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MEMORANDUM FOR DISTRIBUTION

Subj: NAVY ARCTIC ROADMAP

Encl: (1) Navy Arctic Roadmap

1. Scientific evidence indicates that the Earth's climate is changing, and the most rapid changes are occurring in the Arctic. Because the Arctic is primarily a maritime environment, the Navy must consider the changing Arctic in developing future policy, strategy, force structure, and investment.

2. During the Chief of Naval Operations (CNO) Executive Board on 15 May 2009, CNO directed the establishment of Task Force Climate Change (TFCC) and the development of an Arctic roadmap for the Navy. Enclosure (1) provides a holistic, chronological list of Navy action items, strategic objectives, and desired effects regarding the Arctic for Fiscal Years (FY) 2010-2014.

3. The Navy Arctic Roadmap will remain in effect until promulgation of the next Quadrennial Defense Review (QDR) report in FY-14, when the roadmap will be reviewed and revised to incorporate QDR guidance.

J. W. GREENERT
Admiral, U.S. Navy

Distribution:
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U.S. NAVY ARCTIC ROADMAP

October 2009

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Task Force Climate Change / Oceanographer of the Navy

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Executive Summary

The Navy Arctic Roadmap provides a chronological list of Navy action items, objectives, and desired effects for the Arctic region from FY10-14. Focus areas include:

- Strategy, policy, missions, and plans
- Operations and training
- Investments in weapons, platforms, sensors, command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR), installations, and facilities
- Strategic communications and outreach
- Environmental assessment and prediction

Navy action items and objectives within this roadmap are intended to achieve the following desired effects:

- Developing strong cooperative partnerships with interagency and international Arctic stakeholders
- Actively and competently contributing to safety, security, and stability in the Arctic
- Acquiring the right capability at the right cost and right time to meet combatant commander requirements for the region
- The media, public, Department of Defense, and the interagency, and international communities recognizing the US Navy as a positive and active contributor to a safe, secure, and stable Arctic region
- Understanding when significant access for Arctic shipping and other maritime activity is likely to develop

This roadmap specifies Navy actions over three phases – FY10 (phase 1), FY11-12 (phase 2), and FY13-14 (phase 3). Significant action items in phase 1 include:

- Assessments of Fleet readiness and mission requirements in the Arctic region
- Development of Navy Strategic Objectives in the Arctic region
- Continued partnership-building with stakeholders in the region and conduct of a limited objective experiment (LOE) for the Arctic
- Continued monitoring of USAF's Polar Military Satellite Communications (MILSATCOM) program
- Advocacy for accession to the United Nations Convention on the Law of the Sea
- Developing a Navy position regarding combatant commander authorities and responsibilities for the Arctic
- Research and development of a next generation environmental prediction capability applicable to the Arctic

Phase 2 (FY11-12) significant actions include:

- Initiation of Capabilities Based Assessments regarding required Navy Arctic capabilities
- Development of recommendations to address Arctic requirements in Sponsor Program Proposals for the Navy's Program Objective Memorandum for FY14 (POM-14)
- Continuing biennial participation in Arctic exercises including ICEX-11, ICEX-13,

Arctic Edge and Arctic Care

- Formalizing new cooperative relationships that increase Navy experience and competency in search and rescue (SAR), maritime domain awareness (MDA), humanitarian assistance and disaster response (HA/DR) in the Arctic, and defense support of civil authorities (DSCA) in Alaska

Phase 3 (FY13-14) significant actions consist of:

- Execution of the Navy POM-14 budget initiatives that address Arctic requirements, and
- Initiation of combined and bilateral activities which support safety, security, and stability in the region

Director of Task Force Climate Change (TFCC) will provide the Chief of Naval Operations (CNO) quarterly reports on the progress of action items in this roadmap using both activity-based and effects-based metrics. TFCC will review and revise this roadmap every four years following promulgation of the Quadrennial Defense Review (QDR) and will incorporate QDR guidance as appropriate.

1. Introduction

The Chief of Naval Operations (CNO) examined Navy issues and concerns due to global climate change during a CNO Executive Board (CEB) on May 15, 2009. That CEB resulted in decisions to establish Task Force Climate Change (TFCC) and develop Navy Roadmaps first for the Arctic, and then later for global climate change responses more generally.

TFCC is a matrixed organization that runs across multiple Navy staff codes and warfare enterprises. Consisting of a Flag-level Executive Steering Committee, led by the Oceanographer of the Navy, and several senior level working groups, TFCC is tasked to make recommendations to Navy leadership regarding policy, strategy, force structure, and investments relating to the changing Arctic specifically and global climate change in general. TFCC invites advisory participants from interested Joint and interagency stakeholders including U.S. Northern Command (NORTHCOM); Commander, Pacific Fleet (COMPACFLT); U.S. European Command (EUCOM); the Office of Naval Research (ONR); the National Maritime Intelligence Center (NMIC); U.S. Coast Guard Headquarters; the National Oceanic and Atmospheric Administration (NOAA); the Office of the Secretary of Defense (OSD); the office of the Chairman of the Joint Chiefs of Staff (CJCS); and the Center for Naval Analyses (CNA).

TFCC's initial deliverable is this Navy Arctic Roadmap. TFCC's Navy Climate Change Coordination Office (NCCCO), under the Office of the Oceanographer of the Navy, will coordinate execution of the roadmap by TFCC.

2. Strategic Considerations

This roadmap considers a number of strategic drivers including national policy guidance, the changing Arctic environment, the potential increase in natural resource extraction and inter- and intra-Arctic shipping, the activity and interests of other Arctic nations, past and present Navy experience in the Arctic, and current Fleet capabilities and limitations for Arctic operations.

The primary policy guidance statements influencing this roadmap are the National Arctic Policy as defined in National Security Presidential Directive 66 / Homeland Security Presidential Directive 25 (NSPD 66/HSPD 25) and the Cooperative Strategy for 21st Century Seapower (CS21). The National Arctic Policy directs the Departments of State, Homeland Security, and Defense to develop greater capabilities and capacity, as necessary, to protect U.S. borders; increase Arctic maritime domain awareness (MDA); preserve global mobility; project a sovereign United States maritime presence; encourage peaceful resolution of disputes; cooperate with other Arctic nations to address likely issues from increased shipping; establish a risk-based capability to address hazards in the region including cooperative search and rescue (SAR), basing and logistical support; and evaluate the feasibility for using the Arctic for strategic sealift.

CS21 is the Navy, Coast Guard, and Marine Corps Maritime Strategy and applies equally to the Arctic as well as other maritime regions. The expanded core capabilities of

CS21 applicable to the Arctic include: forward presence, deterrence, maritime security, and humanitarian assistance/disaster relief (HA/DR) through the formation and sustainment of cooperative relationships with international partners. As in every other region, the naval services must be prepared to prevent or limit regional conflict when required.

The changing Arctic environment is a significant consideration of the roadmap. The Arctic is warming twice as fast as the rest of the globe. While significant uncertainty exists in projections for Arctic ice extent, the current scientific consensus indicates the Arctic may experience nearly ice free summers sometime in the 2030's. As mentioned in CS21, this opening of the Arctic may lead to increased resource development, research, tourism, and could reshape the global transportation system. These developments offer opportunities for growth, but also are potential sources of competition and conflict for access and natural resources. Reducing the uncertainty in these projections will enable the Navy to make better-informed investment and policy decisions. This is a key objective of this roadmap.

While the United States has stable relationships with other Arctic nations, the changing environment and competition for resources may contribute to increasing tension, or, conversely, provide opportunities for cooperative solutions. The importance of the Arctic region is identified in the strategic guidance of all Arctic nations; therefore, this roadmap considers the requirement for the governance framework provided by the United Nations Convention on the Law of the Sea (UNCLOS).

