most pivotal level of personnel in the contracting workforce. These strategic practitioners are designated an Integrated Planner and Executer (IPE). The IPE is found at the strategic level of an organization. The IPE is responsible for the successful integration of all stakeholders in the development and validation of a comprehensive contracting plan, found in Annex W of a geographic combatant command's operational plan (OPLAN). The IPE requires a staff that is appropriately filled with credentialed experts in contracting, logistics, and OPLAN analysis.

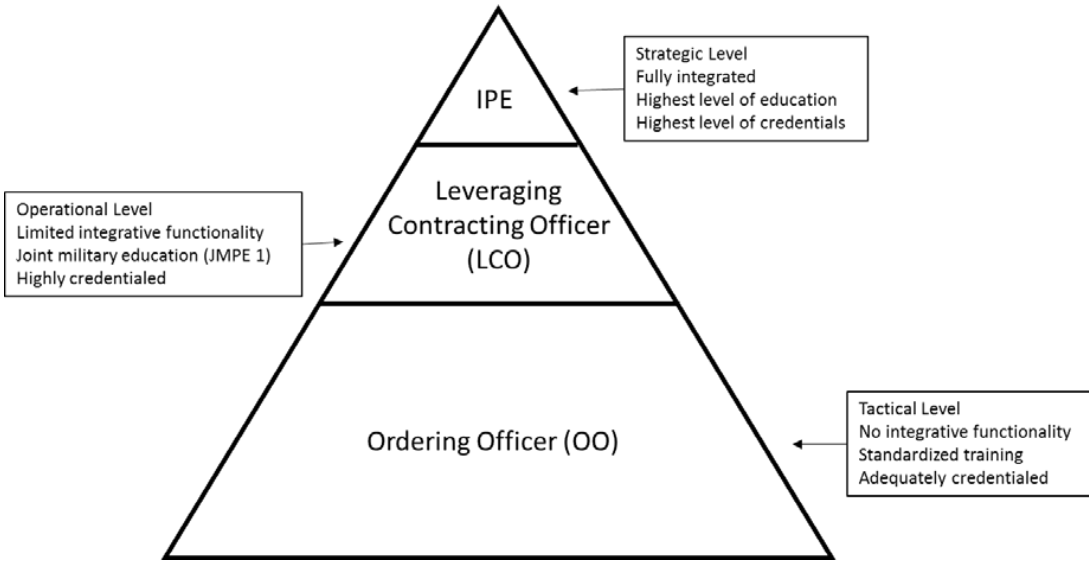

Figure 7: Three-Tier Model (YTTM). Adapted from Yoder (2010).

2. Three Integrated Pillars (TIPS)

Complete integration of personnel, platforms, and protocols are exceptionally important in the Joint environment. Yoder et al.'s 2012 TIPS model is used to asses if the conditions are conducive to strategic contracting success and identify deficiencies in each of the pillars for further emphasis to optimize the environment. The first pillar, personnel, is best addressed with the previously described three-tier model that identified the levels of education, experience, and credentials required at each level of the organizational hierarchy to optimize the holistic integration of contracting professionals in planning and operations. The second pillar, platforms, refers to the degree that contracting is integrated into the geographic combatant commander's platforms for planning and execution by using the Adaptive Planning and Execution System (APEX) and APEX associated systems. The third pillar is the integration of contracting into the protocols of an organization. These protocols represent current or desired optimal sets of rules and guidance that include federal regulations, guidance, and doctrine. Figure 8 is a graphic representation of this model.

