COAST GUARD ICEBREAKING

(110–154)

HEARING

BEFORE THE

SUBCOMMITTEE ON
COAST GUARD AND MARITIME TRANSPORTATION

OF THE

COMMITTEE ON
TRANSPORTATION AND
INFRASTRUCTURE
HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

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July 15, 2008

SUMMARY OF SUBJECT MATTER

TO: Members of the Subcommittee on Coast Guard and Maritime Transportation

FROM: Subcommittee on Coast Guard and Maritime Transportation Staff

SUBJECT: Hearing on Coast Guard Icebreaking

PURPOSE OF HEARING

The Subcommittee on Coast Guard and Maritime Transportation will meet on Thursday, July 16, 2008, at 2:00 p.m. in room 2167 Rayburn House Office Building to receive testimony on "Coast Guard Icebreaking".

BACKGROUND

Icebreaking as a federal responsibility

Icebreaking in the United States began in the 1830s with the advent of steam-powered vessels. At that time, side-wheeled steamers with reinforced bows were used in winter to open harbor channels along the East Coast as far south as the Chesapeake Bay. These icebreaking operations were conducted by private entities.

Federal interest in icebreaking began with acquisition of the Alaska purchase in 1867. For many years, the Revenue Cutter Service – a predecessor to the modern Coast Guard – provided the only Federal presence in the newly acquired territory. The Revenue Cutter Service's responsibilities included protecting sealers and whalers as well as protecting the seals themselves from over-hunting; general law enforcement; and emergency operations, including the more unusual task of transporting Siberian reindeer to the territory as a food staple for starving indigenous peoples.

The Revenue Cutter *Bear*, built in Scotland, along with the *Thetis*, were among several new cutters constructed for ice work in Alaska. These vessels were not true icebreakers as we understand that term today – but they were vessels with reinforced hulls that could withstand the enormous pressures encountered while traveling though thick ice.

True icebreakers were developed during the period from the construction of the *Bear* in 1874 to her retirement in 1926, with most of the development occurring overseas. In 1899, the Russian government accepted the *Ermak*, a British vessel considered to be the first true icebreaker. Several cutters were built in the U.S. during this period for duty in Alaska and along the East Coast. One cutter – the *Androscoggin*, commissioned in 1908 – was built specifically "for the coast of Maine" to "break through the ice along the Maine coast for the relief of shipping."

In 1926, the Coast Guard purchased an ocean tug – the *Kickapoo* – and rebuilt her as icebreaker. *Kickapoo* replaced *Androscoggin* for operations along the Maine coast.

In 1927, the Coast Guard commissioned the *Northland* (WPG-49), a ship that was 216 feet long, just over 2,000 tons, with a welded steel hull and diesel electric engines that provided up to 1,000 horsepower of thrust. *Northland* was used to conduct Bering Sea patrols from San Francisco and Seattle.

Following the construction of *Northland* and beginning in 1932, six 165-foot cutters (known as the *Escanaba* class) were built, with the last vessel in the class – *Mohawk* – being commissioned in 1935. These vessels were intended for light icebreaking on the Great Lakes.

It was not until a year after the completion of the 165-footers that the Coast Guard received authority to conduct what today are referred to as domestic icebreaking operations when President Roosevelt issued Executive Order No. 7521 in December 1936. This Executive Order directed the Coast Guard "to assist in keeping open to navigation by means of icebreaking operations … channels and harbors within the reasonable demands of commerce." The Coast Guard focused its icebreaking operations on clearing harbors and rivers to allow safe passage of oil supply barges to cities in New England.

Domestic Icebreaking

Following the President's 1936 Executive Order, the Coast Guard undertook an extensive study of icebreaker technology leading to the design and construction of the first true icebreakers (vessels that can push through the ice) in the service – the 110-foot *Raritan* class tugs. Four vessels in this class were commissioned in 1939; a total of 17 were eventually built.

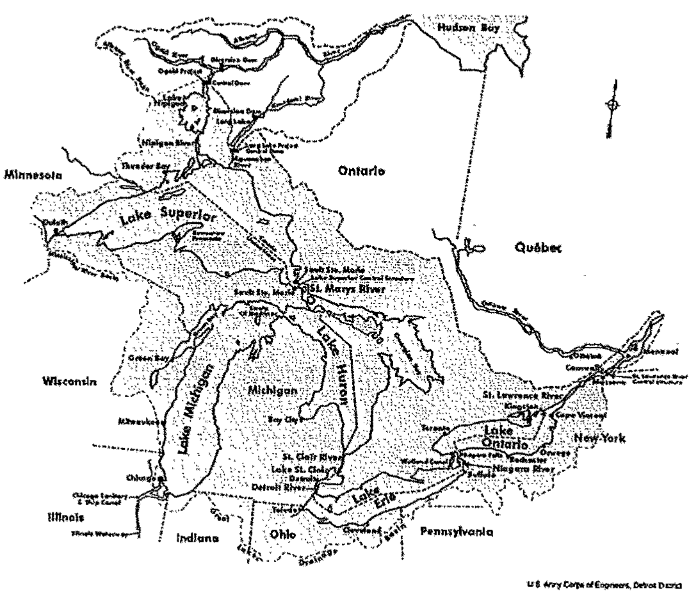
In 1939, the Lighthouse Service (a civilian uniformed service) was transferred from the Commerce Department to the Coast Guard. The Lighthouse Service had already developed the design for a 180-foot buoy tender (the *Cactus* class, later known as the *Balsam* class) that had icebreaking capability because of its hull design, including a cut-away forefoot and rounded, "slack" bilges. Buoy tenders are vessels designed to service aids to navigation. In addition to tending aids to navigation and conducting other duties, *Balsam* class cutters performed routine icebreaking chores along the East Coast for many years. Thirty-nine of these vessels were built in Duluth, Minnesota, between 1941 and 1944; the *Acacia* (WLB 406), served on the Great Lakes until it was decommissioned in 2006 after 62 years of service.

The *Storis* (WMEC-38), a 230-foot vessel originally built as a buoy tender, was commissioned in 1942. The *Storis* served in the Atlantic during World War II and was later relocated to Juneau, Alaska. In 1972, *Storis* underwent a major mid-life renovation that converted her from a tender to a medium endurance cutter with icebreaking capability. *Storis* served in Alaska – conducting Bering Sea patrols in addition to icebreaking and other responsibilities – until February 2007, when she was retired from service as the oldest vessel then in commission in the Coast Guard. Until they were all retired, the *Storis*, the 39 180-foot tenders, and the 17 110-foot tug boats gave the Coast Guard substantial domestic icebreaking capacity.

In the 1970s, the Coast Guard began replacing the aging 110-foot tugs with nine 140-foot tugs of the *Bay* class. These are modern vessels that can push through ice up to 20 inches thick and break ice that is up to three feet thick by ramming. Five of the *Bay* class tugs are homeported on the Great Lakes while four are homeported on the East Coast.

In addition to the 140-foot tugs, the Coast Guard now utilizes 14 175-foot (*Keeper* class) coastal buoy-tenders as well as 16 225-foot (*Juniper* class) seagoing buoy-tenders (which replaced the 180-foot *Balsam* class tenders) to conduct domestic icebreaking operations.

<u>Great Lakes Icebreaking</u>



Map of the Great Lakes

An important element of domestic icebreaking is the demanding requirements for ice operations in the Great Lakes. Compared to domestic icebreaking operations along the East Coast, operations on the Great Lakes cover a large surface area. The coastline of Lake Michigan alone is 1,640 miles – equal to the distance from Portland, Maine, to Homestead, Florida. Despite the expanse of this waterway, which also includes the St. Lawrence Seaway, U.S. Coast Guard assets on the Lakes of all types are minimal and in recent years, icebreaking resources have been reduced even though approximately 115 million tons of cargo is transported on the Great Lakes annually. During "ice season" (December 15 – April 15) alone, 20 percent of the iron ore needed for the nation's manufacturing heartland are carried by Great Lakes vessels. Additionally, 10 percent of the Great Lakes coal load is carried during ice season. Hundreds of thousand of jobs depend on the materials and goods delivered across the Great Lakes.

The cutter *Mackinaw* (WAGB-83) was designed specifically for icebreaking on the Great Lakes. It is a longer, wider version of the *Wind* class cutter that draws less water than the other vessels in that class. *Mackinaw* was commissioned toward the end of World War II and served until 2006, when it was replaced by a new *Mackinaw* (WLLB-30). Assisting the original *Mackinaw* were a minimum of five of the 180-foot *Balsam*-class buoy tenders (*Sundew, Acacia, Woodrush, Bramble,* and *Mesquite*) – some of which had been especially strengthened for ice operations.

The keel for a new *Mackinaw* (WLBB-30), a 240-foot dual-purpose vessel was laid down in 2004; the vessel was commissioned in June 2006 and has carried out its buoy-tending and icebreaking responsibilities from its homeport in Cheboygan, Michigan ever since.

Supplementing the new *Mackinaw* are two 225-foot buoy tenders and five 140-foot *Bay* Class tugs. Since the decommissioning of the *Acacia,* Great Lakes interests have been petitioning the Coast Guard to station an additional *Bay* class tug in the Great Lakes. The Coast Guard continues to reassure Great Lakes interests "that we will continue to provide the same level of professional service that the citizens and mariners of the Great Lakes region have come to expect from the Coast Guard."[1]

Despite these reassurances, last winter, limited icebreaking capacity contributed to circumstances that resulted in damage to six Great Lakes vessels totaling $1.3 million in damages. Two vessels collided because of insufficient maneuvering room and suffered extensive damage, requiring approximately $650,000 in repairs, another two vessels suffered ice damage to their hulls, and two more had propeller damage. In addition, coal deliveries to Green Bay, Wisconsin, were significantly delayed.

It should be noted that in addition to the U.S. Coast Guard, the Canadian Coast Guard and commercial enterprises provide icebreaking capability on the Great Lakes. However, these services come at a price. U.S. shippers pay up to$24,800 per season for icebreaking services provided by Canada, and approximately $500 per hour for commercial icebreaking operations.

Polar Icebreaking Operations

The first truly polar-class icebreakers were built between 1942 and 1946 for the Coast Guard and the U.S. Navy; they were known as the *Wind* class cutters. The seven vessels in the *Wind* class were 269 feet in length with a 63.5-foot beam; they displaced 6,500 tons. Each vessel had three

[1] Letter dated Oct. 12, 2005 to Norman L. Carlson, Jr. Mayor, City of Charlevoix, Minn., from J. X. Monaghan, Chief of Boat Forces, U.S. Coast Guard.

propellers (two aft and one forward) and was driven by a diesel-electric plant utilizing six Fairbanks Morse engines developing a total of 12,000 horsepower. The hulls of the *Wind* class vessels were of exceptional strength due to their close frame spacing and the application of 1 5/8 inch all-welded hull plating.

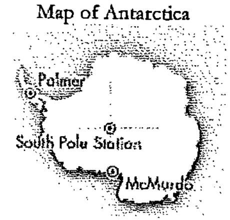
Some of the *Wind* class cutters were transferred by the Coast Guard to the Soviet Union during World War II and several were transferred to the U.S. Navy for the duration of the war. All *Wind* class cutters were returned to the Coast Guard by the mid-1960s. Interestingly, before being returned to the Coast Guard, the *Northwind* participated in Antarctic operations in support of Operation High Jump led by Admiral Byrd in 1946.

Coast Guard icebreakers supported the construction in the 1950s and subsequent resupply of the Distant Early Warning (DEW) line, which was comprised of a string of radar stations – some built above the Arctic Circle – designed to detect incoming Intercontinental Ballistic Missiles.

In 1955, the Coast Guard returned to the Antarctic in support of Operation Deep Freeze I, a collaborative effort among 40 nations to carry out earth science studies from the North Pole to the South Pole. *Wind*-class icebreakers supported these operations annually until the *Westwind* (WAGB-281) made her last Antarctic cruise in 1984.

The ongoing commitment to Deep Freeze operations precipitated a discussion in the late 1950s regarding whether a nuclear icebreaker should be built for the Coast Guard; however, this idea was rejected by the Eisenhower administration as too expensive. A joint Navy-Coast Guard study in the 1960s on icebreaker utilization concluded that all icebreaking operations should be combined in the Coast Guard. It was as a result of this finding that the five *Wind* class vessels transferred from the Coast Guard to the Navy during World War II were returned to the Coast Guard in 1965-66 – bringing the Coast Guard's complement of sea-going class icebreakers to eight. The *Eastwind* (WAGB-279) was decommissioned in 1968 but the other *Wind* class cutters remained in service for a number of years.

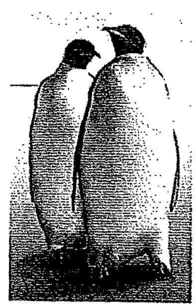
Map of Antarctica



Oil exploration on the North Slope of Alaska in the 1970s brought new challenges to an aging fleet. As a result, two new icebreakers of the *Polar* class were authorized – which eventually gave the Coast Guard the first newly constructed icebreakers since the *Wind* class vessels were built in the 1940s. The *Polar Sea* (WAGB-11, 1976) and *Polar Star* (WAGB-10, 1978) were built by Lockheed Shipbuilding in Seattle at a cost of approximately $50 million each. Each vessel is 399 feet in length, with a beam of 83-feet; each vessel displaces more than 13,000 tons and is designed to break 6.5 feet of ice while traveling a steady three knots. The vessels can break up to 21 feet of ice by ramming. Vessels in the *Polar* Class of icebreakers have two separate propulsion systems: 18,000 horsepower diesel-electric motors for "normal" icebreaking, and a 60,000 horsepower gas turbine that provides extra power to enable the vessels to break heavy ice. Currently, only the *Polar Sea* is being maintained in operational status. It is about to undergo major recurring maintenance which will include repairs to the vessel's main propulsion system, auxiliary systems, and other structural, mechanical, and electrical systems. The *Polar Sea* is used primarily for operations in the Antarctic, particularly in support of the U.S. base at McMurdo (see map of Antarctica above). The *Polar Star* is laid-up – unable to get underway – with a "caretaker" crew of 34 to maintain the vessel.

In the early 1990s, the Coast Guard commissioned the icebreaker/research vessel *Healy* (WAGB-20), a 420-foot vessel with more scientific support facilities than are contained on the *Polar* class vessels but with less icebreaking capability. The *Healy's* primary mission is to support scientific missions in the Arctic.

There is one other vessel in the U.S. polar icebreaking fleet at the moment. In 1992, the National Science Foundation (NSF) commissioned the construction of a smaller "purpose built" vessel capable of supporting scientific research in the Antarctic. The *Nathaniel B. Palmer* is owned by a private firm – Edison Chouset Offshore – and leased by another private firm – Raytheon Polar Services Company – to support NSF research operations and to resupply Palmer Station, a U.S. research station on the Antarctic Peninsula (see map of Antarctica above).



Studies on Polar Icebreaking

There have been two recent studies on U.S. polar icebreaking needs, capacity, and alternatives; additionally, a Coast Guard study on this issue is forthcoming. The National Research Council (NRC) conducted a study – requested in conference report language accompanying the Department of Homeland Security Appropriations Act for Fiscal Year 2005 (P.L. 108-334) – entitled: *Polar Icebreakers in a Changing World: An Assessment of U.S. Needs.*

The major issues addressed in the study are: current and future polar icebreaking capability and how to provide it, with particular emphasis on the U.S. presence in the Antarctic and our ongoing need to access McMurdo and South Pole Stations. The Summary for Congress of the NRC study (September 2006) observes: "For the purposes of the single mission of resupplying McMurdo Station, the icebreakers do not necessarily need to be operated by the U.S. Coast Guard, but to best meet mission assurance requirements, they should be U.S. flagged, U.S. owned, and U.S. operated."

However, NRC concluded that there is a need to construct two new polar icebreakers to be operated by the U.S. Coast Guard. These conclusions are cited in the excerpt from the Summary for Congress below:

> The (study) committee finds that both operations and maintenance of the polar icebreaker fleet have been underfunded for many years, and the capabilities of the nation's icebreaking fleet have diminished substantially. Deferred long-term maintenance and failure to execute a plan for replacement or refurbishment of the nation's icebreaking ships have placed national interests in the polar regions at risk. The nation needs the capability to operate in both polar regions reliably and at will. Specifically, the committee recommends the following:
>
> - The United States should continue to project an active and influential presence in the Arctic to support its interests. This requires U.S. government polar icebreaking capability to ensure year-round access throughout the region.
> - The United States should continue to project an active and influential presence in the Antarctic to support its interests. The nation should reliably control sufficient icebreaking capability to break a channel into and ensure the maritime resupply of McMurdo Station.
> - The United States should maintain leadership in polar research. This requires icebreaking capability to provide access to the deep Arctic and the ice-covered waters of the Antarctic.
> - National interests in the polar regions require that the United States immediately program, budget, design, and construct two new polar icebreakers to be operated by the U.S. Coast Guard.
> - To provide continuity of U.S. icebreaking capabilities, the POLAR SEA should remain mission capable and the POLAR STAR should remain available for reactivation until the new polar icebreakers enter service.
> - The U.S. Coast Guard should be provided sufficient operations and maintenance budget to support an increased, regular, and influential presence in the Arctic. Other agencies should reimburse incremental costs associated with directed mission tasking.
> - Polar icebreakers are essential instruments of U.S. national policy in the changing polar regions. To ensure adequate national icebreaking capability into the future, a Presidential Decision Directive should be issued to clearly align agency responsibilities and budgetary authorities.[2]

In June 2008, the Congressional Research Service (CRS) released an updated report, *Coast Guard Polar Icebreaking Modernization: Background, Issues, and Options for Congress,* that examines the

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[2] *Polar Icebreakers in a Changing World: An Assessment of U.S. Needs,* Committee on the Assessment of U.S. Coast Guard Polar Icebreaker Roles and Future Needs, National Research Council Of The National Academies (2007)

missions of U.S. polar icebreakers, current polar icebreaking resources, the 2007 National Research Council report, current Coast Guard icebreaking plans, cost estimates for modernization *Polar*-class cutters, and issues for Congress.[3] This report found that two of the Coast Guard's three polar icebreakers have exceeded their intended 30-year service lives. CRS found that:

> The *Polar Star* is [currently] not operational and has been in caretaker status since July 1, 2006. The Coast Guard has begun initial studies on replacements for *Polar Star* and *Polar Sea*. Under the Coast Guard's current schedule, the first replacement ship might enter service in 8 to 10 years. The Coast Guard estimates that new replacement ships might cost $800 million to $925 million each in 2008 dollars, and that the alternative of extending the service lives of *Polar Sea* and *Polar Star* for 25 years might cost about $400 million per ship.[4]

The CRS report also outlined potential options for Congress, including:

> "approve the Coast Guard's current plan to study requirements for future icebreakers and then derive an acquisition strategy based on the results of these studies – a plan that might result in an initial replacement icebreaker entering service 8 to 10 years from now; hold hearings to solicit additional information on the issue of polar icebreaker modernization; or direct the Coast Guard to provide such information; direct the Coast Guard to include the option of nuclear power in its studies of requirements and design options for future icebreakers; direct the Coast Guard to pursue a particular acquisition strategy for icebreaker modernization, such as new construction, 25-year service life extension, or some combination of these two approaches; accelerate the procurement of new icebreakers relative to the Coast Guard's current plan by shortening the study period, procuring multiple ships in a single fiscal year, or both; fund the procurement of new icebreakers in the SCN (Shipbuilding and Conversion, Navy) account or the NDSF (National Defense Sealift Fund) rather than in the Coast Guard's budget; and as a risk-mitigation measure, direct the Coast Guard to reactivate *Polar Star* and make it ready for either a single additional deployment or for another 7 to 10 years of operations."[5]

Icebreaking in the 21st Century

Today, the nation's requirements for icebreaking fall into two distinct categories: domestic and polar, with polar needs being further subdivided into Arctic and Antarctic needs. Domestic icebreaking is required on the Great Lakes to enable shipments of raw materials and finished goods to travel on the Lakes. Domestic icebreaking is also required along the East Coast from the Chesapeake north to Eastport, Maine, to ensure that Coast Guard rescue craft can transit the area safely; that cargo, particularly fuel oil, is delivered on time; and that commercial fishing vessels can gain access to the open sea.

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[3] CRS Report RL34391, Updated June 6, 2008
[4] Id, page 2.
[5] Id, pages 21-22.

Polar icebreaking primarily supports scientific research carried out by the NSF by providing research platforms in the Arctic and Southern Oceans and providing the supplies that support on-continent research in the Antarctic. The NSF is the primary customer of U.S. polar icebreaking and ice-strengthened vessel services for scientific research purposes.[6]

The Coast Guard supports NSF's Arctic research with the Coast Guard icebreaker/research vessel *Healy*. Currently, the NSF uses about 90 percent of the *Healy's* deployment days (185-200 days per year). The NSF is responsible for funding *Healy's* operations and maintenance costs, while the Coast Guard is responsible for operating the vessel and carrying out its maintenance. It costs the NSF about $100,000 per day to keep the *Healy* at sea, resulting in an approximate annual expenditure of $20 million.

The NSF is planning to construct a new ice-strengthened vessel to support scientific studies in the Arctic. The NSF estimates that if and when the *Alaska Region Research Vessel* (ARRV) is completed, it could be operated for approximately $20,000 to $30,000 per day.

In the Antarctic, the NSF needs multi-purpose icebreakers that can act as research platforms in the Southern Ocean and that can resupply the coastal Palmer Station on the Antarctic Peninsula. The NSF also needs heavy icebreakers to open the resupply channel through "fast ice" to McMurdo Station, where supplies are transferred to the U.S. research station at the South Pole and remote field stations at other locations on the continent. Without heavy icebreaker support, an on-going U.S. presence cannot be assured in the Antarctic.

The Coast Guard has historically had the responsibility to support the opening of the channel to McMurdo Sound with the *Polar*-class icebreakers *Polar Sea* and *Polar Star*, but in recent years NSF has increasingly opted to use icebreaking funding to contract with foreign flag vessels instead of utilizing Coast Guard assets.[7] For Fiscal Year 2006, the Administration requested that Congress transfer funding ($47.4 million) for polar icebreaking from the Coast Guard budget to the budget of the National Science Foundation. NSF provided $52.74 million for the operation of Coast Guard polar-class icebreakers, and an additional $8 million for the charter of an additional Russian vessel in 2006. NSF has already contracted with the Swedish icebreaker *Oden*, owned and operated by the Swedish government to carry out servicing the Antarctic later this year.

Polar icebreaking funding transfer

FY	Funding Appropriated to NSF	Funding NSF Reimbursed CG for Polar Ops
2006	$47.4M	$55.8M*
2007	$57.0M	$53.8M
2008	$57.0M	$29.8M to date

* NSF reallocated funding internally to provide an additional $8.4M above the appropriated funds to support polar operations.

[6] Testimony of Dr. Arden L. Bement, Jr., Director, National Science Foundation before Subcommittee on Coast Guard and Maritime Transportation, September 26, 2006.

[7] *Polar Sea* and *Polar Star* have either been in repair status or laid-up on caretaker status.

Domestic Icebreaker fleet, including Great Lakes

Length (Class)	No. in Service	Crew Compliment
WLB 225' (*Juniper* Class)	16	50 (8 Officers, 42 Enlisted)
WLBB 240' (*Great Lakes* Class)	1	55 (9 Officers, 46 enlisted)
WLM 175' (*Keeper* Class)	14	24 (1 or 2 officers, 22 or 23 enlisted)
WTGB 140' (*Bay* Class)	9	17 (2 Officers, 15 enlisted)
WYTL 65' (Small Harbor Tug)	11	6 Enlisted

Domestic Icebreaking Program and Financing

Fiscal Year	2006 Actual	2007 Actual	2008 est	2009 est
Ice Operations	$132,000,000	$105,000,000	$116,000,000	$102,000,000

Recent events

The Coast Guard announced last month that it plans a series of exercises this summer season "to build a requirements list for what we might need in the future" according to Lieutenant Commander Michelle Webber, District 17.[8] Items that will be tested include communications capability and maritime security at Prudhoe Bay to see if current equipment is up to the challenges presented by an Arctic environment.

The National Snow and Ice Data Center in Boulder, Colorado, reports that the North Pole may be briefly ice-free by September. Last September, the Northwest Passage opened briefly for the first time in recorded history.[9]

The United States and Canada are collaborating – for the first time – on a United Nations scientific mapping project in the Arctic aimed at extending their sovereignty by proving that their respective continental shelves extend beyond the 200 nautical mile economic zones defined in the United Nations Convention on the Law of the Sea.[10]

On July 3, 2008, Coast Guard District 17 announced that the cutter *Mellon* (WHEC-717) "is presently deployed to the Alaskan Frontier conducting the full spectrum of Coast Guard missions." In addition to protection of living marine resources and fishing vessel safety the *Mellon* is also "developing Arctic Domain Awareness, protecting national sovereignty, and guarding U.S. resources deposits in the region."[11]

[8] *Anchorage Daily News*, Monday, June 23, 2008, "US Coast Guard deploys to Arctic to find answers".
[9] *CBS News*, June 27, 2008
[10] Canadian Broadcasting Company, June 30, 2008
[11] U.S. Coast Guard Seventeenth District Press Release, July, 3, 2008

ISSUES FOR CONSIDERATION

There are several issues regarding icebreaking – domestic and polar – that the Subcommittee may want to consider including: defining domestic and polar icebreaking missions; determining what resources are needed to accomplish the identified missions; and determining how to best provide the resources to carry out the missions.

PREVIOUS COMMITTEE ACTION

The Subcommittee on Coast Guard and Maritime Transportation held a hearing on the National Research Council Report on icebreaking on September 26, 2006.

Section 422 of the House-passed Coast Guard Authorization Act of 2007 (H.R. 2830) requires an "assessment of needs for additional coast guard presence in high latitude regions." Section 917 of the Senate companion bill (S.1892) states the following: "The Secretary of the department in which the Coast Guard is operating shall acquire or construct 2 polar icebreakers for operation by the Coast Guard in addition to its existing fleet of polar icebreakers." H.R. 2830 passed the House 95-7 on April 24, 2008. S. 1892 is awaiting full Senate consideration.

WITNESSES

Member Panel

The Honorable Bart Stupak
Congressman
Michigan, District 1

PANEL I

Admiral Thad Allen, USCG
Commandant
United States Coast Guard

PANEL II

Dr. Arden L. Bement
Director
National Science Foundation

Mr. Mead Treadwell
Chairman
Arctic Research Commission

Mr. James H. I. Weakley
President
Lake Carriers' Association

HEARING ON COAST GUARD ICEBREAKING

Wednesday, July 16, 2008

HOUSE OF REPRESENTATIVES,
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE,
SUBCOMMITTEE ON COAST GUARD AND MARITIME TRANSPORTATION,
Washington, DC.

The Subcommittee met, pursuant to call, at 2:01 p.m., in Room 2167, Rayburn House Office Building, Hon. Elijah E. Cummings [Chairman of the Subcommittee] presiding.

Mr. CUMMINGS. [Presiding.] Ladies and gentlemen, we will call this hearing into order. This Subcommittee convenes today to consider our nation's icebreaking needs, as well as the resources available to meet these needs.

We convene this hearing at a critical time in history, when the continued use of fossil fuels is contributing to changes in the world's climate that appear, in turn, to be causing rapid melting of polar ice—an occurrence that will likely have significant consequences for the United States and, indeed, for the world.

I want to thank Congressman Larsen, who specifically requested that we hold this hearing, for his dedication to ensuring that we are prepared to meet America's interest in the polar regions.

The Coast Guard's icebreaking responsibilities can be divided into two categories: polar icebreaking and icebreaking along domestic waterways, particularly on the Great Lakes and along the East Coast. Today's hearing will examine anticipated needs and current capabilities in both areas.

In the Arctic, the melting of polar ice packs is accelerating to the point that the National Snow and Ice Data Center has reported that, by September of this year, the North Pole may briefly be ice-free. The melting of polar ice is a catalyst for what appears to be increasing interest in the creation of new shipping passages, particularly in the Arctic, as well as the new scramble for the assertion of national control over natural resources.

As shipping traffic increases in the polar regions, the Coast Guard may need to expand its presence to provide many of its traditional services, including search and rescue operations. Additionally, icebreaking capacity is required to resupply the Antarctic, the research station in McMurdo.

Unfortunately, the Coast Guard currently has more limited polar icebreaking capacity than at any time since World War II. The service's two heavy icebreakers, the POLAR STAR and the POLAR SEA, have now both exceeded their intended 30-year service lives. The POLAR STAR has been placed on caretaker status. The

POLAR SEA is scheduled to undergo a major maintenance. Both vessels will need hundreds of millions of dollars of repairs and upgrades, if they are to continue in service.

The Coast Guard's only other polar icebreaker, the cutter HEALY, was commissioned in 2000, and has many years of service left. Unfortunately, the HEALY does not offer the same icebreaking capabilities as the POLAR STAR or the POLAR SEA.

In preparation for the opportunities and challenges that will be created by the rapid changes occurring in the polar regions, Congress must take a comprehensive look at our nation's entire range of polar mission needs.

We look forward to the testimony of Admiral Thad Allen, the commandant of the Coast Guard, regarding the Coast Guard's specific mission priorities in the Arctic and the Antarctic. I know traditionally, the Coast Guard's polar icebreaking missions have been conducted largely in support of the National Science Foundation, which now pays the HEALY's operating and maintenance costs.

However, the foundation has suggested that alternatives not involving the use of military vessels may potentially meet its research needs in a more cost-effective and efficient manner.

If that is the case, we must carefully examine whether the United States should build new icebreakers, and, if so, what specific purposes they should be built to serve. Further, we must assess how all of the parties that would benefit from the construction of new icebreakers can participate equitably in their capital costs.

The other critical icebreaking missions performed by the Coast Guard involve breaking ice on the Great Lakes and along the East Coast of the United States. From Maine as far south as the Chesapeake Bay, the Coast Guard relies on 140-foot icebreaking tugboats and coastal and seagoing buoy tenders to conduct icebreaking operations.

Put simply, these operations are essential to ensure that the heating fuel that keeps millions of East Coast residents warm in the winter reaches them as needed.

Icebreaking on the Great Lakes is currently conducted by the Mackinaw, a 240-foot dual-purpose buoy tender, two 225-foot buoy tenders and five 140-foot icebreaking tugboats. Unfortunately, these vessels do not appear to be providing all needed icebreaking services on the Lakes, across which extensive shipments of coal and other raw materials are moved, even in the dead of winter. As a result, during last winter, several vessels on the Great Lakes suffered ice-related damage.

Today's witnesses include Mr. James Weakley, president of the Lake Carriers' Association, who will speak in more detail about our icebreaking needs on the Great Lakes.

Additionally, we will hear from the National Science Foundation and the Arctic Research Commission regarding their specific research support needs, as well as the growth being observed in shipping and other activities in the polar regions.

We have joined these three organizations on a single panel in an effort to hear the unique perspectives of the agencies and commercial interests that are in essence consumers of the icebreaking services provided by the Coast Guard, and we look forward to their testimony to help inform our understanding of the multiple facets of our nation's icebreaking needs.

And with that, I yield to the distinguished Ranking Member of this Subcommittee, Mr. LaTourette.

Mr. LATOURETTE. Well, thank you very much, Mr. Chairman, and thank you for having this hearing. And thanks also to Chairman Oberstar, who has a great interest in this issue, as well.

The Subcommittee is meeting this afternoon to continue its oversight of the Coast Guard's icebreaking program and to examine the current icebreaking fleet and the assets level necessary to meet forecasted missions needs in this area. Coast Guard icebreakers allow the winter movement of maritime commerce through the Great Lakes and into ports of the Northeast.

I am concerned, however, that the current icebreaking fleet is unable to carry out the full mission load in heavy ice years like we have experienced in the last several years in the Great Lakes. Several Members, including Chairman Oberstar, have requested that the Coast Guard consider transferring an additional icebreaking tug to the Lakes. However, at this moment in time, that request has been refused.

I would urge the service to conduct a review of icebreaking needs to determine how the Coast Guard can best carry out icebreaking missions nationwide. I am mostly concerned about the service's three Polar class icebreakers and the continued transfer of budgetary authority for these vessels to the National Science Foundation. This arrangement leaves the Coast Guard crews and operations dependent on decisions that are made outside of the service.

This year, the NSF has informed the Coast Guard that it does not plan to utilize the POLAR SEA for the annual breakout of the McMurdo Station in Antarctica, and that it does not plan to provide funding to keep the POLAR STAR in caretaker non-operational status. Further, the NSF has contracted with a vessel owned and operated by the Swedish government to carry out missions in Antarctica this winter.

I hope that the witnesses will share with the Subcommittee how such a contract provides a better deal to the American taxpayers than does the use of the POLAR SEA.

The continued availability of Coast Guard icebreakers is necessary to protect American national security and economic interests, both domestically and in the Arctic and Antarctic. As such, it is extremely important that the administration develop a comprehensive plan to meet the current and future mission needs.

I hope that the witnesses will update the Subcommittee on the development of such plans. I look very much forward to hearing from all of our witnesses—in particular, Admiral Allen, who is first up. And I see that he has come prepared with a map that looks familiar to me. And he gave us a little presentation on his kind visit to northeastern Ohio a little while ago, and I found it to be more than informative, and I am sure the other Members of the Subcommittee will, as well.

I thank you, Chairman, and yield back.

Mr. CUMMINGS. Thank you very much, Mr. LaTourette.

Again, I want to now recognize Mr. Larsen. Again, Mr. Larsen, I want to thank you for requesting this hearing and all that you have been doing in regard to this issue.

Mr. LARSEN. Thank you, Mr. Chairman. I want to start by thanking you, as well, for holding this hearing.

As you know, I requested that the Committee hold the hearing on the Coast Guard's polar icebreaking fleet, and so, I am very interested to hear from the Coast Guard on this issue and hope that it will be a productive and informative hearing for everyone.