The Navy's Arctic experience and current operational capabilities and limitations provide the point of departure for this roadmap. Maintaining a presence in the region for decades, Navy experience spans Admiral Byrd's historic overflight of the North Pole in 1926, various campaigns in World War II, consistent activity during the Cold War, and Joint and combined exercises with surface, subsurface, aviation, and expeditionary forces today. This roadmap acknowledges that while the Arctic is not unfamiliar for the Navy, expanded capabilities and capacity may be required for the Navy to increase its engagement in this region.

3. Roadmap Overview

The action items, objectives, and desired effects in this five-year roadmap are organized into the following focus areas:

- Strategy, Policy, Missions, and Plans: Identify Navy's strategic objectives in the Arctic region and provide guidance to achieve these objectives
- Operations and Training: Identify required Navy activities to achieve Navy's strategic objectives in the Arctic region
- Investments (weapons, platforms, and sensors, command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR), installations, and facilities): Guide capability development
- Strategic Communications and Outreach: Guide public discussion

- Environmental Assessment and Prediction: Understand the current environmental changes and identify with high confidence a timeline for increased access in the region

For each focus area, action items are assigned to responsible Navy offices with suspense dates for completion. Supporting organizations are identified but are not limited to those listed.

4. Navy Arctic Roadmap

4.1 Strategy, Policy, Missions, and Plans

Desired Effect: The Navy is engaged in strong cooperative partnerships that preserve a safe, stable and secure Arctic region.

Roadmap Objective 1.1: To identify Navy's strategic objectives in the Arctic region and provide recommendations to operational staffs to achieve these objectives.

Action Item 1.1 Determine *Navy Strategic Objectives and Restrictions in the Arctic Region.*

Description: TFCC, with applicable Navy Component Commands (NCCs) and Combatant Commands (COCOMs), will analyze National, Joint, and Service strategies and policies, determine the desired end-state and strategic objectives for Navy, and translate these into measurable effects. TFCC will also identify undesired side-effects and unintended consequences in the Arctic region, expressing these results-without-side-effects as Navy goals for the Arctic region. These goals shall be reviewed and updated with this roadmap following each Quadrennial Defense Review (QDR). Applicable references will include but not be limited to:

- The U.S. Arctic Region Policy (NSPD-66/HSPD-25)
- National Strategy for Maritime Security (NSMS)
- National Defense Strategy (NDS)
- QDR Report
- Guidance for Development of the Force (GDF)
- Guidance for Employment of Forces (GEF)
- Navy Operating Concept (NOC)
- *A Cooperative Strategy for 21st Century Seapower*

Navy Arctic strategic objectives will be submitted for inclusion in subsequent versions of these documents, as applicable. TFCC will coordinate directly with USCG, and with the interagency community through the Maritime Security Interagency Policy Committee, to ensure Navy's strategic objectives are consistent with the U.S. Government's desired outcome in the Arctic region.

Lead: OPNAV N51
Support: OPNAV N31, N52, USFF, PACOM/CPF, NORTHCOM, EUCOM
Suspense: Q2, FY10

Action Item 1.2 Describe the strategic environment.

Description: TFCC will characterize the current and probable strategic environment in the Arctic region based on its predicted physical and political environment, and key stakeholders' interests in the region. This assessment will be reviewed and updated with this roadmap following each Quadrennial Defense Review (QDR). Additional elements of this assessment will include, but not be limited to:

- Current and predicted threats in order to determine the most dangerous and most likely threats in the Arctic region in 2010, 2015, and 2025.
- Focus on threats to U.S. national security, although threats to maritime safety and security may also be considered.
- Identify the relevant actors concurrent to the forecast timeframe.
- Determine incentives and motivations for each actor

Lead: OPNAV N2/N6C2
Support: ONI, NMIC, USFF, PACOM/CPF, NORTHCOM, EUCOM
Suspense: Q2, FY10

Action Item 1.3 Conduct *mission analyses.*

Description: Based on the Navy goals for the Arctic region and the results of the threat assessment, TFCC, with applicable Navy Component Commands (NCCs) and Combatant Commands (COCOMs), will conduct a thorough mission analysis in order to determine best courses of action to achieve Navy's strategic objectives in the Arctic region. Continuing to utilize the fundamentals of game theory, this analysis will consider the interdependencies between actors and actions in the Arctic and how incentives and decisions are influenced by other actors' decisions. This mission analysis shall be reviewed and updated with this roadmap following each Quadrennial Defense Review (QDR). Specific attention will be given to the following missions highlighted in the National Arctic Policy and CS21:

- Maritime Security
- Search and Rescue
- Humanitarian Assistance/Disaster Response (HA/DR)
- Defense Support of Civil Authorities (DSCA)
- Maritime Domain Awareness
- Strategic Sealift by the Naval Fleet Auxiliary Force (NFAF)
- Strategic Deterrence
- Ballistic Missile Defense

Lead: OPNAV N00X
Support: OPNAV N51, N31, USFF, PACOM/CPF, EUCOM, NORTHCOM, Naval War College (NWC)
Suspense: Q2, FY10

Action Item 1.4 Develop a five-year *Strategic Implementation Plan* (SIP) to achieve Navy's Strategies and Policies in the Arctic region for FY11-15.

Description: The *Navy Arctic Strategic Implementation Plan (NASIP)* will translate strategy and policy into action. This plan will be updated with this Arctic Roadmap every four years following the QDR, and include but not be limited to the following:

- Look forward and reason backwards, using the strategic environment description and mission analysis in *Action Items 1.2 & 2.3*.
- Anticipate other actors' actions or reactions and determine the implications for potential courses of action.
- Incorporate input from applicable Navy Component Commands (NCCs) and Combatant Commands (COCOMs) and translate Navy Whole Goals in the Arctic Region into a results-based list of specified actions
- Based on scientific facts, make actionable recommendations to operational staffs to achieve the desired strategic objectives.
- Inform and direct capability analysis and decisions.
- Inform future strategy and policy development including, but not limited to, updates to the U.S. Arctic Region Policy (NSPD-66/HSPD-25), National Strategy for Maritime Security (NSMS), National Defense Strategy (NDS), QDR, Guidance for the Employment of Forces (GEF), Navy Operating Concept (NOC), and *A Cooperative Strategy for 21st Century Seapower.*
- Include coordinating and collaborative efforts with USCG, and with the interagency community through the Maritime Security Interagency Policy Committee, to ensure consistency with the U.S. Government's desired outcome in the Arctic region and the actions of other Departments and Agencies.
- Incorporate NCC and COCOM input to ensure alignment among Navy stakeholders in the region.

Lead: OPNAV N51
Support: TFCC NCCCO, USFF, USCG, NOAA, ONR, OPNAV OJAG Code 10
Suspense: Q4, FY10

Action Item 1.5 Propose additional studies and research regarding Arctic security.

Description: TFCC will identify potential topics and areas for further research or study and recommend these to appropriate organizations, including but not limited to:

- Interagency Arctic Research Policy Committee
- Commission on Ocean Policy
- Office of Naval Research (ONR)
- National Science Foundation (NSF)
- Naval Post Graduate School (NPS)
- Naval War College (NWC)
- National Defense University's Institute of National Strategic Studies
- National Intelligence Council (NIC)
- Center for Naval Analyses (CNA)
- Center for New American Security (CNAS)
- Naval Studies Board (NSB)
- National Ice Center
- National Academy of Science (NAS)
- Naval Facilities Engineering Service Center (NAVFAC ESC)
- Commander Naval Installations Command (CNIC)

Lead: OPNAV N51
Support: OPNAV N2/N6, N31, N81, OJAG Code 10
Suspense: Q4, FY10

Action Item 1.6 Beginning for FY14, and biennially each POM year thereafter, consider required Navy Arctic capabilities in developing the Navy Strategic Plan.