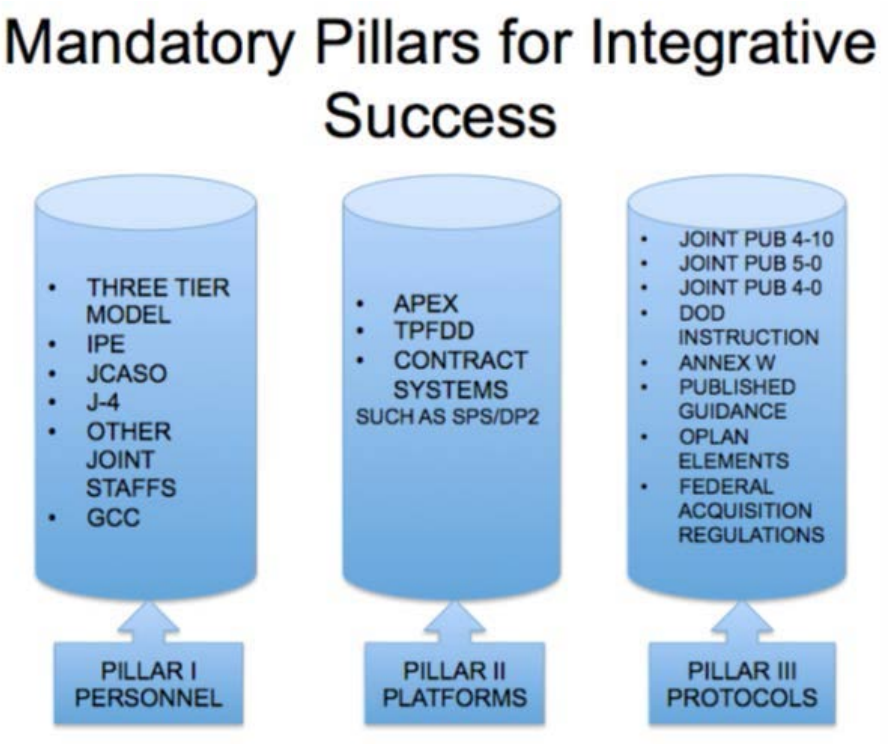

Figure 8: Three Integrated Pillars (TIPS) Model. Source: Yoder et al. (2012).

3. Agility, Discipline, and Risk Pillars (ADRP) Model

The ADRP model is used to analyze the degree of agility, discipline, and acceptable risk that are inherent in a specific endeavor. In relation to contracting, this can be used to establish the optimal contract type to be used for a given situation. In terms of procurement strategy, this framework can be applied to determine if traditional or evolutionary approaches are warranted. Each of the pillars affect the other and all must be balanced to meet optimal outcomes. The ADRP model can be seen in Figure 9.

The first pillar of the model is agility. This refers to the degree of flexibility that is needed in the procurement or contracting effort. This can be a function of the complexity of the product, time frame that the product is needed, or uncertain outcomes of the procurement, such as research and development. The second pillar, discipline, is the amount of oversight and administrative requirements that are mandatory. It includes to what degree additional oversight is needed to ensure the procurement is on schedule, at cost, at specified performance, and that the government interest is protected. There is a direct relationship from agility to discipline. There is a natural phenomenon in that the agility of effort increases as discipline decreases. That is to say, with fewer reporting requirements and administrative burdens, a contractor is free to apply those resources to the completion of the contracted effort. However, more agility and freedom for the contractor and reduction of oversight from the customer creates a higher risk that the customer may not receive the desired outcome within the cost, schedule, and performance specifications. The third pillar, risk, is the level of risk that is acceptable to the customer. The amount of acceptable risk affects the amount of discipline that is needed and limits the agility of a procurement. In order to ensure the optimal outcome of a procurement, all three pillars must be appropriately balanced.