I have serious concerns about the future of the Coast Guard's polar icebreaking fleet. Two of the three multi-mission icebreakers, the POLAR SEA and POLAR STAR—both of which are homeported in Seattle—are nearing the end of their service lives. The POLAR STAR, as we have heard, is in caretaker status and is close to being decommissioned.

Our nation's icebreaking capability has diminished substantially at a time when those icebreakers are needed more than ever. It is expected that vessel traffic in the Arctic will increase dramatically as Arctic Sea ice conditions continue to change.

More maritime traffic, especially in such challenging conditions, will require an increased Coast Guard presence, and I am concerned the Coast Guard does not have the resources and assets it needs to carry out increased operations in this region. We are in a five-nation race in the Arctic, and running fifth.

I know that Admiral Allen has paid quite a bit of attention to this issue over the past few years, and the Coast Guard is currently conducting several Arctic initiatives, including Arctic Domain Awareness flights, testing of seasonal Arctic forward operating locations, waterways analyses and risk assessments.

However, despite the Coast Guard's best efforts to prepare for future operations in this region, they do not currently have the assets and capability necessary to perform the most basic of Arctic operations, conducting patrols and icebreaking. And as we have heard, the Coast Guard does not even have budgetary and management control over its entire fleet.

Mr. Chairman, these are serious issues that demand our attention. And once again, I want to thank you for holding this hearing, and I look forward to hearing from our witnesses.

Mr. CUMMINGS. Thank you very much.

Mr. Young?

Mr. YOUNG. Thank you, Mr. Chairman.

Again, I welcome the Admiral here and the future witnesses.

I just hope that this Congress recognizes, although we have the hearing about the Coast Guard, and I hope they will bring the information to us, that they have not had the control of the icebreaking fleet for a period of time. I think that unfortunate. We put the fleet totally back within the Coast Guard, and that we recognize, as the gentleman from Washington said, we are fifth in a five-nation race in the Arctic. And it is our Arctic—or at least part of it is.

You know, Russia has one of the largest nuclear-powered icebreakers now in the world. Finland has always been ahead of us with icebreaking. They recognize the importance of the Arctic for transportation needs.

I think we ought to address this issue on the congressional level, and appropriate the dollars that are necessary to build a new Arctic fleet for the future of this great nation. And I hope that this hearing will put a little light on this issue, and we recognize the importance of it, and we stop spending money in other areas and spend it on what is good for the domestic Coast Guard facilities in this nation domestically.

And I yield back.

Mr. CUMMINGS. Thank you very much.

Mr. Baird?

Mr. BAIRD. I thank the Chairman, and I thank our witnesses.

Commandant, good to see you again.

Dr. Bement, as well.

This is indeed an important issue. I have the privilege of serving both on this Coast Guard Committee, and also Chair the Research and Education Subcommittee of our Science Committee, which works very closely with NSF, of course. So, we have, I think, what could potentially be very complementary relations here, and I hope that will be the case.

We clearly have a national security investment and an economic investment in a strong polar icebreaking fleet, and the fleet in the Great Lakes, as well. We also, at the same time, have strong scientific agendas in both of those areas. And my hope is that today's hearing will give us an insight into how best we can meet both missions.

I think right now, we are probably not meeting either mission as well as we might, and I hope that this Committee, in concert with the Science Committee and with NSF and the Coast Guard, can work together for both a near term and a long term strategy that preserves both missions.

We have the practice here of introducing things into the record. I wish I could introduce the visual aid I asked the commandant to briefly loan me. This is, my understanding, part of the hull plate of the POLAR STAR. And lest anyone underestimate how difficult it must be to make and maintain and operate these ships, I lift weights occasionally, and I would not want to lift this very often. And this is just a tiny portion.

I am not going to introduce it into the record, but I am going to pass it down to my colleagues, so they can have the—I am going to throw it to Mr. Larsen here, my good friend, and we will see the result.

But the reason I raise it is because these are really extraordinary vessels. They are absolutely essential. They are not easy to make. They are not easy to operate. They are not easy to maintain. And they are not cheap.

But the consequence of not making them, maintaining them and operating them is far more expensive. And we have to be aware of both ends of that cost-benefit equation.

And I thank the Chairman for holding this, and for our witnesses for their service and for their time today. And I yield back as I pass this on to my colleagues.

Mr. CUMMINGS. Thank you very much.

Let me just, as a housecleaning matter. Congressman Stupak had planned to join us. He would have been on the first panel. He would have been the first panelist. But unfortunately, he got called to another matter with the speaker. He may very well join us a little bit later on.

But without objection, want to submit his statement for the record. I hear no objections; therefore, it is a part of the record.

Admiral Allen, we are very pleased to have you with us again, and we look forward to your testimony.

Admiral ALLEN. Thank you, Mr. Chairman, and good afternoon.

Mr. CUMMINGS. Good afternoon.

TESTIMONY OF ADMIRAL THAD ALLEN, COMMANDANT, UNITED STATES COAST GUARD

Admiral ALLEN. Ranking Member LaTourette and the Members of the Committee, it is a great pleasure for me to be here today. And I thank you for the opportunity to address the Committee on this very important topic.

Mr. Chairman, I will make brief opening remarks and ask that my written testimony be accepted for the record.

I would like to acknowledge the panel that will be testifying behind me. Mr. Weakley, Mr. Treadwell and Dr. Bement are professional colleagues of mine. I value their inputs. And you are going to get a wide range of views, and I commend them to you, sir.

Today, our nation is at a crossroads with Coast Guard domestic and international icebreaking capabilities. We have important decisions to make. And I believe we must address our icebreaking needs now, to ensure we will continue to prosper in the years and decades to come, whether on the Great Lakes, the critical waterways of the East Coast or the harsh operating environments of the polar region.

The Coast Guard's icebreaker fleet provides a significant service for the American public by facilitating the nation's ability to navigate U.S. waters, project military-economic power, and presence on the high seas.

Domestically, the Coast Guard icebreakers support federal, state and local agencies. They maintain open waterways to ensure the continuous flow of commerce, patrol waterways to enforce our laws, and protect critical infrastructure and are available to assist mariners in distress.

Domestic icebreaking operations, as you pointed out, Mr. Chairman, are accomplished by the Coast Guard Cutter Mackinaw, our new fleet of buoy tenders, nine 140-foot icebreaking tugs and 11 65-foot small harbor tugs.

Except for the Coast Guard Cutter Mackinaw, which has exceeded performance expectations since its commissioning in 2006, and our new buoy tenders, the rest of the domestic fleet is at or past their designated service lives. We are focusing on critical sustainment projects such as a bridging strategy until these vessels can be replaced or modernized.

We are also coordinating our efforts with our Canadian counterparts to share icebreaking resources in the Great Lakes and the Saint Lawrence Seaway. This arrangement has facilitated the movement of more than $334 million of cargo on the Great Lakes during the 2006-2007 ice season.

These strategies are working, and the Coast Guard continues to provide critical icebreaking services domestically.

However, the challenges of developing and executing a long-term solution is looming, as the domestic icebreaking fleet approaches obsolescence.

Internationally, the Coast Guard's medium icebreaker, HEALY, and heavy icebreakers, POLAR SEA and POLAR STAR, primarily operate in support of U.S. research interests in the Arctic and help maintain routes to supply Antarctica's McMurdo station, and subsequently, the South Pole.

The newest Coast Guard cutter, HEALY, a medium icebreaker, was commissioned in 2000, and conducts annual deployments for Arctic scientific research as a priority. Operational time on HEALY is at a premium, and almost exclusively devoted to direct mission tasking of other agencies and scientific organizations.

Science capacity on ice-capable vessels is critical to current research, as I am sure my colleague, Dr. Bement, will point out. But the challenge exists beyond science. Changing environmental conditions and advances in technology are expanding activity in the Arctic region, as potential access to new energy reserves and more efficient shipping routes fuel demand.

Continued growth in commerce, ecotourism, exploratory activities in the Arctic is increasing risk to mariners and ecosystems and creating demand for Coast Guard operational competencies and capabilities. We are finding ourselves well beyond our traditional science support role in polar regions. The need for U.S. law enforcement and lifesaving presence is required there now and will increase with time.

Without question, the U.S. Coast Guard is the agency most experienced and capable of safeguarding national interests in the maritime domain of the polar regions.

Unfortunately, as you have noted, we are losing ground in the global competition. Russia completes its new generation of national nuclear icebreakers next year, guaranteeing Russia multiple heavy icebreaking platforms well past the year 2020.

Last year, Russia completed a 10-year project, launching the icebreaker 50 Years of Victory, their largest heavy icebreaker, to ensure Russian access to natural resources located along the Arctic Basin.

Like Russia, Germany, China, Sweden and Canada—they are all investing and maintaining and expanding their national icebreaking capabilities.

My strong message to you today is that, while U.S. strategic interests in the Arctic region expand, both domestically and internationally, our polar icebreaking capability is at risk.

Recent reports by the National Research Council and Congressional Research Service have accurately described the current situation, and I know the Committee is well aware of these reports. Without regard to future mission growth, we have externally validated a need for a fleet of three Coast Guard operated icebreakers.

Further, the Omnibus Appropriations Act of 2008 has required us to report on current capabilities and resources to operate in polar regions. We have also included in our fiscal year 2009 appropriation request funding to conduct a detailed Polar High Latitude Study.

Finally, the administration is conducting an Arctic policy review. Interagency review and coordination are continuing. Efforts are focused on completing the policy process quickly.

Collectively, these actions will create a solid way ahead and form a policy basis from which to formulate a solution to our long-term icebreaking needs. I support every one.

My problem, however, is more near term and is becoming critical. It is imperative that we retain our current validated capability, pending long-range decisions, so that our growing responsibilities in the polar regions can be met.

To that end, it is critical that the current funding shortfalls and governance issues related to the operation of our icebreakers be addressed. POLAR STAR, which has been in a caretaker status for several years, must be retained, pending any long-term action.

I am anxious to work with my colleagues in the administration and the Congress to improve the management and governance for icebreaker fleet. And my intent here today is to generate light, not heat.

I am concerned that we are watching our nation's domestic and international icebreaking capability decline as reliance on foreign icebreakers grows. For Coast Guard icebreakers the time is now, and my responsibility is clear.

Thank you for the opportunity to testify, and I look forward to your questions.

Mr. CUMMINGS. Thank you very much, Admiral, and very pleased to hear your testimony.

What are the specific Coast Guard missions? And what is the level of mission activity that you envision the Coast Guard needing to perform in the polar regions in the coming years, as human activity in these regions increase?

Admiral ALLEN. Mr. Chairman, everywhere there is water, that is subject to our jurisdiction. And now, there is water where there did not used to be. And I will tell you, even if there was not an issue with receding ice, there would still be an issue.

Any activity that requires Coast Guard regulation, law enforcement activity, search and rescue or environmental response, takes on a much harder, tougher dimension in polar operations. As we see more oil and gas exploration off the North Slope of Alaska, more vessel traffic through for ecotourism, cruise ships—there is the largest zinc mine in the world is north of Arctic Circle in the Bering Straits.

All of this is increasing traffic through the Bering Straits into the Arctic area and creates a demand for the same services we would provide at lower latitudes with a degree of difficulty associated with maintaining presence and response capability up there, sir.

Mr. CUMMINGS. So, it is clear to you that we now, right now, we are in trouble.

Admiral ALLEN. Sir, the offshore oil and gas exploration structures off the north coast, what we need to understand is that they are subject to the same types of requirements as the oil and gas exploration in the Gulf of Mexico. And we are talking about things like captain to port authorities, oil spill response plans.

As this opens up and activity begins there, how are we going to manage oil spill response organizations and make sure that the plans are in place? And that is just talking about environmental response. The same could be said for search and rescue as well, sir.

Mr. CUMMINGS. Now, the National Security Cutters, such as the Bertholf and others, tell me, do they—are they ice-strengthened?

Admiral ALLEN. No, sir, they are not.

Mr. CUMMINGS. And was that ever considered when we were looking at creating them?

Admiral ALLEN. No, sir, it was not, because at the time the specifications were developed, there was not a huge problem at that time with the U.S. icebreaker fleet. HEALY was being constructed, and we had stability in icebreaking program.

Mr. CUMMINGS. And at that time, these things were not—these problems were not—anticipated.

Is that right? Is that what you are saying?

Admiral ALLEN. Yes, sir. That does not mean, though, that at some point in the future we will not move a National Security Cutter through the Bering Straits as long as it is ice-free and we can operate up there in the proper time of the year, sir.

Mr. CUMMINGS. But I want to go back to what I am asking you. In other words, when we were coming up with the plans for Deepwater——

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. —did that issue come up? In other words——

Admiral ALLEN. It did, but——

Mr. CUMMINGS. Hold on. I just want to get my whole question out.

And what changed, if anything, from the time that those plans were being made? Because it sounded like you were saying to me a little bit earlier—I think you just said this about 2 minutes ago—was that there were certain circumstances that have changed from when you all were planning this. And I am just wondering what they might be.

Admiral ALLEN. Yes, sir.

First of all, we do not routinely operate High Endurance Cutters, which the National Security Cutters are replacing north of the Bering Strait. It usually is not accessible. So, that was not present at the time.

There was stability in the program at the time. The POLAR STAR and the POLAR SEA still had many years of service life left. And we knew that we were going to be constructing the Coast Guard Cutter HEALY, so we basically had separated the two programs, because they appeared to be adequately resourced at the time, sir.

Mr. CUMMINGS. Do you believe that the United States should continue to meet our polar research needs through the construction of vessels that have a dual scientific-military mission?

Admiral ALLEN. Mr. Chairman, I think we need a mix of different kinds of vessels. As Mr. Bement will probably tell you, they operate leased vessels, the Nathaniel Palmer and one other vessel, that are much more oriented towards scientific research and are operated by contractors.

The issue before the Committee and before all of us, sir, is to figure out what other missions need to be performed in excess of the science mission, and how you capitalize that and how you create that presence and that mission effectiveness. And then, how can that also support science?

I will tell you right up front that the POLAR STAR and the POLAR SEA are not optimum science platforms, and I believe Dr. Bement would agree with me. But they were constructed to create access into the polar regions for all mission sets the Coast Guard operates, and science was second.

The HEALY was constructed with more science space on it, to carry more scientists. And I think moving forward, that is a discussion we have to have together, sir.

Mr. CUMMINGS. Is it cheaper to operate an icebreaker with a civilian crew as opposed to a Coast Guard crew?

Admiral ALLEN. Yes, sir, it is.

Mr. CUMMINGS. And why is that?

Admiral ALLEN. Well, first of all, the manning is much different. We man our cutters to be able to handle different situations, including fire safety and military operations, the law enforcement operations.

These other ships are built to commercial specs. They are operated by civilian crews, and they have a different approach on how they would defend the ship against fire and flooding, and so forth. So, they are more minimally staffed than our cutters, sir.

Mr. CUMMINGS. So, what you are saying is that, because of your, I guess your regs, your regulations and what have you, I guess you could—but for the regulations, I guess you could actually operate, say, for example, the HEALY, with fewer Coast Guard personnel, but because of the regulations, you have to have certain personnel on board. Is that it? Is that what you are saying?

Admiral ALLEN. Yes, sir. I would not say it was regulations. I would say it was doctrine how you operate the ship—firefighting teams and be able to handle emergencies.

We did reduce the staffing on HEALY related to helicopter operations, which are needed in the polar regions, and have been contracting out helicopter services, sir. And the HEALY is more lightly staffed than the POLAR STAR and the POLAR SEA.

Mr. CUMMINGS. Mr. LaTourette?

Mr. LATOURETTE. Thank you, Mr. Chairman.

Admiral, it is nice to see you again. And thank you again for coming to northeastern Ohio. The Station Fairport and Station Ashtabula are still buzzing about your visit. So, I do not know if they have ordered any new uniforms yet, but they are still working on that.

I wanted to talk to you a little bit about the Great Lakes. I mentioned in my opening remarks that I believe Chairman Oberstar had made a request that assets be transferred to the Great Lakes. And it is my understanding—icebreaking assets—it is my understanding that that request has not been granted.

And then, just would like you to walk us through what process the service goes through in reaching the determination as to when to move assets and the steps that you look at, and why, at least at this point, you have reached the conclusion that that is not a reasonable request.

Admiral ALLEN. Yes, sir. The current distribution of vessels, icebreakers and other on the Great Lakes and the East Coast, came about due to a mission analysis that the Coast Guard did in 1997 for the Great Lakes, and then another one on the East Coast in 2002.

When we first started building the new buoy tender fleets that we have right now, our 225-foot tenders and 175-foot tenders, we did an analysis of the existing tenders, their speed, the new buoy tenders and their speed, what areas they could cover, knowing that they were going to be multi-missioned. They would tend buoys in the warm weather and help the icebreaking mission.

Mackinaw was never an issue. There was always going to be a Mackinaw or a replacement for the Mackinaw.

All that was factored into the coverage when we built the new buoy tender fleets in the 1990s into the early 2000s, and they were distributed at that point based on these mission analyses. We can provide all that detail for the record to the Committee.

What we do since then, if there is a particular season, as there was this last year, where it was a little colder than normal and we needed assistance up there, as you know, we moved a 140-foot icebreaking tug from the East Coast around into the Great Lakes, which we can do in any year, sir.

Mr. LATOURETTE. Okay. Thank you very much.

Relative to the Polar icebreakers and this issue of the National Science Foundation—and, again, in my opening remarks, I mentioned the contract that they have entered into with the Swedes—did you have an observation or an opinion as to what the impact of having the National Science Foundation basically have the budget authority for the icebreakers does to the service relative to dollar impact, administration, running of the ships?

Admiral ALLEN. Well, I have said on several occasions and in prior hearings, and I will restate it here, the current situation, while well-intended when it was created, is somewhat dysfunctional in regards to how we have to manage this, because it puts a huge, enormous management burden on the National Science Foundation, that puts almost an evidentiary responsibility on the Coast Guard to demonstrate what we intend to do with the vessels, so they can certify what the funds are being used for and they are adequately being spent.

And I do not begrudge them a bit for doing that, but it is very, very cumbersome.

Mr. LATOURETTE. If they, in fact, had not entered into the agreement with the Swedes, would those have been funds available to the Coast Guard for the use of your assets?

Admiral ALLEN. At the start of every year, we come up with an operating plan. And there is a certain base amount of money that is provided in the National Science Foundation budget, and I will let Dr. Bement speak to that.

We provide them a plan. They approve the plan. And that is the source of the funds that are transferred from the National Science Foundation to the Coast Guard.

And it varies from year to year based on the amount of operations we are conducting and the maintenance required on the ships.

Mr. LATOURETTE. And do those funds in that budget that you lay out at the beginning of the year, are those funds always sufficient to the cost incurred by the Coast Guard for those missions?

Admiral ALLEN. Well, there has been an ongoing issue about whether or not, as ships get older—and this is not just to do with icebreakers, it could be any ship you are talking about—they become more expensive as they get older.

There probably is an added issue of an inflation factor and the ability to keep up with the demands for maintenance on the ships.

Mr. LATOURETTE. And then, the last question—I think the Chairman phrased it, or asked the question—are we in trouble relative to our icebreaking capabilities compared to others?

Could you just have a quick rundown of the number of icebreakers other countries operating in the Arctic region have at their disposal currently today?

Admiral ALLEN. I can provide that for the record.

[Information follows:]

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Fifty-five polar icebreakers in the world have propulsion capability greater than 10,000 horsepower. Russia operates the largest fleet (24 ships, two of which are leased from the Netherlands) while Canada, Finland, and Sweden each operate seven to nine polar icebreakers. The United States has four polar icebreakers (three operational and one in caretaker status). Four other countries operate one to two polar icebreakers.

Russia is the only country which has nuclear propulsion plants aboard their polar icebreakers (eight ships), and only Russia and the United States operate polar icebreakers with propulsion capability in excess of 45,000 horsepower (ie. heavy icebreaker). Most of the world's polar icebreakers operate in and around the Baltic Sea. As requested, below is the background on the number and type of icebreakers operated in the world today.

Nation	Ship Name	Propulsion	Displacement (Tons)	Continuous Icebreaking Capability	Back and Ram Icebreaking Capability	Year in Service
USA	Polar Star	60,000 GT 18,000 DE	13,334	6 ft @ 3 KT	21 ft	1974
USA	Polar Sea	60,000 GT 18,000 DE	13,334	6 ft @ 3 KT	21 ft	1976
USA	Healy	30,000 DE	16,165	4.5 ft @ 3 KT	8 ft	1999
USA	Nathaniel B. Palmer	12,700 D	6,640	3 ft @ 3 KT	5 ft	1992
Russia	Rossiya	75,000 N	23,625	6.5 ft @ 3 KT	Not Available	1985
Russia	Sovietskiy Soyuz	75,000 N	23,625	6.5 ft @ 3 KT	Not Available	1990
Russia	50 Let Pobedy	75,000 N	25,800	7.5 ft @ 3 KT	Not Available	2007
Russia	Yamal	75,000 N	25,800	7.5 ft @ 3 KT	Not Available	1993
Russia	Arktika (Out of Service)	75,000 N	24,170	6.5 ft @ 3 KT	Not Available	1975
Russia	Sibir (Out of Service)	75,000 N	24,170	6.5 ft @ 3 KT	Not Available	
Russia	Taymyr	47,600 N	20,000	6 ft @ 3 KT	Not Available	1989
Russia	Vaygach	47,600 N	20,000	6 ft @ 3 KT	Not Available	1990
Russia	Yermak	36,000 DE	20,241	Not Available	Not Available	1974
Russia	Admiral Makarov	36,000 DE	14,058	6 ft @ 3 KT	Not Available	1976
Russia	Krasin	36,000 DE	14,058	6 ft @ 3 KT	Not Available	1976
Russia	Kapitan Dranitsyn	22,000 DE	15,000	5 ft @ 3 KT	Not Available	1980
Russia	Kapitan Sorokin	22,000 DE	15,000	Not Available	Not Available	1977
Russia	Akademik Fedorov	36,000 DE	13,000	6 ft @ 3 KT	Not Available	1987
Russia	Kapitan Khlebnikov	22,000 DE	15,000	5 Fft @ 1 KT	9.8 ft	1981
Russia	Kapitan Nikolayev	22,000 DE	15,000	Not Available	Not Available	1978
Russia	Talagy	16,800 D	1,169	Not Available	Not Available	1979
Russia	Mudyug	12,400 D	5,342	Not Available	Not Available	1982
Russia	Magadan	12,800 D	5,342	Not Available	Not Available	1982
Russia	Dikson	12,400 D	5,342	Not Available	Not Available	1983

Nation	Ship Name	Propulsion	Displacement (Tons)	Continuous Icebreaking Capability	Back and Ram Icebreaking Capability	Year in Service
Russia	Vladimir Ignatyuk	23,200 D	4,234	4 ft @ 7 KT	Not Available	1977
Russia	Fesco Sakhalin	17,500 DE	6,882	Not Available	Not Available	2005
Russia (Leased from Netherlands)	Smit Sakhalin	14,900 D	3,340	Not Available	Not Available	1983
Russia (Leased from Netherlands)	Smit Sibu	14,900 D	3,340	Not Available	Not Available	1983
Canada	Louis St Laurent	30,000 DE	11,400	4 ft @ 3 KT	Not Available	1969, 1993
Canada	Kigoria	16,800 D	7,600	Not Available	Not Available	1978
Canada	Terry Fox	23,200 D	4,234	4 ft @ 7 KT	Not Available	1983
Canada	Henry Larsen	16,000 DE	6,166	Not Available	Not Available	1988
Canada	Amundsen	13,960 DE	5,910	3.8 ft @ 2 KT	Not Available	1982, 2003
Canada	Pierre Radisson	13,400 DE	5,910	3.8 ft @ 2 KT	Not Available	1978
Canada	Des Grosseliers	13,400 DE	5,910	3.8 ft @ 2 KT	Not Available	1983
Canada	Mary L. Black	8,847 DE	3,809	Not Available	Not Available	1986
Canada	George R. Pearkes	8,847 DE	3,809	Not Available	Not Available	1986
Canada	Edward Cornwallis	8,847 DE	3,809	Not Available	Not Available	1986
Canada	Sir Wilfred Laurier	8,847 DE	3,809	Not Available	Not Available	1986
Canada	Ann Harvey	8,847 DE	3,809	Not Available	Not Available	1987
Canada	Sir William Alexander	8,847 DE	3,809	Not Available	Not Available	1987
Finland	Fennica	20,115 DE	6,370	2.6 ft @ 11 KT	Not Available	1994
Finland	Nordica	20,115 DE	6,370	2.6 ft @ 11 KT	Not Available	1994
Finland	Urho	21,400 DE	7,525	5 ft @ 2 KT	Not Available	1975
Finland	Sisu	21,400 DE	7,525	6 ft @ 2 KT	Not Available	1976
Finland	Otso	20,400 DE	7,066	Not Available	Not Available	1986
Finland	Kontio	20,400 DE	7,066	Not Available	Not Available	1987
Finland	Botnika	13,410 DE	6,370	2.0 ft @ 8 KT	Not Available	1998
Finland	Voima	17,460 DE	4,159	2.7 ft @ 2 KT	Not Available	1954, 1979
Finland	Apu (Dudinka/ 2006)	12,000 DE	4,890	2.8 ft @ 2 KT	Not Available	1970
Norway	Svalbard	13,410 DE	6,500	3.3 ft @ 3 KT	Not Available	2002
Sweden	Oden	23,200 D	13,042	6.2 ft @ 3 KT	Not Available	1989
Sweden	Atle	22,000 DE	9,500	3.6 ft @ 2 KT	Not Available	1974
Sweden	Ymer	22,000 DE	9,500	3.6 ft @ 2 KT	Not Available	1977
Sweden	Frej	22,000 DE	9,500	3.6 ft @ 2 KT	Not Available	1975

Nation	Ship Name	Propulsion	Displacement (Tons)	Continuous Icebreaking Capability	Back and Ram Icebreaking Capability	Year in Service
Sweden	Tor Viking	18,000 DE	4,000	Not Available	Not Available	2001
Sweden	Balderr Viking	18,000 DE	4,000	Not Available	Not Available	2001
Sweden	Vidar Viking	18,000 DE	4,000	Not Available	Not Available	2001
Denmark	A551 Danjorn	10,500 DE	3,685	3.3 ft @ 2 KT	Not Available	1965
Denmark	A552 Isbjorn	10,500 DE	3,685	3.3 ft @ 2 KT	Not Available	1965
Germany	Polarstern	20,000 DE	17,300	4.5 ft @ 5 KT	Not available	1982

GT = Gas Turbine
D = Diesel
DE = Diesel Electric
N = Nuclear

Admiral ALLEN. But I know, for instance, the Russians have more icebreakers than anybody else. And I think it is either seven or eight nuclear-powered icebreakers. And they are well up into, I would say, between 10 and 15 icebreakers. And several of those are what we would call heavy icebreakers. Heavy icebreakers have more than 45,000 shaft horsepower.

The only other country in the world that has icebreakers with that capability is the United States Coast Guard, and is the POLAR SEA and the POLAR STAR, which are 60,000 shaft horsepower rated.

And when you come down from that, it would be Finland after that, Canada, and then Sweden.

Mr. LATOURETTE. The issue that I think was raised earlier relative to the melting in the ice and the opening, and different territorial claims by different countries up in the Arctic region relative to natural resources, based upon our current level of icebreaking capability in the Arctic region, is the Coast Guard in a position to protect and project America's interests in this regard?

Admiral ALLEN. I think we are holding our own right now. I have grave concerns in future years. As the Chairman indicated and we found out recently ourselves, we have the possibility this year that the North Pole will be uncovered for the first time in recorded history.

So you have the issue of access up there, vessels getting up there when it is clear. But with the oil and gas exploration, and things that could happen when there is ice there, the ability to have access and presence up there for an on science mission, I think is a significant issue moving forward, especially if there is an expansion of oil and gas exploration off the north coast.

Mr. LATOURETTE. And the last thing for the record, I think in a conversation we had, this business about the ice melting has the potential to open up a new shipping lane, a shorter shipping lane for trans-Arctic shipping, does it not?

Admiral ALLEN. Potentially it does. There are two routes that could be opened up.

One is over the top of Russia, say, from the Barents Sea around to Japan, so oil coming from off the Norway coast could be transported to Japan without going through the Panama Canal or the Suez Canal, and has the potential to shorten the trip by about 4,000 miles and the potential to save upwards of $1 million on each transit.

The Northwest Passage is a little bit more problematic. There are a bunch of islands, as you can see, that are in the way. And the ice actually accumulates in there after it drifts south in the summer. But I am not sure we know in the future exactly when that will be a reliable path.

I met recently with the head of the A.P. Moller family that run the Maersk shipping line in Copenhagen. And they are not prepared yet to start putting routes in there, because they do not know if it is really going to be sustainable and predictable. However, the traffic in and out through the Bering Strait, no doubt that is going to be increasing each year.

Mr. LATOURETTE. Okay. And with the rising price of fuel, if they become sustainable, based upon what you just said, the savings could be about $2 million a round trip?

Admiral ALLEN. I have heard different estimates, $1 to $2 million, yes, sir. And those are estimates.

Mr. LATOURETTE. Okay. Thanks so much.

Thank you, Mr. Chairman.

Mr. CUMMINGS. Thank you.

Mr. Larsen?

Mr. LARSEN. Thank you, Mr. Chairman.

Admiral Allen, you have answered one of my questions about building trends for other countries. And it sounds like I underestimated my number being fifth in a five-nation race. It might be seventh or eighth in a seven-or eight-nation race in terms of trying to stay ahead of other folks, looking at their interests in the Arctic.

But I wanted to talk to you first about the Arctic policy. We have had conversations about this. Both certainly agree the region holds an importance to U.S. national security, sovereignty and commerce.

I understand that the Coast Guard is planning to submit a report on polar mission requirements to Congress soon. Can you give us a preview of some of the major conclusions of that study?

Admiral ALLEN. Well, we are still finalizing it. But what we are going to find out is related to some of the comments that I have talked about here.

One of them is the expansion of oil and gas leases up there. The Minerals Management Service just did an auction up there, and they issued over $2 billion worth of leases—much more than they had expected.

Another example is there are 10 cruise ship passages up there planned this summer. We have the prospect that, if the water warms, we may have fish stocks move through the Bering Sea, and there are no fisheries plans up there on how we would manage that.

But collectively, though, the body of work continues to work, sir.

Mr. LARSEN. And as you pointed out in your testimony, is that wherever there is water that is under U.S. control, it is your job to be there. It is the Coast Guard's job to be there.

Admiral ALLEN. Yes, sir. And I am not trying to be glib, because I know there are a lot of opinions about why what is happening is happening. What I tell everybody is I am agnostic to the science. There is water where there did not used to be, and I am responsible for it.

Mr. LARSEN. Right.

Admiral ALLEN. Yes, sir.

Mr. LARSEN. Which means, if you are responsible for it, we are going to have an expectation that you are actually doing something about that responsibility.

Admiral ALLEN. Yes, sir.

Mr. LARSEN. Which then gets back to Mr. Young's comments about making sure that you have the assets to do just that, to exercise their responsibility.

Admiral ALLEN. Yes, sir. If I can make a quick comment.

We are taking the assets we have right now and are moving them up there in the summer as a risk mitigation factor. It is also allowing us to get feedback on how they operate.

We are sending a vessel through the Bering Straits to look at navigation and communications and waterways issues. But we will be also reaching out to the native tribes up there, and doing some communication with them.

We are going to put small boats and helicopters up on the North Slope. And the first week of August, I will be traveling with Secretary Chertoff up there to personally observe what is going on, sir.

Mr. LARSEN. You should go up in January with Mr. Young.

[Laughter.]

I understand that POLAR SEA completed a deployment to the waters in April and May, primarily for the purpose of renewing the crew's qualifications. Can you tell us what sort of missions the POLAR SEA performed, what it accomplished and whether or not the crew was able to fully renew their qualifications?

Admiral ALLEN. Sir, we moved out into the—through the Gulf of Alaska, through the Aleutian Chain up into the Bering Sea. We did fisheries patrols, did what we would call Arctic Domain Awareness—just up there sensing what is going on, an idea for the amount of vessel traffic.

We did science of opportunity. We got into the very, very light ice areas there.

It was good. We needed to do it. I am glad we did it. I appreciate the National Science Foundation support on doing that.

I wish we could have done more. I wish we could have got deeper into the ice and spent a longer time there, because these competencies atrophy over time, and I am concerned that at a certain point, there will not be a baseline level of competency to operate these ships, which we are going to need to do in the future.

But there are constraints put on the operation of POLAR SEA by the agreements with the National Science Foundation. We did what we could.

Mr. LARSEN. What constraints are on it?

Admiral ALLEN. Well, we prenegotiate how much we are going to use the ship. There is the matter of risk, if you get into the ice and you have some wear and tear, or you have issue with the propeller, or things that need to be done, number one, that increases cost or the risk that the vessel might not be available next year when it is going to be in standby for the contracted icebreaker for the McMurdo breakout.

Mr. LARSEN. So then, when the crew is not able to fully renew their qualifications, in your view?

Admiral ALLEN. Well, they atrophy in time. We are okay right now, but that is the reason I am trying to press forward with a sense of urgency. We kind of have to get this resolved. Otherwise, we are going to lose our seed corn.

Mr. LARSEN. And so, it sounds to me like they were not able to fully renew their qualifications.

Admiral ALLEN. We would have liked to have done more. Yes, sir.

Mr. LARSEN. So, what does it take to do more?

Admiral ALLEN. Well, I think we need to continue to work on the management issues associated with it, and arrive on a consensus on how we can sustain the current fleet and the competencies in the Coast Guard and still meet the requirements of the National Science Foundation. It is going to have to be a collaborative effort, sir.

Mr. LARSEN. It sounds like you need a collaborative effort, but it also sounds like those limitations are preventing you from achieving your mission.

Admiral ALLEN. I am concerned about our readiness eroding. Yes, sir.