Description: Navy Arctic requirements will be considered during the development of the Navy Strategic Plan using the following :

- Navy Strategic Objectives for the Arctic (*Action Item 1.1*)
- Arctic mission analysis and strategic environment descriptions (*Action Items 1.2 & 1.3*)
- Arctic-related CBA's (*Action Items 3.2 & 5.2*)
- Arctic Environmental Assessment & Outlook Reports (*Action Item 5.8*)

Lead: OPNAV N3/5
Support: OPNAV N31, N51, N2/6, TFCC NCCCO
Suspense: Q4, FY11

Roadmap Objective 1.2: Promote a safe, stable, and secure Arctic region by strengthening existing and fostering new cooperative relationships.

Action Item 1.7 Develop a Navy position on COCOM responsibilities in the Arctic for the Unified Command Plan (UCP).

Description: Currently, COCOM responsibility for the Arctic region is divided between U.S. EUCOM, U.S. NORTHCOM, and U.S. PACOM. TFCC will develop a recommended Navy position on COCOM responsibilities in the Arctic

based on the desired end-state(s) and recommended courses of action to achieve them. TFCC will review these responsibilities as necessary.

Action: OPNAV N51
Support: OPNAV N31, N2/N6, USFF, PACOM/CPF, EUCOM
Suspense: Q3, FY10

Action Item 1.8 Expand cooperative partnerships with Joint, interagency, and international Arctic Stakeholders.

Description: Navy partnerships in the Arctic region will provide capability and contribute to achieving the Navy's objectives and desired effects in the region. The process to develop and strengthen these partnerships will include:

- Evaluate existing agreements with the USCG, U.S. Air Force, U.S. Army, foreign militaries, and foreign government agencies/organizations (e.g. Canadian Coast Guard) that operate in the Arctic.
- Initiate discussions with the USCG, U.S. Air Force, U.S. Army, and foreign militaries to expand existing, or form new agreements concerning interoperability and collaborative efforts in the Arctic. Topic areas will include operations, training, and common investments to achieve economies of scale. Every attempt will be made to leverage existing venues (e.g. USN-USCG Staff Talks).
- Formalize new or revised agreements with the USCG, U.S. Air Force, U.S. Army, and foreign militaries concerning interoperability and collaborative efforts in the Arctic.

Lead: OPNAV N3/5
Support: OPNAV N51, OJAG Code 10, USFF, EUCOM, PACOM/CPF, NORTHCOM
Suspense: Q2, FY10 – Evaluate existing agreements
Q4, FY10 – Initiate discussions
Q1, FY12 – Formalize new or revised agreements
Q1, FY12 – Implement new agreements

Action Item 1.9 As applicable, provide support for U.S. accession to the United Nations Convention on the Law of the Sea (UNCLOS).

Description: TFCC will provide support for U.S. accession to UNCLOS as applicable to Navy's interests in the Arctic. Key aspects of this support will include, but not be limited to:

- Expression of Navy interest in the areas for which UNCLOS provides effective governance: freedom of navigation, treaty vs. customary law, environmental laws, and extended continental shelf claims.
- Development of talking points, information papers, or briefings for senior Navy leadership and Congressional staffs as requested.

- Expression of the related message that the Navy is committed to being responsible stewards of the environment. While being committed to conducting military readiness activities in an environmentally sound manner, the Navy is opposed to any framework which unreasonably restricts or prevents our ability to train and operate effectively.

Lead: OPNAV OJAG Code 10
Support: OPNAV N31, N51, N52, N2/N6,
Suspense: Ongoing/As requested

4.2 Operations and Training

Desired Effect: The Navy is a capable and active contributor to a safe, stable, and secure Arctic region.

Roadmap Objective 2: Develop competency in accomplishing Arctic missions assigned by combatant commanders.

Action Item 2.1 Conduct a *Fleet Readiness Assessment* for operating in the Arctic.

Description: A *Fleet Readiness Assessment* will identify current capabilities and limitations for operating in the Arctic environment. Suitability of current doctrine, such as ATP-17 (Navy Arctic Manual) will be evaluated, and consideration will be given to anticipated requirements based on mission and strategic environment assessments performed in *Action Items 1.2 & 1.3* of this roadmap. Specific attention will be given to the following:

- Strategic Sealift
- Maritime Security
- Search and Rescue
- Humanitarian Assistance/Disaster Response (HA/DR)
- Defense Support of Civil Authorities (DSCA)
- Maritime Domain Awareness (MDA)
- Strategic Sealift by the Naval Fleet Auxiliary Force (NFAF)
- Strategic Deterrence
- Ballistic Missile Defense
- C4ISR
- Integration with USCG capabilities

Lead: USFF
Support: TFCC NCCCO, OPNAV N31, N51, N2/N6, ONI, NMIC, USCG
Suspense: Q3, FY10

Action Item 2.2 Continue participation in periodic Arctic exercises and operations, and evaluate feasibility and requirement to expand these activities.

Description: The Navy has frequently participated in exercises, training events, and operations in the Arctic region including the state of Alaska. Continuing this participation will support the strategic objectives of this roadmap to develop Navy competency in the region and substantially contribute to a safe, secure, and stable region. By coordinating with the Arctic combatant commanders and the USCG, the Navy will consider engagement in the following periodic events and operations:

- ICEX-11, ICEX-13
- Arctic Edge (Formerly Northern Edge)
- Northern Eagle
- Innovative Readiness Training (IRT) initiatives under Alaska Command
- HA/DR
- DSCA (e.g. support to Exxon Valdez oil spill)
- Limited Objective Experiment (LOE) 7 (NORTHCOM lead)
- Arctic Care
- Arctic Crossroads

Lead: USFF
Support: PACOM/CPF, EUCOM, ONR, COMSUBFOR, ASL, COMSECONDFLT, COMTHIRDFLT, CNMOC, USCG
Suspense: FY10-14 (Ongoing)

Action Item 2.3 Increase the number of observers sent to, and hosted from the Arctic nation navies, and document knowledge gained from these exchanges into Navy Lessons Learned.

Description: COMSECONDFLT recently gained valuable lessons learned by observing the Canadian Navy's Operation NANOOK 2009. Increasing this practice and reciprocal opportunities for our foreign counterparts will yield more knowledge and understanding that will ensure safe and effective engagement in the Arctic. Knowledge gained from these exchanges will be included in Navy Lessons Learned.

Lead: USFF
Support: NORTHCOM, ALCOM, PACOM/CPF, EUCOM, ONR, COMSUBFOR, ASL, COMSECONDFLT, COMTHIRDFLT, CNMOC, OPNAV OJAG Code 10
Suspense: Q1, FY11

4.3 Investments

Desired Effect: The Navy has the right weapons, platforms, sensors, C4ISR capability, and installations and facilities at the right time and cost to meet combatant commander requirements in the Arctic region

Roadmap Objective 3: Provide weapon, platform, sensor and C4ISR capability, and installations and facilities required to implement Navy, DOD, and National policy regarding the changing Arctic region

Action Item 3.1 Monitor Polar MILSATCOM implementation.

Description: Navy will review the annual submission of the USAF Enhanced Polar Program for polar MILSATCOM and advocate continued funding. Sustainment of this program and development of a replacement in POM-12 is critical to Navy operations in the Arctic.

Lead: OPNAV N2/N6
Support: None
Suspense: Q4, FY10-FY14 (Annually)

Action Item 3.2 Initiate a *Capabilities Based Assessment* (CBA) for Naval Arctic capabilities.