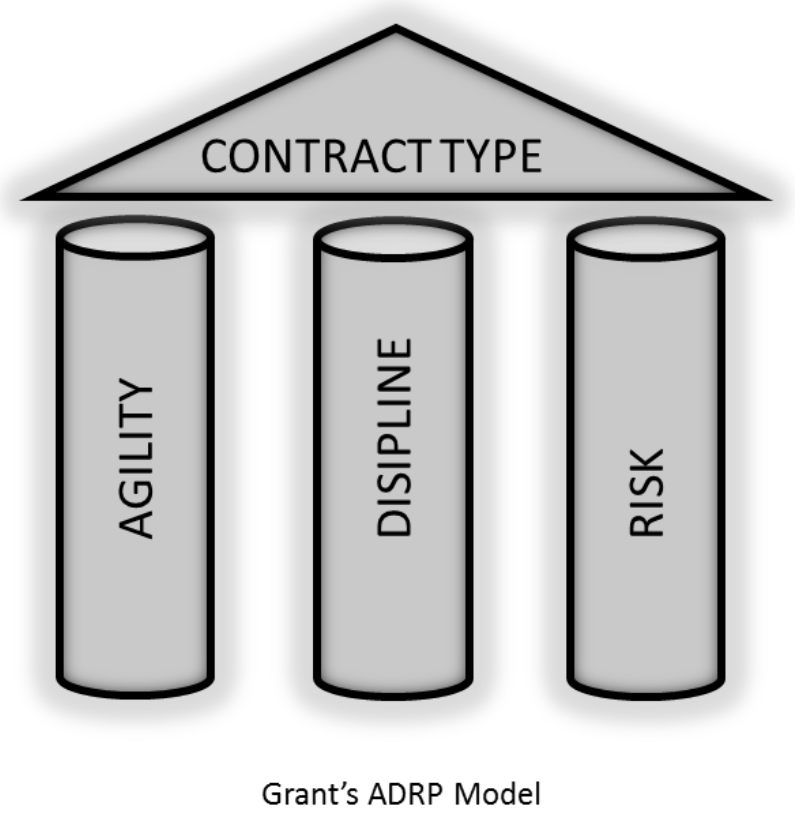

Figure 9: Agility, Discipline, and Risk Pillar (ADRP) Model

B. MODEL IMPLEMENTATION

1. YTTM

To apply Yoder's Three-Tier Model to this research, each level of an organization's acquisition workforce is examined to determine if the appropriate skills, credentials, and experience exist as described by the model. When examining an organization, the hierarchy must have levels that comply with each tier of the model to be considered optimally integrated. The ordering officer, normally the most junior employee in an organization, is synonymous with the first tier and found at the tactical level. This officer has no integration capability at the local level and is limited in education and certifications. When looking at the Acquisition workforce this tier is represented in our organizations. The second tier, the leveraging contracting officer, is found at the operational level. This officer has limited local integration capability, has a lower level

joint education, and is highly credentialed. This position is represented in acquisition organizations, but often lack the joint professional military education that enhance the integrative functionality of the LCO. The first tier, the top of the model, is the IPE. This position exists at the strategic level and is fully capable of stakeholder integration. There is not currently a position in the acquisition organization that is focused on integration as the model describes.

2. TIPS

When applying the Three Integrated Pillar model each pillar is analyzed independently of each other to determine if our current architecture provides for the personnel, platforms, and protocols that will facilitate successful integration in the joint environment. Personnel systems are analyzed using YTTM as the analytical tool. The second pillar platforms are analyzed against the unique requirements of a specific domain. When applied in any given scenario a researcher must ask; Are there adequate systems in place to facilitate the joint force projection? Are there systems to facilitate the joint acquisition of goods or services? Are their adequate systems to accomplish what I need to do? The answer to these questions will yield a critical check of the capability or suitability of the existing platforms. Protocols, at face value, appear to be easier to apply to the model due to the abundance of regulations, law, and guidance available of procurement. However, analysis must be conducted to determine if the available protocol is adequate and appropriate for the subject of analysis. Protocol is abundant, but may not address emerging technologies. Key questions this researcher asked were: Are there protocols for the subject of my research, and are those protocols adequate? Is there ambiguity in the protocol? If so, to what degree does that ambiguity affect the DOD?

3. ADRP

The application of the ADRP model to this research is accomplished by first determining the type of work to be accomplished that requires a contractual agreement. The type of work has inherent qualities that require a level of agility and discipline to best need the requirement while still providing adequate oversight and reporting requirements. The amount of risk that cannot be mitigated is accepted and the degree of acceptable risk is

identified. Once the type of work to be accomplished is identified and its qualities analyzed the three pillars are balanced by implementing the appropriate degree of discipline without unduly stifling the required agility without exceeding the governments risk thresholds. Once the necessary balance is achieved the contract type can be ascertained by the degree of the pillars. An example of the application of the model in contracting for research would be described; as risk and agility rise to allow for the innovation that is germane to research, discipline lowers to allow for the freedom to conduct this activity. This would lend itself to a variation of a cost contract. When the model is applied to the procurement of logistical services within a moderately established distribution network, agility and risk is low while discipline remains moderate. This lends itself to a variation of fixed price contract.