Mr. LARSEN. All right. It sounds to me like you cannot achieve the mission that you want to, that you ought to be achieving and that we expect you to, because of the constraints.

But thank you very much, Commandant, for answering the questions, and look forward to your answers from other Members.

Thank you, Mr. Chairman.

Mr. CUMMINGS. Thank you.

Mr. Young?

Mr. YOUNG. Thank you, Mr. Chairman.

Commandant Allen, welcome. Good to see you. And you have been up-to-speed on this issue for quite a length of time.

The POLAR STAR was originally scheduled to transit the Bering Sea this summer and operate in the north area. And the voyage was cancelled. Was that the lack of funds? Or was the vessel not operational?

Admiral ALLEN. Sir, the POLAR SEA is in commission——

Mr. YOUNG. POLAR STAR——

Admiral ALLEN. —Polar Star, I am sorry, is in commission special status right now and is basically laid up at the pier. So, it would not have gone anywhere.

The POLAR SEA deployed. And that was the deployment I just discussed, sir.

Mr. YOUNG. And now, it is not up there, or it is up there?

Admiral ALLEN. It has returned, sir.

Mr. YOUNG. It is not in the Arctic?

Admiral ALLEN. No, sir. But the HEALY will be operating this summer, sir.

Mr. YOUNG. Okay. The other one, I have been reading the testimony, and I will ask you, because you represent the administration, too, because all three witnesses note that the administration is conducting a comprehensive Arctic policy review.

What is the timeframe for completing that policy review? And will the review include federal infrastructure and needs, such as the icebreakers, Coast Guard forward operating policies and facilities? And is the secretary as supportive of accompanying the commandant to the Arctic this summer? Are you going to go?

Admiral ALLEN. Yes, sir, with Secretary Chertoff, week after next, sir.

Mr. YOUNG. Okay. Now, but the first part of that question, the timetable of the policy review.

Admiral ALLEN. Yes, sir.

Mr. YOUNG. When is it coming out?

Admiral ALLEN. As I said in my opening statement, it is underway right now, and they are trying to get it done as quickly as they can, sir. And the Coast Guard has been involved in it.

Mr. YOUNG. In all due respect, now, is there a timeframe? There are three agencies involved, I take it. Is that correct?

Admiral ALLEN. Well, sir, this is a complete interagency review through the interagency process of the entire——

Mr. YOUNG. What I am concerned with here—and it is not your fault, you know, I have dealt with agencies for a long time—that there is a continued, ongoing study or policy review, and no results for a period of time.

Admiral ALLEN. Yes, sir.

Mr. YOUNG. I am a little bit intrigued here, because supposedly, the North Pole is going to be open, and the Great Lakes had three of the worst ice years in history. There is always an interesting factor.

But I think we should get ahead of this now. And it is up to you to lead us in the sense, what does this Congress have to do? Because you cannot do it out of open sky. We have to back you up.

But until we know the program, we will not know what to do. The Chairman will not know what to do. We will not know what to do.

And so, I think that program, as soon as it is finalized, is a lot better.

So, you do not have an answer yet. Maybe the other Members will——

Admiral ALLEN. I can tell you this, sir. I have been involved in the process since it was started. It has been done under the auspices of the National Security Council. I am happy with the progress. It will be done as soon as it can. You know, I am happy where we are at on it, sir.

As the commandant, I can tell you that.

Mr. YOUNG. Well, again, I urge those that are in the administration to understand—even in the next administration—is we are going to have, regardless, we are going to have a transfer. And I do not want this thing getting behind again, because you have just mentioned that Russia has seven nuclear, I believe, icebreakers. They have one of the largest in the world now. It goes on down the line.

And the Arctic is where the action is. It is not just going to the Bering Straits. I believe, if you will check the globe—and you have a picture of it here—the majority of the global resources that exist in the world today are in the Arctic. They are not in the Antarctic. They are in the Arctic.

And that is not only going to be a shipping channel. There is going to be availability for the first time to have the ability to take those resources into the northern markets. And that is where the Coast Guard has to be involved, because not only oil, we have $2.6 billion for the Chucki Sea. Now, the North Pole, you have got a picture of the North Pole, the possibility of that occurring. But you have all the other minerals that are going to be—there is huge abundance up there, but never been accessible by mankind before.

So, you have got a big responsibility. So, I do not want this thing to wait for next year or year after, year after that or year after that, because I do not think we are doing a good service, Mr. Chairman, in all their respects, to the nation as a whole. That is all that my interest is.

Admiral ALLEN. Yes, sir. And that is my position, and I have represented it in the interagency, sir.

Mr. YOUNG. Thank you.

Mr. CUMMINGS. Mr. Baird?

Mr. BAIRD. Thank you, Mr. Chairman.

Admiral, based on your comments today and your written testimony, and that of others that we have read, as I hear it, to summarize, there are sort of three traditional missions of the Coast Guard: commerce, national security and public safety, sort of making sure all of those work well. And then, there is also the science overlay in the case of particularly the Antarctic mission, but to a degree, the Arctic mission as well.

Then I am also hearing that you have got two sort of timeframes of problems. You have got an imminent concern that you have basically got the POLAR SEA and POLAR STAR, only one of which is functional now, and both of which are sort of nearing the end of their natural life. But you do not have a replacement for either that can do the heavy icebreaking mission.

So, the first question, do you view that your traditional missions within the polar regions, as compatible with the science mission? So, can you do the icebreaking used to get into McMurdo and whatever else needs to be done up north, and still carry out your missions?

Admiral ALLEN. They are compatible with the science mission. But I would tell you—and I would defer to Dr. Bement—the POLAR SEA and the POLAR STAR are not optimal science platforms, and we know that. They were constructed as heavy icebreakers to gain access, command and control, open up an area and keep it open.

Then your ability to do science with whatever is left in terms of space and manning on the ship is what you do.

So, that is true. The POLAR SEA and the POLAR STAR are never going to be optimal science platforms, sir.

Mr. BAIRD. Okay. But right now, we certainly do not have an alternative. We do not have a heavy icebreaker that could do—bust its way into McMurdo and also serve as an optimal science platform, at least within our fleet.

Admiral ALLEN. Right. The best hybrid we have right now is HEALY. But HEALY, while it is more optimally manned for scientific research, has less icebreaking capability and is not a heavy-duty icebreaker.

Mr. BAIRD. Well, let us look at the capital, the financial side of it. So, there are operational budgets. The current operational budget, as I understand it, for the heavy icebreakers is within NSF's portfolio.

Admiral ALLEN. That is correct.

Mr. BAIRD. And then, there is also a need for a capital budget in two senses. One, short-term needs—Polar Sea, POLAR STAR, or at least the case POLAR STAR is——

Admiral ALLEN. Laid up, yes sir.

Mr. BAIRD. Yes, the POLAR STAR is laid up.

So, if you were to try to get it operational, what are your estimates of what it would take to get the—and let me say, there are two timeframes. So, the short term of getting those two functional, and then a longer term which this Committee needs to look at, I think, in terms of replacing those two vessels at some point in the quite foreseeable future. But in the short term, we are not going to be able to do it.

What are your fiscal demands in the short term in a capital budget to get the POLAR STAR up to steam?

Admiral ALLEN. Sir, the sequence we would envision will be something like this. First of all, to keep the POLAR STAR in a laid up status requires approximately $3 million a year for the personnel and the maintenance that is being done on it. And even that does not guarantee that it is going to be ready. And I can elaborate on that.

If we were asked to do it, and the POLAR STAR was brought back into commission, we would renovate it and get it up to speed for a deployment to McMurdo. We would send it down there, and we would basically do an operational test and evaluation. That would be somewhere between $8 to $10 million to get the ship ready to do that.

Following that deployment, we would evaluate the condition and the functioning of the machinery and the systems on board, to see what would need to be done to extend its service life, say, seven to 10 years in the same range that we have done to the POLAR SEA. So we would have two icebreakers that are available to operate while there is a long-range decision made. That gets you up into the $60 million range, sir.

Mr. BAIRD. So, I actually, I think, misspoke. I said there are sort of two timeframes, near term and short term. There are actually three. There is the immediate term of keeping the POLAR STAR from just, for lack of a better word, going belly up. I mean, that is an immediate need.

Admiral ALLEN. Yes, sir.

Mr. BAIRD. And then you have got a more intermediate need, and then the longer term need for probably a completely new capacity.

Could you—by what timeframe—currently, from my reading of NSF's testimony, they are contracted to some degree with the Oden, which we actually saw them, when we were down there with our Science Committee. We saw it starting its run into McMurdo.

Could you provide, in your judgment—and Dr. Bement may have a different opinion—in your judgment by—obviously, this year seems committed—by the following year, would that be possible, if the Congress provided the necessary funds?

Admiral ALLEN. My response to that would be that the POLAR SEA would be available as—it will be available as a backup in 2009.

Mr. BAIRD. So, the POLAR SEA could be used by 2009, even for——

Admiral ALLEN. The plans are to hold the POLAR SEA in reserve for 2009, during the austral summer. That is correct.

Polar Sea could be available the following year in 2010, as well.

We would need to bring the POLAR STAR out and do some work on her. So, between 2010 and 2011, you could make that initial trip with the POLAR STAR, if the funding were available.

Mr. BAIRD. And as I understand it, it is important, in your judgment, to keep these vessels operational, both because you need them in the interim, but also because you have got to have a crew that is familiar with this kind of operation. And as the vessels get laid up, you cannot go out and actually have people work in the field doing the kind of things they need to do.

Admiral ALLEN. Yes, sir. And there is no substitute for experience in the ice.

Mr. BAIRD. So, if we were to say we want to farm out the mission to a foreign country, that reduces our capacity, not only in terms of vessels, but crew knowledge, experience, training——

Admiral ALLEN. It shrinks the base. Yes, sir.

Mr. BAIRD. Thank you, Mr. Chairman.

Mr. CUMMINGS. Thank you very much.

Mr. Coble?

Mr. COBLE. Mr. Chairman, I apologize. I have been back and forth from Judiciary, and I may have to be called back now. I feel like a monkey on a stick today. But I did not want to miss the admiral's testimony.

Admiral, good to see you again.

As I understand it, Mr. Chairman, in 2006, Congress transferred budget authority for polar icebreaking to the National Science Foundation. And they, in turn, reimburse the Coast Guard for operations.

It is furthermore my understanding that the NSF has begun to contract with foreign icebreaking companies to fulfill their needs in the Arctic. And I want to ask you a couple of questions in a just a minute, Admiral.

But to conclude, Mr. Chairman and my colleagues, I have a keen interest in icebreaking. And I am subjectively involved, because I used to be stationed aboard a Coast Guard cutter. I am sure, Admiral, she has long been decommissioned. I do not know where she is now.

But I would like to encourage our Committee, Mr. Chairman, to continue to review the shared responsibilities between the National Science Foundation and the Coast Guard with regard to polar icebreaking. While I support the mission of both agencies, I question whether the current funding mechanisms best fit the respective needs of the two organizations.

And Admiral Allen, what I want to do, I want to put a three-part question to you. And I am going to probably have to abruptly leave to go back to Judiciary. But my questions to you, Admiral, are:

Has this procedure that I just described affected your operations and readiness of the polar icebreaking fleet, A?

[Information follows:]

Page 48, following Line 1126

The Coast Guard cutter HEALY's operations and readiness have not been adversely impacted by the funding arrangement with National Science Foundation (NSF). However, cutters POLAR SEA and POLAR STAR operations and readiness have been negatively impacted. POLAR STAR is currently in caretaker status and not operational. POLAR SEA is currently in an acceptable state of readiness but NSF is not employing the ship to its capacity for scientific or other missions.

NSF has no operational tasking for POLAR SEA in FY 2008 and has not provided any specific operational tasking for POLAR SEA in FY 2009. Due to urgent training concerns, the Coast Guard requested to deploy POLAR SEA to the Arctic in the spring of 2008, and NSF approved with certain caveats related to operational utilization and risk.

NSF is working to preserve POLAR SEA's service life by restricting operations. By not deploying POLAR SEA, however, crew readiness is degraded as personnel do not receive the underway training and experience critical to safely operating the cutter. The Coast Guard needs full operational control of the icebreaker fleet to ensure readiness and availability for operations.

Mr. COBLE. B, does the current funding arrangement with the National Science Foundation allow for adequate maintenance of the polar icebreaker fleet, B?

[Information follows:]

Page 48, following Line 1129

The Coast Guard cutters HEALY and POLAR SEA are "In Commission," ready for operations and have been effectively maintained in this relationship. The funding arrangement has prevented the normal operation and maintenance of the POLAR STAR. The National Science Foundation (NSF) does not plan to fund POLAR STAR's caretaker status in FY 2009.

Mr. COBLE. And C, what are the long-term implications of continuing this funding arrangement?

[Information follows:]

Page 48, following Line 1131

Long-term implications of continuing the National Science Foundation (NSF) funding arrangement include:

1. Coast Guard Cutter HEALY remains dedicated solely to Arctic research to the exclusion of other emerging Arctic missions.
2. Coast Guard Cutter POLAR STAR does not return to service and the nation loses 50 percent of its existing heavy icebreaking capability.
3. Coast Guard Cutter POLAR SEA remains in service through 2014, though underutilized, and upon decommissioning the nation no longer has any heavy icebreaking capability.
4. Overhaul or recapitalization of POLAR SEA and POLAR STAR would not occur given funding constraints.

And Admiral, if you—and Mr. Chairman, if you will pardon me, I have got to get back to Judiciary. But if you would answer those for the record, Admiral, I would appreciate that.

Mr. CUMMINGS. Thank you very much, Mr. Coble.

Admiral?

Admiral ALLEN. Provide for the record, sir?

Mr. COBLE. Pardon?

Admiral ALLEN. Was it to provide the answer for the record, sir?

Mr. COBLE. If you would.

Mr. CUMMINGS. Yes, we would love to hear the answer now.

Admiral ALLEN. I can do that, too, sir.

There is an issue with current readiness, and it is not a—let me say it up front here. I have all the respect in the world for Dr. Bement, and we are good friends and we are colleagues. I think we are both in a really tough situation here.

Any time you have one of the three icebreakers that this country operates through the Coast Guard that have been validated by an external study by the National Research Council in a commission special status, you have a readiness problem.

So, is there a readiness problem? Yes, there is, sir.

That vessel is tied up. It has got a caretaker crew on it. We are making sure the machinery could be brought back in a year or so, if it was needed.

But we have had divers down looking at the hull. We have problems with the zinc anodes that are on there that protect against corrosion. There is marine growth on it.

So, even the readiness of the vessel that is laid up continues to be an issue with us.

Is this adequate in the long term? Obviously, it is not. We need three polar icebreakers to operate in this country, and one is laid up.

And in the long term, my goal is to stabilize what is going on right now and make sure we keep the POLAR STAR where it is at, pending the policy resolutions that will lead us to a long-term solution.

But our readiness now is not what it should be. I do not believe it is adequate, and we have to have a long-term fix, sir.

Mr. CUMMINGS. Well, what about the short term? I know we have to have the long term. And I think, as I listen to your testimony, just to follow up on what I think Mr. Coble might have asked—and I think Mr. Baird may have alluded to this, too.

Where are we—I guess—you just said that we are short one. Is that right? But it is actually more than one, isn't it, Admiral? In other words, as far as capability is concerned.

Admiral ALLEN. Yes, sir. What I am trying not to do is get ahead of a policy decision on what the requirements are up there. Basically——

Mr. CUMMINGS. Well, let me——

Admiral ALLEN. But there was a report issued in 2006, that validated the need for the Coast Guard to operate three icebreakers.

Mr. CUMMINGS. Okay. And——

Admiral ALLEN. We are operating two.

Mr. CUMMINGS. Well, wait a minute. I just want to make sure I am clear. I am not trying to——

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. —put words in your mouth.

I guess what I am trying to get to is, the two that we have, they are not at full operation, both of them. Are they?

Admiral ALLEN. They are available for operations. They are, sir. The POLAR SEA and HEALY are available for——

Mr. CUMMINGS. And they can do everything that we would hope that they would do.

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. Right now.

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. All right. So, we are down one. Is that right?

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. Okay. And so, when you say long range—you said maybe we ought to have a long-range plan—I guess what I am trying to get to is that, in the short range, right now, we do have a problem then.

Admiral ALLEN. Yes, sir. And it is because the effort and the money that is being transferred is sized to support the science mission, not all the missions we need to do, sir.

Mr. CUMMINGS. I see. And——

Admiral ALLEN. I think Dr. Bement would tell you we are just fine where we are at, and I understand where he sits on that. But I have got other things I have to do out there.

Mr. CUMMINGS. You would rather not be sharing any efforts with the National Science Foundation.

Admiral ALLEN. No, I would rather be supporting them completely without any money transfers——

Mr. CUMMINGS. Right.

Admiral ALLEN. —and giving him what he needs, and then, with the capacity that I have, in addition to the science, be creating presence where we need to, based on the evolving mission, sir.

Mr. CUMMINGS. Very well.

Mr. BAIRD. Mr. Chairman?

Mr. CUMMINGS. Yes.

Mr. BAIRD. A clarification, if I may. My understanding from your written testimony and conversations that we have had in the past, when the Chairman asked, do we have three or two vessels that can do everything you want, I think there needs probably to be clarification. The HEALY is not interchangeable with the POLAR SEA. The HEALY has a much different mission.

So, you could not say, well, we are going to dispatch the HEALY to bust its way into McMurdo.

Admiral ALLEN. That is correct.

Mr. BAIRD. Is that accurate?

Admiral ALLEN. Thank you for the clarification.

Mr. BAIRD. I think that is really important.

Mr. CUMMINGS. Well, that is where I was trying to go. But in courtesy to Ms. Richardson, Ms. Richardson, thank you very much.

Ms. RICHARDSON. Thank you, Mr. Chairman.

Admiral, I am a new Member on this team here, so you will have to excuse if I ask a few questions that maybe you have covered in the past.

Upon reviewing the background information, it tells me that the NSF had provided funding, you know, $55 million, $53 million in 2006, 2007. And then there was a huge drop, almost in half, for 2008.

Why was this done?

Admiral ALLEN. There was not a huge drop. The difference in the—excuse me, I am sorry. We have had pretty much stable funding from 2006, 2007 to 2008. The 2009 request that is currently on the Hill is $3 million less than the prior year, which reflects the absence of money to maintain the POLAR STAR, ma'am.

Ms. RICHARDSON. So, I am reading a document that says funding NSF reimbursed Coast Guard for polar ops in 2006 was $55.8 million, 2007, $53.8 million, and in 2008, 29.8 to-date.

Admiral ALLEN. We can update that last figure for you, because we had not been through the recent HEALY deployment. It was more than that, ma'am. I can do that for that record.

[Information follows:]

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The National Science Foundation (NSF) reimbursed the Coast Guard $55.2 million in FY 2006, $52.1 million in FY 2007, and $51.0 million in FY 2008. The first two figures reflect fuel credits and undelivered order de-obligations which were settled since the hearing.

Ms. RICHARDSON. And then, my follow-up question is, it says—and I realize we have a person from NSF who will be testifying shortly—it says here that NSF has increasingly opted to use icebreaking funding to contract with foreign flag vessels instead of utilizing Coast Guard assets.

Why is that?

Admiral ALLEN. Well, I will let Mr.—or, excuse me—Dr. Bement address that. But basically, the cost per day of operating a contracted vessel is much less than a Coast Guard cutter, because you are buying more with a Coast Guard cutter. You are buying a multi-mission platform and crews that can do other things.

If I am sitting at the National Science Foundation, I want the best bang for my buck, so I understand what they are doing. But the funding mechanism, the management structure that is in place right now is not conducive for the long-range health and readiness of the U.S. icebreaker fleet.

Ms. RICHARDSON. So, do you feel comfortable that a foreign flag ship has the same security that the Coast Guard would have and the same interests and protection of our country as a foreign flag vessel?

Admiral ALLEN. Well, what they are trying to do is meet the requirement to break out the channel into McMurdo Station, so vessels can come in and resupply it, for ultimately to resupply the South Pole and other science stations that are down there. It is basically an icebreaking function.

I have not addressed the security dimensions of it, and I will let the National Science Foundation comment on that in their testimony.

Ms. RICHARDSON. Okay, because to me it is kind of like saying, you know, we have TSA at our airports, but we will allow, you know, someone from whatever, XYZ country to come in and to maintain the whole role. And I am just surprised. You do not have a personal opinion on the security of that?

Admiral ALLEN. I actually do not have visibility into the contracting vehicle and what are the specifications of the contract. And I will leave that to Dr. Bement to comment on.

Ms. RICHARDSON. Okay. My last question is, in 2005, the National Security Research Council conducted a study, and they found the following things. And I would like to know if you agree with those recommendations.

One, they said that the United States should continue to project an active and influential presence in the Arctic to support its interests.

Yes?

Admiral ALLEN. Yes.

Ms. RICHARDSON. The United States should continue to project an active and influential presence in Antarctica to support its interests.

Admiral ALLEN. Yes.

Ms. RICHARDSON. The United States should maintain leadership in polar research.

Admiral ALLEN. Yes.

Ms. RICHARDSON. National interests in the polar regions require the United States immediately to program, budget, design and construct two new polar icebreakers to be operated by the U.S. Coast Guard.

Admiral ALLEN. I think we need to ultimately look at the replacement of the icebreakers, but I think we need to look at the changes in the Arctic and the policy associated with that as an interim step to validate that. And that is what is happening right now with the interagency review that is proceeding.

Ms. RICHARDSON. Okay. To provide the continuing of the U.S. icebreaker capabilities, the POLAR SEA should remain mission capable and the POLAR STAR should remain available for reactivation.

Admiral ALLEN. I would agree. And if possible——

Ms. RICHARDSON. And finally——

Admiral ALLEN. —get the POLAR STAR underway to increase the competency of our work force.

Ms. RICHARDSON. Okay. And finally, the U.S. Coast Guard should be provided sufficient operations and maintenance budget to support an increase in regular and influential presence in the Arctic.

Admiral ALLEN. Well, that is a two-part question, because currently, the maintenance money resides with the National Science Foundation. Without prejudice, I believe the money should be in the Coast Guard base, and we should operate it. But that is a policy decision to be made.

Ms. RICHARDSON. Okay. My final question, of all these recommendations, since the majority you agreed with, have you communicated this to the administration?

Admiral ALLEN. I think my views are well known in the administration, ma'am, yes.

Ms. RICHARDSON. Excuse me?

Admiral ALLEN. Yes.

Ms. RICHARDSON. Yes, you have.

Admiral ALLEN. Yes.

Ms. RICHARDSON. And updated that you——

Admiral ALLEN. I have been involved in the interagency review that is going on right now as far as Arctic policy goes. And I have been supported by Secretary Chertoff, and our views have been known. Yes, ma'am.

Ms. RICHARDSON. Okay. Thank you, Mr. Chairman.

Mr. CUMMINGS. Thank you.

Let me just follow up, because I am just not—I do not want to—I know you have got things to do, but I do not want to let you go, because I wanted to make sure we are clear on this.

On the POLAR STAR, it is in bad shape. Is that right? Is that a good description? I mean, in other words——

Admiral ALLEN. It is tied up in Pier 36 in Seattle and has a crew of about 30 on board to keep the vessel painted, keep it clean. They test the machinery and roll it over every once in a while. But it has not moved in a number of years.

And the concern we have right now is whether or not there is going to be corrosion on the hull due to marine growth. And as I said, we put a—we attached to the hull blocks of zinc, because they corrode before the hull does. It keeps the hull from corroding.

They are gone. So, we are to the point now, if we are going to keep it even in the status that it is in, we are probably going to have to do something with the hull. And I have directed my engineers to take a look at that.

Mr. CUMMINGS. So, right now, you are waiting for a report from your engineers. Is that right?

Admiral ALLEN. Yes, I am.

Mr. CUMMINGS. And when do you expect that report to come in?

Admiral ALLEN. Well, they are going to do an internal inspection of the ship and make sure that there is no corrosion taking place from the inside out and outside in. And that is being actively done right now.

Mr. CUMMINGS. But now——

Admiral ALLEN. I discussed it today with my chief engineer.

Mr. CUMMINGS. I understand.

What is the worst case, Admiral, with regard to that ship, the POLAR STAR?

Admiral ALLEN. Well——

Mr. CUMMINGS. If they come back with a report and it is the worst—I mean, within reason, what is the worst case?

Admiral ALLEN. I do not think we are going to find anything catastrophic. As you saw, sir, when we passed the part of the deck plating along, you know, that is the kind of plating that is on that ship. What we need to make sure is that, if there is something going on, we arrest it right then and take care of it, so it does not degrade further, sir.

Mr. CUMMINGS. I guess what I am trying to get to is, we have got a ship. We have got 30 people maintaining it. I guess that is a good word. Is that appropriate?

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. And that ship has not been out of that position since when? Where it is right now, how long has it been there?

Admiral ALLEN. It has been at least 2 years. I will give you the exact date, sir, but at least 2 years.

Mr. CUMMINGS. But at least a year.

Admiral ALLEN. Two.

Mr. CUMMINGS. Two years.

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. It is sitting there.

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. And you would agree with me, I think, based upon your testimony, that it would—that we ought to—we actually need three ships. Right? We need the HEALY, and we need this one and the other one. Is that right?

Admiral ALLEN. The requirement was validated by the National Research Council in 2006, sir. Yes, sir.

Mr. CUMMINGS. Right.

Now, has there been any—have there been any requests—I mean, has the administration discussed or tried to figure out how they want to solve this problem from a financial standpoint?

Admiral ALLEN. Well, sir, what I believe is—and I will get back to the question that Mr. Young asked—the imminent interagency report on policy will set the baseline for where the federal government goes on this, and I wholeheartedly support that, sir.

Mr. CUMMINGS. And do you know what kind of timetable we have on that?

Admiral ALLEN. Very soon, sir. But again, I cannot attach a date to it, because I am not the controlling officer.

Mr. CUMMINGS. Now, you know, Admiral——

Admiral ALLEN. As I told Mr. Young, we have been—we have a very frank——

Mr. CUMMINGS. I have a tremendous amount of respect for you, and that very soon——

Admiral ALLEN. I am happy with the progress. I will tell you that, sir. And if I was not happy, I would tell you.

Mr. CUMMINGS. All right. Well, could you kind of let—could you give us—obviously, you are not prepared to do it today, but we have to deal in some kind of timetables here, or else, you know, you will be gone, and we will be up in heaven, and we will still be talking about this.

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. So, I mean, I will be up there with you, but——

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. —we will be hanging out.

[Laughter.]

Admiral ALLEN. We are going to know each other for a long time, Mr. Chairman.

[Laughter.]

Mr. CUMMINGS. But what I am saying is, we really do need to try to move this along.

Admiral ALLEN. Yes, sir.

Mr. CUMMINGS. I am not sure. Mr. Larsen, I think one of his concerns was the very issue that—and he can correct me if I am wrong—is the very issue that I am raising right now. And I wanted—and so, I did not want you to leave unless we kind of tried to get to the bottom of this as to—we have got a ship sitting there. It is not going anywhere.

And it sounds like, if we were to try to use it, we are not sure whether it is going to—we are not sure—and correct me if I am wrong—whether it would be able to do all the things that we want it to do. And even if it were, we are not sure of how long it would be able to do it. Is that right?

Admiral ALLEN. I can give you a more quantitative answer to that. We believe that it would take an availability and about $8.6 million to make the POLAR SEA ready to go to sea and do a mission, sir.

Mr. CUMMINGS. Okay. And just one last question.

Did I hear you correct to say that you—you, the admiral of the Coast Guard—you are pushing the administration to do, to get the resources to get it out there? I mean, to do the 8.6, at least? Is that an accurate statement?

Admiral ALLEN. The current review that is going on regarding Arctic policy is going to address everything, including Coast Guard icebreaking and navigation up there. All the things that we have talked about are going to be addressed in this review, sir.

Mr. CUMMINGS. Do they ask your opinion?

Admiral ALLEN. They did, sir.

Mr. CUMMINGS. And what was your opinion?

Admiral ALLEN. Sir, you know I am not shy. They have got it.

Mr. CUMMINGS. And what was it?

Admiral ALLEN. Pretty much what I have said here today, sir.

Mr. CUMMINGS. Very well.

All right. Thank you very—Mr. Larsen, did you have something?

Mr. LARSEN. Just, Mr. Chairman, I would like to enter into the record a memorandum from the Chairman of the Joint Chiefs of Staff, signed by—or to the Chairman of the Joint Chiefs of Staff—signed by the commander of U.S. NORTHCOM, TRANSCOM and PACOM, in support of a program for construction of new polar icebreakers to be operated by the Coast Guard.

Mr. CUMMINGS. Thank you very much.

Ladies and gentlemen, we have—we actually have six votes. Therefore, we will—we will adjourn for probably about, a little bit less than an hour. That is about how long it is going to take to do the votes.

Mr. BAIRD. Mr. Chairman?

Mr. CUMMINGS. Yes.

Mr. BAIRD. Before we adjourn, Mr. Coble said he was not sure where his ship that he had served on is. I think it is in a tall ship museum moored next to the USS Constitution.

[Laughter.]

Mr. CUMMINGS. You do not want to know.

[Laughter.]

Admiral ALLEN. Mr. Chairman, will this panel continue after the——

Mr. CUMMINGS. No. Admiral, thank you very much, and we will pick up——

Mr. TAYLOR. Mr. Chairman?

Mr. CUMMINGS. Yes.

Mr. Taylor?

Mr. TAYLOR. Admiral, thank you for being here.

I am curious, what percentage of the total cost of operating an icebreaker during wintertime is for fuel?

And what is leading to that is my understanding that the Soviets, 20 or 30 years ago, went to atomic, nuclear-powered icebreakers. And I guess you know I have been pushing the Navy to get——

Admiral ALLEN. Yes, sir.

Mr. TAYLOR. —the next generation of cruisers, next generation of amphibs.

Given today's fuel costs, has the Coast Guard run any sort of a comparison of—and, quite frankly, given the enormous horsepower needs of an icebreaker when it is in operation—have you run any sort of cost comparison over the projected 20-to 30-year life of an icebreaker?

Admiral ALLEN. Sir, what I would like to do is take the current fuel price, because our projections, when we budgeted for this thing 2 years ago, as you know, are way off the scale right now. Let us revise that, give you that information. And I would be happy to provide that for the record, if that is okay, sir.

[Information follows:]

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The estimated cost of building a new diesel electric-powered icebreaker the length, horsepower and tonnage of a POLAR class icebreaker is between $800 and $925 million (in 2008 dollars). All estimates are preliminary and subject to substantial variations during design and production.

The estimated cost of building a new nuclear powered icebreaker the length, horsepower and tonnage of a POLAR class icebreaker is between $1.6 and $2.0 billion (in 2008 dollars). This estimate reflects U.S. Navy shipbuilding experience for the first CVN-68 class nuclear powered aircraft carrier and the requirement to develop new (or modified) nuclear reactor, steam generation, and turbine propulsion systems.

For purposes of comparison, the Coast Guard assumed 200 days at sea per year the following operational profiles:

Mode	Time During Deployment
Full Power	4%
Light Icebreaking at Full Diesel Power (20,000HP)	32%
High Speed Transit at Full Diesel Power (20,000HP)	32%
Stationary in Ice (ships service, and heating loads only)	32%

The diesel electric icebreaker would consume an average of 880 gallons of fuel per hour including average propulsion, ships service, and heating loads. Assuming the average price of diesel fuel is $4.10 per gallon (current price - July 2008) for Marine Grade Oil (MGP) fuel, it equates to $17.3 million per year to fuel the diesel electric powered icebreaker, or $520 million for fuel for 30 years (in 2008 dollars).

A nuclear powered icebreaker may require one refueling during a 30 year service life. The estimated refueling cost would equal 30% of the installed cost of the nuclear propulsion plant. It should be noted the most advanced U.S. Navy reactors do not require mid-life refueling. It may prove possible to employ equivalent technology for nuclear powered icebreakers, however this requires further investigation. For the purposes of this example we have assumed the nuclear icebreaker would not be refueled.

The total ownership cost of one nuclear icebreaker was calculated to be $2.55 billion as compared to $1.80 billion for the conventional diesel electric icebreaker with identical propulsion power and scientific research facility. These figures for total ownership costs are reflected in 2008 dollars. The difference is attributed to the cumulative impact of the much higher acquisition cost of the nuclear plant compared to the 2 diesels and 2 gas turbines required for the diesel electric plant, the disposal costs of the nuclear plant, higher shipyard costs for nuclear powered ships, engineering costs for the new nuclear plant, and higher government acquisition program costs reflecting the incorporation of a nuclear propulsion system, more costly crew training and certification, and increased maintenance and support cost.

Mr. TAYLOR. I would—and if you need to pick a number out of the sky for an availability, may I suggest that you look at an A1B power plant, which is one of the two power plants that will go into the next generation of carrier. And I think for a couple of reasons, number one, you get standardization of crew training. And obviously, there would be some economies of scale of buying more of a single power plant rather than having eight or 10 different varieties out there.

So, I am asking specifically——

Admiral ALLEN. Yes, sir.

Mr. TAYLOR. —if the Coast Guard would look at that as your power plant to do a cost comparison with.

Admiral ALLEN. We will do that, sir.

Mr. TAYLOR. Thank you very much, sir. Thank you, Mr. Chairman.

Mr. CUMMINGS. Thank you.

We will now adjourn for an hour.

[Recess.]

Mr. CUMMINGS. We are very pleased to have Dr. Arden Bement, who is the director of the National Science Foundation. Mr. Mead Treadwell is the chair of the United States Arctic Research Commission. And Mr. James Weakley is the president of the Lake Carriers' Association. And welcome.

And we will hear from you, Dr. Bement?