Description: This assessment will be performed in accordance with JCIDS guidance in CJCSI 3170.01G and will include, but not be limited to the following:

- Assessment of current and required capability to execute undersea warfare, expeditionary warfare, strike warfare, strategic sealift, regional security cooperation, HA/DR, and DSCA.
- Assessment of current and required C4ISR capability.
- Assessment of current and required infrastructure, installations, and facilities in the region.
- Leveraging results from the studies and environmental assessment in *Action Items 3.2 & 5.7* of the roadmap, and the mission analysis and description of the strategic environment identified in *Action Items 1.2 & 1.3* of the roadmap.
- Assessment of the potential for leveraging Joint, interagency, and international partnerships addressed in *Action Item 1.8* of this roadmap.
- Potential for Joint, international, and interagency investments to find efficiencies and/or economies of scale

Lead: TFCC NCCCO
Support: OPNAV N2/N6C5, N31, N45, N46, N51, N8F, N81, N85, N86, N87, N88, USFF, USCG, CAN, NAVFAC ESC, CNIC
Suspense: Q1, FY11

Action Item 3.3 Identify *Arctic Capability Science and Technology (S&T) Needs* to assist with the development of required Naval capability for operating in the Arctic.

Description: TFCC will maintain a standing list of *Arctic Capability Science and Technology Needs* to annually inform Arctic science and research organizations

so that they may improve the Navy's capability for operating in the Arctic environment. These needs will be determined from the CBA conducted in *Action Item 3.2*, outreach to the scientific and academic community, and engagement with combatant commanders and the Fleet concerning Arctic requirements. Specific areas to address will include, but not be limited to:

- Undersea Warfare
- Expeditionary Warfare
- Strike Warfare
- Strategic Sealift
- Regional Security Cooperation
- HA/DR
- DSCA
- C4ISR
- Infrastructure

Lead: ONR
Support: OPNAV N8F, N81, N85, N86, N87, N31, N51, TFCC NCCCO, USCG, USFF
Suspense: Q2, FY11 (Annually)

Action Item 3.4 Investigate C4ISR interoperability with the U.S. Coast Guard.

Description: In anticipation of increased Joint USN-USCG operations in the region, this effort will assess to what extent the two services can communicate, exchange ISR data, and share C2 data. Capability gaps, and potential solutions to improve Arctic C4ISR interoperability between the services will also be identified. The overall objective of this effort will be to identify ways to improve sharing common MDA of the region to enhance interoperability.

Lead: OPNAV N2/N6
Support: OPNAV N31, N51, N81, N85, N86, N87, N88, ONI, NMIC, PEO C4I, TFCC NCCCO
Suspense: Q2, FY11

Action Item 3.5 Beginning with POM-14 and biennially each POM year thereafter, assess the Navy Strategic Plan's guidance, if any, relating to warfare capability in the Arctic, and address these requirements in Sponsor Program Proposals.

Description: If required, Sponsor Program Proposals will include recommendations relating to the Navy's Arctic capability gaps identified in the CBA in *Action Item 3.2* and will include, but not be limited to:

- Science and technology (S&T) needs from *Action Item 3.3*
- Research and development (R&D) requirements
- Leveraging Joint, interagency and international partnerships evaluated in

Action Item 1.8 of the roadmap to find efficiencies and/or economies of scale

Lead: OPNAV N2/N6, N4, N8F, N80
Support: OPNAV N81, N85, N86, N87, N88, N31, N51, TFCC NCCCO, NAVFAC
ESC, CNIC, USFF, USCG
Suspense: Q1, FY12

4.4 Strategic Communications and Outreach

Desired Effect: The media, public, government, DOD, and interagency, and international community believe the Navy is contributing to a safe, secure, and stable Arctic region

Roadmap Objective 4: To inform the media, public, government, Defense, and inter-agency, and international audiences regarding the Navy's policy, strategy, investments, intentions, and actions regarding the changing Arctic.

Action Item 4.1 Develop a Navy Arctic Strategic Communications Plan (SCP) for FY10-14.

Description: The Navy Arctic SCP for FY10-14 will provide a framework for how the Navy discusses the Arctic in the public and media, and will define the targeted audiences, organizations, venues, and milestones for communicating Navy action and outreach with regard to the Arctic. These will include but are not limited to:

- CHINFO Rhumblines
- Navy News
- Navy Times
- Stars and Stripes
- Naval Institute *Proceedings*
- Navy League's *Seapower* Magazine
- Social media venues (e.g. Facebook)
- Alaska Public Radio Network
- National Public Radio
- Military Channel
- Weather Channel
- Major US Newspapers
- Local & regional Alaska radio stations & newspapers

The SCP will be reviewed and updated every two years or as required by the Director, TFCC.

Lead: TFCC NCCCO
Support: OPNAV N51, CHINFO, MSC

Suspense: Q1, FY10

Action Item 4.2 Develop a Navy Arctic Outreach & Engagement Plan for FY10-14.

Description: The Navy Arctic Outreach & Engagement Plan will identify organizations the Navy will inform, be informed by, and partner with for achieving the objectives and desired effects of this roadmap. This outreach and engagement plan will be reviewed and updated every two years or as required by the Director, TFCC. Elements of this plan will include, but not be limited to:

- Socializing and requesting OSD designate TFCC as the Department of Defense (DOD) Executive Agent for the Arctic
- Providing DOD assets with *Arctic Environmental Assessment Reports* (*Action Item 5.7* of the roadmap), other TFCC products, and information and reports concerning the Arctic DOD, scientific, media, interagency, and international sources. These DOD assets will include but not be limited to:
    - NORTHCOM
    - EUCOM
    - PACOM
    - USFF
    - COMSECONDFLT, COMTHIRDFLT, COMSEVENTHFLT
    - COMSUBFOR
    - COMNAVSURFOR
    - COMNAVAIRFOR
    - OSD
    - CJCS
    - USAF Director of Weather
    - Arctic Submarine Lab (ASL)
    - Commander, Naval Meteorology and Oceanography Command
    - Office of Naval Intelligence (ONI)
- Establishing and maintaining consistent outreach with, and providing information related to the Navy Arctic Roadmap to U.S. government and interagency organizations involved in the Arctic. These organizations will include but not be limited to:
    - White House Office of Science and Technology Policy (OSTP), Council on Environmental Quality (CEQ)
    - Commission on Ocean Policy
    - Department of State's Arctic Policy Group
    - Department of Energy
    - NOAA
    - U.S. Coast Guard
    - NASA
    - USGS
    - National Geospatial Intelligence Agency (NGA)
- Establishing and maintaining consistent outreach with, and providing information related to the Navy Arctic Roadmap to scientific, research and

academic organizations involved in the Arctic. These organizations will include but not be limited to:

- National Science Foundation (NSF)
- National Academy of Science
- National Research Council
- U.S. Arctic Research Commission
- Naval Post Graduate School
- Naval War College
- National Defense University
- Office of Naval Research (ONR)
- Strategic Environmental Research and Development Program (SERDP)
- U.S. Army Corps of Engineers (USACE) Cold Regions Research Lab (CRREL)
- University of Washington's Applied Physics Lab Polar Science Center
- University of Colorado, Boulder
- University of California, Los Angeles
- Pennsylvania State University
- Wood Hole Oceanographic Institution
- University of Alaska, Fairbanks' International Arctic Research Center
- University of New Hampshire
- NASA's Jet Propulsion Laboratory
- NOAA's National Snow and Ice Data Center, National Climatic Data Center, National Weather Service, National Ocean Service, Climate Program Office, and Pacific Marine Environmental Laboratory
- Consortium for Ocean Leadership
- National Ice Center

- Establishing and maintaining consistent outreach with, and providing information related to the Navy Arctic Roadmap to international offices, agencies, governments, and militaries involved in the Arctic. These will include but not be limited to:
  - Canadian Navy
  - Royal Navy
  - UK Hydrographic Office
  - Russian Navy
  - Danish Navy
  - Norwegian Navy
  - International Ice Patrol
  - Japanese Maritime Self Defense Force (JMSDF)
  - Icelandic Coast Guard
  - Canadian Coast Guard
  - Russian Border Guard
- Establishing and maintaining consistent outreach with, and providing information related to the Navy Arctic Roadmap to indigenous peoples

within the state of Alaska. This will include adherence to relevant executive orders and legislation relating to consultation to Native American and Native Alaskan tribes and regional cooperations.