C. CHAPTER SUMMARY

This chapter provided an explanation of the frameworks to be used in the analysis of the strategic contracting needs for the Arctic region. Chapter IV applies the frameworks in an effort to answer research questions and provide findings and recommendations.

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IV. FINDINGS AND RECOMMENDATIONS

A. FINDINGS AND RECOMMENDATIONS

1. Does the Department of Defense Have the Appropriate Capabilities to Meet Arctic Responsibilities?

a. Findings

The DOD does not currently possess the required trained personnel, weather appropriate equipment, or proficiency operating in the Arctic. This capability gap will create contract requirements in the shaping phase of the operation in the Arctic region. These contracting requirements will undoubtedly signal an increase in the workload for the acquisitions workforce in the region. Analyzing necessary personnel, protocols, and platforms, are accomplished using Yoder's Three Integrated Pillars model. Applying YTTM as a framework for contracting personnel analysis, the DOD does not have an Integrated Planner and Executer (IPE) at the strategic level. Leveraging Contracting Officers and Ordering Officers that are responsible for the region are not located in the region and lack the necessary integrated functionality that is required for the level of interagency coordination to support contract actions for the Department of Defense's eighteen supporting tasks. There are adequate platforms to facilitate successful outcomes. APEX, TPFDD, and contracting systems are designed to facilitate the joint environment. There is an abundance of published protocols that are applicable to the Arctic region. However, current protocols are ambiguous when specifically addressing the Arctic region.

b. Recommendations

The IPE and an appropriate supporting staff manned with Leveraging Contracting Officers who are highly credentialed, possess a Joint military education, and have a degree of integrated functionality is a critical element to ensuring successful outcomes in the Arctic region. The IPE, LCO, and OO should be forward located from USNORTHCOM to the Arctic to support interagency integration and develop the required knowledge of the unique physical and social characteristics of the Arctic region. The joint integrated systems, regulations, and guidance that make the DOD business processes are joint in nature and not necessarily applicable to the interagency environment. Platforms and protocols

will need to be agile enough to give the IPE the appropriate room to maneuver the interagency environment.

2. What Are the Department of Defense's Responsibilities in the National Strategy for the Arctic?

a. Findings

The specified tasks for the DOD were established in the implementation strategy for the Arctic region. The DOD is responsible for development of a framework for the prediction of forecasting of sea ice. However, it was given responsibility as a supporting organization in eighteen objectives. These supporting tasks are identified in the Implementation plan for the National Strategy for the Arctic Region (2012) as;

- Sustain and support evolving aviation requirements
- Develop a communications infrastructure in the Arctic
- Enhance Arctic awareness
- Preserve Arctic freedom of the seas
- Promote international law and freedom of the seas
- Conserve Arctic ecosystem
- Use Integrated Arctic Management to Balance Economic Development, Environmental Protection, and Cultural Values
- Implement the Pilot Distributed Biological Observatory in the Pacific Arctic
- Improve Understanding of Glacial Dynamics
- Understand Atmospheric Processes to Improve Climate Predictions
- Support a Circumpolar Arctic Observing System
- Integrate Arctic Regional Models
- Chart the Arctic Region
- Enhance Arctic Search and Rescue
- Accede to the Law of the Sea Convention
- Delineate the Outer Limit of the U.S. Extended Continental Shelf
- Expedite International Maritime Organization Polar Code Development and Adoption
- Promote Arctic Waterways Management

b. Recommendations

The specified lead and supporting tasks are clearly defined. However, the tasks should be further analyzed and delineate each task by phase of the operation and identify key tasks to accomplish each task. Clear metrics for success need to be clearly defined.