TESTIMONY OF MR. ARDEN L. BEMENT, DIRECTOR, NATIONAL SCIENCE FOUNDATION; MR. MEAD TREADWELL, CHAIRMAN, ARCTIC RESEARCH COMMISSION; MR. JAMES H.I. WEAKLEY, PRESIDENT, LAKE CARRIERS' ASSOCIATION

Mr. BEMENT. Thank you, Mr. Chairman, Ranking Member LaTourette and Members of the Subcommittee.

I am pleased to appear before you again to speak on behalf of the National Science Foundation. NSF is an agency with an extraordinary mission of enabling discovery, supporting education and driving innovation—all in service to society and the nation.

In addition, the foundation has been tasked with chairing the Interagency Arctic Research Policy Committee, created under federal statute to coordinate Arctic research sponsored by federal agencies. NSF also manages the U.S. Antarctic Program on behalf of the U.S. government, as directed by Presidential Memorandum 6646, issued in 1982.

The Arctic and Antarctic are premier national laboratories. Their extreme environments and geographically unique settings permit research on fundamental phenomena and processes not feasible elsewhere.

Polar research depends heavily on ships capable of operating in ice-covered regions. They serve as research platforms in the Arctic and Southern Oceans, and as key components of the logistic chain supporting on-continent research in Antarctica.

As a principal source of U.S. support for fundamental research in these regions, the NSF is the primary customer of polar icebreaker and ice-strengthened vessel services for scientific research purposes.

The NSF's responsibilities take somewhat different forms in the Arctic and in Antarctica. My written testimony explains in detail how icebreaker requirements differ in each region. But in both cases, the question of how best to meet those responsibilities boils down to consideration of three factors: cost, performance and policy.

For example, current deployment standards allow HEALY to spend only 200 days or less at sea annually, averaging 100 days less than our international partners. Additionally, the operating costs are significantly higher than non-military research icebreakers. As I have already stated, the HEALY is a capable ship. If she could be operated more cost effectively, she would be of even more value to the research community.

Antarctic ship-based research and Palmer Station resupply depend primarily on two privately-owned vessels, the Laurence M. Gould and the Nathaniel B. Palmer. These ships are well equipped for their mission, and they operate at sea more than 300 days annually at a daily rate of roughly $24,000 and $54,000, respectively.

Operation of McMurdo and South Pole Stations require the annual delivery of fuel and supplies by sea. To fulfill this requirement, NSF has long depended on the U.S. Coast Guard POLAR SEA and POLAR STAR to break out of the thick ice in McMurdo Sound. The Coast Guard has performed this icebreaking mission in Antarctica with distinction for many decades, but with increasing difficulty in recent years.

These two ships are at or close to the end of their service life, and have become extremely expensive to maintain and operate. In the past 4 years alone, NSF has spent roughly $29 million on extraordinary maintenance. It is clear that the Polar icebreakers are becoming an increasingly fragile resource that could jeopardize the critical foreign policy and scientific objectives in the Antarctic, if we are unable to procure other icebreaker services.

The overriding question is how to open the channel to McMurdo Station, so that year-round operations of the nation's McMurdo and South Pole Stations can continue. This year-round occupation is center to demonstrating the active and influential presence, which is the cornerstone of U.S. policy in Antarctica.

As noted in the National Academy report in 2006, meeting this requirement is a significant national challenge.

Accordingly, and after consultations with officials in OSTP and OMB, I wrote on May 31, 2006, to Dr. Anita Jones, in her role as chair of the NAS icebreaker study, as follows: ″Given the rapidly escalating costs of government providers for icebreaking services and the uncertain availability of U.S. Coast Guard icebreakers beyond the next 2 years, it is NSF's intention to—[seek] competitive bids for icebreaking services that support the broad goals of the U.S. Antarctic Program. This competition will be open to commercial, government and international service providers.″

Based on our experience of working with other foreign and domestic icebreakers, I continue to believe that this is the most cost-effective means of meeting NSF's resupply requirements.

Mr. Chairman, NSF's commitment to polar research, as well as its responsibility to manage the U.S. Antarctic Program, are unchanging. We only seek the flexibility to do so in the most cost-effective manner possible.

I appreciate the opportunity to appear before the Subcommittee, and would be pleased to answer questions you may have. Thank you.

Mr. CUMMINGS. Thank you very much, Doctor.

Mr. Treadwell?

Mr. TREADWELL. Thank you, Mr. Chairman and Members of the Committee. Good afternoon.

On behalf of my fellow commissioners, thank you for the invitation to speak with you today.

My testimony represents the view of the U.S. Arctic Research Commission, an advisory body to the executive branch and Congress. My statements here today do not necessarily represent the views of the administration.

The commission establishes goals for Arctic research to be conducted by our nation and works to ensure that research programs and platforms, including vessels, laboratories and monitoring networks, are there to do the job. Arctic research cuts across many agencies, ties with many nations, advances basic knowledge, national security, human health, social and economic development and environmental protection.

I could say much today about the valuable contributions our national icebreaker fleet provides to science. In fact, in this International Polar Year, there have been some significant discoveries and significant work done to advance American claims, sovereignty claims in the Arctic.

But because we have both the director of the National Science Foundation and the commandant of the Coast Guard today, I am going to speak less about science and security needs, and I am going to draw from the part of my written testimony that addresses the economic issues we encounter, which should also be central to any national needs assessment on icebreaker capacity.

As has been said, the administration is conducting a comprehensive interagency review on a wide range of Arctic issues. The tremendous homework to prepare for an accessible Arctic Ocean—the new Mediterranean once predicted by Arctic explorer Stefansson—has certainly begun.

Mr. Chairman, the Alaska Purchase in 1867 made us an Arctic nation. Our ocean boundaries include more than the Atlantic and Pacific, and today's Arctic infrastructure for transport, energy, telecom, food production and defense is global infrastructure.

The Arctic Ocean is becoming increasingly accessible in summer, and ice is receding faster than our climate models predict.

With these factors in mind, the Arctic Council's eight nations, with indigenous participants and the global shipping industry, are conducting an Arctic Marine Shipping Assessment, which is due in 2009. Our deputy director, a former Coast Guard icebreaker captain, Dr. Lawson Brigham, is chair of this effort for the eight Arctic nations.

AMSA will report that Arctic shipping is not a far off, future thing. It is a now thing. Shipping tied to specific resource development projects, tourism and serving the needs of Arctic communities is significant and growing.

Winter access, of course, remains a challenge, except for the most capable of icebreaking ships. The question comes up: Will trans-

Arctic seaways be as important to global commerce as the Panama and Suez Canals? Or will the Arctic Ocean continue more as a venue for shipping in and out of the Arctic itself, for tourism, local needs and to bring natural resources to market?

Our work with AMSA suggests that we have to prepare for both possibilities. AMSA tells us that Arctic shipping will grow further when rules are certain and when products can be delivered competitively with other routes. And this means on a time and cost basis, not just on shorter distances.

Assistant Secretary of State Dan Sullivan said at the Arctic Energy Summit last fall that shipping in the Arctic Ocean should be safe, secure and reliable. And icebreakers are essential in making that three-part goal a reality.

The Committee is hearing again today about the importance of icebreakers to commerce in the Great Lakes. The wording of President Roosevelt's 1936 commitment to support shipping with icebreakers is not limited by geography. Icebreakers may eventually be needed to support commercial fishing—commercial shipping—in U.S. Arctic waters.

The Arctic Research Commission has urged the government to move expeditiously in building and maintaining new icebreakers for the Arctic. That begins with a clear understanding of national needs and interests.

We have been guided by the National Research Council's conclusion that two Polar Class ships are necessary. Polar Class icebreakers are the largest and most capable of ice-going ships.

Changing ice conditions do not obviate the advantages of having Polar Class icebreakers. Scientists are predicting tougher operating conditions and higher sea states, due to the evolving nature of sea ice and changing wind and weather patterns.

Mr. Chairman, Arctic icebreakers are expensive to build and to operate. As the nation assesses its needs, let me conclude by listing some of the billion-dollar, if not trillion-dollar, national interests that we encounter in looking at the science agenda for the country. And these very expensive national interests may help balance the cost to taxpayers of having these icebreakers.

Number one is security and sovereignty. Admiral Allen has talked about the current missions of the Coast Guard that you need icebreakers to meet. It should also be noted, as was put in the record, that an accessible Arctic means newer, expanded routes for U.S. military sealift. And the commission believes polar icebreakers are an essential maritime component to guarantee this mobility exists.

I mentioned what icebreakers are doing to help us expand the territory of the United States. The estimated value of the territory that we stand to gain under the law of the sea is over $1 trillion, according to the Department of State.

Two, energy. Close to 15 percent of America's oil is produced on the North Slope of Alaska. Arctic shipping brings the infrastructure in, and as we move offshore and prove up close to $3 billion in recent leases, the potential need to ship oil and gas year-round from the American Arctic increases.

Number three, transport and trade. If Arctic seaways become a venue for global trade, the economic impact, again, is in the billions of dollars. We have just been calculating a set of statistics, Mr. Chairman, that reveals that approximately 7,800 ice-class ships in the world today, about 4.5 percent of the world shipping fleet. This percentage is expected to increase to 10 percent, as more ships are built for ice strength and polar use.

Number four, mineral production. World-scale mines producing or on the drawing board in Alaska, Canada and Russia, reach that billion-dollar magnitude already. And some of these projects conduct, or expect to conduct, year-round Arctic shipping, and they are footnoted in my written testimony.

Food production in the U.S. Arctic. The Bering Sea, where fishing vessels operate in or near the seasonal ice edge, is a billion-dollar industry. And ice-strengthened vessels are not only essential platforms for research into those fisheries and understanding what is going on in an ecosystem, but also fisheries oversight.

Six, understanding of and response to climate change. I could highlight very much of the research going on with icebreakers, but I just want to make the point that the costs of—the cost our nation and other nations expect to incur in responding to climate change will also total in the trillions of dollars.

Icebreaker-based research will help set and track our progress in meeting international climate goals. There are very many amazing things happening in the Arctic with the feedback loops there, where having this capability is a very important thing to expensive decisions made all over the rest of the world.

Seven, there are Arctic values we cannot put a price tag on. Human lives in the Arctic and maintain a subsistence life style, practiced by these cultures for thousands of years. The need to understand and protect the marine mammals of this region is well established in U.S. law. And icebreakers play a key role in both objectives.

Through support and research in all polar conditions, the U.S. Arctic Research Commission has urged the nation to maintain U.S.-owned, operated and commanded Polar Class icebreakers. And under the principle of freedom of navigation, global shipping can come to our doorstep, whether we invited it or not.

Whether you envision the Arctic Ocean as a new seaway, or as simply an expansion of current shipping in and out of the Arctic, the time to prepare is now. We will be glad if we do, and sorry if we do not.

Thank you very much.

Mr. CUMMINGS. Thank you very much.

Mr. Weakley?

Mr. WEAKLEY. Thank you, Mr. Chairman.

Every day, the 2,500 professional American mariners sailing on the Great Lakes risk their lives and their livelihoods to feed the economic engine that drives North America. They deserve the resources to ensure a safe and efficient passage. Without adequate Coast Guard resources, the gears of this economic engine come to a grinding halt.

As president of the Lake Carriers' Association and vice president of the Great Lakes Maritime Task Force, I have the privilege of testifying on behalf of those mariners and U.S. flag vessel operators. We deliver iron ore, limestone, coal and jobs.

I recently retired as a Coast Guard officer with more than 23 years of combined active and reserve service—16 years on the Great Lakes. I can tell you without a doubt, that some of the active duty, reserves and civilians from the Lakes are the most dedicated public servants.

There is, however, one thing that no amount of dedication can overcome: a lack of resources. Sailors need ships.

Since 2004, the Lake Carriers' Association has asked for additional icebreaking vessels. We need one additional 140-foot-long icebreaking tug, homeported in Duluth, Minnesota, and an additional seagoing buoy tender stationed in Charlevoix, Michigan.

Just as roadways need to be plowed, our waterways need sufficient icebreaking to remain conduits for commerce. Just as cities use snowplows, and police, cruisers, to serve the public, our Coast Guard uses a mix of vessels. We need to provide nautical snowplows where the ice is and waterborne squad cars elsewhere.

The Great Lakes form a maritime highway, moving as much as 200 million tons of cargo a year. Sixty-six U.S. flag lakers moved 104 million tons in 2007. Of that total, 15 million tons, valued at $1.1 billion, were delivered during the ice season.

The winter of 2007-2008 was considered normal. It was, nonetheless, the worst winter since 2003, and demonstrated the lack of icebreaking resources. Much of the Great Lakes was abandoned to the elements.

The price tag for just three LCA members exceeded $1.3 million in vessel damages. Lives were unnecessarily risked when the Coast Guard failed, because of inadequate resources to answer the call.

Six Coast Guard cutters break ice in the 150-mile stretch of the Hudson River. By contrast, the entire Great Lakes have six icebreakers and two buoy tenders. Lake Michigan alone boasts more than 1,640 miles of coastline—the distance from Maine to Miami. Currently, the lake is home to one 140-foot-long icebreaker, homeported in Green Bay. The equivalent East Coast shoreline has 90 Coast Guard vessels.

The Coast Guard uses East Coast icebreakers primarily for security. This is not the best solution. It is the nautical equivalent of putting a blue light on a snowplow.

First District 140s will spend an average of 157 hours breaking ice, compared to 870 hours for the average D-9 icebreaker. Contrast the 101 hours the Great Lakes 140 spend on security with the 900 hours by D-1.

Providing the Great Lakes with one additional icebreaker and one additional buoy tender would have a tremendous impact on our ability to meet the needs of commerce and not hinder the Coast Guard's performance in the rest of the country.

I am not asking for parity, but I believe there should be more equity.

Thank you.

Mr. CUMMINGS. Thank you all very much.

I want to first of all go to you, Mr. Bement, and to you, Mr. Treadwell, regarding the POLAR SEA's most recent mission to the Arctic. Can either of you comment on why the vessel did not go further north than it did?

Mr. BEMENT. Yes. Our procedure in working with the Coast Guard to allocate the—or not to exceed budget that we get from the Congress, which this past year was of the order of $54 million—is that we provide to the Coast Guard a set of requirements, operating requirements.

They, in turn, take those requirements and give us an operating plan, plus costs, for O-and-M costs as well as normal operating costs. We negotiate that plan and finally come up with a settlement, which then gets transferred to the Coast Guard for operations.

In the case of the POLAR SEA and operating in the Arctic, most of those operations were to requalify crewmen for certification for operations.

We felt at the time of our negotiations with the Coast Guard—and we came to agreement—that taking the POLAR SEA into deep ice was risky, because of the possibility of serious damage, so that it seemed to be more prudent to transfer crewmen who needed to be certified for ice operations to the HEALY, since the HEALY was operating in deep ice.

Those crewmen did achieve their service on the HEALY. They did get certified. So, as an alternative set of conditions, that seemed to be the best decision we could arrive at, at that time.

Mr. CUMMINGS. So the—basically, because the POLAR SEA is old, you were concerned?

Mr. BEMENT. Well, we usually have the POLAR SEA for backup service. And in many cases, you need two ships, because it is hard enough from season to season how thick the ice is going to be. And if the ice is sufficiently thick, you need a backup vessel. Also, if one of the ships gets damaged, you need the backup vessel to take over the operation.

If the POLAR SEA, operating on its own in the Arctic, had gone into deep ice and had undergone serious damage that required lengthy maintenance, that would almost knock out all capability for icebreaking in the Antarctic for another year, or perhaps longer.

So, we have been trying to not only deploy our assets, but also to protect our assets in the most prudent way, by not putting them in risk where other alternatives would serve. So, that was the basis for our decision.

Mr. CUMMINGS. Did you have a comment, Mr. Treadwell?

Mr. TREADWELL. We have talked to the Coast Guard and we have talked to the National Science Foundation, and I have no contradiction with what Dr. Bement has said.

What I will say is that, if we are in a situation where we cannot put our Polar Class icebreaker into the ice, because we are afraid we will break it, that is probably prima facie evidence that we need a new icebreaker. And because we probably should have two backing it up, I think that particular episode is a very good piece of evidence for Congress to take action on this issue.

Mr. CUMMINGS. You know, as I listen to you often say that, I think that there are a lot of presumptions that are made. And if someone were to say that we might find ourselves—and this goes to all of your testimony, including you, Mr. Weakley—that in the United States, that we would find ourselves in the situation where we did not have the capacity that you are saying. People assume that we have the capacity.

It is sort of like Hurricane Katrina. They assume a lot of assumptions. They say, this is the United States of America, the most powerful country in the world. And then, when something happens and you are waiting for the rubber to meet the road, you discover there is no road.

And so, it sounds like what you all have just described—and Dr. Bement, I do not know whether that is your normal demeanor, but you look like you are very sad in giving your statement.

[Laughter.]

That was——

Mr. BEMENT. Not my normal demeanor. Just late in the day.

Mr. CUMMINGS. But I think we can—I think you all agree that we can do better as a country. We have got to do better.

But let me just ask you just a few more questions.

Mr. Bement, are the vessels currently available to the National Science Foundation, from the contract community and from foreign sources, capable of handling current ice—Europe agencies—current icebreaking needs to support research in the polar regions?

Mr. BEMENT. We believe so, but we have not fully tested that.

Two years ago, we put out a Request for Information. And as a matter of fact, it was through these RFIs that brought us the Krasin from Russia and the Oden from Sweden. And I should point out parenthetically, these are not agreements between the National Science Foundation and a private contractor. It is a government-to-government agreement.

And in the case of the Swedish Oden, it also carries with it a science agreement. It is a science exchange, because the Oden is capable of doing science, and there is a very active, collaborative activity between U.S. scientists and Swedish scientists in working the Southern Ocean. And so, the Oden, while it is deployed in the Southern Ocean, is also there for science, as well as a break-in.

I think that if we were to put out an RFI and ask those questions, based on the responses we got in the past, we would probably find expressions of interest, even private interest, that would build-to-lease icebreaker services over a period of time.

Mr. CUMMINGS. So, is it fair to say that NSF does not care where it gets its icebreaking services?

Mr. BEMENT. Our only—our only mandate, by presidential directive, is to operate in the Antarctic and in the logistics support of the Antarctica Program in the most cost-effective way possible. And, of course, the most cost-effective way carries with it a lot of conditions and a lot of options. So, we explore all those options in determining how we can operate under least cost.

Mr. CUMMINGS. But you mentioned Sweden and Russia, did you say?

Mr. BEMENT. Yes.

Mr. CUMMINGS. Were they cheaper?

Mr. BEMENT. Four years ago, we did have the problem where the POLAR SEA was out of operation. As a matter of fact, since that time, we have invested $29 million in extraordinary maintenance in order to get the POLAR SEA back into operation. And that is why we call it a fragile resource.

Now, at that time, it was agreed by the Coast Guard that we needed a backup vessel. And it was then that we put out an RFI and discovered that the Krasin was available. And so, we contracted with Russia. The Krasin is a GOCO vessel. It is government-owned, contractor-operated, as is the Oden. The Oden is also GOCO. It is government-owned, contractor-operated.

So, for two seasons, we backed up the Coast Guard with the Krasin. And then, 2 years ago we shifted to the Oden, because there was an expression of interest on the part of Sweden to enter into a U.S.-Swedish science exchange in return for also using the icebreaker for break-in services. And that was a very generous offer that we took advantage of.

So, that gave us the adequate primary break-in capability, and it allowed us to use the Coast Guard as the backup. And so, that is the way we have operated for the last two seasons.

Mr. CUMMINGS. Before we go to Mr. Oberstar, let me just ask you this. You said you spent $29 million? And over how much, over what course of time?

Mr. BEMENT. It was over 4 years.

Mr. CUMMINGS. How long?

Mr. BEMENT. Four years.

Mr. CUMMINGS. Four years.

Mr. BEMENT. About 4 or 5 years. But I can give you more detailed information for the record, to give you all the details.

But if you go back about 4.5 years ago, the POLAR STAR was operational. The POLAR SEA was not fully operational. It required extensive maintenance. So, we invested in getting the POLAR SEA back into operational capability.

And at that time, the POLAR STAR then underwent some damage. And so, it was then that we put POLAR STAR in caretaker status. And it was the expectation, based on the repairs that we had made in the POLAR SEA, that it was good for another 7 or 8 years, as long as we used the resource prudently.

Mr. CUMMINGS. And would you deem it prudent to contribute capital costs for the building of a new icebreaker?

Mr. BEMENT. I think at this point, based on my understanding of the mission space, that the Coast Guard has, especially with the opening up of the Arctic over time, that it would be a prudent course of action.

But my estimate or judgment would be that, even if the funds were approved tomorrow, it would take about 8 years to complete the construction of the vessel and make it operational. And we still have to—we still have to plan our course of action for the next 8 years, and that is where we need flexibility.

Mr. Oberstar, the Chairman of the Transportation Committee?

Mr. OBERSTAR. Thank you, Mr. Chairman, for enduring a long afternoon with interruption by votes and other diversions from our hearing.

I apologize also to the witnesses for keeping you so late today. We have no control over the votes on the House floor. And I regret my own absence on other Committee business—aviation and energy for transportation, a whole host of matters that I had to attend to.

And so, I sort of left you an orphan here, Mr. Chairman.

Mr. Cummings does a superb job as Chair of the Committee, and I enjoy being here with him and participating with him. And our Ranking Member, Mr. LaTourette, as well, who has really invested himself vigorously in the issues of the Committee.

So much to start with.

Mr. Weakley, thank you for your leadership on the Great Lakes, your work on behalf on Lake Carriers' Association, advocacy for icebreaking services, among many other contributions that you have made. And I think those charts you showed on the screen are very compelling.

We have at long last the replacement, Mackinaw, and in support from the icebreaking tugs and buoy tenders. But this past winter, when there was a need for icebreaking capability on Lake Superior—at the beginning of the spring shipping season there was still a great deal of ice, slush ice, heavy ice, shore ice—the Mackinaw was not available to come upstream, up-lake and serve in there. I know vessels were supposed to be supported by these icebreaking tugs, suffered $1 million, $1.5 million in damages, I recall.

What was the problem? We had the Coast Guard here earlier this year, and I asked the question. They gave me this vague, non-responsive answer, that they were busy on other business, but no other business that I could find from lake carriers in the lower lakes.

So, what is your—and I am not putting you in a position of criticizing the Coast Guard. But what has happened there? What is going on?

Mr. WEAKLEY. Thank you for that question, Mr. Chairman.

I think, listening to the commandant's testimony earlier, something that he may not have mentioned is that there is a natural tension between icebreaking and buoy tending. As you are finishing your buoys, you have got to start icebreaking, and the vessels cannot do both at the same time. And equally important, they cannot be in two places at one time.

As recently as the late 1980s, early 1990s, there were as many as five 180-foot buoy tenders on the Great Lakes. They were replaced with two 225s. If you look at their records, the Coast Guard claimed that that would work, because the 225s and the Mack were going to be more efficient.

The fact of the matter is, the 225s, I believe, are the most unreliable platform in the Coast Guard fleet. They were not designed for ice operations. They have a tendency to blow hub seals and leak oil in the water, and quite frankly, have been an extreme disappointment. They were——

Mr. OBERSTAR. I have seen those in operation, and I am disappointed with them, too. That is why I pressed Mr. Obey, my colleague to the east, advocated so vigorously for the replacement, a major icebreaker, the Mackinaw. But we saw how ineffective those harbor icebreakers are, those—they are really tugs.

They do not have the capability to keep a lane—they might be able to keep it open for a short period of time, but you get a 40-below cold snap, as happens, and that slush ice freezes down 18, 20 inches or more—to three feet, even.

Mr. WEAKLEY. Yes, sir. What we have seen is, the 225s are effective at maintaining a track once the track is established by a more capable icebreaker. They are not maneuverable. The 140s are more effective in the river system and at close-in support.

And the fact of the matter is that there just are not enough vessels to go around. And even the 140s are at the end of their service life, and we have seen a tremendous failure rate from those in the past 3 to 4 years.

I will say that the Coast Guard is on the right track at rehabbing some of those boards and some of the engineering plant of the 140s. It is a good hull. Those boats have been in fresh water most of their service.

I think we could do more with as little as two more vessels. We have been making the argument for at least 4 years, and have been told that—not to worry, that the Coast Guard will be there to answer the call when we ask for the resource.

I think this winter proved beyond anybody's doubt, that they were not able to answer the call. They send one East Coast icebreaker to support Canadian operations in the Seaway, it did not benefit the U.S. fleet or the upper Great Lakes by moving that U.S. breaker into Canada.

Mr. OBERSTAR. We have much more traffic on the Lakes interlake at those times of year than through the Seaway. Certain vessels need to get out there——

Mr. WEAKLEY. Right.

Mr. OBERSTAR. —grain and international cargo. But—I mean, in international trade.

But it seems to me, I just have this feeling, you know, looking at that number and security, 900 hours on security on the East Coast, 101 on the Great Lakes, icebreaking, 870 hours on the Great Lakes, 157 on the East Coast.

I think the Coast Guard has been taken captive by the Department of Homeland Security, been taken hostage. I do not know what is happening, but they are messing up the resources for—in the name of security, and neglecting the purpose of keeping shipping lanes open for the purpose of national economic interests.

Mr. WEAKLEY. And from my perspective, I could not think of a worse law enforcement platform than a tugboat. They are slow. They are a good communication package. They have some seakeeping capability. Certainly not nearly as capable as a patrol boat, an 87-footer, or the new Security Class Cutters.

The Coast Guard has gotten a significant increase in the number of vessels since 9/11, everywhere expect the Great Lakes. I think we are the only area where the number of vessels is decreasing, not increasing. And we also have a security mission on the Great Lakes, where the appropriate platform there is an ice-capable vessel.

Mr. Chairman, I could not agree more with what you said.

Mr. OBERSTAR. Is the Mackinaw a sufficient vessel for icebreaking duty on the Great Lakes?

Mr. WEAKLEY. I have been surprisingly impressed with the capability of the Mackinaw. The Mackinaw cannot do it all. It cannot be in both—in more than one place at one time. And as the skipper of the Mackinaw once said to me, his biggest concern is the health of the 140s.

We have—for the past 3 years, up until this year, I have been saying we have been one casualty away, of the Coast Guard resources, of having a catastrophe. This winter proved exactly what I had been saying, that there are not enough resources, and they are inadequate to maintain shipping lanes.

And if you look at the 30-year time span, this was a normal winter. This was not a bad winter. I fear the day when we have a winter like we did in 2003 or 1993.

Mr. OBERSTAR. Or 1964 or 1968.

Mr. WEAKLEY. Yes, sir.

Mr. OBERSTAR. We may not get back to global climate change, but it seems to me, the glacier makes a return every November and December in the northland. And we need that.

Mr. Chairman, the pressures of moving commodities from the upper lakes to the lower lakes are growing. We are seeing greater shipments, Powder River Basin low-sulfur coal by trainload to the lake head in Duluth and Superior, huge unloading facilities. That commodity has to move to lower lake ports to fuel Detroit Edison, Con Edison, Cleveland.

The iron ore from the northland, from my district and from the Upper Peninsula of Michigan, Mr. Stupak's district, is in ever-increasing demand. For the first time since the 1970s, we are seeing a resurgence in steelmaking.

And I know, Mr. Chairman, you recall when you had Sparrows Point steelmaking in Baltimore, and the shipbuilding in Baltimore. Well, it is coming back in this country. The price is going up.

Shipments of iron ore are increasing in greater amounts. And we need that icebreaking capability. We cannot ship enough ore during the summer, especially with the low water levels on the Great Lakes. And the Corps of Engineers has not been dredging the channels and the harbors, because they have shifted their resources elsewhere.

We had high water on the Great Lakes for the 20-year period from the early 1960s through the mid-1980s. And now, we have the need for dredging on the channels and the harbors, and our taconite ships are making three extra—extra voyages are going out 7,500 tons light—making three extra voyages per vessel, per season. That is thousands and millions of additional dollars in transportation costs to the steel industry, because we do not have the capability on the Lakes.

And in addition to that, we do not have icebreaking sufficiently up there. Our economy is hurting. We just cannot afford that.

So, I think we need to revisit the issue of the smaller-size support icebreaking capability for the Mackinaw on the Great Lakes.

Now, Dr. Bement, our former Chairman, Mr. Young, asked me to raise with you the Arctic regional research vessel that would be homeported in Alaska, operated by the university at Fairbanks. Since your 2009 budget does not include second year funding for the vessel, one wonders why.

And he also asked whether final design review would be completed and approved in time for the balance of those funds to be included in the 2010 fiscal year.

Mr. BEMENT. The current policy of the National Science Board is that projects must complete a final design review before they are submitted for the president's budget. Anything that can be done to accelerate the final design review, of course, would be very advantageous, because timing is not favorable.

On the other hand, there is carryover for the amount of funding in the account. And it would be possible to expend those funds in 2009.

The key thing right now is to be sure that we get a healthy budget for ARRB in the 2010 budget, so that if we are able to procure the long lead items out of the $34 million, and at the same time secure a shipyard and get it scheduled in the shipyard, which is still yet to be determined, now, we would then be able to start construction at a full scale at the beginning of 2010, and go on a 2-year construction schedule and have it ready for deployment in 2012.

And so, that seems to be a reasonable expectation at this point. The main thing is that we have to continue to support the vessel and support the budget for the vessel, and to keep it on the track that we are on now.

Mr. OBERSTAR. Well, thank you. I will be sure Mr. Young gets the transcript of—gets the transcript of your remarks.

I noticed with interest in your submitted testimony, your delivered testimony, use of a contractual arrangement with a Swedish icebreaker for your—is that for the Antarctic operations?

Mr. BEMENT. It is.

Mr. OBERSTAR. What is the shaft horsepower of the vessel? Is it one icebreaker, or more than one?

Mr. BEMENT. The actual specifications for the icebreaker I believe are in my written testimony, but we can provide it for the record.

But generally speaking, the weight and the shaft horsepower for the Oden and POLAR SEA are comparable. The main difference is that the POLAR SEA also has turbine power, so that when they back and ram, they can develop additional horsepower—of course, with adequate amount of fuel, it is very fuel-intensive to do that—to break ice.

Now, the Oden does it a slightly different way. They use water spray lubrication. They bring the nose up on the ice and use the weight of the vessel to crush the ice.

Mr. OBERSTAR. Crush the ice, yes.

Mr. BEMENT. And they can also move their ballast back and forth, so they can rock the ship in order to deal with deep ice. So, it is a different design.

Mr. OBERSTAR. Is there a significant difference in the quality of ice in the Antarctic, the Baltic and the Arctic?

Mr. BEMENT. Well, I am not an ice expert, so I could probably shoot myself in the foot in answering that question. But ice has so many different crystalline forms, that even in any one particular region, depending on the depth, the pressure of the ice, the temperature record, and so forth, the ice is going to be different.

Mr. OBERSTAR. In the Bay of Bothnia, I know that vessels there, shipping encounters ice of 20-, 30-foot thickness or greater.

Mr. BEMENT. Yes.

Mr. OBERSTAR. Sometimes as much as 60-foot thickness. And it is a harder, sharper ice, seafarers tell me, than compared to the Antarctic ice. And the Arctic has also different characteristics.

The Finns built the first nuclear-powered icebreaker. They had to give it to the Soviet Union as war reparations after World War II. And then they continued to build the class of vessels. And they also build a standard, that is non-nuclear vessel, the most powerful of which is the Urho, built at the Wartsila shipyards in Helsinki.

And that had—that has—it is still in operation—65,000 shaft horsepower capability. And they also developed the air skin around the vessel to slip more readily through the ice and the ability to ship 400, 500 tons of water from one side to another, to roll through and crush, as well as break ice.

Did you give any consideration to working with the Finns on——

Mr. BEMENT. Well, let me——

Mr. OBERSTAR. —icebreaking needs?

Mr. BEMENT. Thank you for bringing up that information. It turns out that the Oden was built by the Finns. So, it could be a sister ship to the one you are describing.

Mr. OBERSTAR. Oh. Oh, well, very good. They are the master ship—icebreaker——

Mr. BEMENT. That is right.

Mr. OBERSTAR. —icebreaking ship builders.

Mr. BEMENT. The difference—a major difference between the Oden and the POLAR SEA—and the POLAR STAR, for that matter—is that the Oden can use fresh water for ballast.

The POLAR SEA uses fuel for ballast. That fuel has to come out of our McMurdo stock whenever the Sea or the Star operates in McMurdo, so there is a million gallons. And with the price of fuel, even at the pump, that is $4 million. And you can use your imagination what fuel costs after you get it all the way down to McMurdo.

And that is an incremental cost that we pay to the Coast Guard that is over and above the appropriated funds that we provide them for readiness to serve and for operation and maintenance.

So, that is where the difference really comes in, in using the Oden versus the POLAR SEA or the POLAR STAR.

The other big difference is that, because the Coast Guard icebreakers are military ships and have multiple missions, they have a much larger crew strength. Their manning is about 134 crew, officers and crew, compared with 18 on the Oden.

And it is important to keep in mind that, as a contractor-operated vessel, these people are career icebreakers. They have served for years, so they are highly professional. And that is in comparison with the crew on the POLAR SEA, where the Coast Guard has to spend an enormous amount of time and effort to continually requalify crew, because of the turnover in the manning of the icebreaker.

Now, there are many other differences that make the Oden a very good bet for the taxpayer. First of all, it has much more scientific berthing for scientists, and it also has abundant laboratory space and full instrumentation for oceanographic research. And that is a reason why it is of great interest to us as a science vessel.

So, we not only get the service of the Oden—on a fixed-price basis, incidentally—if anything breaks on that ship, or any maintenance has to be done, or if there are any other operating expenses that were not anticipated, it is all covered under the fixed price, under the contract. We do not have to pay that additional cost.

Mr. OBERSTAR. What you are really saying is, you do not really need to have an NSF-owned icebreaker. It is probably lower cost and more efficient to stay with the current arrangement.

Mr. BEMENT. The current arrangement is a good one, because we are only paying for the time we use. In other words, if it is only in use for 2 months, we only pay for 2 months of the use of the vessel.