- Establishing and maintaining consistent outreach with, and providing information related to the Navy Arctic Roadmap to organizations within industry that will be working and investing in the Arctic region.

Lead: TFCC NCCCO
Support: CHINFO, ONR, NOAA, USCG. OPNAV OJAG Code 10
Suspense: Q1, FY10

4.5 Environmental Assessment and Prediction

Desired Effect: The Navy understands the changes and projections for the Arctic environment, specifically when and to what extent ice will recede allowing for increased maritime access to the Arctic.

Roadmap Objective 5: To provide Navy leadership and decision makers a comprehensive understanding of the current and predicted Arctic physical environment on tactical, operational, and strategic scales in time and space. The science-based timeline developed through this focus area will inform accomplishment of the action items and objectives within the other focus areas of this roadmap.

Action Item 5.1 Contribute to the development and implementation of the National Ocean Policy

Description: The White House Council on Environmental Quality (CEQ) is leading a National Ocean Policy Task Force that will deliver a National Ocean Policy which will include a framework for Marine Spatial Planning in the Arctic in December 2009. Navy contribution through the Office of the Secretary of Defense (OSD), Joint Chiefs of Staff (JCS), and Department of the Navy (DoN) will ensure the Navy's equities and strategic concerns regarding the Arctic are represented in both the final policy document, and in the implementation of that document.

Lead: OPNAV N45, TFCC NCCCO, OJAG Code 10
Support: None
Suspense: FY10-14 (Ongoing)

Action Item 5.2 Initiate a *Capabilities Based Assessment* (CBA) of the Navy's Arctic observing, mapping, and environmental prediction capabilities in the Arctic.

Description: This assessment will be performed in accordance with Joint Capability Integration and Development System (JCIDS) guidance in CJCS 3170.01G. It will evaluate the Navy's capability and requirements to observe the physical environment in the Arctic region, to include hydrographic, atmospheric,

oceanographic, and ice data, and will recommend future investments. This CBA also will evaluate the Navy's capability to predict air-ocean-ice conditions on tactical (hours-days), operational (days-weeks), and strategic (months-decades) scales. Specific emphasis will be placed on new capabilities that current technology may provide to reduce uncertainty in 10-30 year predictions of arctic ice coverage. Current and programmed systems will be assessed, and future investments will be recommended. This CBA will include, but not be limited to, the following elements:

- Assessment of previous or ongoing studies regarding the Arctic, climate change, and national security such as:
  - CNA, National *Security and the Threat of Climate Change* (2007)
  - Center for New American Security (CNAS), *Uncharted Waters: The U.S. Navy and Navigating Climate Change* (2008)
  - National Intelligence Council, *National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030* (2008)
  - CNA, *Impact of Climate Change on Naval Operations in the Arctic* (2009)
  - CNA, *Global Climate Change and State Stability* (2009)
  - Pew Center on Global Climate Change, *National Security Implications of Global Climate Change* (2009)
  - OSD QDR, *Assessment of DOD infrastructure vulnerability* (ongoing)
  - GAO, *Survey of Federal Government Efforts to Adapt to a Changing Climate* (ongoing)
  - Strategic Environmental Research and Development Program (SERDP), *Climate Change Planning for Military Installations* (ongoing)
  - Naval Studies Board, *National Security Implications of Climate Change on U.S. Naval Forces* (ongoing)
- Assessment of existing and programmed DOD, interagency, and international observation programs, processes, and organizations for meeting Navy requirements:
  - National Ocean Policy
  - T-AGS multi-mission survey ships
  - National Ice Center
  - Study of Environmental Arctic Change (SEARCH)
  - Arctic Observing Network (AON)
  - Sustained Arctic Observing Network (SAON)
  - International Arctic Buoy Program
  - Space based monitoring (e.g. RADARSAT)
  - Extended Continental Shelf (ECS) Task Force and related efforts
  - Science Exercise (SCICEX) Science Accommodation Missions (SAMs)
  - National Ocean Partnership Program (NOPP efforts)

    - Russian-America Long Term Census of the Arctic (RUSALCA)
    - NOAA Arctic Program
    - Tiksi Arctic Observatory
    - APL-UW Polar Science Center experimentation
    - APL-UW Arctic glider surveys
    - University of Alaska, Fairbanks International Arctic Research Center
    - University of Washington, Applied Physics Laboratory's Polar Science Center
    - Woods Hole Oceanographic Institute
    - U.S. Army Corps of Engineers Cold Weather Research and Engineering Laboratory
    - Naval Facilities Engineering Service Center
- Assessment of FY09 validation and verification of numerical weather prediction capability
- Assessment of current and required architecture and computational capacity
- Evaluation of the potential for developing a coupled, air-ocean-ice, single-km resolution, non-hydrostatic prediction capability suitable for the Arctic region
- Potential for leveraging interagency partnerships with NOAA, DOE, NASA, and the National Ocean Partnership Program
- Potential for leveraging international partnerships

Lead: OPNAV N2/N6
Support: OPNAV N81, TFCC NCCCO, USFF, CNMOC, ONR
Suspense: Q1, FY11

Action Item 5.3 Continue SCICEX accommodation missions (SAMs).

Description: SCICEXs have provided the scientific community with data important to our understanding of the Arctic environment and predicting future changes. When operational requirements permit, SAMs will be conducted according to the Science Plans agreed to by the SCICEX Science Advisory and Interagency Committees.

Lead: COMSUBFOR
Support: USFF, OPNAV N87, ONR, ASL, NSF, LDEO, NSIDC, CRREL
Suspense: FY10-14 (Ongoing)

Action Item 5.4 Identify *Science and Technology Needs for Arctic Assessment and Prediction.*

Description: TFCC will maintain a standing list of science and technology needs for Arctic assessment and prediction to annually inform Arctic science and research organizations so that they may improve the Navy's understanding of the

current and predicted Arctic environment. These needs will be determined from the CBA conducted in *Action Item 5.2*, outreach to the scientific and academic community, and engagement with combatant commanders and the Fleet concerning Arctic requirements. Specific areas to address will include, but not be limited to:

- Hydrography
- Oceanography
- Ice Extent and Dynamics
- Meteorology
- Climate
- Geology and geophysics and engineering (foundation) properties of seafloor and substrates

Lead: ONR
Support: OPNAV N2/N6, TFCC NCCCO, NOAA, USFF, CNMOC
Suspense: Q4, FY10-14

Action Item 5.5 Develop cooperative partnerships for environmental observation and mapping with interagency and international Arctic stakeholders.

Description: Navy partnerships in the Arctic region will provide capability and contribute to achieving the Assessment and Prediction Objective and Desired Effects in this roadmap. The process to develop and strengthen these partnerships will include:

- Evaluate existing agreements with Arctic stakeholders, including but not limited to:
  - USCG
  - NOAA
  - NGA
  - U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL)
  - Interagency Arctic Research Policy Committee
  - U.S. Arctic Research Commission
  - National Science Foundation (regarding SERCH and AON)
  - Department of State (regarding SAON)
  - Hydrographic offices of the UK, Japan, and the Arctic Council Member States
  - Meteorological offices of the UK, Japan, and the Arctic Council Member States
  - Canadian Ice Service
  - Industry
- Initiate discussions with the Arctic stakeholders to expand existing, or form new agreements concerning collaborative efforts for environmental observation and mapping in the Arctic. Every attempt will be made to

leverage existing forums (e.g. quarterly Navy, NOAA, USAF Tri-Agency lunch). Topic areas will include but not be limited to:
    - Hydrographic, oceanographic, and meteorological data exchange
    - Joint investments to achieve economies of scale.
    - Cooperative hydrographic surveys in the Bering Strait choke points, logistic ports of debarkation, and in Fleet Arctic Operating areas to ensure safe navigation of Fleet (surface and subsurface) units operating in the region.
    - Become an active member of the proposed Arctic Hydrographic Commission.
- Formalize new or revised agreements with the Arctic environmental stakeholders.