3. Are There Opportunities to Capitalize on Existing Networks to Minimize Cost while Providing Capability?

a. Findings

There are several opportunities with governmental and non-governmental organizations to capitalize on existing efforts that will provide an economical benefit. With each of the tasks assigned to the DOD in the implantation strategy have inherent efficiencies by the nature of the task and the relationship of the lead and supporting agencies. In fact, several of the agencies have a long history of successfully completing the research related tasks.

b. Recommendations

The DOD should maximize the use of interagency agreements to support the accomplishment of all research related tasks while leveraging the departments' robust logistical networks to facilitate the research. An investment in acquisitions workforce interagency familiarization and training is necessary to ensure that the DOD best understands the limitations and the opportunities that exist.

4. What Contract Actions Are Appropriate for Phase Zero of Arctic Planning?

a. Findings

Each of the specified tasks that have been assigned to the DOD in either a lead or supporting role also have several agencies assigned the same task to maximize the efficiencies of each organizations competencies. The predominance of these tasks are research oriented or have a research component to facilitate the accomplishment of the task. Using the ADRP model to analyze the optimal contract type for the research requirements the following is observed;

- A high degree of agility is required to facilitate positive research outcomes
- A high degree of discipline would result in cumbersome reporting requirements and as a result not appropriate
- As a result of a lower degree of discipline and a higher degree of agility the government accepts a high degree of risk
- When applying the ADRP model to contracts that provide a service or a to support the research efforts the following is observed;
- A degree of agility may be required to provide research support services as a result of the unique physical environment, but the agility lies in the methods and not the unproven practices. This renders a need for a low degree of agility.
- A higher degree of discipline may be required to ensure that outcomes meet expectations in services as performance specifications are commonly subjectively defined.
- A low degree of agility and a high degree of discipline lend itself to a low degree of acceptable government assumption of risk

b. Recommendations

Based on the efficiencies of interagency cooperation full use of CRADAs should be used in an effort to facilitate the most economical manner to attain the DOD's objectives. In scenarios when interagency cooperative research agreements are not feasible or applicable the Cost type contract is appropriate. Research lends itself well to the cost type contract. In services acquisitions where agility remains low, discipline remains high, and risk remains low, the Fixed Price contract type should be used. In the event of increased risk from uncertainties of contract price determinations and an increase in required agility the Cost type contracts are more appropriate.

B. OPPORTUNITIES FOR FURTHER RESEARCH

This research was limited in scope to the specific research questions posed. Through this research effort it has become clear that opportunities exist for further research in the following topics;

- Develop the ADRP model in other acquisition decision processes
- Implications of the Trump administration's policies on current Arctic efforts
- Analyze the required procurement efforts in the remaining phases of theater operations
- Determine appropriate acquisition strategy in the Arctic region

V. CONCLUSION

Through this research, I have found that the Department of Defense is not currently prepared for the challenges of operations in the Arctic. The Navy as the maritime component lacks the training and equipment to conduct its traditional defense role in the Arctic. The Department of Defense lacks a strategic Integrated Planner and Executer (IPE) capable of integrating the interagency, international, and non- governmental efforts to fill our national capability gaps while taking advantage of our robust protocols and platforms. The role provided by the IPE is pivotal to capitalizing on existing networks to minimize costs through integration of efforts.

Although gaps exist in the research capabilities, the Department of Defense is far more prepared to fulfill the mission requirements and has the capacity to manage the contracts for the capability gap, but not fully integrate the efforts for efficient outcomes. The Arctic has a unique physical and political environment. The uniqueness of the region imposes specialized requirements for equipment, regional specific training for personnel, and special considerations for the international and indigenous peoples. Appropriately educating, manning, and organizing the acquisitions workforce to meet these unique regional requirements is necessary.

Appropriate contracts and agreements that are executed successfully in the shaping phase of the operation lay the groundwork for successful subsequent phases of the operation. Correctly selecting the contract type that fills a capability gap, meets customer expectations, while assuming an acceptable amount of risk is key to long term Arctic industrial base development and meeting our national security objectives in the region.

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APPENDIX

Table 1. National Arctic Implementation Specified Task Matrix. Adapted from White House (2014).