That is much better than owning a vessel for a short season down in the Antarctic. And that is a reason why having flexibility to look at various types of icebreaking providers—and in many cases we will have to fall back on the Coast Guard, there is no doubt about it, if the need arises and we cannot get other bidders.

But when we can get other bidders, it is much better than the current arrangement where we have to pay for the entire year, for the vessel, for the maintenance, the crew costs, the operation—I mean, the training of the crew, the readiness to serve—when we are only using it for a relatively short season.

Mr. OBERSTAR. I certainly think, Mr. Chairman, the Coast Guard needs a replacement for the POLAR SEA and the POLAR STAR. I recall when the POLAR SEA was launched—I had just begun my service on the Coast Guard Subcommittee—put out to sea, went up to the ice off Alaska and got stuck.

I actually called the chairman of Wartsila Shipyards, Tankmar Horn, and I said, send out the Urho and rescue our Coast Guard icebreaker. We had a great news story. They did not want to embarrass the Coast Guard.

But I think they need—they, the Coast Guard—need much improved capability. We certainly need better service on the Great Lakes.

I think the research work done in the Antarctic is of critical importance, especially in this era of global climate change. Many people are sticking their head in the snow, thinking it is not with us. It is happening. And we need to know more about the forces at work. And your research initiatives are leading us in that direction.

Mr. BEMENT. Thank you.

Mr. OBERSTAR. Thank you, Mr. Chairman. I need not prolong this—many more questions, as you know I always have. But I think we could—I could suspend there.

Mr. CUMMINGS. Thank you very much, Mr. Chairman.

Ms. Richardson?

Ms. RICHARDSON. Thank you, Mr. Chairman.

I would like to build a little bit upon what our Chairman Oberstar was just referencing, regarding the foreign flag ships.

You know, someone taught me an old saying. They said, if you have to make a decision, do the old-fashioned Ben Franklin, and do a positive and a negative.

And I was just a little curious of why were we supporting really another country's being able to build up their fleet, and have, as Mr. Oberstar has shared, you know, can do it all, when we clearly have a fleet that is not adequate? Why wouldn't we be putting the money into our own fleet?

Mr. BEMENT. Well, I am very sensitive to that point of view. And I do not take any issue with the question. I just do not have a very good answer for it.

Ms. RICHARDSON. Well, I would like to suggest that we may want to consider, when I was referencing the kind of Ben Franklin pros and cons, the contractor idea, you know, sure, you might save a few bucks.

But for me, the plus and minuses for the Coast Guard, number one, we have better security, because from what I understand on our ships, we have more people who are actually on the vessel. And by having the Coast Guard, they are not only doing the icebreaking, but they are taking care of other tasks.

And if we were to pay for those independently, and you include the cost of icebreaking, it actually ends up costing us more.

The second point is jobs—I mean, if we are actually building these.

Third would be a faster response, if we have a national disaster. This gentleman just talked about the fact that, you know, it was said, help is coming.

Well, I have got to tell you. If someone in Finland or Sweden has to choose between their issue and ours, and we have a national disaster, they are going to their home first. They are not coming to us.

And then, the whole building and maintenance of our own fleet. We need to maintain some of our own independence, because God forbid, we do not want to be stuck with having no fleet, or a fleet that is not really appropriate, if we unfortunately come into a time of war. And maybe now we no longer have that relationship, and they are not willing to work with us.

So, Mr. Chairman, I would just like to really push back that, as we consider—and I have been listening to the thoughts of the discussion of the hearing thus far today. It seems like there is a will to have these additional fleets on our end.

But I would just like to really push the point for the reasons that I just gave. We need to be more self-dependent, independent ourselves, and not relying upon some other country to bail us out.

I do not think that that is what America is about. And I do not think, if you had a choice, that would be probably where you would want to go.

Do you have a comment on that?

Mr. BEMENT. Well, I think, again, that is a matter of national policy. And the National Science Foundation is probably the last agency that ought to be involved in those kind of determinations.

Our focus is to carry on frontier science and to do it in the most cost-effective way possible.

And I think you rightly pointed out that the mission space for icebreaking is suddenly expanded. If I look at the Congressional Research Service report, they had five particular missions—five specific missions for icebreaking—and we were bullet number one. But there were four bullets underneath. And those are totally out of the scope of the National Science Foundation.

So, that is the only way I could answer your question. But again, I am very sympathetic to your point of view.

Ms. RICHARDSON. Well, not only sympathetic. We might make a little money, because then we could contract ourselves. That would be a novel idea for us.

Mr. BEMENT. And I might point out, incidentally——

Ms. RICHARDSON. I am sorry?

Mr. BEMENT. And I might point out, incidentally, that the National Science Foundation is not the only federal agency leasing ships from the Swedish.

Ms. RICHARDSON. Oh, I understand.

Mr. BEMENT. The Department of Defense is leasing—they have leased a submarine and they are leasing a merchant vessel from the Swedes to help in their operations in the Middle East.

So, you know, the military in-service sealift command is also involved in leasing vessels from other countries in the world, and——

Ms. RICHARDSON. Sir, I have down to 30 seconds. I did not mean to insinuate that you are not the only agency that is doing it. It is just—it is something I do not particularly happen to agree with, and would prefer to see us doing less of.

Mr. Chairman, would you allow me 30 seconds to hear Mr. Weakley's comments on that question?

Mr. CUMMINGS. Yes.

Ms. RICHARDSON. Thank you, sir.

Mr. WEAKLEY. May I? There is no question, I represent American sailors. I think we have a proud tradition. We have a proud tradition, not just of going to sea, but I think we build the finest ships in the world. I think the U.S. Merchant Marine and our shipbuilding capability won World War II.

I would be happy to take that mission. I think the labor unions that I work with sitting behind me would welcome the opportunity to man those ships. If it is a mission that the Coast Guard cannot handle and it is seen as more of a private sector, we are ready to step up and meet that challenge.

Ms. RICHARDSON. Thank you, sir. Thank you, Mr. Chairman.

Mr. CUMMINGS. Thank you very much.

I am not going to hold you all any longer.

And I was just thinking about, just listening to all of this, though, and I was just saying, we can do better. As a nation, we can do better. And we are going to try to find—figure out, by working with the Coast Guard—trying to figure out how we can increase our capability, so that when—so that we are not in the position that we are in.

And I think a lot of the information that you all have provided us is just extremely valuable. And I think, basically, you have put the—you sounded the alarm that we have problems.

And I think this is our watch, all of ours. And under our watch, I think we can either turn our heads and act like there is not a problem and pass it on to somebody else, or we can try to address it ourselves.

And I think it is our duty and responsibility to try to do that. And so, we will continue to look into this.

But I want to thank you all for your patience. I understand you all have busy schedules. And again, the length of the hearing was just totally out of our control. I try to always be very, very, very aware and understanding of people's schedules. Time is valuable. As I often say, we have one life to live. This is no dress rehearsal. And this is that life. And every second is valuable.

And so, thank you very much. We will have some follow-up questions for you. And this hearing is called to——

Ms. RICHARDSON. Mr. Chairman?

Mr. CUMMINGS. Yes.

Ms. RICHARDSON. I am sorry. Could I make one other point——

Mr. CUMMINGS. Yes.

Ms. RICHARDSON. —that I think was not as clear. I apologize.

Mr. CUMMINGS. Yes.

Ms. RICHARDSON. I did not in any mean want to suggest that I would not want the Coast Guard to continue doing the work. What I was saying is that we could actually get—have a great fleet ourselves and so some work for Finland and Sweden and everybody else. So, I wanted to make sure we kept them in the driver's seat.

Thank you very much, Mr. Chairman.

Mr. CUMMINGS. No, I—and I agree with you. I guess I just have—I have said it many times, that this is a great country. And a lot of our authority has, throughout the world, has come from our moral standing. But it has also come from our innovation.

And I think when we hear all of this, it is just a reminder that we have got to be not only innovative, but we have got to build on what we already know, and not get comfortable, because I think one of the problems is that we are depending more and more upon other nations, I mean, out of necessity. And I understand that.

And one of the things that we have constantly said to the Coast Guard is that we want you to be able to carry out all of your missions. And we have got to get you the resources and the personnel.

In this past budget we increased their personnel by 1,500. There is only, as you well know, only about 41,000 people in the Coast Guard, a little bit over 41,000. So, we are trying to do that.

But again, we have got to shed light on all of these situations where there may be a weak link, because keep in mind, where the weak link is, is where the chain breaks. And so, we do not want any broken chains.

With that, this hearing is called to a close.

[Whereupon, at 6:15 p.m., the Subcommittee was adjourned.]

SUBCOMMITTEE ON COAST GUARD & MARITIME TRANSPORTATION

"Coast Guard Icebreaking"

July 16, 2008 – 2:00 p.m.
Room 2167, Rayburn House Office Building

Statement of Chairman Elijah E. Cummings

The Subcommittee will come to order [GAVEL].

The Subcommittee convenes today to consider our nation's icebreaking needs – as well as the resources available to meet these needs.

We convene at a critical time in history, when the continued use of fossil fuels is contributing to changes in the world's climate that appear in turn to be causing the rapid melting of polar ice

– an occurrence that will likely have significant consequences for the United States and indeed for the world.

I thank Congressman Larsen – who specifically requested that we hold this hearing – for his dedication to ensuring that we are prepared to meet America's interests in the polar regions.

The Coast Guard's icebreaking responsibilities can be divided into two categories: polar icebreaking and icebreaking along domestic waterways – particularly on the Great Lakes and along the East Coast. Today's hearing will examine anticipated needs and current capabilities in both areas.

In the Arctic, the melting of polar ice packs is accelerating to the point that the National Snow and Ice Data Center has reported that by September of this year, the North Pole may briefly be ice free.

The melting of polar ice is a catalyst for what appears to be increasing interest in the creation of new shipping passages – particularly in the

Arctic – as well as a new scramble for the assertion of national control over natural resources.

As shipping traffic increases in the polar regions, the Coast Guard may need to expand its presence to provide many of its traditional services, including search and rescue operations.

Additionally, icebreaking capacity is required to resupply the Antarctic research station McMurdo.

Unfortunately, the Coast Guard currently has more limited polar icebreaking capacity than at any time since World War II.

The service's two heavy icebreakers – the *Polar Star* and the *Polar Sea* – have now both exceeded their intended 30-year service lives. The *Polar Star* has been placed on caretaker status. The *Polar Sea* is scheduled to undergo a major maintenance.

Both vessels will need hundreds of millions of dollars of repairs and upgrades if they are to continue in service.

The Coast Guard's only other polar icebreaker, the cutter *Healy*, was commissioned in 2000 and has many years of service life left.

Unfortunately, the *Healy* does not offer the same icebreaking capabilities as the *Polar Star* or the *Polar Sea.*

In preparation for the opportunities and challenges that will be created by the rapid changes occurring in the polar regions, Congress must take a comprehensive look at our nation's entire range of polar mission needs.

We look forward to the testimony of Admiral Thad Allen, the Commandant of the Coast Guard, regarding the Coast Guard's specific mission priorities in the Arctic and Antarctic.

I note that traditionally, the Coast Guard's polar icebreaking missions have been conducted largely in support of the National Science Foundation – which now pays the *Healy's* operating and maintenance costs.

However, the Foundation has suggested that alternatives not involving the use of military vessels may potentially meet its research needs in a more cost-effective manner.

If that is the case, we must carefully examine whether the United States should build new icebreakers and if, so, what specific purposes they should be built to serve. Further, we must assess how all of the parties that would benefit from the construction of new icebreakers can participate equitably in their capital costs.

The other critical icebreaking missions performed by the Coast Guard involve breaking ice on the Great Lakes and along the East Coast of the United States.

From Maine as far south as the Chesapeake Bay, the Coast Guard relies on 140-foot icebreaking tug boats and coastal and sea-going buoy tenders to conduct icebreaking operations. Put simply, these operations are essential to ensure that the heating fuel that keeps millions of East Coast residents warm in winter reaches them as needed.

Icebreaking on the Great Lakes is currently conducted by the *Mackinaw*, a 240-foot dual purpose buoy tender, two 225-foot buoy tenders, and five 140-foot icebreaking tug boats.

Unfortunately, these vessels do not appear to be providing all needed icebreaking services on the Lakes, across which extensive shipments of coal and other raw materials are moved even in the winter. As a result, during the last winter, several vessels on the Great Lakes suffered ice-related damage.

Today's witnesses include Mr. James Weakley, President of the Lake Carriers' Association, who will speak in more detail about icebreaking needs on the Great Lakes.

Additionally, we will hear from the National Science Foundation and the Arctic Research Commission regarding their specific research support needs as well as the growth being observed in shipping and other activities in the polar regions.

We have joined these three organizations on a single panel in an effort to hear the unique perspectives of the agencies and commercial interests that are in essence “consumers” of the icebreaking services provided by the Coast Guard – and we look forward to their testimony to help inform our understanding of the multiple facets of our nation’s icebreaking needs.

WITH THAT, I RECOGNIZE THE RANKING

MEMBER, MR. LaTOURETTE.

Bart Stupak

STATEMENT OF BART STUPAK
MEMBER OF CONGRESS
BEFORE THE
SUBCOMMITTEE ON COAST GUARD AND MARITIME
JULY 16, 2008

Thank you, Chairman Cummings and Ranking Member LaTourette, for allowing me to testify before the Subcommittee on the importance of ice breaking to Michigan and the Great Lakes region.

The Coast Guard Cutter ACACIA was decommissioned on June 7, 2006, after over 60 years of service to this country. The ACACIA had been stationed in Charlevoix, Michigan, since 1990.

The ACACIA provided essential navigational and search and rescue services in the Northern Great Lakes. She also tended nearly 200 buoys and lighthouses and kept channels open by breaking ice. This work is important for safety as well as for businesses and individuals that rely on the Great Lakes. The community has felt great pride in being the home of the ACACIA, and I have been proud that the cutter has been stationed in my district.

The Great Lakes serve as a main through fare for iron ore to America's steel mills and other cargos to destinations in the United States, Canada, and overseas. During the winter months, 17 million tons of commerce moves through the Great Lakes. Without sufficient cutter presence, these goods will not reach their destination.

Icebreaking operations in the Great Lakes also play an important role for the local community. The residents of Beaver Island relied upon the Coast Guard's icebreaking assets in Charlevoix to assure their safety and support their economy. This year's cold winter showed the need for a cutter presence when Beaver Island again had to make an emergency call to the Coast Guard to break the ice to facilitate a fuel shipment. This is a common occurrence during cold winters.

Also, in March of this year there was a collision in the Mackinaw Straits because there was not sufficient ice breaking capabilities. The American Republic was trapped in the ice, blocking the previously cleared path through the Straits. The Cason J. Calloway attempted to pass by the American Republic, and there was a collision. This incident caused about $1.5 million in damage to these two ships.

When this occurred, the two 140 foot buoy tenders were breaking ice on the St. Mary's River as the Soo Locks has just been opened. The MACKINAW was above the Soo Locks at the time and the third 140 foot buoy tender was not in operation.

It was clear that the Coast Guard had their hands full with ice along the Michigan-Canadian border and did not have the ability to respond to the American Republic. With an additional vessel with ice breaking capabilities, this collision could easily have been avoided.

The Coast Guard's operation in the area has also become increasingly important because the Canadian government has now decommissioned two of its ice breakers without replacing them, increasing the demand on U.S. vessels.

It is important that a new Coast Guard cutter or similar asset be stationed in Charlevoix, Michigan to replace the ACACIA and continue the Coast Guard's long standing presence in the Northern Great Lakes.

In order to facilitate this, I worked closely with Chairman Oberstar to include language in the Coast Guard Authorization Act of 2006. The bill language states that: "The Secretary shall take all necessary measures to ensure that the Coast Guard maintains, at a minimum, its current vessel capacity for carrying out ice breaking in the Arctic and Antarctic, Great Lakes, and New England regions, including the necessary funding for operation and maintenance of such vessels."

This language supports sustained ice breaking vessel capacity in the Great Lakes. However, the Coast Guard has ignored Congressional intent.

I have written the Coast Guard multiple times requesting that they follow Congressional intent. Unfortunately, the Commandant of the Coast Guard, Admiral Thad Allen, continues to insist that the Coast Guard will not follow the requirements within the Fiscal Year 2006 Coast Guard

Authorization bill, leaving Northern Michigan without a replacement for the ACACIA.

While the new 225 foot cutter, the MACKINAW, is stationed in Cheboygan, ice breaking capacity in the Northern Great Lakes has been reduced from two cutters to one, threatening the Coast Guard's ability to meet its operational responsibilities on the Great Lakes. The Coast Guard fleet is down one hull, but the scope of its icebreaking mission is still the same.

I believe the Coast Guard will be unable to provide adequate ice breaking services on the Great Lakes unless an additional icebreaking ship is assigned to the Ninth Coast Guard District. To ensure that commerce on the Great Lakes continues to operate efficiently and efficiently, we must replace the ACACIA with another Coast Guard asset in Charlevoix.

I look forward to continuing my work with the Subcommittee and Chairman Oberstar to ensure that the Coast Guard honors Congressional intent to replace the ACACIA and provide adequate icebreaking services in the Great Lakes. Thank you.

U. S. Department of Homeland Security

United States Coast Guard

Commandant
United States Coast Guard

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DEPARTMENT OF HOMELAND SECURITY

U. S. COAST GUARD

STATEMENT OF

ADMIRAL THAD W. ALLEN
COMMANDANT

ON

COAST GUARD ICEBREAKING

BEFORE THE

SUBCOMMITTEE ON COAST GUARD AND MARITIME TRANSPORTATION

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE

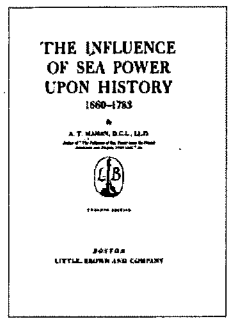
U.S. HOUSE OF REPRESENTATIVES

JULY 16, 2008

Good Afternoon Mr. Chairman and distinguished members of the Subcommittee. It is a pleasure to appear before you today to discuss the Coast Guard's icebreaking program.

STRATEGIC SIGNIFICANCE OF USCG ICEBREAKING CAPABILITY

Captain Alfred Thayer Mahan, President of the Naval War College, unofficial advisor to President Theodore Roosevelt, and author in 1890 of the landmark treatise titled *The Influence of Sea Power Upon History,* framed the importance of strong naval forces and merchant marine capacity to a nation's ability to facilitate and project military, economic, and political strength on its waters and the high seas. The significance of Mahan's strategic view continues to this day and is memorialized in statute (e.g., Jones Act and Cargo Preference Act), regulation (e.g., Federal Acquisition Regulations requirements to assert preference for U.S. flag vessels to move certain government cargo and officials), and policy designed to support and develop the Nation's governmental and commercial maritime capacity. Recognizing the key strategic benefits of a robust and capable U.S. fleet articulated by Mahan and substantiated historically, it is imperative that our Nation maintain its ability to project maritime strength in all environments throughout the world.



Whether on the Great Lakes, the critical waterways of the East Coast or in the harsh operating environments of the Polar Regions, the Coast Guard's icebreaker fleet provides a vital service to the Nation across all safety, security and stewardship missions. The Coast Guard has statutory authority and Executive direction to carry-out icebreaking operations and maintain icebreaking facilities to support multiple missions. Domestically, Coast Guard ice breakers support Federal, state and local agencies, maintain open waterways to ensure the continuous flow of commerce, patrol waterways to enforce our laws and protect critical infrastructure, and are available to assist mariners in distress. Internationally, the Coast Guard's medium and heavy icebreakers primarily operate in support of U.S. research interests in the Arctic and help maintain resupply routes to Antarctica's McMurdo Station.

Changing environmental conditions and advances in technology are expanding activity in the Arctic Region. The potential for access to more efficient shipping routes is fueling demand. Continued growth in commerce, tourism, and exploratory activities in the Arctic is increasing risks to mariners and ecosystems while challenging law enforcement regimes, operational capabilities, and conventional assumptions of sovereignty. The U.S. Coast Guard must be capable of protecting national interests in the Polar Regions. I am committed to ensuring we have the capability, competency and capacity needed to remain responsive to the Nation's domestic and Polar icebreaking needs.

DOMESTIC ICEBREAKING

Ice formation on the Great Lakes and the rivers and harbors of the East Coast would render most vessels inoperable during winter months if not for Coast Guard domestic icebreaking operations. On the Great Lakes, Coast Guard icebreakers provide support that extends the shipping season for transport of critical cargo such as iron ore, coal, and steel. In the Northeast, icebreaking services ensure critical supplies of heating oil are delivered throughout the winter. Moreover, Coast Guard icebreakers break ice jams to help prevent flooding in the Great Lakes, the Northeast, and the Mid-Atlantic.

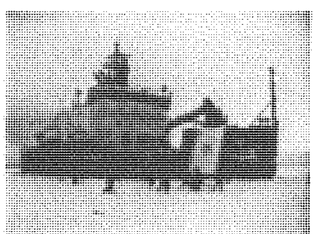
Assets

Domestic icebreaking operations are primarily accomplished by the 240-foot CGC MACKINAW, nine 140-foot icebreaking tugs, and eleven 65-foot small harbor tugs (which are necessary for operation in shallow waterways). The 225-foot seagoing buoy tenders are also used for icebreaking operations, although on a more limited basis. The 175-foot coastal buoy tenders are occasionally employed to conduct icebreaking operations in addition to maintaining aids to navigation.

CGC MACKINAW, five 140-foot icebreaking tugs, and two 225-foot buoy tenders are homeported on the Great Lakes. In addition, there are four 140-foot icebreaking tugs, eleven 65-foot small harbor tugs and three 225-foot buoy tenders homeported in the First and Fifth Districts on the East Coast. With the exception of CGC MACKINAW and the buoy tenders, the 22 vessels comprising the remainder of the domestic icebreaking fleet are at or past their designed service lives. Both the 140-foot icebreaking tugs and the 65-foot small harbor tugs are showing signs of age and wear. We are focusing maintenance projects on critical engineering systems as a bridging strategy until the vessels can be replaced or modernized through an appropriate recapitalization program.

CGC MACKINAW – COMMISSIONED JUNE 2006

The winter of 2007-2008 was the first ice season that the new CGC MACKINAW was fully engaged with icebreaking operations on the Great Lakes. Ice conditions were more severe than in previous years and provided an operating environment suitable to test the ship's icebreaking performance as well as develop icebreaking tactics that maximize the capability of the new propulsion system. CGC MACKINAW exceeded our initial expectations and offers several advantages over the vessel it replaced.



CGC MACKINAW's state-of-the-art "azipod" propulsion system provides excellent maneuverability and greater flexibility in difficult ice conditions. This unprecedented level of agility in ice saves time when assisting beset vessels and when coming about in restricted waterways. In addition to icebreaking, CGC MACKINAW serves as a capable buoy tender. Overall, the acquisition of MACKINAW is a resounding success for the Coast Guard and the American public.

Providing Economic Security

The Great Lakes iron ore, steel and freight transportation industries constitute a considerable economic force, employing some 500,000 people in the region. Approximately 15 million tons of raw materials are shipped on the Great Lakes during the winter. An economic analysis of the Coast Guard's domestic icebreaking mission completed in 2002 by the Center for Naval Analysis concluded that the benefit-cost ratio of the Great Lakes icebreaking mission ranges from 2-to-1 to 4-to-1. During the 2006-2007 ice season, the U.S. Coast Guard and Canadian Coast Guard partnered to facilitate movement of more than $334 million of cargo on the Great Lakes. Beyond benefits to the economies of both countries, other benefits include flood control and other response capabilities including search and rescue.

POLAR ICEBREAKING

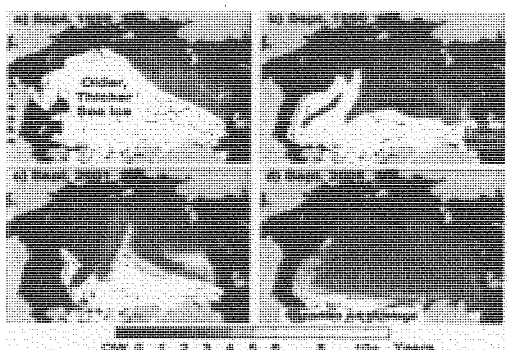
Ice-strengthened vessels work in the Arctic to enable maritime mobility and enforce fisheries and safety laws. These multi-mission vessels also support the Coast Guard's role in national defense and our ability to project U.S. presence to protect national and homeland security interests. Polar-class icebreakers primarily provide support to other agencies for national research and science needs in the Polar Regions. These icebreakers also support the full spectrum of Coast Guard missions while enroute to, and operating in, high-latitude areas.

POLAR SEA in Alaska Enforcing Fisheries and Safety Laws (April 2008)

If climatic conditions enable greater access to the Polar Regions, I expect we may see an increase in human activity, oil and gas exploration, commodity transportation, fishing, and eco-tourism. There are still many risks and technological challenges to overcome before these activities become economically feasible. Eventually, however, each of these activities will require the Coast Guard to have the capability to meet statutory responsibilities involving maritime domain awareness, disaster/humanitarian relief, enforcement of laws and treaties, marine pollution response, search and rescue and national security. Icebreakers or ice-strengthened vessels will be part of that capability.

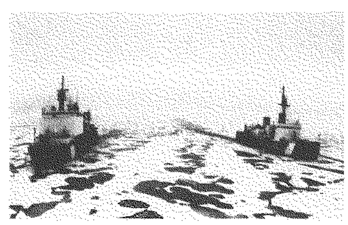
Changing Conditions and Evolving Strategic Needs

The future need for U.S. icebreaking capability is currently under discussion in several interagency forums and will be addressed specifically in the Coast Guard's High Latitude Study, described in the President's 2009 Request. In my personal assessment as Commandant, I believe several factors related to interest in Arctic exploration and development indicate the region will become increasingly more critical to U.S. national security interests in the future:



- Dynamic Movement of Arctic Sea Ice: During the warmer months in the Arctic, greater ice movement may increase danger to shipping owing to unpredictable and dynamic movement of ice. If more ships transit Arctic waters, the need for U.S. icebreaking capability could increase with the dissolution of solid, formerly predictable multi-year ice.
- Energy Security: A significant percentage of the world's energy reserves (i.e., oil, gas, gas hydrates) are estimated to be in the Arctic region and some portion of those reserves are within United States offshore claims. As offshore oil/gas industry infrastructure grows over the next few decades, the United States may need additional maritime presence, possibly including greater icebreaking capability, to help protect national and allied critical infrastructure in these isolated areas.
- U.S. Sovereign Rights: The United States Government needs icebreaking capability to continue to project maritime presence and reinforce U.S. sovereign rights in the Arctic Ocean.
- Prevention and Incident Response: The United States Government must be prepared to address "all threats, all hazards" in the Polar Regions involving safety, security and stewardship. Increased activity will lead to increased threats on many fronts for which we must be prepared to respond. Additional icebreaking capability may be needed.
- Safeguarding our Oceans and Resources: Increased incursions into the U.S. Exclusive Economic Zone (EEZ) will likely occur over an expanded area as ice recedes and fisheries shift northward. Increased ice-strengthened surface presence will be useful to detect and prevent illegal incursions and protect U.S. living marine resources.

Identification and prioritization of U.S. national interests in the Polar Regions will drive development of Administration capability and resource requirements.



Assets

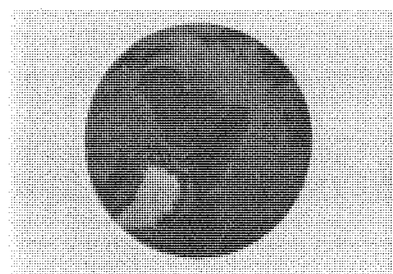
The Coast Guard medium and Polar-class icebreaker fleet consists of the cutters HEALY, POLAR SEA, and POLAR STAR, all homeported in Seattle, Washington. The newest cutter, CGC HEALY, was commissioned in 2000 and conducts annual deployments for Arctic scientific research as a priority. Operational time on CGC HEALY is at a premium and almost exclusively devoted to direct mission tasking of other agencies.

CGC POLAR SEA and CGC POLAR STAR were commissioned in the late 1970s and have reached the end of their designed service lives. CGC POLAR SEA completed an extensive overhaul in 2006 that is expected to extend her service life through 2014. The National Science Foundation (NSF) uses CGC POLAR SEA in a backup capacity for Operation Deep Freeze, the annual resupply of McMurdo Station in Antarctica. In addition, NSF advised the Coast Guard of the likelihood that there would be Arctic science projects for the POLAR SEA in FY 2009. The Coast Guard recently deployed her to the Bering Sea to support law enforcement and conduct ice operations training to preserve minimal levels of competency and currency. CGC POLAR STAR was placed in caretaker status (i.e., lay-up) in 2006 and requires 12 to 18 months lead time and significant overhaul to return to full operational condition.

Funding Arrangement with the National Science Foundation (NSF)
In 2006, the Department of Homeland Security's Appropriations Act transferred the Coast Guard's $47.5 million in budget authority for Polar icebreaking to NSF. Through a Memorandum of Agreement (MOA), NSF later funded a total of $55.2 million in FY 2006 and $52.1 million in FY 2007 for the vessels. The FY 2008 appropriation to NSF is $57.0 million.

While Polar-class icebreakers primarily provide support to NSF and other agency's research missions, the current Coast Guard-NSF MOA gives the Coast Guard a reasonable ability to divert these vessels to search and rescue, oil spill and other missions to respond to emergencies and threats to maritime safety and security. We are working closely with NSF and the Administration to ensure preservation and efficacy of our Nation's critical icebreaking capabilities and competencies. To prepare for the impacts of changing Arctic conditions on multiple agencies and their missions, the Administration has undertaken an Arctic policy review in which the Coast Guard is an active participant.

CONCLUSION
The Coast Guard icebreaking mission, our cutters, and the men and women who operate them are national assets providing a significant service and return on investment for the American public. CGC MACKINAW and CGC HEALY are two of the most technologically-advanced cutters in the Coast Guard and continue to surpass every expectation. Despite these successes, many challenges remain including several of our icebreaking assets reaching their designed service life. *We must keep faith with Mahan's vision and doctrine for the United States to maintain the capacity to project its power at sea*, and I am committed to ensuring the Coast Guard can meet America's icebreaking needs through use of a modern fleet capable of mission success in harsh ice environments at home and abroad.



International Bathymetric Chart of the Arctic Ocean
Courtesy of National Geospatial-Intelligence Agency

Thank you for the opportunity to testify today. I look forward to your questions.

CRM D0005195.A2 / Final
January 2002

U.S. Coast Guard East Coast Domestic Icebreaking: A Capability Assessment

Jonathon D. Mintz

CNA
4825 Mark Center Drive • Alexandria, Virginia 22311-1850

Approved for distribution: January 2002

James R. East
Coordinator of U.S. Coast Guard Program
Advanced Technology and Systems Analysis Division

Contents

Summary

Task

The Director of Operations Capability, Headquarters USCG, asked The CNA Corporation (CNAC) to assess the Coast Guard's capability to perform its domestic icebreaking mission and to determine an optimal force mix.

Approach

To determine the force's icebreaking capability, we developed a mathematical model to calculate how long an icebreaking assignment should take, given the length of the waterway(s) involved, the probable ice thickness, and the capabilities of the vessel(s) used. We then populated the model with the best available data. We ran the model to compute the number of hours required to complete various missions, and compared this result to the number of hours available for each mission, in order to determine whether any resource gaps exist.

Limitations

The limitations of our analyses are mostly due to funding constraints and a lack of data. We believe our methodology is good, but additional resources and data would allow us to further refine and add detail to our conclusions.

Our quantitative assessment is limited to the Coast Guard's East Coast areas. Because of funding constraints, it was necessary to narrow the focus to the areas of greatest concern to our sponsor.

We further limited our analyses to preventative icebreaking (PI). Preventative icebreaking (i.e., track maintenance to support commerce), is mandated by executive order and accounts for 60 to 80 percent of the DOMICE mission in most years.

Our analyses do not include the newer buoy tenders—We did not have sufficient operational data for the WLB(R), the new 225-foot seagoing buoy tender, or for the WLM(R), the new 175-foot coastal buoy tender. We suspect that these data may not yet exist, as these vessels have seldom been used for icebreaking and have not yet been tested under severe winter conditions.

Because of limited resources and data, we made four assumptions in our quantitative analyses (i.e., in order to generate numbers to run our model):

- Icebreaking begins at the mouth of the waterway.
- After icebreaking upriver, the vessel returns downriver at its maximum speed.
- Icebreaking is performed once per day on critical waterways.
- Coast Guard groups that are geographically close can share vessels as needed to perform icebreaking in their areas of responsibility.

Conclusions

Based on our analysis, the Coast Guard will be able to meet its East Coast requirements for the foreseeable future.

- This is largely because there is no specific legal requirement for the level of service that the Coast Guard must provide. The Coast Guard has developed internal standards, but tbese are open to interpretation and appear to be set below what the Coast Guard typically does.
- Recent winters have been relatively mild; it is unknown whether the Coast Guard will be able to provide the same level of service in a severe winter that it has provided over the last several seasons. However, the Coast Guard's standard for service (i.e., the requirement) is lower for severe winters.

There may be a disconnect between Coast Guard standards and customer expectations.

While Coast Guard standards can be interpreted to allow for several days of waterway closings each year, waterways in District 1 are rarely closed because of ice. Customers have become accustomed to that level of service. If severe winter conditions or the unavailability of vessels causes waterways to be closed for several days, customers would be dissatisfied, regardless of whether the Coast Guard met its own standards. It's obvious, but worth noting, that in a severe winter, the demand for home heating oil—and hence, the need to keep the East Coast waterways open—is greater than in a normal winter, not less. Thus, lowering the standards for a severe winter does not make sense from the customer's point of view.

The aging fleet of WYTLs (65-foot small harbor tugs) does much of the icebreaking. It is unknown whether the newer buoy tenders can provide adequate supplemental capability under surge conditions.