Lead: TFCC NCCCO
Support: USFF, CNMOC, ONR, NOAA, USCG, OJAG Code 10
Suspense: Q2, FY10 – Evaluate existing agreements
Q4, FY10 – Initiate discussions
Q1, FY12 – Formalize new or revised agreements
Q1, FY12 – Implement new agreements

Action Item 5.6 Establish an interagency partnership to develop and implement a Next Generation Numerical Environmental Prediction (NEP) capability for coupled air-ocean-ice modeling.

Description: Environmental prediction capabilities exist, and are being programmed across DOD and the interagency community. Establishing a permanent partnership to synchronize these efforts towards a common goal of improving global environmental assessment and prediction will improve the Navy's understanding of the current, and projected Arctic environment – thereby achieving the Assessment and Prediction Objective and Desired Effects in this roadmap. The process to develop this partnership will include:

- Evaluate existing agreements with environmental prediction stakeholders, including but not limited to:
    - NOAA
    - NASA
    - Department of Energy and its subordinate national laboratories
    - USAF
    - US Group on Earth Observations
- Initiate discussions with these stakeholders to form a new collaboration agreement on environmental prediction. Every attempt will be made to leverage existing venues (e.g. quarterly Navy, NOAA, USAF Tri-Agency Lunch). Topic areas will include but not be limited to:
    - Leveraging existing programmed efforts (e.g. the National Unified Operational Prediction Capability – NUOPC)
    - Exploiting each agency's unique areas of expertise (e.g. data

assimilation for the Navy)
    - Reducing redundancy in research, development, and investment.
- Formalize the new agreement and begin implementation

Lead: TFCC NCCCO
Support: USFF, CNMOC, ONR, NOAA, USCG
Suspense: Q2, FY10 – Evaluate existing agreements
Q4, FY10 – Initiate discussions
Q1, FY12 – Formalize new or revised agreements
Q1, FY12 – Implement new agreements

Action Item 5.7 Beginning in FY10 for POM-14, and biennially each POM year thereafter, produce an *Arctic Environmental Assessment and Outlook Report* to inform Navy policy, strategy, and investment decisions.

Description: This biennial report will provide a comprehensive assessment of the state of the Arctic environment, including the oceanography, hydrography, meteorology, fisheries, ice-extent, and climatic trends. Also included will be projections based upon the latest scientific studies, research, and modeling efforts regarding future Arctic environmental conditions, with particular emphasis on the time-frame in which ice extent and thickness will allow for trans-Arctic shipping and significant increases in intra-Arctic shipping resource extraction, and eco-tourism.

Lead: TFCC NCCCO
Support: ONR, CNMOC, NPS
Suspense: Q4, FY10

Action Item 5.8 Beginning with POM-14 and biennially each POM year thereafter, assess the Navy Strategic Plan's requirements, if any, relating to Navy environmental observation, mapping, and numerical environmental prediction capability in the Arctic, and address these requirements in recommendations to Sponsor Program Proposals.

Description: If required, Sponsor Program Proposal recommendations relating to the Navy environmental observation, mapping, and numerical environmental prediction capability gaps will be based upon the CBA in *Action Item 5.2* and will include, but not be limited to:

- Science and technology (S&T) needs from *Action Item 5.3.*
- Research and development (R&D) requirements
- Leveraging Joint, interagency, and international partnerships evaluated in *Action Itesm 5.5 & 5.6* to find efficiencies and/or economies of scale
- Application of unmanned systems for observation and mapping

Lead: TFCC NCCCO
Support: USFF, CNMOC, ONR

Suspense: Q1, FY12

Action Item 5.9 Evaluate the re-establishment of ONR's High Latitude Program.

Description: In the past, ONR's High Latitude Program coordinated mission-driven science to address national security needs through scientific data gathering in the Arctic. ONR's High Latitude Program was a proven and effective funding agency that provided a wealth of knowledge to the Navy and the nation. Re-establishing this program, with emphasis on support to research of sea ice thickness using Navy submarines, will lead to improved understanding and prediction of Arctic ice extent and the timeline for increasing access in the Arctic.

Lead: ONR
Support: USFF, CNMOC, TFCC NCCCO
Suspense: Q4, FY11

Action Item 5.10 Initiate *Environmental Planning Documentation* for the Arctic region.

Description: The Navy's Director of Environmental Readiness (OPNAV N45) is coordinating the completion of a phased, comprehensive approach to environmental planning for Navy military readiness and scientific research activities at sea. This documentation is required by the Secretary of the Navy and regulations contained in Executive Order (EO) 12114 Environmental Effects Abroad of Major Federal Actions, the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), and the National Environmental Policy Act. Documentation for the Arctic region will cover at sea Fleet Training, and as practicable Acquisition-related research, development, test, and evaluation (RDT&E) activities sponsored by program executive offices (PEO), environmental effects of new systems that reach Initial Operating Capability (IOC), and ONR-sponsored science and technology activities.

Lead: USFF/CNMOC
Support: OPNAV N45, N31, ONR, NAVAIR, NAVSEA
Suspense: Q2, FY12

Action Item 5.11 Increase operations of unmanned systems for Arctic data collection, monitoring, and research.

Description: Using capabilities from the Naval Oceanography Program's Littoral Battlespace Sensing, Fusion, and Integration (LBSF&I) program, assets from the Commander, Naval Meteorology and Oceanography Command (CNMOC) will increase the temporal and spatial coverage of Arctic data collection, monitoring, and research in order to improve nautical charts, atmospheric and ocean models, estimates of ice extent and thickness, and climate change indicators. Specific capabilities will include, but not be limited to:

- Gliders systematically deployed to map oceanographic conditions
- Unmanned underwater vehicles (UUVs) for oceanographic and hydrographic data collection
- Buoys to collect atmospheric and ice-related data
- Evaluation of the potential for collecting atmospheric and ice-related data using unmanned aerial systems (UASs)

Lead: USFF/CNMOC
Support: OPNAV N86, N87, N2/N6, TFCC NCCCO, NOAA
Suspense: Q1, FY13

5. Roadmap Execution

The Oceanographer of the Navy, as Director, TFCC will oversee execution of this roadmap. Navy offices responsible for action items in this roadmap will report accomplishment status quarterly to TFCC's Navy Climate Change Coordination Office (NCCCO), led by the TFCC Deputy Director. The following additional action items will support execution of this roadmap:

Action Item 6.1 Identify costs for the assessments in this roadmap

Description: TFCC will evaluate the costs for the mission, threat, and capability based assessments in this roadmap and provide them to OPNAV N81 for consideration and potential inclusion in Navy's PR-11 end game decisions.

Lead: TFCC NCCCO
Support: N81, N00X
Suspense: Q1, FY10

Action Item 6.2 Develop metrics to assess roadmap execution status.

Description: TFCC will develop a set of both activity-based and effects-based metrics to assess accomplishment of the roadmap. The activity-based metrics will apply to the roadmap action items and objectives, while the effects-based metrics will apply to the roadmap's five desired effects.

Lead: TFCC NCCCO
Support: N81
Suspense: Q1, FY10

Action Item 6.3 Provide quarterly reports regarding roadmap execution to the CNO.