	Department of Defense	Department of Transportation	Department of Homeland Security	Department of the Interior	Department of Commerce	Federal Communications Commission	National Aeronautics and Space Administration	National Maritime Intelligence-Integration Office	Department of State	National Science Foundation	Department of Energy	Environmental Protection Agency	Member Departments and Agencies of the United States National Response Team	Agencies of the Committee on the Marine Transportation System	Office of Science andTechnology Policy	Smithsonian Institute	Department of Health and Human Services	Member Departments and Agencies of the Aquatic Nuisance Species Task Force	National Invasive Species Council	U.S. Arctic Research Commission	Department of Agriculture
Prepare for increased activity in the maritime domain	Support	Lead	Support	Support	Support		Support	Support		Support											
Sustain and support evolving aviation requirements	Support	Lead	Support	Support	Support		Support														
Develop communications infrastructure in the Arctic	Support	Support	Support		Lead	Support															
Enhance Arctic awareness	Support	Support	Lead		Support		Support	Support	Support	Support											
Preserve Arctic Region Freedom of the Seas	Support	Support	Lead		Support				Support	Support											
Promote International Law and Freedom of the Seas	Support		Support						Lead												
Pursue the Development of renewable Energy Resources			Support	Support						Support	Lead										
Ensure the Safe and Responsible Development of Non-Renewable Energy Resources				Support	Support						Support										
Conserve Arctic Ecosystem	Support	Support	Support	Support	Lead							Support									
Improve Hazardous Material Spill Prevention, Containment, and Response			Lead									Lead	Support								
Use Integrated Arctic Management to Balance Economic Development, Environmental Protection, and Cultural Values	Support	Support	Support	Lead	Support							Support			Lead						
Develop a framework of Observations and Modelling to Support Forecasting and Prediction of Sea Ice	Lead		Support	Support	Support		Support			Support	Support										
Implement the Pilot Distributed Biological Observatory in the Pacific Arctic	Support		Support	Support	Lead		Support			Support											
Develop Integrated Ecosystem Research in the Beaufort and Chukchi Seas				Support	Support		Support			Lead											
Improve Understanding of Glacial Dynamics	Support			Support	Support		Support			Lead											
Understand Terrestrial Ecosystem Process				Lead			Support			Support											
Investigate Wildland Fires in the Arctic				Lead						Support	Support										
Understand Atmospheric Processes to Improve Climate Predictions	Support				Support		Support				Support	Lead									
Support a Circumpolar Arctic Observing System	Support		Support		Support		Support				Lead	Support									
Integrate Arctic Regional Models	Support			Support	Support		Support				Support	Lead									
Improve Arctic Community Sustainability, Well being, and Cultural and Linguistic Heritage				Support						Support						Lead					
Understand Human Health in the Arctic					Support					Support						Support	Lead				
Chart the Arctic Region	Support	Support	Support	Support	Lead				Support												
Promote Arctic Oil Pollution Preparedness, Prevention, and Response Internationally	Support	Support	Lead	Lead									Support								
Enhance Arctic Search and Rescue	Support	Support	Lead						Support												
Prevent Unregulated Arctic High Seas Fisheries			Support		Support				Lead												
Reduce Transport Contaminants			Support	Support	Support				Support	Support		Lead									
Identify and Assess Invasive Species Risks and Impacts				Lead														Support	Support		
Promote Scientific Research and Monitoring			Support	Support	Support		Support		Support	Lead	Support	Support								Support	
Develop a Robust Agenda for the U.S.Chairmanship of the Arctic Council			Support	Support	Support				Lead	Support	Support	Support									Support
Reduce Black Carbon in the Arctic		Support	Support	Support	Support				Support	Support	Support	Lead					Support				Support
Accede to the Law of the Sea Convention	Support	Support	Support	Support	Support				Lead												
Delineate the Outer Limit of the U.S. Extended Continental Shelf		Support	Support	Support	Support					Lead											
Resolve Beaufort Sea Maritime Boundary				Support	Support				Lead												
Expedite International Maritime Organization Polar Code Development and Adoption	Support	Support	Lead		Support				Support	Support		Support									
Promote Arctic Waterways Management	Support	Support	Lead		Support																

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