- Operational capabilities—The actual operational icebreaking capabilities of the newer buoy tenders (WLB(R) and WLM(R)) are largely unknown.
- Availability—As the newer vessels' primary mission is buoy tending, not icebreaking, there may be problems allocating resources. This is because the same conditions that require more icebreaking (i.e., severe winter weather) also require more aids-to-navigation (ATON) maintenance. Thus, some trade-offs will be necessary; some missions may not be accomplished in as timely a manner as desired.
- Size issues
  - The WLB(R) is safely navigable in only one of District 1's critical waterways that now depend on the WYTL for icebreaking.
  - Because of this, the WLM(R)s—which can safely navigate all but one of these waterways—are more important to the future of icebreaking in District 1 than the WLB(R)s.

The lack of data on the newer buoy tenders limited our optimal force mix analysis. However, our limited analysis suggests:

- One WTGB (140-foot icebreaking tug) can clear as much ice as roughly 3.3 WYTLs in the same time period.
- Optimal use of these icebreakers means using WTGBs wherever possible, and using the smaller WYTLs on those waterways that the WTGBs are too large to safely navigate.
  - — Data indicate that District 1 already does this.

Recommendations

Evaluate service-level standards.

The apparent disconnect between the Coast Guard's service-level standards and customer expectations should be resolved. Otherwise, a conflict is possible if waterways are ever closed for several days—i.e., the level of service won't fall below the Coast Guard standard, but will be low enough to leave customers dissatisfied. Resolving the disconnect means better defining the standards and bringing them more in line with what is currently typically provided and expected.

Develop an analysis of capabilities in severe winter conditions.

Our analyses look at average conditions for the foreseeable future, because that is what the ice thickness data reflect. Severe winters represent a "surge"; any capability shortfalls will be more apparent at that time. An analysis that focuses on severe winter conditions with appropriate ice thickness probability distributions for each critical waterway would be helpful in predicting potential shortfalls.

Use the mathematical model we developed as a tool for answering questions about capability and force mix—but first, replace assumptions in the model with real data.

In particular, these data should include:

- Actual icebreaking lengths—for our calculations, we assumed that each waterway freezes from its mouth upriver. This is rarely the case, and provides an overestimate of the amount of ice-breaking required.

- How often waterways should be cleared—we assumed that each critical waterway needs to be cleared every day in which it is impassable to commercial traffic; we are not sure whether this is true for all of them.
- Real operational data for WLM(R) and WLB(R), so that all available vessels can be included in the analyses.

Introduction

Task

The Director of Operations Capability, Headquarters USCG, asked CNAC to assess the Coast Guard's capability to perform its domestic icebreaking mission and to determine an optimal force mix.

Background

By executive order [1], the Coast Guard performs icebreaking on domestic waterways of commercial importance along the East Coast (Districts 1 and 5) and on the Great Lakes (District 9). This is done to keep certain shipping routes and ports open during the parts of winter when they would otherwise be impassable by commercial vessels. The Coast Guard also responds to vessel operators' requests for assistance when they are disabled or stranded in ice-covered waters. In response to specific requests from the Army Corps of Engineers, the Coast Guard also breaks ice to control flooding caused by ice jams during the spring thaw.

The Coast Guard uses the following ship classes in its East Coast icebreaking operations: WTGB (140-foot icebreaking tugs), WYTL (65-foot small harbor tugs), WLB(R) (225-foot seagoing buoy tenders), and WLM(R) (175-foot coastal buoy tenders).[1] Icebreaking is a primary mission for the WTGBs and WYTLs. The other vessels perform icebreaking as a secondary mission, or in support of aids to navigation (ATON) work (which is their primary mission).

1. One WLI (65-foot inland buoy tender), *Chokeberry*, was used infrequently for icebreaking before it was decommissioned in 2000. While another WLI (*Blackberry*) remains in District 5, we did not consider it part of the icebreaking fleet, as it has never been used for that purpose and likely never will be.

The WYTLs do much of the icebreaking in the Northeast. The 11 WYTLs in the fleet have served an average of 36 years, and have had numerous mechanical breakdowns over the past few years. In the past, it was proposed that these vessels be decommissioned (presumably other vessels would be used to do the icebreaking). This was rejected because of the concern that the loss of the WYTLs would prevent the Coast Guard from fulfilling all of its icebreaking requirements. Current proposed options include giving the WYTLs a service life extension, or replacing them with vessels that have similar icebreaking capabilities.

Approach

To get an initial sense of the icebreaking mission, we first visited field units and deployed on a WTGB during an icebreaking mission. We met with a representative from the Army Corps of Engineers (ACOE) to learn about the impact of the DOMICE mission from its perspective.

To determine the force's icebreaking capability, we developed a mathematical model to calculate how long an icebreaking assignment should take, given the length of the waterway(s) involved, the probable ice thickness, and the capabilities of the vessel(s) used. We then populated the model with the best available data. We ran the model to compute the number of hours required to complete various missions, and compared the results to the number of hours available for each mission, in order to determine whether any resource gaps exist.

Data sources

Our analysis required that we have data for

- Lengths of commercially important waterways
- Probabilities of ice thicknesses along these waterways, and
- Icebreaking capabilities of the vessels available for use on these waterways.

We derived waterway lengths by using Capn Voyager software,[2] which contains integrated nautical charts. We plotted a middle-of-the-channel course along each waterway, using the starting and stopping points found in the East Coast mission analysis report (ECMAR) [2]. The software returned the distance of the course.

We derived ice thickness probabilities from predictions given in [2], which projects, for each waterway, what percentage of years a given ice thickness will be exceeded, and what its average duration will be during those years. We converted these predictions to sets of probabilities that discrete ice thicknesses will occur on any random future winter day.

We derived functions to describe the icebreaking capabilities of WTGBs from operational data in [3]. We derived similar functions for the WYTLs using operational data obtained from phone interviews with shipboard personnel.

Limitations and assumptions

Limitations

Our quantitative assessment is limited to the Coast Guard's East Coast areas. Because of funding constraints, it was necessary to narrow the focus to the areas of greatest concern to our sponsor.

We further limited our analyses to preventative icebreaking (PI). Preventative icebreaking (i.e., track maintenance to support commerce), is mandated by executive order [1] and accounts for 60 to 80 percent of the DOMICE mission in most years. The other types of icebreaking noted in district ice reports are direct assistance to vessels (DA), flood control (FC), and miscellaneous (MISC).

Our analyses do not include WLB(R) and WLM(R)—We did not have sufficient operational data for the newer buoy tenders. We suspect that

2. Capn Voyager is an electronic nautical charting system that is used by the Coast Guard. It is published by Nautical Technologies, Bangor, Maine. www.thecapn.com

these data may not yet exist, as these vessels have seldom been used for icebreaking and have not yet been tested under severe winter conditions.

Our analyses do not account for vessels' "back-and-ram" capability—Our quantitative analyses was based on each vessel's *continuous* speed through ice of different thicknesses.

Assumptions

Because of limited resources and data, we made several assumptions in our quantitative analyses. We describe these here, and discuss how they potentially affect our findings. Note that correcting or verifying these assumptions would strengthen our model, and thus help to answer questions about capability and force mix more accurately.

Icebreaking begins at the mouth of the waterway. This is rarely the case, because ice usually starts forming well upriver of the mouth. This assumption overestimates the requirement for each river.

After icebreaking upriver, the vessel returns downriver at its maximum speed. To calculate the length of time it takes to break ice upriver, we used the maximum theoretical speed that each vessel can move through ice of various thicknesses. Similarly, to calculate the length of time for the return trip downriver, we used each vessel's maximum speed (i.e., while travelling through a cleared channel). However, this overestimates the capability to some degree, because these vessels rarely travel at their maximum speed due to concerns over fuel consumption, the potential damage to shoreline structures, and the increased risks of damage from floating ice. The vessel may at times reach close to maximum speed on the return trip, particularly when its wake is being used to break additional ice through the broken channel, but its actual speed on the return trip probably lies somewhere between its speed with minimal ice cover and its maximum speed.

On critical waterways, icebreaking is performed once per day (when there is sufficient ice cover to be impassable to commercial traffic). This is based on discussions with shipboard personnel working on the Connecticut, Hudson, and Penobscot rivers. We assumed that this procedure is used for the other critical waterways. If preventative icebreaking is routinely performed more than once per day, we have underestimated the requirement.

To clear the Port of Providence, it is necessary to clear the closest 1.5 n.mi. of the Providence River. The Port of Providence is noted as a critical waterway in District 1's most recent ice operations report. However, ECMAR does not list starting and stopping points for this waterway, so we assumed that keeping the port clear means clearing the final stretch of the Providence River. This either overestimates or underestimates the requirement somewhat, depending on whether our assumption of 1.5 n.mi. is too large or too small.

Coast Guard groups that are geographically close can share vessels as needed to perform icebreaking in their areas of responsibility—For part of the analyses we assumed that Group Portland can share vessels with Group Southwest Harbor. Likewise, we assumed that Groups LI Sound, Boston, and Woods Hole can share vessels. These assumptions are based on information in the East Coast mission analysis report.[3] They probably overestimate the capability, because not all available vessels in one group will always be readily available to the other groups that are geographically close to it.

Organization of this report

We first define the requirements for East Coast icebreaking, in terms of the waterways that need to be cleared and the ice that is likely to be on them. We then determine the icebreaking capabilities of Districts 1 and 5, in terms of vessels in their fleets and the operational capabilities of those vessels. Finally, we quantitatively compare icebreaking capabilities with requirements.

3. Table 1-6 of ECMAR lists cutters available to perform icebreaking for each waterway. Cutters listed as available for a particular waterway often fall under different Coast Guard groups. For example, the cutters available to work on the Penobscot River include ships from Group Portland and Group Southwest Harbor.

Domestic icebreaking requirements

Legal requirements

The legal requirements for preventative icebreaking (PI) to support commerce consist of a presidential executive order, followed by Coast Guard instructions.

Executive Order 7521 of December 1936 [1] first directed the Coast Guard to perform icebreaking to meet "the reasonable demands of commerce."

Reference [4], Coast Guard Instruction 16151.1C, outlines the three Coast Guard missions can involve domestic icebreaking: search and rescue, flood control, and facilitation of navigation. For facilitation of navigation, the policy is to conduct icebreaking on critical waterways that are normally open to navigation in the winter. For those critical waterways that are normally impassable in the winter without ice-breaker assistance, the Coast Guard policy is to "continue to meet the reasonable needs of commerce as in the past," but vessel owners and operators are encouraged to use vessels that are capable of navigating ice-covered waterways without assistance.

Instruction 16151.1D (currently in draft) adds standards for icebreaking—e.g., how many closed waterway days are acceptable. Currently, each district decides what it should do. For example, the First Coast Guard District icebreaking instruction [5] specifies waterways that are to be kept clear to facilitate navigation.

Customer expectations

The amount of PI that is done is largely customer driven, not legally mandated. Waterways that are considered critical for commerce are regularly cleared of ice, so that barges carrying home heating oil, for instance, can reach their destinations.

Because the Coast Guard has conducted icebreaking operations, free of charge, for almost 70 years, no economically viable commercial alternative has been developed.

Quantifying the requirements

To project whether the Coast Guard can continue to meet its requirements, we first sought to describe the requirements mathematically. From the customer's point of view, certain waterways need to be cleared when they are impassable because of ice. Thus, the requirements are simply the waterways that need to be cleared and the frequency with whicb they need to be cleared. From the Coast Guard's point of view, in considering the capability needed, the requirements are further defined by the lengths of each of these waterways (specifically the distance traversed by the icebreaking vessels), and the thickness of ice that is covering them.

The East Coast mission analysis report (ECMAR [2]) lists 116 East Coast waterways on which the Coast Guard has conducted icebreaking. Of these, 39 are listed as "most important" in terms of various measures of impact that would result if icebreaking were not done.[4] Below, we describe how we derived the lengths of these waterways, and the probabilities that they will be covered with ice of various thicknesses.

Waterway length

We derived the lengths of these waterways using Capn Voyager software, which contains integrated nautical charts. ECMAR lists "starting" and "stopping" points for waterway dimension measurements, denoted as channel marker light list numbers (LLNRs). The starting point is usually at the mouth of the waterway, and the stopping point, according to ECMAR, is the point beyond which no icebreaking is done. For each waterway, we found these points on the digital nautical charts, and plotted a middle-of-the-channel course between them.

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4. ECMAR alternately refers to these as the "most critical" waterways. To avoid confusion with District 1's eight critical waterways, which we address later in the report, we henceforth refer to these 39 as "most important" waterways.

The software then returned the distance of the plotted course.[5] The distances and other dimensions for each of the 39 important waterways are listed in appendix A.

Ice thickness probabilities

According to a survey conducted for [2], commercial customers can transit up to 4 inches of ice (on average) without assistance. When the ice thickness exceeds that on a waterway and commercial passage is desired, icebreaking is necessary.

ECMAR gives ice thickness predictions for each waterway, in terms of the percentage of years in which a given ice thickness will be exceeded, and the average duration of that condition during those years. Table 1 shows an example of these predictions for the Penobscot River, Maine.

Table 1. Ice thickness predictions for the Penobscot River from ECMAR, appendix IV

Ice thickness (in)	% of years occurring[a]	Average duration (days)[b]
4	100	100
6	100	98
9	100	91
12	100	83
14	100	77
16	100	70
18	98	62
20	91	55
22	78	50
24	62	41
26	44	33
28	20	29
30	2	50
32	2	29
34	0	0

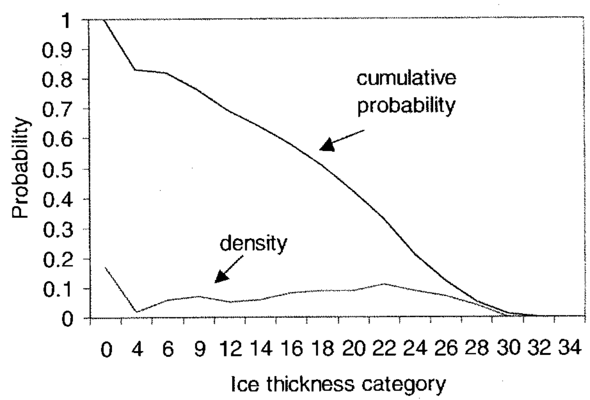
a. The percentage of years in which the thickness in the first column will be exceeded.
b. The duration of the condition during the years that it occurs.

5. Note that waterways are rarely covered with ice at the mouth, so the resulting measurement is an overestimate of the actual length on which icebreaking must be done.

For each waterway, we converted these ECMAR predictions into a set of ice thickness probabilities—in discrete categories of thickness—for any random future winter day.[6] These probabilities are acknowledged as being based on fairly weak data (this is explained in great detail in [2]). The data, however, were the best that we had available.

Figure 1 illustrates the ice thickness probability distribution for the Penobscot River. Appendix B describes the calculations used and gives calculated probabilities for all 39 of the most important East Coast waterways.

Figure 1. Ice thickness probability distribution for the Penobscot River[a]



a. The ice thickness categories are as follows: "0" = 0 to 4 inches of ice; "4" = greater than 4, but less than or equal to 6 inches of ice; 6 = greater than 6, but less than or equal to 9 inches of ice, etc.

6. ECMAR defines the winter season as lasting 120 days, running from the beginning of December to the end of March. Leap years have 121 days from 1 December to 31 March, but we used 120 days for our calculations.

Calculating icebreaking requirements

According to shipboard personnel that we spoke to, the Connecticut, Hudson, and Penobscot rivers are cleared daily during the winter to enable commerce to navigate. Assuming that a waterway which is impassable to commercial traffic must be cleared once each day, the icebreaking requirement for that waterway is a combination of its length and the thickness of the ice that is covering it. As demonstrated in appendix B, the Penobscot River, for example, will require icebreaking 83 percent of the time or 100 days of the 120-day winter season, on average.[7] For those 100 days, icebreakers will need to break ice ranging from just over 4 inches to 32 inches thick (according to the ice thickness predictions), over the 21 nautical miles (n.mi.) of the Penobscot River.

The amount of vessel time required to do this depends on the capabilities of the vessels doing the work. We address vessel capability in the next section.

7. Seventeen percent of the time (or 20 days out of the 120-day winter season) the ice will not exceed 4 inches, and will thus be navigable by most customer vessels (see figure 1, or appendix B).

Domestic icebreaking capabilities

Vessels available

Vessels used for icebreaking on the East Coast fall into two categories: icebreaking tugs (WTGB and WYTL), for which icebreaking is a primary mission; and buoy tenders (WLB(R) and WLM(R)), for which icebreaking is a secondary mission. The dimensions of these vessels and numbers of them homeported in District 1 (D1—Maine to Shrewsbury River, New Jersey) and District 5 (D5—rest of New Jersey to North Carolina) are shown in table 2.

Vessel operational capabilities

For icebreaking purposes, the operational capability of a vessel is the speed at which it can traverse ice of different thicknesses. We have fairly good data for the WTGB (from [3])[8] and WYTL (from [7]). We have very limited data for the WLB(R)s and WLM(R)s; these have been in use for only two seasons, so their capabilities are largely unknown.[9] The available data are plotted in figure 2. Resulting least-squares curves for the WTGB and WYTL are described in appendix C.

8. The Volpe study [3] gives operational data for both brash ice and plate ice. According to the shipboard personnel we spoke to, brash ice—previously broken ice that has refrozen together—is the type most commonly encountered on the East Coast. So for the WTGB, we used the data given for brash ice. Note also that the Volpe study concerned icebreaking on the Great Lakes. According to [6], because freshwater ice is harder to break than saltwater ice, a WTGB conducting icebreaking operations on the East Coast waterways (many of which have at least some saltwater) should perform better than predicted by the Volpe study.

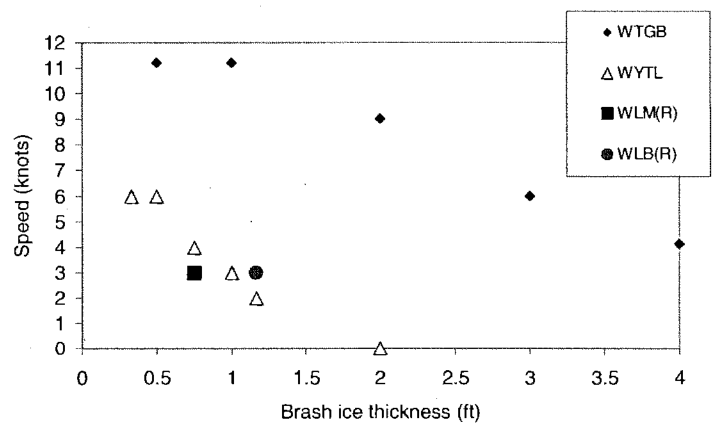
9. These were designed to duplicate the capabilities of their predecessors, the WLB and WLM, respectively [6]. However, we have no icebreaking operational capability data for these vessels either.

Table 2. Icebreaking vessels homeported on the East Coast

Icebreakers	Length (ft)	Nav. draft (ft)	Masthead height (ft)	Min. channel width (ft)	# in D1	# in D5
WTGB	140	18	73	150	3	0
WYTL	65	10	32	50	8	3
Buoy tenders[a]						
WLB(R)	225	20	84	200	2	1
WLM(R)	175	12	61	100	4	3

a. These vessels have icebreaking capability, but icebreaking is not a primary mission for them. In addition to those listed here, there are also two WLM(R)s and one WLB(R) homeported in District 7 that could be deployed to either D1 or D5 to help with icebreaking missions during severe winters.

Figure 2. Operational capabilities of ice-capable vessels



Vessel availability

Although the vessels might be operationally capable of breaking ice at a particular rate, they might not be available to do so. By instruction, the number of cutter employment hours is limited to 1,800 per year for each WTGB and 700 per year for each WYTL [8]. Also, each of the vessels has other missions; not even the vessels for which icebreaking is a primary mission will be able to spend all of their available time on PI, because ice-related search and rescue and flood control will take precedence, if needed. Thus, any discussion of capability must incorporate the availability of the vessels.

The question is: How much time is available for PI? Specifically, what portion of each cutter's employment hours can be spent on the DOMICE mission? And what portion of its DOMICE time can be spent on PI?

We have data for hours spent on DOMICE, and PI specifically, for the primary icebreakers (WTGB and WYTL) for the last several years. We can compare these data to the available number of cutter employment hours [8], to give us an approximate average availability for the foreseeable future. Unfortunately, we do not have similar data for the other vessels.

DOMICE as part of each cutter's overall mission

Table 3 shows the per-cutter hours used for DOMICE for the past nine seasons, compiled from annual district ice reports. These range from 5 percent to 29 percent of overall cutter hours for the year, and this percentage is necessarily higher in the more severe winters. As icebreaking is the primary mission for the WTGB and WYTL, and our data show that usage has reached as high as 29 percent, we will assume for our calculations that up to 29 percent of cutter hours may be used for icebreaking in any given year (all of which will be used during the 120-day winter season). This converts to 522 available hours per WTGB (.29 * 1,800) and 203 hours per WYTL (.29 * 700) per season.

Preventative icebreaking (PI) as part of each cutter's overall mission

While the number of hours spent on PI will necessarily increase in severe winters, the *percentage* of PI relative to overall hours spent breaking ice *decreases* in more severe winters. This is because more icebreaking is required for reactive or emergency purposes, such as direct assistance to stuck vessels and flood control. Since the percentage of PI to overall icebreaking hours will vary from year to year, we will use the median over the last 10 years for each class (see table 4).

For the WTGB, that's 83 percent, and for the WYTL, it's 63 percent. Therefore, the number of annual hours available for PI is 433.3 for each WTGB (522 DOMICE hours * .83), and 127.9 for each WYTL (203 DOMICE hours * .63). The hours available for vessels home-ported in Districts 1 and 5 are shown in table 5. (Data on these vessels are given in appendix D.)

Table 3. D1 asset usage for DOMICE mission

Season	WTGB DOMICE hr per cutter	% of available hr (1,800)[a]	WYTL DOMICE hr per cutter	% of available hr (700)[b]
1992/1993	168.7	9	105.3	15
1993/1994[c]	416.0	23	176.4	25
1994/1995	92.3	5	48.5	7
1995/1996	302.8	17	127.2	18
1996/1997	136.7	8	60.1	9
1997/1998[c]	134.7	8	35.7	5
1998/1999	135.7	8	100.2	14
1999/2000	228.3	13	203.5	29
2000/2001	240.0	13	155.0	22

a. According to ECMAR, WTGBs on the East Coast (Districts 1, 5, and 7) actually averaged 1,869 total hours per year from 1986 to 1995.
b. According to ECMAR, WYTLs on the East Coast actually averaged 861 total hours per year from 1986 to 1995.
c. We did not have a district ice report for this season, so we used other data supplied by Coast Guard headquarters.

Table 4. Part of DOMICE mission that is PI (covered by model)

	WTGB PI hours per cutter	% of DOMICE that is PI	WYTL PI hr per cutter	%PI
1992/1993	141.7	84	85.6	81
1993/1994	n/a	n/a	n/a	n/a
1994/1995	77.0	83	29.8	61
1995/1996	226.7	75	73.0	57
1996/1997	123.0	90	49.3	82
1997/1998	n/a	n/a	n/a	n/a
1998/1999	125.7	93	94.0	94
1999/2000	178.3	78	80.2	39
2000/2001	186.3	78	97.8	63

Table 5. The East Coast icebreaking fleet (Districts 1 and 5), and numbers of available hours

Class	No. of vessels	No. of annual cutter employment hours[a]	No. of DOMICE hours	No. of PI hours
WTGB	3	5,400	1,566[b]	1,299.8[c]
WYTL	11	7,700	2,233[d]	1,406.8[e]
WLB(R)	3	n/a[f]	n/a[f]	n/a[f]
WLM(R)	7	n/a[f]	n/a[f]	n/a[f]

a. Annual cutter employment hours as dictated by instruction [8] (WTGB: 1,800; WYTL: 700) * number of vessels.
b. Number of WTGBs * 1,800 * .29.
c. Number of WTGBs * 1,800 * .29 *.83.
d. Number of WYTLs * 700 * .29.
e. Number of WYTLs * 700 * .29 * .63.
f. No data available.

The next section compares capabilities with requirements.

Quantitative comparison of capabilities and requirements

In the previous sections, we reviewed the Coast Guard's icebreaking requirements and capabilities. To compare them quantitatively (i.e., to determine whether the current force mix is theoretically sufficient to meet the current requirements), we built a mathematical model incorporating the available data.

Our model quantifies the icebreaking capability of a given force mix over a given waterway (or given waterways). The model incorporates:

- Lengths (n.mi.) of the waterways on which icebreaking is done, derived as described earlier, and listed in appendix A.
- Ice thickness probabilities for waterways on which icebreaking is done, derived as described earlier, and listed in appendix B.
- The operational capabilities of the WTGB and WYTL, in terms of the speed (knots) at which they can continuously traverse ice of different thicknesses. Equations describing these are derived from the data illustrated in figure 2, and these are explained in appendix C.

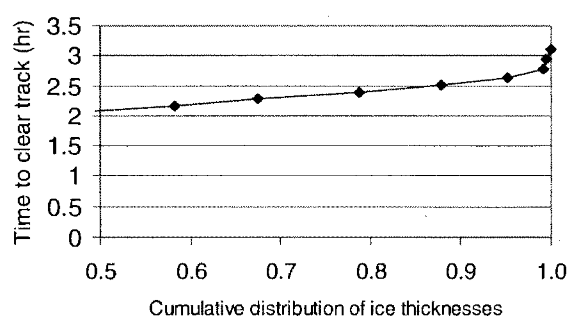
To run the model, the user inputs the "requirement" in terms of either the waterway(s) that need to be cleared or the distance (n.mi.) to be covered, and the desired number of ships of each class type to do the icebreaking. The model returns the number of hours this assignment will take; this is given as a probability distribution that reflects the probability of encountering different ice thickness conditions. Note that this is icebreaking time only, for a single trip upriver, between the "starting point" and "stopping point" given in [2]; transit time is not included. An example of the output, for the Penobscot River using a single WTGB, is given in table 6 and illustrated in figure 3.

Table 6. Model output for Penobscot River, using a single WTGB.

Thickness category	Cumulative distribution[a]	Time (hr)
0	0.17	0.00
4	0.18	1.88
6	0.24	1.88
9	0.31	1.88
12	0.36	1.88
14	0.42	1.98
16	0.49	2.07
18	0.58	2.17
20	0.68	2.28
22	0.79	2.39
24	0.88	2.51
26	0.95	2.64
28	0.99	2.79
30	1.00	2.94
32	1.00	3.10
34	1.00	

a. The cumulative distribution shows the probability that the waterway will be covered by the given ice thickness or less. In this example, 95% of the time (i.e., where the cumulative distribution = .95), ice thickness will fall into the "26" category or less (i.e., the thickness of the ice will be 28" or less).

Figure 3. Illustrated model output for the Penobscot River



District 1 critical waterways and vessels available

According to the 2001 District 1 ice report [9], the critical waterways in that district are the Connecticut, Hudson, Penobscot, Piscataqua, and Thames rivers, the Port of New Haven, the Port of Providence,[10] and Cape Cod Canal.[11]

Table 7 shows the Coast Guard groups responsible for these waterways, and the icebreaking vessels available to them. We combined groups that are close enough to each other to routinely share vessels.

Table 7. Coast Guard groups (combined according to proximity), critical waterways in their areas of responsibility (AORs), and vessels homeported in their areas

D1 Coast Guard groups	Waterways in AOR	WTGB	WYTL	WLB(R)	WLM(R)
Groups Portland and SW Harbor	Penobscot River Piscataqua River	1	3	0	2
Groups LI Sound, Boston, and Woods Hole	Connecticut River Thames River Port of Providence New Haven Harbor Cape Cod Canal	0	2	2	1
Activities NY	Hudson River (Upper, Middle, and Lower)	2	3	0	1

Table 8 shows the dimensions for each of the waterways, and usable available vessel types. "Usable" refers to those classes that do not exceed the dimensions of the waterway. For example, a WLB(R) is available in the Connecticut River area (Group Long Island Sound), but the navigational draft of that vessel is 20 feet, and the Connecticut

10. The Port of Providence is not listed in ECMAR, so we assumed that keeping it clear requires clearing the last 1.5-n.mi. stretch of the Providence River.

11. We don't count the Kennebec River here, because it is considered critical due to its potential for flooding from ice jams, not for its importance to commercial traffic.

River has a minimum depth of 15 feet. WLB(R)s are also excluded by the Connecticut River's height restriction of 65 feet, since their mast height is 84 feet.

Table 8. Critical waterway dimensions and usable vessel types

Waterway	Length (n.mi.)	Min. depth (ft)	Min. width (ft)	Height restriction (ft)	Usable available types
Penobscot River	21	17	600	135	WTGB, WYTL, WLM(R)
Connecticut River	47.3	15	200	65	WYTL, WLM(R)
Upper Hudson River	21	32	400	135	WTGB, WYTL, WLM(R)
Middle Hudson River	43.6	32	400	135	WTGB, WYTL, WLM(R)
Lower Hudson River	57.9	26	750	150	WTGB, WYTL, WLM(R)
New Haven Harbor	4.2	16	400	N/A	WYTL, WLM(R)
Thames River	14.1	20	250	75	WYTL, WLM(R)
Port of Providence	12.6	20	600	N/A	WYTL, WLM(R)
Cape Cod Canal	7.5	32	480	135	WYTL, WLB(R), WLM(R)
Piscataqua River	0.6	31	400	35	WYTL

Number of icebreaking hours required

For each of the waterways, we ran the model using the best available vessel. The only transit time we accounted for was the return time, i.e., the time it would take for the vessel to return to the mouth of the waterway after icebreaking. We calculated this by dividing the length of the waterway by the vessel's maximum speed.[12]

Table 9 shows the predicted required amounts of time (icebreaking from mouth to end + return time) under 90 percent of conditions,[13] and under the worst predicted conditions. For example, on

12. According to the Coast Guard's web site, the WTGB's maximum speed is 14.7 knots. The WYTL's maximum speed is 10.5 knots.

13. Coast Guard instruction 16151.1D (in draft) uses 90% as an acceptable standard of service for enabling commerce during normal winters (i.e., provide sufficient icebreaking so that commerce can transit ice-covered waters 90% of the time).

90 percent of days, a WTGB can clear the Penobscot River in 3.9 hours or less. Under the worst predicted conditions (i.e., the greatest predicted thickness from the mouth of the river through to the end), it will take 4.4 hours.

Table 9. Predicted times to complete icebreaking assignments

Waterway	Best available vessel	Approx. 90% time (hr)	Approx. worst case time (hr)
Penobscot River	WTGB	3.9	4.4
Connecticut River	WYTL	15.5	23.9
Upper Hudson River	WTGB	3.7	4.0
Middle Hudson River	WTGB	7.4	8.0
Lower Hudson River	WTGB	9.1	9.1
New Haven Harbor	WYTL	0.9	1.1
Thames River	WYTL	4.7	7.1
Port of Providence	WYTL	0.5	0.8
Cape Cod Canal	WYTL	2.2	3.8
Piscataqua River	WYTL	0.4	0.6

Over an average season

The winter season runs from the beginning of December through the end of March. To calculate icebreaking hours required over an entire season (120 days), we first calculated a weighted average time,[14] and multiplied it by 120. We then added the sum of the return times for those days when icebreaking is required.

Table 10 shows the total time required, according to our model, for an entire season of preventative icebreaking on each of D1's critical waterways, using the best available vessel (WTGB if available, otherwise WYTL) for that waterway. We did not include WLB(R) or WLM(R) in this analysis, since there are not enough data to derive equations to describe their capabilities under different ice

14. None of the critical waterways is predicted to have sufficient ice (> 4 inches) to require icebreaking every day of the season. For those days when icebreaking is not done, we counted that as an assignment completed in 0 hours.

thicknesses (as we did for the WTGB and WYTL, as explained in appendix C).[15]

Table 10. Total hours required for each waterway oven an average season[a]

	Best available vessel	Weighted avg time	Return time (hrs)	Days requiring icebreaking	Total time (PI) required for season (hrs)[b]
Penobscot River	WTGB	1.9	1.4	99.6	365.5
Connecticut River	WYTL	4.6	4.5	51.6	779.6
Upper Hudson River	WTGB	1.7	1.4	97.2	345.3
Middle Hudson River	WTGB	2.8	3.0	81.6	576.8
Lower Hudson River	WTGB	0.7	3.9	16.8	152.6
New Haven Harbor	WYTL	0.1	0.4	21.6	24.2
Thames River	WYTL	1.4	1.3	51.6	232.5
Port of Providence	WYTL	0.1	0.1	51.6	24.2
Cape Cod Canal	WYTL	0.6	0.7	48.0	110.9
Piscataqua River	WYTL	0.1	0.1	81.6	20.6

a. Transit time is not included, but icebreaking is assumed to start at mouth of river.
b. Numbers in previous columns are rounded to one decimal place for display purposes, so calculations using them will not necessarily produce the numbers shown in this column.

Are the required numbers of hours available?

As discussed earlier, preventative icebreaking is a subset of the DOMICE mission, which is a subset of the Coast Guard's work. Given that each cutter in District I does other types of icebreaking and other missions, how many hours does that (theoretically) leave for preventative icebreaking? Table 11 shows the Coast Guard groups combined as in table 7, with the required PI hours summed from table 10.