Description: TFCC will submit Quarterly Arctic Roadmap Execution Reports to the CNO via the DNS. These reports will provide an assessment of the accomplishment of the roadmap's action items, objectives, and desired effects using metrics developed by TFCC. These reports also will provide a summary of

significant Navy engagement and near-term future actions regarding the Arctic.

Lead: TFCC NCCCO
Support: OPNAV N2/6, N3/5, N4, N8, CHINFO, ONR, USFF, USCG, NOAA, OJAG Code 10
Suspense: Q1-Q4, FY10-14

Action Item 6.4 Evaluate the requirement for a classified annex to this roadmap and initiate development if required.

Description: The classified Annex to this roadmap will provide a list of actions from FY10-14 that will accomplish the roadmap objectives and desired effects in this document.

Lead: OPNAV N2/N6C2
Support: OPNAV N31, OPNAV N51, USFF, EUCOM, PACOM/CPF, NORTHCOM, ONI, NMIC
Suspense: Q2, FY10

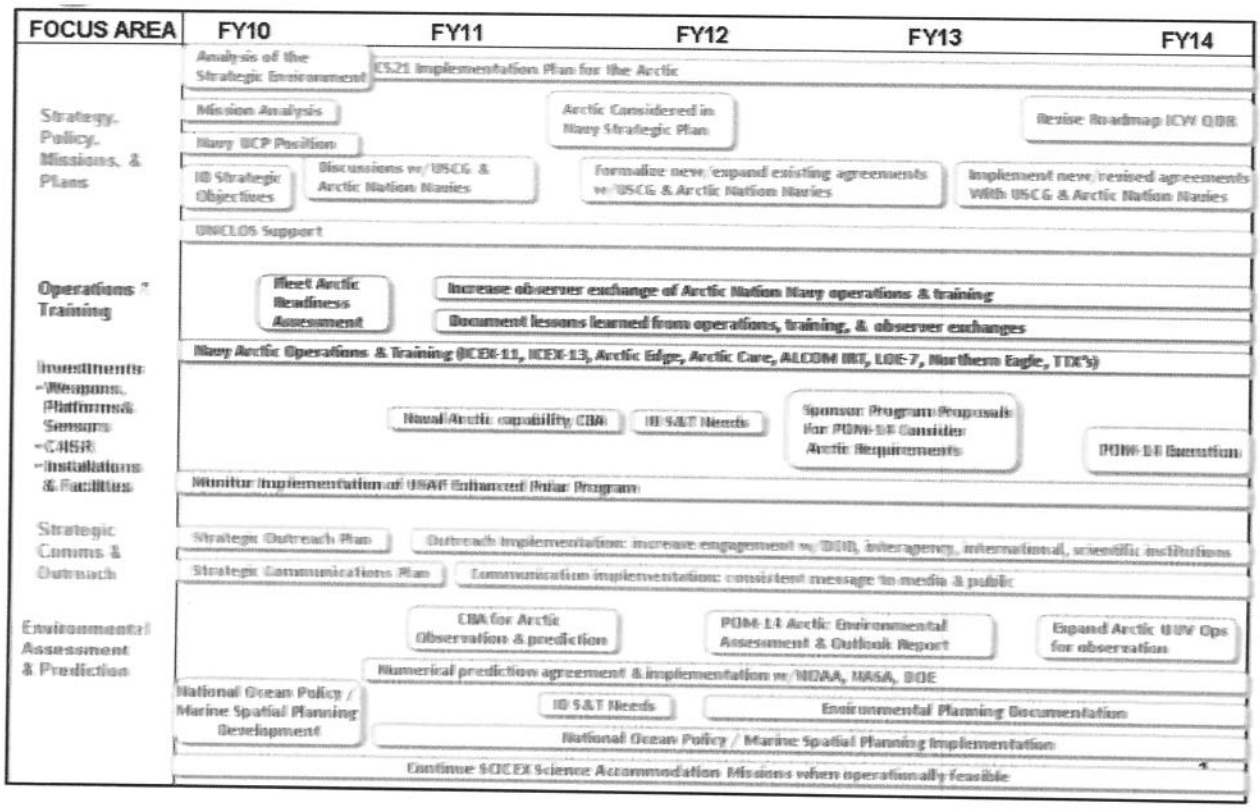
Action Item 6.5 Review and revise the Navy Arctic Roadmap.

Description: TFCC will review and revise this roadmap every four years after promulgation of the Quadrennial Defense Review (QDR) and incorporate QDR guidance as appropriate. The revised roadmap will provide a 5-year action plan for FY 14-19 with Navy objectives and desired effects regarding the Arctic.

Lead: TFCC NCCCO
Support: OPNAV N2/6, N3/5, N4, N8, CHINFO, ONR, USFF, USCG, NOAA, OJAG Code 10
Suspense: Q1, FY14

