

THE NATIONAL ACADEMIES

Polar Research Board Transportation Research Board

Assessment of U. S. Coast Guard Polar Icebreaker Roles and Future Needs

Summary

Ships capable of operating in ice are essential for the United States to conduct operations in the Antarctic and the Arctic regions. This study will assess the role of Coast Guard icebreakers in supporting United States operations in the Antarctic and the Arctic, including scenarios for continuing those operations, the roles of ice-capable ships in the support of and conduct of scientific programs, and potential changes in the roles of Coast Guard icebreakers in the Arctic that may develop due to environmental change.

Background

Context

Since 1965, when the polar icebreaker program transferred from the U.S. Navy, the Coast Guard has been the principal provider of polar icebreaking services for the Nation. Coast Guard polar icebreakers provide a capability for national defense, search and rescue, maritime law enforcement, marine environmental protection, and scientific research and logistics support in the polar regions. For a variety of scientific and political reasons, the United States is expected to show a substantial presence there in years to come.

In the Antarctic, the Coast Guard has two ships that normally operate in the Southern Ocean, the POLAR SEA (commissioned in 1978) and POLAR STAR (commissioned in 1976), which are the two most powerful of the Coast Guard's icebreaker fleet. These icebreakers were designed with exceptional hull design, power, strength and weight, and for their time incorporated many innovative features. The POLARS are able to ram through ice up to 21 feet thick and steam continuously through 6 feet of ice at approximately 3 knots. They serve a variety of missions while operating in polar regions. During Antarctic deployments, the primary mission is breaking a channel through the sea ice to resupply food, fuel and supplies to McMurdo Research Station in the Ross Sea. In addition, both have some capabilities as research platforms: Polar Star has five laboratories and accommodations for up to 20 scientists and technicians, plus cranes and work areas near the stern and port side of ship that give scientists the capability to do at-sea studies in the fields of geology, vulcanology, oceanography, sea-ice physics and other disciplines. Polar Sea is equipped with 5 internal laboratories and accommodations for about 20 scientists and technicians as well. The ship can accommodate an additional seven portable science laboratories on deck. Both ships have been in service for more than 25 years and are approaching the end of their service life. Based on preliminary

analysis conducted by the Coast Guard, the costs to recapitalize both of these icebreakers are very significant.

The United States' newest and most technologically advanced icebreaker is the Coast Guard Cutter HEALY (commissioned in 2000). HEALY is designed to break 4 ½ feet of ice continuously at three knots and can operate in temperatures as low as -50 degrees F. HEALY was specifically designed to support a wide range of research activities, providing more than 4,200 square feet of scientific laboratory space, numerous electronic sensor systems, oceanographic winches, and accommodations for up to 50 scientists. At a time when scientific interest in the Arctic Ocean basin is intensifying, HEALY substantially enhances the United States Arctic research capability. As a Coast Guard cutter, HEALY is also a capable platform for supporting other missions in the polar regions, including logistics, search and rescue, ship escort, environmental protection, and enforcement of laws and treaties.

Recent analysis of the Arctic and Antarctic regions have produced data indicating pronounced climate changes in the mid-to-long term. The polar regions are leading indicators for climate change, yet these regions are among the least understood. Given this scenario, demand for and use of the polar regions for scientific research, commerce and transit would be expected to increase, as might associated support operations, treaties, laws and other internal and external policies related to Polar Ice Operations capability and capacity.

Forward-looking planning is needed to be prepared to accomplish the full range of Coast Guard missions in the polar regions and in particular whether assets are and will be available to meet needs in the near, mid- and long-terms, whether alternatives methods of providing needed services are available, and how to provide the required services in the most cost effective way. It is particularly important that the right types of sea-borne assets be available as we approach the International Polar Year scheduled for 2007-2008 so that assets can be deployed and coordinated effectively.

Given the challenges facing the Coast Guard and stakeholders of Arctic and Antarctic regions, due in part to the condition of these aging cutters and the significant investment that will be needed to continue their service, Congress passed legislation in the fall of 2004 requiring the Coast Guard to request a study from the National Academy of Sciences exploring the role of the Coast Guard icebreakers in supporting US operations in the Antarctic and Arctic. This study will complement past and ongoing related activities by providing a comprehensive overview of polar operations needs and giving full consideration to the international context in which polar operations are conducted.

Plan of Action

Statement of Task

Ships capable of operating in ice are essential for the United States to conduct operations in the Antarctic and the Arctic regions. This study will assess the role of Coast Guard icebreakers in supporting United States operations in the Antarctic and the Arctic, including scenarios for continuing those operations, the roles of ice-capable ships in the

support of and conduct of scientific programs, and potential changes in the roles of Coast Guard icebreakers in the Arctic that may develop due to environmental change. Specifically, this study will:

1. Provide an overview of the role of U. S. Coast Guard icebreakers in supporting United States operations in the Antarctic and the Arctic and analysis of the overall demand for icebreaking services, including:
 - a. Describe present uses of polar icebreakers and ice-capable ships with respect to the relevant missions in the Antarctic and Arctic (including national defense, support of economic activity, environmental protection, and the support of and conduct of science);
 - b. Describe expected future needs for polar icebreakers and ice-capable ships, such as where and when the polar icebreakers will be expected to operate and what capabilities are needed. In particular, describe the potential roles of ice-capable ships in providing logistical support for science programs and platforms for research.
 - c. Compile a general inventory of the number and type(s) of existing and planned polar icebreakers (including ships of other nations) and their capabilities, differentiating among heavy polar icebreakers, medium polar icebreakers, light polar icebreakers and ice-strengthened vessels;
 - d. Compare the assessment of needs to ship assets that are available or reasonably expected to be available, identifying gaps and timing issues that would affect the accomplishment of Coast Guard missions, science priorities, and political commitments.
2. Describe potential changes in the roles and missions of Coast Guard icebreakers in support of future marine operations in the Arctic that may develop due to environmental change, including the amount and kind of icebreaking support that may be required in the future to support marine operations in the Northern Sea Route and the Northwest Passage and the type of icebreakers that might be needed for these new roles.
3. Present and analyze a small number of feasible scenarios for continuing ice-capable ship operations in the polar regions, including service life extension of existing Coast Guard icebreakers, replacement of existing Coast Guard icebreakers, and alternate methods of meeting identified needs (e.g., resupply of McMurdo Station and availability of platforms for marine research) that do not use Coast Guard services.
4. Provide ideas to improve polar icebreaker management, efficiency, funding and reimbursement in the future, such as improvements to funding scenarios; inter-agency reimbursement options; and other funding and operations options that could ensure that ship capabilities are adequate to meet national needs.

Expertise Required

The study would be conducted by an ad hoc committee composed of approximately 15 volunteer experts, with experience and expertise in areas such as marine engineering, naval architecture, national defense/homeland security operations and policy, Arctic and Antarctic policy, maritime shipping industry, marine geology and geophysics, biological oceanography, physical oceanography, atmospheric science, climate science, ice dynamics, Antarctic logistics, economics, and other relevant areas. Committee members will have experience in the Arctic and/or the Antarctic and the various other perspectives necessary to the study. The committee will reflect the NRC's normal efforts to achieve diversity in areas such as geographic representation, institutional affiliation, plus age, gender, race and other perspectives.

Preliminary Work Plan

To be determined through consultation with Congress and the sponsoring agencies. The legislation required a report to the House and Senate Appropriations Committee by September 30, 2005. Given the complexity of the tasks, The Academies will seek either to extend the deadline or to have the ability to deliver an interim report by September 2005 and a final, more detailed report at a later date.

If this two phased approach is approved, phase one will produce an Interim Report that focuses on conducting the demand analysis (task 1) and reflects the needs from various stakeholders (science, defense, commerce) and highlights items that are especially time-dependent. In phase two, the committee will address items 2, 3, and 4 of the Statement of Task and prepare a final report. In each phase, committee meetings, email, and conference calls will be used to discuss the issues, gather information, deliberate, and prepare reports that meet all National Academies review requirements.

This study will rely heavily on synthesizing existing materials: it will canvass available reports and survey existing user groups to gather information and look at analogies from other fields where science leases assets to provided needed services. It will rely on the Coast Guard's soon-to-be completed mission analysis as an important base document. This study will not delve into the specifics of vessel design. The study committee will provide opportunities for input from a range of relevant stakeholders. The process may include opportunities for international input, identify obstacles to international collaboration, and suggest improvements. It will attempt to analyze demand and supply with the goal of helping ensure that necessary services are provided in the most cost effective way.

In total, the committee will meet approximately XXX times over XXX months (with 3 additional months included in the contract period to allow for production of the final published volume). The committee and its report will be subject to all standard NRC appointment, operating, and review procedures. NRC staff will manage the activity, including conducting the committee nominations process, supporting committee research and travel needs, facilitating report preparation, ensuring compliance with all NRC procedures, and maintaining communication with the sponsors. The Polar Research

Board (PRB) will take the lead management role, with assistance from the Transportation Research Board's Marine Board (MB) and other units as appropriate.

FEDERAL ADVISORY COMMITTEE ACT

The Academy has developed interim policies and procedures to implement Section 15 of the Federal Advisory Committee Act, 5 U.S.C. App. § 15. Section 15 includes certain requirements regarding public access and conflicts of interest that are applicable to agreements under which the Academy, using a committee, provides advice or recommendations to a Federal agency. In accordance with Section 15 of FACA, the Academy shall submit to the government sponsor(s) following delivery of each applicable report a certification that the policies and procedures of the Academy that implement Section 15 of FACA have been substantially complied with in the performance of the grant with respect to the applicable report.

Public Information About the Project

In order to afford the public greater knowledge of Academy activities and an opportunity to provide comments on those activities, the Academy may post on its website (<http://www.national-academies.org>.) the following information as appropriate under its procedures: (1) notices of meetings open to the public; (2) brief descriptions of projects; (3) committee appointments, if any (including biographies of committee members); (4) report information; and (5) any other pertinent information.

Product and Dissemination Plan

All reports will be prepared subject to the standard National Research Council review procedures. They will be disseminated to the project sponsor, other interested state and federal agencies, NGOs, congressional staff, scientists and interested local communities. The project staff will coordinate with the NRC Office of News and Public Information to produce materials appropriate for dissemination to the popular press and television and radio media. The report will be made available to the public without restriction and will be posted on the NAS World Wide Web site.

Estimated Cost

The total estimated cost of this study is \$xxx,xxx for xx months (with an additional 3 months allowed in the contract period for provision of the published volume).