For the most part, the calculated numbers of hours required for each grouping are fairly consistent with the theoretical numbers of hours available, with the exception of the grouping of Coast Guard Groups Long Island Sound, Boston, and Woods Hole—in that case, there are five times as many hours required as hours available. This result does

15. Figure 2 shows the available data for the WLB(R) and WLM(R) (one data point for each).

not reflect reality; in the last two ice seasons, these waterways have had a total of 95 hours of PI [9, 10]. This overestimate is probably because the *waterway* length used in our calculations may not accurately reflect the actual *icebreaking* length for one or more of these waterways (i.e., ice may begin forming far upriver from the mouth).[16] Note that the available numbers of hours do not include those of the ice-capable buoy tenders homeported in District 1 (four WLM(R)s and two WLB(R)s); we are not sure how often these have been used for PI.[17]

Table 11. Predicted average season, using theoretical number of PI hours available (rounded to nearest whole hour)

	WTGB hours required	Approx. WTGB hours available[a]	WYTL hours required	Approx. WYTL hours available[b]
Groups Portland & SW Harbor —Penobscot and Piscataqua rivers —1 WTGBs, 3 WYTLs	366	433.3	21	383.7
Groups LI Sound, Boston, & Woods Hole —Connecticut and Thames Rivers, Port of Providence, New Haven Harbor, and Cape Cod Canal —2 WYTL's	0	0	1,171	255.8
Activities NY —Lower, Middle, and Upper Hudson River —2 WTGBs, 3 WYTLs	1,075	866.5	0	383.7

a. Number of WTGBs * 1800 * .29 * .83
b. Number of WYTLs * 700 * .29 * .63

Predicting an optimal force mix

This portion of the study was limited, because some data were unavailable—specifically operational capability information for the WLB(R) and WLM(R).

16. This may be the case for the Connecticut River, which is roughly 47 n.mi. long; icebreaking length may be only a fraction of that.

17. Data received from Coast Guard headquarters list CGC *Juniper*, a WLB(R), as having logged 34 icebreaking hours in calendar year 2000, and CGC *Marcus Hanna*, a WLM(R), as having logged 67 hours. These hours were not recorded in the ice operations reports [9, 10].

We could, however, compare the relative operational capabilities of the WTGB and WYTL over the East Coast's "most important" waterways (those named in [2] and listed in appendix A). To do this, we combined these waterways. This gave a waterway roughly 785 miles long. We derived ice conditions by calculating a weighted average of the probabilities of all the component waterways.[18]

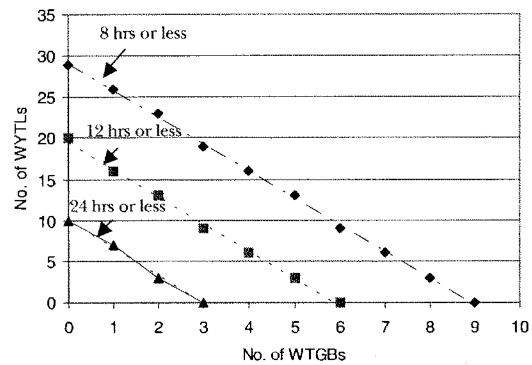
We sought to answer the following: How many of each vessel type does it take to clear the total length of the waterway under 90 percent of probable ice conditions in 24 hours or less? In 12 hours or less? In 8 hours or less?

For each scenario, we first calculated how many WTGBs it would take to do the job. We then took a WTGB out of the mix, and calculated how many WYTLs would be needed to complete the mission. We then took another WTGB out of the mix, and again calculated how many WYTLs would be needed to complete the mission. We continued until no more WTGBs were left in the mix. Figure 4 shows the results of these model runs.

In each case, it took roughly 3.3 WYTLs to match the output of a WTGB. Using these vessels optimally would dictate using WTGBs wherever possible, and using the smaller WYTL's on those waterways that the WTGBs are too large to safely navigate. It appears that District 1 already does this for the most part—WTGBs are used on the Hudson and Penobscot rivers, while on the Connecticut River, the height restriction (a bridge) is lower than the masthead height of the WTGB, so a WYTL must be used. The two vessel types are also used in tandem on the same river. For example, [9] reports that on the Hudson River, a WTGB provides track maintenance to keep commerce moving up and down the river, while the WYTL fleet clears ice around the commercial facilities on the river.

18. We assumed no restrictions due to waterway dimensions—this was strictly to compare operational capabilities.

Figure 4. Comparison of force mixes on the combined East Coast waterways, under 90% of probable conditions



Can the newer buoy tenders fill the gaps in meeting the Coast Guard's icebreaking requirements?

As we discussed, we don't know much about the capabilities of the newer buoy tenders, so we cannot adequately compare them to the WTGBs and WYTLs.

We do know that, operational capabilities aside, the size of the WLB(R) precludes it from navigating all but one of the D1 critical waterways that now depend on the WYTL for icebreaking (see table 8). The smaller WLM(R) can safely navigate five of those waterways. Therefore, it's more suitable than the WLB(R) for this task, at least in terms of being able to navigate the most critical waterways. Neither the WLB(R) nor the WLM(R) can safely navigate the Piscataqua River.

How will the current force handle the next severe winter?

Our calculations give predictions for a random day in the foreseeable future, and an average season made up of 120 such random days. In reality, however, severe winters occur every so often, where "worst case" days may be strung together over several weeks. During the next such winter, will the current force be able to complete its mission?

Most likely it will, if looked at in terms of the actual requirements and the Coast Guard's own level of service standards. The requirements of the mission are vague, and the standards of service (as listed in [5]) are open to interpretation. For example, [5] states that waterway closures should be limited to less than eight days per year. However, it is unclear whether the eight-day limit refers to each waterway or to the district as a whole—i.e., if three rivers are closed for three days each, does this mean that this standard has been exceeded for the season?

Also, the standards of service are lower for severe winters. During most years, the goal is to allow commerce to move at 3 knots or better, 90 percent of the time. But in a severe winter (as defined by a winter severity index), the standard is to allow commerce to move at 3 knots or better 70 percent of the time.

These standards do not appear to mesh with the level of service that the Coast Guard typically provides, which is what customers have come to expect. According to the district ice reports that we've read, waterway closings and delays (which occur when commerce cannot move at 3 knots or better) are very infrequent.[19] If waterways were to be closed for several consecutive days, it is likely that customers would be dissatisfied (and would not care whether or not the Coast Guard met its own standards). Furthermore, it's worth noting that in a severe winter the need for home heating oil—and hence, the need to keep the East Coast waterways open—is greater than in a normal winter, not less. Thus, lowering the standards for severe winters does not make sense from the customers' point of view.

Resource limitations did not allow us to do a more detailed analysis of the current force's capabilities under severe winter conditions.

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19. We've read the District 1 ice reports submitted in 1993, 1995, 1996, 1997, 1999, 2000, and 2001. It's possible that the reason that so few waterway closings and delays appear in these reports is that they have been inconsistently reported in the past, according to [6].

Conclusions and recommendations

In this section, we summarize our findings and give recommendations.

Conclusions

Based on our analysis, the Coast Guard will be able to meet its East Coast requirements for the foreseeable future.

- This is largely because there is no specific legal requirement for the level of service that the Coast Guard must provide. The Coast Guard has developed internal standards, but these are open to interpretation and appear to be set below what the Coast Guard typically does.
- Recent winters have been relatively mild; it is unknown whether the Coast Guard will be able to provide the same level of service in a severe winter that it has provided over the last several seasons. However, the Coast Guard's standard for service (i.e., the requirement) is lower for severe winters.

There may be a disconnect between Coast Guard standards and customer expectations.

While Coast Guard standards can be interpreted to allow for several days of waterway closings each year, waterways in District 1 are rarely closed because of ice. Customers have become accustomed to that level of service. If severe winter conditions or unavailability of vessel caused waterways to be closed for several days, customers would be dissatisfied, regardless of whether the Coast Guard met its own standards. It's obvious, but worth noting, that in a severe winter, the demand for home heating oil—and hence, the need to keep the East Coast waterways open—is greater than in a normal winter, not less. Thus, lowering the standards for a severe winter does not make sense from the customers' point of view.

The aging fleet of WYTLs does much of the icebreaking. It is unknown whether the newer buoy tenders can provide adequate supplemental capability under surge conditions.

- Operational capabilities—The actual operational icebreaking capabilities of the newer buoy tenders (WLB(R) and WLM(R)), which have been proposed as eventual replacements for the WYTLs, are largely unknown.
- Availability—As the newer vessels' primary mission is buoy tending, not icebreaking, there may be problems allocating resources. This is because the same conditions that require more icebreaking (i.e., severe winter weather) also require more aids-to-navigation (ATON) maintenance. Thus, some trade-offs will be necessary; some missions may not be accomplished in as timely a manner as desired.
- Size issues
  - — The WLB(R) is safely navigable in only one of District 1's critical waterways that now depend on the WYTL for icebreaking.
  - — Because of this, the WLM(R)s—which can safely navigate all but one of these waterways—are more important to the future of icebreaking in District 1 than the WLB(R)s.

The lack of data on the newer buoy tenders limited our optimal force mix analysis. However, our limited analysis suggests:

- One WTGB can clear as much ice as roughly 3.3 WYTLs in the same time period.
- Optimal use of these icebreakers means using WTGBs wherever possible, and using the smaller WYTLs on those waterways that the WTGBs are too large to safely navigate.
  - — Data indicate that District 1 already does this.

Recommendations

Evaluate service-level standards.

The apparent disconnect between the Coast Guard's service-level standards and customer expectations should be resolved. Otherwise, a conflict is possible if waterways are ever closed for several days—i.e., the level of service won't fall below the Coast Guard standard, but will be low enough to leave customers dissatisfied. Resolving the disconnect means better defining the standards and bringing them more in line with what is currently typically provided and expected.

Develop an analysis of capabilities in severe winter conditions.

Our analyses looked at average conditions for the foreseeable future, because that is what the ice thickness data reflect. Severe winters essentially represent a "surge"; any capability shortfalls will be more apparent at that time. An analysis that focuses on severe winter conditions with appropriate ice thickness probability distributions for each critical waterway would be helpful in predicting potential shortfalls.

Use the mathematical model we developed as a tool for answering questions about capability and force mix.

- It can:
  - — Determine how long an icebreaking assignment should take, given the waterways to be cleared, and the vessels available.
  - — Compare relative capabilities of vessels over the same waterway.
- However, assumptions in the model must be replaced by real data, particularly:
  - — Actual icebreaking lengths—for our calculations, we assumed that each waterway freezes from its mouth upriver. This is rarely the case, and provides an overestimate of the amount of icebreaking required.

— How often waterways should be cleared—we assumed that each critical waterway needs to be cleared every day in which it is impassable to commercial traffic; we are not sure whether this is true for all of them.

— Real operational data for WLM(R) and WLB(R), so that all available vessels can be included in the analyses.

If the Coast Guard wants to develop this model further, so it can be useful for answering questions about force capability and determining an optimal force mix, we recommend the following:

- Obtain real operational data for the WLB(R) and WLM(R), or at least provide theoretical data.
- Determine how much of their time will be available for icebreaking. This is an issue not just for improving the model but also for possible future resource allocation.

These steps would allow us to address such questions as: If some of the primary icebreakers are temporarily unavailable, will the other available vessels be able to perform the mission? Can we predict and quantify any resource gaps?

This approach might also be useful in answering similar questions for District 9 (Great Lakes).

Use consistent terminology with regards to "critical" waterways.

ECMAR [2] and the most recent District 1 ice operations report [9] both refer to sets of waterways as being "critical," but these sets do not match. For example, ECMAR lists the East River as one of District 1's "most critical" waterways—but District 1's ice operations report does not.

Appendix A: Dimensions of the most important East Coast waterways

Table 12 shows the icebreaking track lengths we calculated using Capn Voyager software, as described in the text. The other dimensions are from [2].

The Delaware River is listed for two different stretches.

Table 12. Dimensions of waterways that the East Coast mission analysis report lists as most important for icebreaking, listed from north to so u th

Waterway	Icebreaking track length (n.mi.)	Min. chart depth (ft)	Min. depth[a] (ft)	Min. width (ft)	Height restriction (ft)
Penobscot River	21.0	17	22.5	600	135
Penobscot Bay	40.6	32	37	5,280	
Kennebec River	33.6	13	15.5	150	135
Casco Bay	1.3	40	44.5	3,000	
Fore River	2.9[b]	28	32.5	100	
Piscataqua River	0.6	31	33	400	35
Boston Harbor	1.9	35	39.5	1,000	
Weymouth Fore River	5.0	29	33.5	300	
Town River	0.9	35	39	300	
Weymouth Back River	1.5	14	18.5	200	
Lewis Bay	1.0	10.5	12	100	
Cape Cod Canal	7.5	32	33.5	480	135
Vineyard Haven Harbor	1.5	19	20	300	
Nantucket Harbor	1.9	15	16.5	300	
Narragansett Bay	11.2	35	36.5	600	194
Mount Hope Bay	6.8	35	36.5	400	135
Providence River	12.6	20	22	600	
Thames River	14.1	20	21	250	75
Connecticut River	47.3	15	16.5	200	65
New Haven Harbor	4.2	16	19	400	

Table 12. Dimensions of waterways that the East Coast mission analysis report lists as most important for icebreaking, listed from north to south (continued)

Waterway	Icebreaking track length (n.mi.)	Min. chart depth (ft)	Min. depth[a] (ft)	Min. width (ft)	Height restriction (ft)
Black Rock Harbor	1.3	18	21.5	225	
Port Jefferson	1.8	13	16	300	
Upper Hudson River	21.0	32	34	400	135
Middle Hudson River	43.6	32	33.5	400	135
Lower Hudson River	57.9	26	28	750	150
East River	14.3	20	22.5	300	127
NY Harbor (Upper Bay)	4.0	33	35	3,900	2,000
Newark Bay	3.8	35	37	400	
Arthur Kill	10.5	30	32	500	137
Delaware Bay	25.0	40	41	1,000	
Delaware River	80.1	20	23	400	135
Delaware River	3.3	12	15	200	135
Christina River	1.1	16	19	500	
Schuylkill River	5.1	15	17.5	200	135
C&D Canal	15.8	35	36	400	136
Chesapeake Bay (Baltimore)	124.0	16	16.5	1,500	186
Anacostia River	1.0	15.5	17	300	
Potomac River	114.0	20	20.5	450	135
Nanticoke River	20.3	8	9	300	
Wicomico River	19.6	10	11	75	75

a. Chart depth + one-half of the tidal range.

b. To derive a distance for the Fore River (Maine), we had to assume starting and stopping points; the LLNRs listed in the EC MAR for this waterway actually exist in the *Forge* River (in Moriches Bay, New York). The other dimensions listed for this waterway are consistent with the nautical chart for the Fore River.

Appendix B: Ice thicknesses of the important East Coast waterways

Table 13 shows ice thickness probability calculations for the Penobscot River. Columns 1–3 are from [2], although we added the first row, which gives values for ice thicknesses up to 4 inches. The ice thickness categories on left are as follows: "0"= 0 to 4 inches of ice; "4" = greater than 4, but less than or equal to 6 inches of ice; 6 = greater than 6, but less than or equal to 9 inches of ice; etc.

Table 13. Ice thickness probability calculations for the Penobscot River

Ice thickness category	% of years occurring	Average duration (days)	Fraction of season[a]	Cumulative probability[b]	Density[c]
0	100	120	1.00	1.00	0.17
4	100	100	0.83	0.83	0.02
6	100	98	0.82	0.82	0.06
9	100	91	0.76	0.76	0.07
12	100	83	0.69	0.69	0.05
14	100	77	0.64	0.64	0.06
16	100	70	0.58	0.58	0.08
18	98	62	0.52	0.51	0.09
20	91	55	0.46	0.42	0.09
22	78	50	0.42	0.33	0.11
24	62	41	0.34	0.21	0.09
26	44	33	0.28	0.12	0.07
28	20	29	0.24	0.05	0.04
30	2	50	0.42	0.01	0.00
32	2	29	0.24	0.00	0.00
34	0	0	0.00	0.00	0.00

a. This is the average duration divided by 120.

b. This is the probability of encountering this thickness category or higher on any particular day during the ice season. This is calculated as the fraction of season divided by the % of years occurring * 100.

c. This is probability of encountering this particular ice thickness category on any particular day during the ice season. For each category, this is calculated as its cumulative probability minus the cumulative probability of the next highest category. For example, the density of the "0" category is calculated as 1.00 (its cumulative probability) - 0.83 (the cumulative probability of the "4" category) = 0.17. This means that thickness category is encountered 17% of the time. Differences between values calculated from the cumulative probablity column as described and the values shown in this column are due to rounding.

Table 14 shows the results for each of the waterways identified as "most important" in [2].

Table 14. Ice thickness probabilities for each of the East Coast important waterways listed in ECMAR

	Ice thickness category															
Waterway	0	4	6	9	12	14	16	18	20	22	24	26	28	30	32	34
Penobscot River	.17	.02	.06	.07	.05	.06	.08	.09	.09	.11	.09	.07	.04	.00	.00	.00
Penobscot Bay	.29	.13	.37	.20	.01	.00										
Kennebec River	.19	.03	.06	.08	.07	.08	.10	.12	.11	.09	.06	.01	.00			
Casco Bay	.26	.08	.20	.29	.14	.04	.00	.00								
Fore River	.33	.16	.39	.12	.00											
Piscataqua River	.32	.07	.19	.24	.11	.06	.01	.00								
Boston Harbor	.82	.14	.05	.00												
Weymouth Fore River	.63	.11	.17	.09	.01	.00										
Town River	.63	.11	.17	.09	.01	.00										
Weymouth Back River	.63	.11	.17	.09	.01	.00										
Lewis Bay	.71	.15	.14	.00												
Cape Cod Canal	.60	.11	.16	.13	.01	.00										
Vineyard Haven Harbor	.60	.14	.16	.09	.01	.00	.00									
Nantucket Harbor	.68	.16	.16	.00	.00											
Narragansett Bay	.63	.15	.18	.04	.00											
Mount Hope Bay	.60	.14	.16	.09	.01	.00	.00									
Providence River	.57	.10	.16	.13	.04	.00										
Thames River	.57	.10	.16	.13	.04	.00										
Connecticut River	.57	.10	.16	.13	.04	.00										
New Haven Harbor	.82	.11	.07	.00												
Black Rock Harbor	.82	.11	.07	.00												
Port Jefferson	.82	.11	.07	.00												
Upper Hudson River	.19	.03	.06	.08	.07	.08	.10	.12	.11	.09	.06	.01	.00			
Middle Hudson River	.32	.04	.09	.13	.10	.11	.08	.08	.03	.02	.00	.00				
Lower Hudson River	.86	.03	.05	.05	.01	.00	.00									
East River	.88	.04	.07	.01	.00											
NY Harbor (Upper Bay)	.90	.07	.03	.00												
Newark Bay	.99	.01	.00													
Arthur Kill	.88	.04	.07	.01	.00											
Delaware Bay	.90	.02	.04	.03	.01	.00	.00									
Delaware River	.81	.05	.06	.04	.02	.01	.00	.00								
Delaware River	.81	.05	.06	.04	.02	.01	.00	.00								

Table 14. Ice thickness probabilities for each of the East Coast important waterways listed in ECMAR (continued)

	Ice thickness category															
Waterway	0	4	6	9	12	14	16	18	20	22	24	26	28	30	32	34
Christina River	.85	.06	.06	.03	.00	.00										
Schuykill River	.85	.06	.06	.03	.00	.00										
C&D Canal	.87	.06	.05	.02	.00											
Chesapeake Bay (Baltimore)	.87	.03	.04	.04	.01	.00	.00									
Anacostia River	.95	.02	.01	.01	.01	.00										
Potomac River	.95	.01	.01	.01	.00	.01	.01	.00	.00							
Nanticoke River	.98	.01	.01	.00	.00											
Wicomico River	.98	.01	.01	.00	.00											

Appendix C: Derived equations describing vessels' icebreaking capabilities

Figure 2 in the main text shows continuous vessel speed versus ice thickness. Resulting least-squares curves for the WTGB and WYTL are described as follows:

Where y = the speed of the vessel in knots, where x is the ice thickness in feet:

- WTGB: For x = 0 to 1, y = 11.2. For x = 1.1 to 7, $y = 0.22 * x^2 - 3.45x + 14.59$
- WYTL: For x = 0 to 0.5, y = 6. For x = .51 to 2, $y = -1.25 * x^3 + 6.73 * x^2 - 14.26 * x + 11.57$. For x > 2, y = 0.

Appendix D: Vessels homeported in Districts 1 and 5 that have icebreaking capability

Table 15 lists the names, classes, homeports, and groups of vessels in Districts 1 and 5 that have icebreaking capability.

Table 15. Vessels homeported in Districts 1 and 5 that have icebreaking capability[a]

Ship name	Homeport	Class	District	Group
Abbie Burgess	Rockland, ME	WLM	1	Southwest Harbor
Bollard	New Haven, CT	WYTL	1	LI Sound
Bridle	Southwest Harbor, ME	WYTL	1	Southwest Harbor
Capstan	Philadelphia, PA	WYTL	5	Philadelphia
Chock	Portsmouth, VA	WYTL	5	Hampton Roads
Cleat	Philadelphia, PA	WYTL	5	Philadelphia
Elm	Atlantic Beach, NC	WLB	5	Fort Macon
Frank Drew	Portsmouth, VA	WLM	5	Hampton Roads
Hawser	Bayonne, NJ	WYTL	1	Activities NY
Ida Lewis	Newport, RI	WLM	1	Woods Hole
James Rankin	Baltimore, MD	WLM	5	Baltimore
Juniper	Newport, RI	WLB	1	Woods Hole
Katherine Walker	Bayonne, NJ	WLM	1	Activities NY
Line	Bayonne, NJ	WYTL	1	Activities NY
Marcus Hanna	South Portland, ME	WLM	1	Portland
Pendant	Boston, MA	WYTL	1	Boston
Penobscot Bay	Bayonne, NJ	WTGB	1	Activities NY
Shackle	South Portland, ME	WYTL	1	Portland
Sturgeon Bay	Bayonne, NJ	WTGB	1	Activities NY
Tackle	Rockland, ME	WYTL	1	Southwest Harbor
Thunder Bay	Rockland, ME	WTGB	1	Southwest Harbor
William Tate	Philadelphia, PA	WLM	5	Philadelphia
Willow	Newport, RI	WLB	1	Woods Hole
Wire	Saugerties, NY	WYTL	1	Activities NY

a. *Blackberry*, a WLI homeported in District 5, technically has some icebreaking capability. However, as it has never been used for that purpose and likely never will be, we did not include it in this list.

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[1] Executive Order No. 7521, Dec 21, 1936

[2] Soza & Company, Ltd. *U.S. Coast Guard East Coast Domestic Icebreaking Mission Analysis Report–Part I.* Developed for the Icebreaking Division, Office of Aids to Navigation, Assistant to Commandant for Operations, U.S. Coast Guard, Jan 1997

[3] John A. Volpe National Transportation Systems Center. *Analysis of the Great Lakes Icebreaking Requirements, Final Report,* prepared for Ice Operations Division, Office of Navigation Safety and Waterway Services. United States Coast Guard, Mar 1995

[4] U.S. Coast Guard, COMDTINST 16151.1C, *Domestic Icebreaking Policy and Reporting Requirements.* Mar 1993

[5] U.S. Coast Guard, CGDONEINST 16151.1D, *First Coast Guard District Icebreaking Plan.* Jan 1998

[6] CDR J. Bodenstedt, Chief, Ice Operations Division, USCG Headquarters, personal communication

[7] WYTL shipboard personnel, personal communication

[8] U.S. Coast Guard, COMDTINST 3100.5, *Cutter Employment Standards,* Jul 1991

[9] Commander, First Coast Guard District. *First District Domestic Ice Operations Report.* Aug 2001

[10] Commander, First Coast Guard District. *First District Domestic Ice Operations Report.* Sep 2000

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G-OPN-1 COPY

U.S. COAST GUARD
EAST COAST DOMESTIC ICEBREAKING
MISSION ANALYSIS REPORT - PART 1

Developed for:

Icebreaking Division (G-OPN-1)
Office of Aids to Navigation (G-OPN)
Assistant Commandant for Operations (G-O)
U.S. Coast Guard

U.S. Coast Guard Headquarters
2100 Second Street, SW
Washington, DC 20593-0001

Developed by:

Soza & Company, Ltd.

SOZA

Under Contract No. DTCG23-95-D-HMS026
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January 1997

East Coast Domestic Icebreaking
Mission Analysis Report - Part 1

Executive Summary

The United States Coast Guard has the requisite legal authority, and has been mandated by executive order to conduct the domestic icebreaking mission to support the reasonable demands of commerce. The consequences of not fulfilling this mission are that some locations on the eastern seaboard may be left cold, dark, and quiet during those periods of time when the waterways servicing them close due to ice.

Key Issues

Are the present icebreaking capabilities of the Coast Guard currently being used effectively? No, they are not. The CGC Morro Bay's icebreaking capabilities are far from fully utilized. Its AOR is the Chesapeake Bay, Delaware Bay, and their tributaries, where the maximum ice thickness is predicted to be 14" for an average duration of 9 days, and occurring 2% of years. On balance, the remainder of the East Coast WTGBs icebreaking capabilities are being effectively used. The WYTLs have low operating hours: less than 700 per year per cutter, of which only 7.1% are dedicated to icebreaking. The WLBs, WLMs, (and their replacements), used for ATON pose a resource allocation challenge to operational commanders because when icebreaking requirements increase, so do ATON response workloads.

Should the Coast Guard replace the WYTL capabilities? Yes, if the Coast Guard wants to provide full service to all customers, including fishing vessel fleets during severe winters to support the movement of commerce at the current level of service.

Is it cost efficient for the Coast Guard to provide icebreaking services? Yes, transportation costs to the taxpayer/consumer for cargo now moved by water during the winter would increase by 60% if waterways were closed because the Coast Guard no longer provided icebreaking services.

East Coast Domestic Icebreaking
Mission Analysis Report - Part 1

Critical Customers and Waterways

The most critical customers of Coast Guard icebreaking services are the ships, tugs, and barges that supply fuel to oil distributors, refineries, and power plants. The primary waterways for these customers are the Hudson, East, Wicomico, Fore, & Penobscot Rivers; New York and Port Jefferson Harbors; and Jamaica, Raritan, and Oyster Bays.

Alternative Icebreaking Resources

Survey data collected indicated that for up to 4" of ice, the majority of commercial cargo vessels require no assistance. An industry survey disclosed the existence of only two commercial icebreaking providers. One services the Nantucket ferries, and the other, in Boston, has seen no business thus far. Tug boats on the Hudson River do provide icebreaking services, but prefer other work. Government owned tugs provide icebreaking services in Washington, DC, Baltimore Harbor, and at Smith Island in the Chesapeake Bay. The Navy has a fleet of YTBs at Norfolk and New London, but are not available to assist Coast Guard icebreaking efforts.

Ice Thickness Predictions

To determine mission requirements, ice thickness predictions were made based on past ice observations, historical weather data, and a static ice formation model. Since the consequences of under predicting are far more serious than over predicting, a very conservative approach was taken. These predictions agreed well with anecdotal records, except on the Wicomico River where ice thicker than the model prediction has been encountered on occasion.

Data Recommendations

The recommendations in this report were based on static ice growth model predictions for ice thickness and duration. These predictions were, in turn, based on ice observation data collected by the Coast Guard. The paucity and quality of available ice observation data were troubling. There were very few records of ice thickness observations. Those that existed showed considerable inconsistency due to differing measurement techniques. Recommend improvement in the ice data collection process and the frequency of observations to facilitate future program standard reviews.

East Coast Domestic Icebreaking Mission Analysis Report - Part 1

Coast Guard Resource Recommendations

The following recommendations are based on the capabilities of the current icebreaking cutter fleet, worst case predicted ice thicknesses on the East Coast waterways, resource availability, and the assumed decommissioning of the WYTL fleet. Although the WTGB, WLB and WLM have sufficient capability to break the ice for the majority of years, the available hours are insufficient to support surge year conditions - when icebreaking is needed the most.

Group Southwest Harbor: The resource hours required by the waterways in this area necessitate assigning two icebreakers in addition to the WTGB, WLB, and WLM available to this group. These additional cutters or boats will need an icebreaking capability of 12"-14".

Group Portland: One resource with 12"-14" icebreaking capability is needed. This, in addition to larger cutters homeported in Southwest Harbor, should suffice in carrying out the domestic icebreaking mission in the Group Portland area.

Group Boston: Group Boston should be assigned one facility capable of breaking 9"-12" of ice. The hours to cover the many waterways in the area necessitates an ice capable cutter or boat.

Group Woods Hole: No ice capable resources other than the WLB and WLM already planned for this area are recommended.

Group Long Island Sound: It is recommended that one cutter or boat with 9"-12" of icebreaking capability be assigned to Long Island Sound. Other resources that may be required in surge years can be shared with Group New York.

Group New York: One resource with 9"-12" of icebreaking capability, in addition to the two WTGBs, one WLB(R), one WLM(R) currently assigned to the New York area, is recommended. The range of the Hudson River and the time to maintain New York area waterways requires an additional facility.

Coast Guard Resource Recommendations (continued)

Group Cape May: As done currently, a shared resource with Group Philadelphia is sufficient to accommodate Cape May's icebreaking needs.

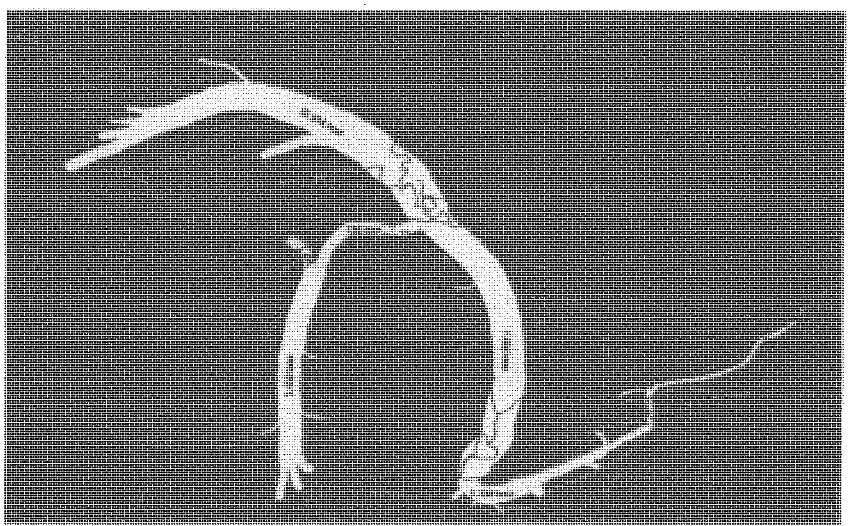
Group Philadelphia: One cutter or boat with 9"-12" icebreaking capability is all that is recommended for the Philadelphia AOR. The frequent transits of commercial vessels on the Delaware River and its tributaries leads to less need for icebreaking services.

Group Baltimore: The Baltimore AOR includes many large, critical waterways. The icebreaking resource hours to support these waterways have been provided in the past from adjacent Groups and the WLB-180 and WLM-157 fleets. The reduction of resources with the planned change to the replacement tenders require three additional ice capable cutters or boats capable of breaking 9"-12" of ice. These added facilities are required even allowing for the availability of Seventh District cutters to augment requirements in this AOR during the severest years. At least one of these resources should be small enough for use on the Nanticoke and Wicomico Rivers, which may not be able to accommodate the WLM(R).

Although the CGC Morro Bay's icebreaking capabilities are not being used effectively, its employment as a training cutter adds a dimension to the siting issue beyond the scope of this study.

GREAT LAKES ICEBREAKING MISSION ANALYSIS REPORT

5 June 1997



U. S. Coast Guard
Commandant (G-O-2b)
Mission Requirements and Analysis
Washington, D.C. 20593

5 June 1997
Final Report

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Executive Summary

The Coast Guard has prepared this report to define icebreaking and other related mission requirements for the Great Lakes region. This report assesses mission requirements, revalidates the need to continue the mission, defines levels at which the mission will be accomplished against performance standards and customer needs, and assesses the adequacy of Coast Guard capabilities available to accomplish the mission.

Icebreaking mission requirements in this report are assessed primarily on the Coast Guard's federal mandate to, "keep open to navigation by means of icebreaking operations ... channels and harbors within the reasonable demands of commerce."

Part I

Part I of the mission analysis demonstrates that the Coast Guard will not be able to satisfactorily carry out its domestic icebreaking mission on the Great Lakes unless appropriate Coast Guard heavy icebreaking capabilities, currently provided exclusively by CGC *Mackinaw*, are preserved or replaced.

CGC *Mackinaw*, commissioned in 1944, is in the twilight of its useful service life. *Mackinaw*'s WWII era systems and single mission character make it an expensive and inefficient resource. The costs of assuring *Mackinaw*'s mission readiness are escalating and cannot be sustained indefinitely. This sole capable asset approach to Great Lakes heavy icebreaking has always left Great Lakes winter shipping somewhat vulnerable to mission failure and has restricted the Coast Guard's ability to deal with more than one heavy icebreaking problem at a time.

Current plans to replace three 180' WLBs with two 225' WLBs circa 2002 would further reduce Great Lakes icebreaking capabilities.

The Coast Guard's domestic icebreaking mandate remains valid and well aligned with national strategic objectives. The long term forecast of Great Lakes demand for Coast Guard icebreaking services is stable, at or slightly above the current level.

Industry customers have accepted and agreed that new Coast Guard Great Lakes domestic icebreaking mission performance standards satisfy "the reasonable demands of commerce" as our mandate requires.

CGC *Mackinaw*, five WTGBs, three 180' WLBs, and Canadian partnering assets have provided adequate performance against the standards. A "stay the course" fleet consisting of an increasingly unreliable and expensive *Mackinaw*, five WTGBs, two 225' WLBs, and reduced Canadian partnering assets will fail icebreaking mission performance standards.

The costs of inadequate performance are real and substantial. Previous studies found Coast Guard Great Lakes total icebreaking services to have an estimated average annual outcome value of $49-78M to industry alone. The Volpe study estimated the average annual outcome value of *heavy icebreaking* is at least $13-20M. These estimates are based on direct industry costs of least cost alternatives; they do not include any estimates of the consequences of higher costs in a highly competitive global market or the downstream impact in jobs or the larger economy. The Great Lakes iron ore, steel and freight transportation industries alone constitute a considerable economic force within the United States employing 485,000 to 525,000 persons with an annual payroll in excess of $6.7 billion.