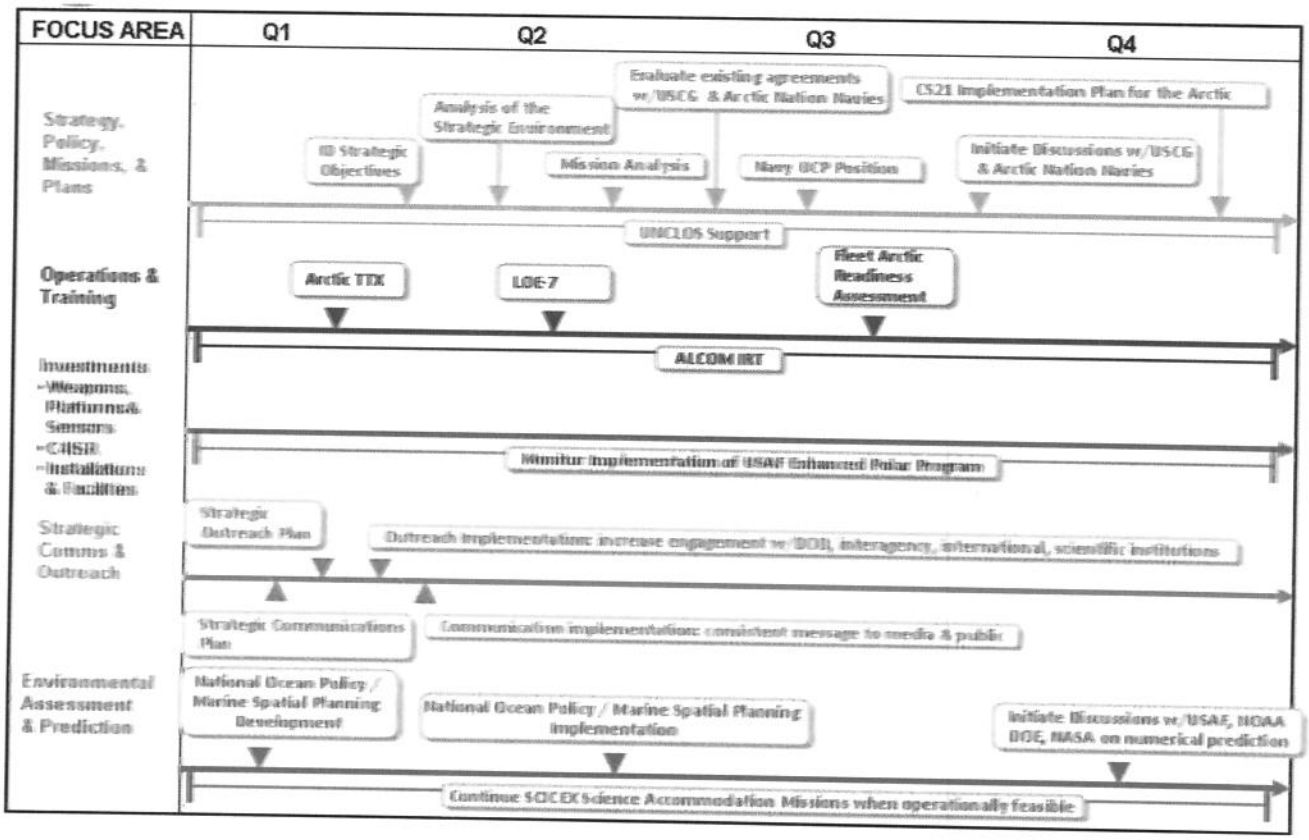
Appendix A

Navy Arctic Roadmap – Significant Actions



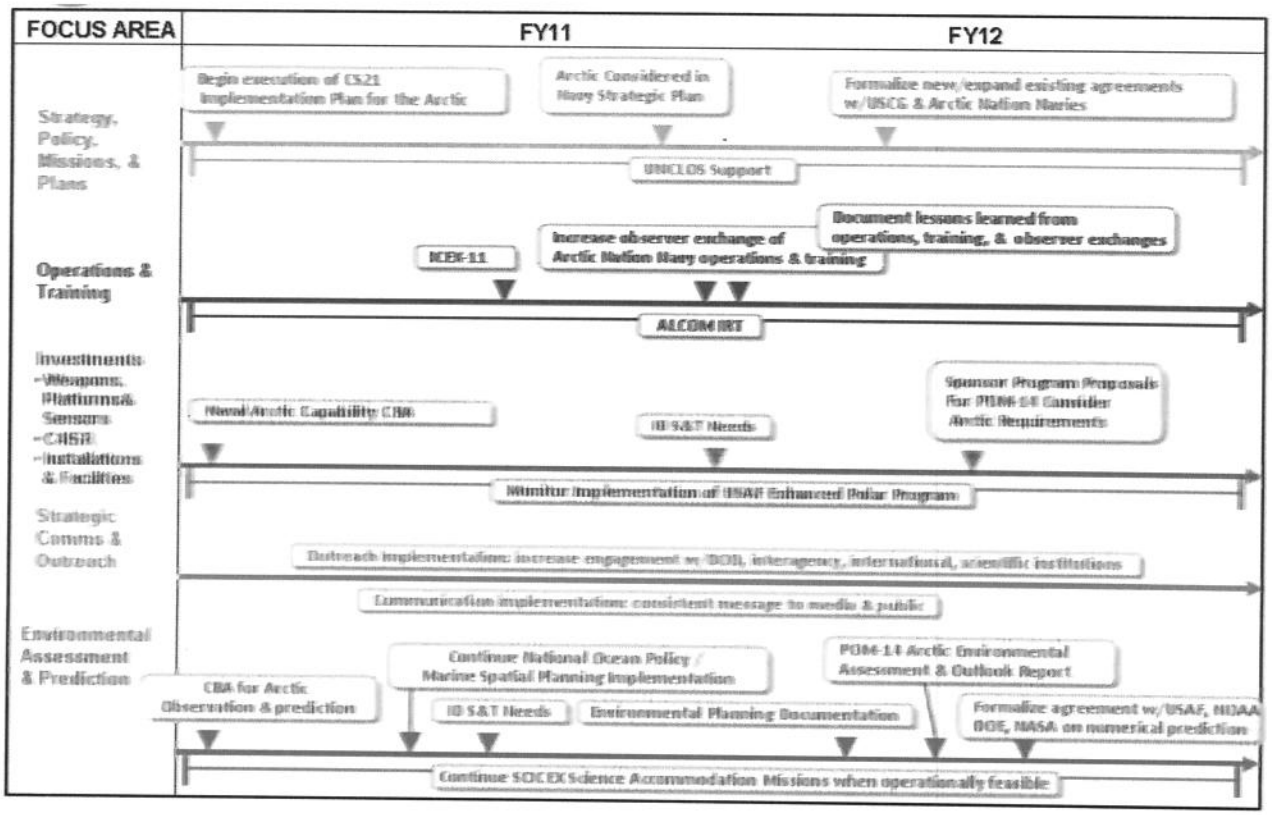
Appendix A

Navy Arctic Roadmap - Phase 1 (FY10)



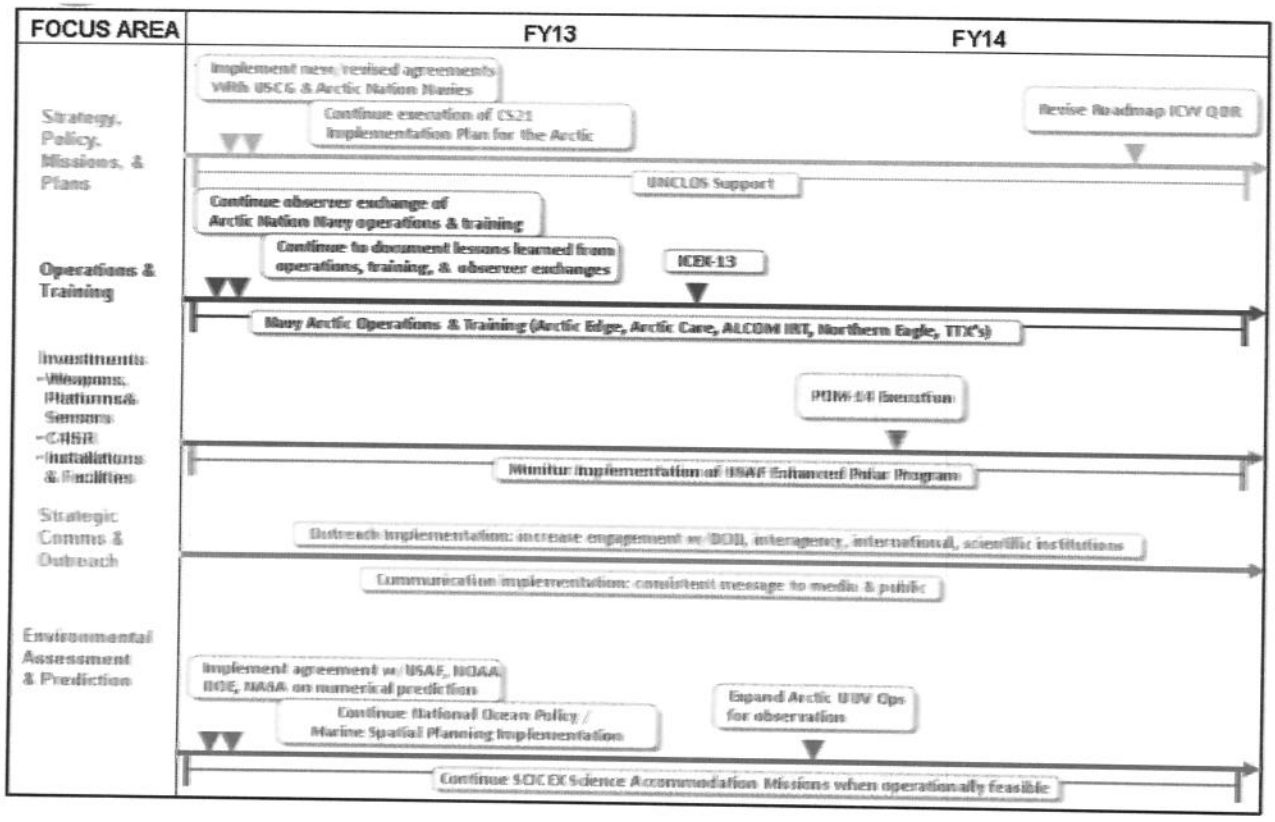
Appendix A

Navy Arctic Roadmap - Phase 2 (FY11-12)



Appendix A

Navy Arctic Roadmap - Phase 3 (FY13-14)



Appendix B

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