Non-material alternatives explored included shortening the winter shipping season, leasing a Canadian icebreaker, or paying for commercial icebreaking; none are acceptable as long term solutions.

Part II

Part II presents several alternatives to meet the future icebreaking resource gaps projected for the Great Lakes. In addition to traditional modernization/replacement of the existing heavy icebreaking asset, there is an opportunity to explore the feasibility of a multi-mission icebreaking buoy tender. Building heavy icebreaking capable tenders takes advantage of the opportunity to develop a resource mix to effectively and economically satisfy both Great Lakes icebreaking and aids to navigation mission performance requirements rather than continuing on a course that develops independent single/focused mission solutions. *Canada has proven the concept with CCGS Risley operations on the Lakes for more than twelve years.*

Preliminary analysis indicates the multi-mission approach warrants further exploration and evaluation along with other heavy icebreaker modernization/replacement options. Icebreaking capability requirements (deep draft) and aids to navigation limitations (shallow draft) may conflict and require a compromise or trade-off among single asset capabilities.

The Great Lakes Icebreaking MAR Parts I and II provide a compelling basis to establish a major systems acquisition project and to proceed with the mission needs statement. Preliminary estimates indicate a lead ship replacement or modernization will cost $93-$130 million.

Weekly Timeline

Specific weeks of the season are referred to throughout this report. The following is a chart which pairs dates with their respective week numbers. All charts and tables in the report correspond to this weekly timeline.

Week	1 16OCT-22OCT	2 23OCT-29OCT	3 30OCT-5NOV	4 6NOV-12NOV	5 13NOV-19NOV
Week	6 20NOV-26NOV	7 27NOV-3DEC	8 4DEC-10DEC	9 11DEC-17DEC	10 18DEC-24DEC
Week	11 25DEC-31DEC	12 1JAN-7JAN	13 8JAN-14JAN	14 15JAN-21JAN	15 22JAN-28JAN
Week	16 29JAN-3FEB	17 5FEB-10FEB	18 12FEB-17FEB	19 19FEB-24FEB	20 26FEB-3MAR
Week	21 4MAR-10MAR	22 11MAR-17MAR	23 18MAR-24MAR	24 25MAR-31MAR	25 1APR-7APR
Week	26 8APR-14APR	27 15APR-21APR	28 22APR-28APR	29 29APR-5MAY	30 6MAY-12MAY
Week	31 13MAY-19MAY	32 20MAY-26MAY	33 27MAY-2JUN	34 3JUN-10JUN	

Seasons by week:

Fall ATON Decommissioning Season................ Weeks 1 - 10
Winter Ice Season.. Weeks 9 - 26
Spring ATON Commissioning Season................ Weeks 25 - 33
Sault Ste. Marie Lock Closure......................... Weeks 14 - 23

1.0 INTRODUCTION

This report defines icebreaking and other related mission requirements for the Great Lakes region. The report assesses mission requirements, revalidates the need to continue the mission, defines levels at which the mission will be accomplished against performance standards and customer needs, and assesses the adequacy of Coast Guard capabilities available to accomplish the mission. Icebreaking mission requirements in this report are assessed primarily on the Coast Guard's responsibility to, "keep open to navigation by means of icebreaking operations ... channels and harbors within the reasonable demands of commerce."

1.1 Previous Studies

Three previous studies contain information relevant to this Mission Analysis Report. These studies and their primary focus include:

(1) *Analysis of Great Lakes Icebreaking Requirements* (Volpe Study), Volpe NTSC, 1995: Icebreaking operations and economic benefits.

(2) *Environmental Impact Statement Great Lakes Icebreaking* (EIS), Brown & Root Environmental, 1996: Environmental and economic impact of Great Lakes icebreaking.

(3) *Aids to Navigation Service Force Mix 2000 Project* (SFM2000), Volpe NTSC, 1992: Aids to navigation mission requirements and proposed buoy tender fleet.

2.0 SUMMARY OF EXISTING MISSIONS

2.1 Customers

Primary beneficiaries of Great Lakes icebreaking are the general public and Great Lakes industry, including the commercial winter shipping fleet.

Public: Search and Rescue assistance, passenger ferry service, and flood relief efforts provided during the winter shipping season represents the public demand for Great Lakes icebreaking.

(1) *Search and Rescue*: Ninth District cutters maintain readiness and lake SAR standby duty during the severe weather season on the Great Lakes, defined as 1 November through 15 April. During this season, the Ninth District assigns a BRAVO-2 resource (ready to be underway in two hours) to all five Great Lakes except Lake Ontario. Designated vessels assume BRAVO-2 status when gale force winds are predicted for their respective lake. Search and rescue services have typically been required for a diverse mix of mariners, island residents, fisherman, aircraft passengers, and winter sportsman.

(2) *Passenger Ferry Service*: Upon request, Coast Guard icebreakers assist passenger ferries to minimize transit delays caused by ice. Ferries operate at the following locations during the winter season.

Sugar Island, St Marys River	Harsens Island, St Clair River
Neebish Island, St Marys River	Washington Island, Northern Green Bay
Drummond Island, St Marys River	Isle Royale National Park, Lake Superior

(3) *Flood Relief*: At the request of the U. S. Army Corps of Engineers (ACOE), the Coast Guard provides flood relief assistance primarily in the St. Marys, St. Clair, and Detroit Rivers. While the ACOE has general statutory responsibility for flood control, the Corps does not have suitable equipment for ice management tasks. The Corps relies on the Coast Guard to provide facilities to break ice to prevent or relieve

flooding. During the past 15 years, the Coast Guard expended an average of 87 hours annually toward flood relief; **an extreme flood condition occurred once every seven years.**

Industry: U. S. industries currently rely on Great Lakes shipping for the movement of approximately 150 million tons of raw materials each year. Shipments during the winter shipping season (December 15 through April 15) amount to approximately 11.8 million tons of cargo including light heating oil, iron ore, limestone, coal, cement, and potash. An additional estimated 3.2 million tons of cargo, required by Canadian industry, raises the total amount of winter cargo shipped on the Great Lakes to 15 million tons.[1] Figure 2-1 illustrates primary shipping lanes and volume of cargo transported during the winter shipping season.

Source: LCA annual reports **Figure 2-1**

The iron ore, steel and Great Lakes freight transportation industries directly tied to Great Lakes shipping constitute a considerable economic force within the eight-state region of Minnesota, Wisconsin, Michigan, Illinois, Indiana, Ohio, Pennsylvania, and New York. In those states, approximately 161,000 persons are directly employed in the industries directly affected by the Great Lakes shipping trade. Assuming direct employment multipliers of 3 to 3.25 for these basic industries would mean a total of approximately 485,000 to 525,000 persons employed directly and indirectly as a result of the continuing health of these industries. The direct annual payroll of these industries is in excess of $6.7 billion dollars.[2]

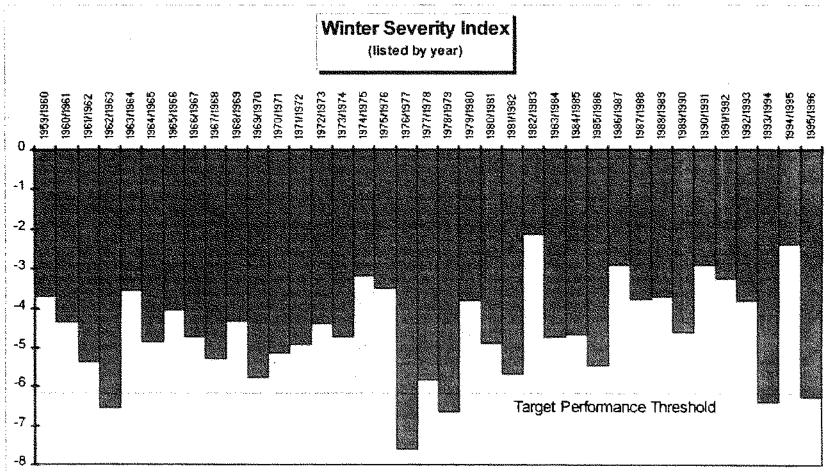
Shipping: The U.S. Great Lakes carrier fleet consists of 70 vessels with a total per-trip carrying capacity of approximately 1.9 million gross tons. The 14 members of the Lake Carriers' Association (LCA) own 59 of the 70 vessels.[3] Approximately 18 additional Canadian cargo vessels and tankers operate on the Great Lakes during the winter shipping season.

The LCA maintains the current fleet has been optimized to meet current shipping demand within the 42 week shipping season, and there is no excess capacity to deliver the same volume of cargo in a shorter season. During the 1970s, the Great Lakes shipping fleet was significantly reduced and modernized based on a 42 week extended shipping season relying on adequate and available icebreaking support. By reducing shipping costs, the United States steel industry and its customers gain a competitive edge in the world market.

2.2 Great Lakes Winter Severity

Ice conditions for a given winter and waterway vary significantly from year to year due to fluctuations in temperature, wind, and snowfall.

Temperature Data A standard winter severity index has been developed for the Great Lakes region using accumulated freezing degree days (AFDD). The average mean monthly temperatures (degrees C) from November through February at Duluth, Sault Ste Marie, Detroit, and Buffalo are combined to form the index. Ice thickness is a function of accumulated freezing degree days. As freezing degree days accumulate, ice conditions worsen and transiting ice covered waters becomes increasingly difficult. Based on 37 years of historical data, Figure 2-2 shows a severity index of -6.3 or colder is likely to occur once every seven years. This severity level serves as the target threshold for icebreaking performance standards.



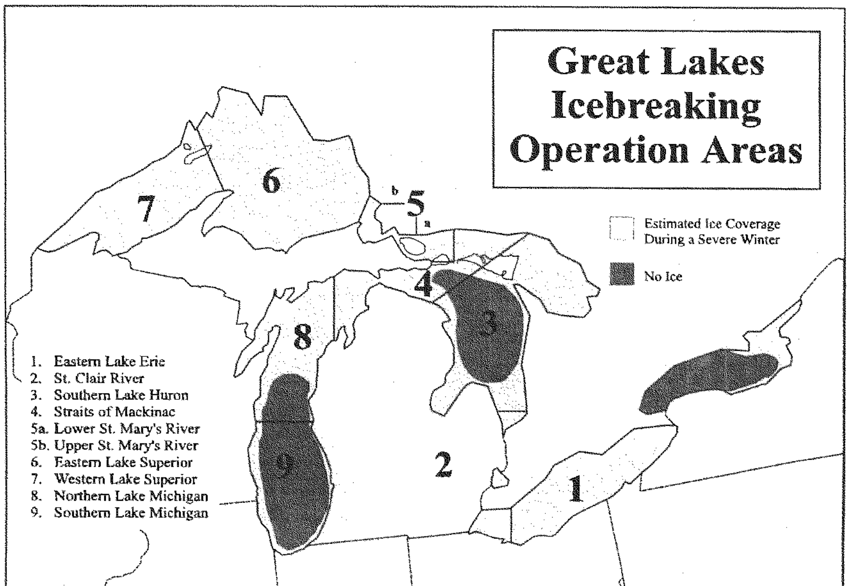
Source: National Weather Service **Figure 2-2**

Effects of Wind Strong winds in excess of 20 knots can have a significant impact on a vessel's ability to transit ice covered waterways, particularly in open bays and waters such as the Straits of Mackinac, Western Lake Superior, Whitefish Bay, Northern Green Bay, and Western Lake Erie. During storms and strong winds, large floes of ice can shift creating ridging and rapidly closing existing tracks. In thick ice, greater than 20 inches, these conditions negate the effectiveness of all but larger icebreakers (WAGB) and may present hazardous situations for smaller icebreakers (WTGB, WLB). Winds exceeding 15-25 knots also prevent WTGBs from making open lake transits during the winter season due to hazardous topside icing. As a result, WTGBs are often delayed when called to respond to vessels waiting for icebreaking assistance.

Effects of Snow The presence of snow on ice fields will reduce a ship's transit speed and overall effectiveness, particularly for the WLB and WTGB class vessels. Actual snowfall will also reduce visibility making navigation and maneuvering more difficult.

2.3 Ice Conditions and Critical Waterways

Icebreaking operations on the Great Lakes are directed by the Commander, Ninth Coast Guard District in Cleveland, Ohio. To manage icebreaking operations, the Ninth Coast Guard District has designated nine icebreaking operational areas shown in Figure 2-3. The figure also shows estimated ice coverage during a severe winter.



Source: D9INST M16150.1B **Figure 2-3**

Ice Conditions In general, two types of ice forms on the Great Lakes: (1) new (or plate) ice is hard unbroken ice that forms at the surface and typically forms at a rapid rate early in the freeze cycle provided wind, current, and traffic does not interfere with the formation process; (2) broken (or brash) ice is plate ice that has fractured to smaller pieces and typically develops to greater depths than plate ice. When temperatures remain below freezing, the severity of brash ice worsens with increased traffic volume and maintenance of existing tracks. Ice can also develop into severe "rafting" or "ridging" conditions due to wind effects. In restricted channels, current effects can create severe ice jams, particularly during spring break-up.

Critical Waterways Seven waterways have been identified as critical to defining Great Lakes icebreaking requirements based on historical ice conditions, volume of traffic, and potential for flooding:

Area 2

Western Lake Erie: The western part of Lake Erie is very shallow and freezes rapidly. During severe winters, plate ice thickness will average approximately 14-20 inches with maximum thickness of 24 inches and pressure ridges 4-6 feet.

St Clair River: The southern part of Lake Huron forms a bottleneck area as it funnels down into the St Clair River. Ice conditions deteriorate when the ice bridge that forms above Port Huron breaks and the broken mass of ice travels down the river to the lower reaches. On occasion, ice jams can develop to extreme depths, greater than 12 feet, causing severe flooding conditions. In addition, a passenger ferry at Harsen's Island operates through the winter season. Minimum channel depth while working in the river is 21 feet.

Area 4

Straits of Mackinac: This critical waterway which links Lake Michigan and Lake Huron is very susceptible to wind action. Ice coverage and severity is unpredictable; however, during severe winters, plate ice thickness will average 20-26 inches with a maximum thickness of 30 inches and pressure ridges of 6-9 feet.

Area 5

St Marys River: The river and its associated lock system serves as the only navigable waterway connecting Lake Superior to the lower lakes. During severe winters, plate ice thickness will average 20-26 inches with a maximum ice thickness of 30 inches. Due to the high volume of traffic and extensive track maintenance required, broken ice in the channel can grow to 4-6 feet. At certain bottleneck areas, ice jams can form to extreme depths, greater than 9 feet. Prior to lock opening in late March, brash ice in the track can refreeze to a maximum thickness of 48-60 inches. Ferry service operates at three locations in the river: Sugar Island, Neebish Island, and Drumond Island. Minimum channel depth while working in the river is 21 feet.

Whitefish Bay: At the lower end of Lake Superior, this shallow bay forms ice rapidly and is exposed to the prevailing westerly winds. During severe winters, plate ice thickness will average 24-30 inches with a maximum ice thickness of 33 inches. Strong Northwest winds rapidly close tracks and create 6-9 foot pressure ridges. Prior to the lock opening in late March, brash ice can refreeze to a maximum thickness of 48-60 inches.

Area 7

Western Lake Superior: Ice begins forming in Duluth-Superior in early December and builds out to the east. During severe winters, ice thickness will average 20-26 inches with a maximum ice thickness of 30 inches. If winds shift to the east, rafting conditions, similar to Whitefish Bay can be expected. In late March, brash ice can refreeze to a maximum thickness of 48-60 inches.

Area 8

Northern Green Bay: This area includes the waters between Escanaba and Lake Michigan including Little Bay De Noc. During a severe winter, plate ice thickness will average 20-26 inches with a maximum ice thickness of 30 inches. In mid March, brash ice can refreeze to a maximum thickness of 36-42 inches. Strong winds will quickly close tracks and create 6-9 foot pressure ridges. By early April, the majority of ice drifts out to the open waters of Lake Michigan due to the prevailing westerly winds. Ferry service between Door County and Washington Island operates year round.

2.4 Operating Season

The Great Lakes ice season is outlined below in figure 2-3. The winter shipping season is the period during which safe vessel operations are impeded by the presence of ice. Typically, this period is defined as 15 December through 15 April. During the 1994 and 1996 severe winters, the winter shipping season began on approximately 11 December and ended on 1 May. The closed shipping season is defined as the period of 15 January to 25 March when the Sault locks are closed to Lake Superior shipping. Traffic in the lower Lakes continues through this period, at a reduced level.

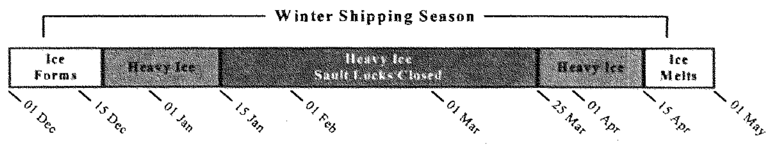


Figure 2-3

Figure 2-4 shows the average weighted workload of the Ninth District icebreaking effort for FY94 and FY96, two severe winters recording severity indexes of -6.4 and -6.3 respectively. Using the WTGB as the performance baseline, *Mackinaw's* employment hours are weighted by a factor of 2 as compared to the WTGB employment effort. While escorting vessels and establishing tracks, the *Mackinaw* is considered to be more effective than 2 WTGBs. Resource hours represent underway hours reported for track maintenance, vessel escorts, and direct assistance.[4] Employment hours for Canadian and commercial icebreaking assets are not included.

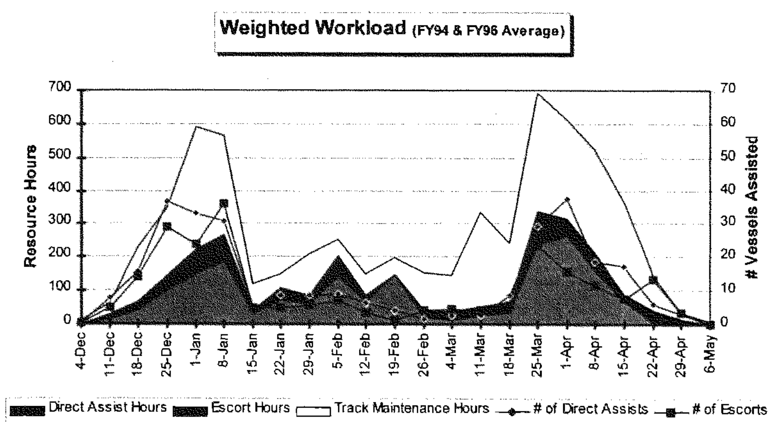


Figure 2-4

2.5 Historical Summary

The following summary is found in the 1982 version of the "USCG Roles and Missions Study."

Coast Guard icebreaking in domestic waters began in the 1930's with memos from President Roosevelt to the Commandant "suggesting" that icebreaking services be provided on the Hudson River and in New England harbors. The icebreaking mission originated with Executive Order No. 7521, dated December 21, 1936, which directed the Coast Guard "to assist, as practicable, in keeping channels and harbors open to navigation by means of icebreaking operations in accordance with the reasonable demands of commerce and to use, for that purpose, such vessels subject to its control and jurisdiction as are necessary and are reasonably suited for operations." In 1939, to partially meet the new demand for domestic icebreaking, the Coast Guard began construction of a fleet of 110-foot harbor tugs, each capable of operating on the ice-bound harbors and rivers in the Northeast and the Great Lakes. Buoy tenders, maintained by the U.S. Lighthouse Service, tasked to maintain aids to navigation in ice covered waters were (and continue to be) ice strengthened and turned over to the U.S. Coast Guard.

World War II had a significant impact upon Coast Guard domestic icebreaking operations. Accelerated industrial activity required a substantial increase in maritime commerce during winter months when Great Lakes and Northeast harbors were frozen and previously closed to maritime commerce. To meet this new icebreaking demand, the Coast Guard used ice-capable cutters, tugs, and buoy tenders; acquired civilian ferry boats with icebreaking capabilities; and in 1944 commissioned the CGC MACKINAW, a 290-foot icebreaker designed specifically for Great Lakes operations. Great Lakes icebreaking was especially critical to the war effort allowing a greater flow of taconite iron ore to be transported from Northern Great Lakes mining regions to the Midwest industrial centers of Chicago, Detroit, and Cleveland. Since World War II, the Coast Guard has continued to provide domestic icebreaking services to Great Lakes maritime commerce using many of the same resources that were used during the War, including CGC MACKINAW.

Depending on the severity of the winter, the Great lakes shipping season generally runs 10 to 11 months with commercial traffic ceasing from mid-January to Mid-March. In the past, Coast Guard icebreaking operations have been limited to the upper four Great lakes: Superior, Michigan, Huron, and Erie. Little winter shipping activity takes place on Lake Ontario, as it is bound on its ends by the Welland Canal and the St. Lawrence Seaway - both of which are closed during winter months. The small amount oficebreaking on Lake Ontario is carried out by the Canadian Coast guard in Canadian waters. Ice conditions vary considerably throughout the upper four lakes. The most difficult areas are Duluth-Superior and Western-Lake Superior, Whitefish Bay and the St. Marys River (connecting Lakes Superior and Huron), the Straits of Mackinac (connecting Lakes Michigan and Huron) and Escanaba on Lake Michigan. Ice thickness in these areas generally exceeds two feet. In the St Marys River, brash ice accumulations have generally been three to six feet. In the Straits of Mackinac, windrows and ridges of eight to ten feet thick are common.

During the early 1980s, Great Lakes icebreaking was carried out by CGC MACKINAW, five new 140-foot icebreaking tugs, and occasionally by the five 180-foot buoy tenders. During severe winters, the Milwaukee-based polar icebreaker WESTWIND was also available for domestic icebreaking operations.

The Coast Guard's fleet of icebreaking tugs, ice-capable buoy tenders, and ice-reinforced boats has undergone substantial changes and fleet reductions since the early 1980s; as the new more capable 140-foot Bay Class icebreaking tugs replaced the aging fleet of 110-foot tugs. Additionally, WESTWIND and two of the 180-foot WLBs were removed from Great Lakes service without replacement. Replacement cutters have generally been larger, fewer in number, and more capable to meet changing requirements for their primary mission areas.

3.0 ICEBREAKING MISSION REQUIREMENTS

3.1 Agreements With Other Agencies

The United States and Canadian Coast Guards operate under a cooperative agreement to provide joint icebreaking services on the Great Lakes and Saint Lawrence Seaway to best facilitate commerce using existing resources.[5] Under the agreement, each agency has principal icebreaking responsibility in the following areas:

Canadian Responsibility	United States Responsibility
Thunder Bay, Ontario	Western Lake Superior
Georgian Bay	Whitefish Bay
Southern End of Lake Huron	St. Mary's River
St Clair River (jointly with United States)	Straits of Mackinac
Eastern Lake Erie	Western Lake Erie
St. Lawrence Seaway	Northern Green Bay

3.2 Federal Mandates

The Coast Guard operates under numerous federal mandates with regard to Great Lakes icebreaking. Those mandates include:

Executive Order No 7521, dated 21 December 1936 "The Coast Guard shall assist in keeping open to navigation by means of icebreaking operations ... channels and harbors within the reasonable demands of commerce."

14 USC 2 "The Coast Guard shall ... develop, maintain, and operate icebreaking facilities for the promotion of safety on and over the high seas and waters subject to the jurisdiction of the United States."

14 USC 88 "The Coast Guard shall aid persons or vessels in distress on the high seas or on waters which the United States has jurisdiction." Distress may be caused by, among other things, vessels beset in ice or regions imperiled by flooding due to ice.

14 USC 141 "The Coast Guard may, when so requested by proper authority, utilize its personnel and facilities to assist, among others, Federal and State agencies." Under this authority the Coast Guard conducts icebreaking in channels and harbors to relieve flooding conditions.

3.3 Program Goals

To comply with these federal mandates, the Coast Guard conducts icebreaking, activities during the winter months to facilitate maritime commerce and to prevent loss of life, personal injury, and property damage on the navigable waters of the Great Lakes. This has been interpreted to mean the establishment and maintenance of tracks, providing escort and direct assistance, and relieving ice jams as necessary to:

(1) Extricate vessels and personnel from danger caused by ice;

(2) Prevent damage due to flooding caused by ice dams;

(3) Maintain the navigation season in ice bound areas where cost/benefit analysis and environmental impact studies indicate such services are in the nation's interest; and

(4) Minimize delays to commerce on navigable waters caused by ice and navigation hazards.

3.4 Functional Requirements

Functional requirements are defined as fundamental tasks necessary to meet program goals, expected operating conditions, and performance standards for a severe winter (index -6.2). A flowchart summarizing the development of functional requirements is provided as Appendix A.

Escort Vessels	Escort commercial vessels at 3 knots in plate ice up to 32 inches thick with 6-9 foot pressure ridges. Escort at 3 knots in 6-9 feet of brash ice.
Establish Tracks	Establish tracks in plate ice up to 32 inches thick with pressure ridges up to 12 feet.
Maintain Tracks	Maintain existing tracks in refrozen brash ice up to 60 inches or dense brash ice 6-9 feet thick.
Assist	Assist/free vessels beset in 8-12 feet of brash ice and or plate ice up to 32 inches thick.
Recover	Recover, remove, or relocate AtoN and other hazards in refrozen brash ice up to 60 inches thick or dense brash ice 6-9 feet thick. Recover personnel from ice covered waters and provide emergency medical assistance.
Tow	Tow distress vessels/AtoN in an existing track.
Transport	Transport passengers of Island communities when Ferry service is impeded by ice.
Relieve	Relieve ice jams (brash to a depths of 9-12 feet) in restricted waterways.
Flush	Flush brash ice to a depths of 6-9 feet from vicinity of docks, piers, and lock walls.
Extract	Extract own ship from beset condition without assistance under the following ice conditions: - plate ice 36 inches with winds to 40 knots. - ice ridging 9-12 feet with winds to 40 kts. - brash ice 8-12 feet in 40 kt winds (2 kt current).
Endurance	Operate 10 continuous days conducting icebreaking operations in restricted waters.
Maneuver	Maneuver alongside piers and vessels without tug assistance in plate ice up to 32 inches. Maneuver alongside aids to navigation in 24 inches of ice. Reverse direction by casting or backing in 30-32 inches of plate ice in unrestricted waters or in an existing track of 6-9 feet of brash ice within a confined channel width of 300 feet.
Transit	Transit in restricted waters, minimum channel width of 150 feet and a minimum depth of 19 feet. Transit in open water during icing conditions (winds of 45 kts, seas 8-12 feet).
Identify	Identify ice, hazards to navigation, and other vessels in restricted and unrestricted visibility.
Comms	Communicate with other vessels, aircraft, and shore stations when underway and inport.
Night Ops	Escort vessels and transit restricted waters during reduced visibility and at night.

4.0 CURRENT CAPABILITY

4.1 Current Fleet Mix

Three vessel classes are currently employed by the Coast Guard for icebreaking: WAGBs (1), WTGBs (5), and WLBs (3). Table 4.1 lists their characteristics.

Table 4.1 Coast Guard Ninth District Icebreaking Characteristics

Vessel Class	Length (ft)	Beam (ft)	Draft (ft)	Shaft Horse-power	Max Speed	3 knot Design Criteria	3 knot effective capability Hard Plate	Dense Brash	Wind Ridges
WAGB	290	74	19	10000	18.7 kts	32.4 in	36 in	9-12 ft	12-15 ft
WTGB	140	37	12	2500	14.7 kts	20 in	22 in	4-6 ft	6-9 ft
WLB	180	37	13	1200*	13.0 kts	14 in	14 in	2-4 ft	4-6 ft .

*Sundew 1650 horsepower

The "effective" icebreaking capabilities shown above are estimates based on vessel design parameters, WAGB/WTGB comparison tests conducted in 1981, expert opinion surveys conducted for the Volpe study, and Juniper/WTGB operational tests conducted in 1996. For this study, the effective capability in plate ice is defined as the maximum ice thickness that a vessel can operate at 3 knots or better. The effective capability of the WTGB used for this study was validated during 1996 operational tests and differ significantly from the Volpe study which estimated the WTGB capable of breaking approximately 30 inches at 3 knots. For dense brash and ridging, the criteria are subjective and based on horsepower and displacement.

Table 4.2 shows an inventory of current icebreakers and their primary area of responsibility. Vessels are frequently reassigned to secondary areas to meet local ice and shipping demands.

Table 4.2 Coast Guard Ninth District Icebreaking Inventory

Class	Vessel	Homeport	Age (yrs)	primary operating area
WAGB	Mackinaw	Cheboygan, MI	53	All areas
WTGB	Biscayne Bay	St Ignace, MI	18	Straits of Mackinac
	Bristol Bay	Detroit, MI	18	St. Clair River
	Katmai Bay	Sault Ste Marie, MI	19	St. Marys River
	Mobile Bay	Sturgeon Bay, WI	18	Escanaba
	Neah Bay	Cleveland, Oh	18	Lake Erie
WLB	Acacia	Charlevoix, MI	53	Straits of Mackinac
	Bramble	Port Huron, MI	53	St. Clair River
	Sundew	Duluth, MN	53	Duluth

140' WTGB "Bay" Class At full power and utilizing the bubbler system, the Bay Class icebreaker is able to continuously break up to 24 inches of solid ice with a foot of snow cover. In greater ice thickness to 30 inches or in pressure ridges 6-9 feet thick, the Bay Class icebreaker is able to make an average speed of one to two knots by utilizing the "back and ram" technique. The hull air lubrication "bubbler" system also facilitates quick extraction from ridges, even in heavy snow. With its shallow draft and narrow beam, the WTGB working alone is severely limited in its ability to break a new track when plate ice exceeds 29 inches, or when refrozen brash in an established track exceeds 4-6 feet. While establishing tracks and escorting vessels, two WTGBs operating in tandem can create a track more than twice the width of a single WTGB. Tandem WTGB operation has also been effective while assisting vessels in areas of extensive ice ridging and/or deep brash to depths of 6-9 feet.

The WTGB's endurance is typically limited to 18 hours of continuous operation for 4-5 consecutive days during the peak operating season. The seakeeping capability of the WTGB during winter months is also limited. While transiting open water during freezing conditions, rapid and hazardous topside icing occurs at wind speeds greater than 15-25 knots or seas greater than 3-5 feet. As a result, the WTGB is limited in its ability to transit across the Great Lakes to meet the demands of changing ice conditions.

WAGB Class The *Mackinaw*'s wide beam, high horsepower, and deep draft makes this icebreaker suitable for establishing tracks and escorting vessels in new ice greater than 22 inches thick. It is also the most effective icebreaker for relieving severe ice jams (12+ feet) which can form during strong winds in the open lake or rapid currents experienced in the narrow channels. The *Mackinaw's* seakeeping capability and endurance far exceeds that of the WTGB. Its size and seakeeping capability render it less susceptible to topside icing.

180' WLB Class Plate ice up to 18 inches thick does not usually present any significant problems for the WLB. The presence of any snow on the field ice, however, will greatly impede the progress when backing and ramming. Ridges exceeding 4-6 feet present problems for the WLBs and are best avoided, if possible, or approached with caution when tracks are closing rapidly. These conditions negate the effectiveness of the WLB and may place the vessel in extreme danger. As a limited icebreaker, WLBs are most effective in maintaining established tracks and flushing river ice.

4.2 Other Icebreaking Assets

There are currently several commercial tugs and three Canadian Coast Guard icebreaking buoy tenders (CCGS *Samuel Risley, Griffon, and Simcoe*) operating on the Great Lakes full time. One additional Canadian icebreaker (CCGS *Pierre Radisson*) has been made available on a limited capacity.

Commercial Icebreaking Several tug boat companies operate commercial tugs in moderate ice conditions up to 12-18 inches thick. The smaller tugs have excellent maneuvering characteristics and are routinely used to assist within harbor limits clearing ice and assisting vessels during docking evolutions.

Canadian Coast Guard Assets The Canadian Coast Guard's Central and Arctic Region is responsible for Canadian icebreaking requirements for the Great Lakes. Three icebreakers are assigned to the Great Lakes: *Simcoe, Griffon,* and *Samuel Risley*. The *Pierre Radisson* operated in Lake Superior during the severe FY94 and FY96 winter season. The following table lists Canadian Coast Guard vessels and their estimated operating characteristics.

Table 4.3 Great Lakes Icebreaking Capabilities

Vessel	Owner	Class	Length (ft)	Beam (ft)	Draft (ft)	Horse-power	3 knot ice capability plate	brash
Radisson	Canada	1200	322	65	24	13,600	36+ in	
Risley	Canada	1050	229	45	17/22	8,840	30 in	6-9 ft
Griffon	Canada	1100	234	49	12	4,000	20 in	4-6 ft
Simcoe	Canada	1000	179	38	12			

Source: Canadian Coast Guard Homepage

Simcoe operates on Lake Ontario and is typically unavailable to the rest of the Great Lakes; *Griffon* operates primarily in the St. Clair River area; and *Samuel Risley*, the most capable of the three vessels, operates on Lake Superior when the Sault Locks are open. The *Samuel Risley* moves down to Georgian Bay (northeast of Lake Huron) when the locks close and returns to Lake Superior when the locks re-open in March.

During the FY94 and FY96 winter seasons, the Canadian Coast Guard temporarily moved the *Pierre Radisson* from the Laurentian Region into the Great Lakes after the locks in the St. Lawrence Seaway were reopened in March. While both the *Mackinaw* and *Radisson* operated in Lake Superior during the last two severe winters, continued availability of a heavy (1200 class) icebreaker has not been committed by the Canadian Coast Guard for future operation on the Great Lakes.

4.3 Cutter Employment

Figure 4-1 shows the historical icebreaking hours delivered by the Ninth District for FY88 through FY96. Figures represent underway hours dedicated to direct assistance, escorts, and track maintenance as reported in the Ninth District annual end of season reports.

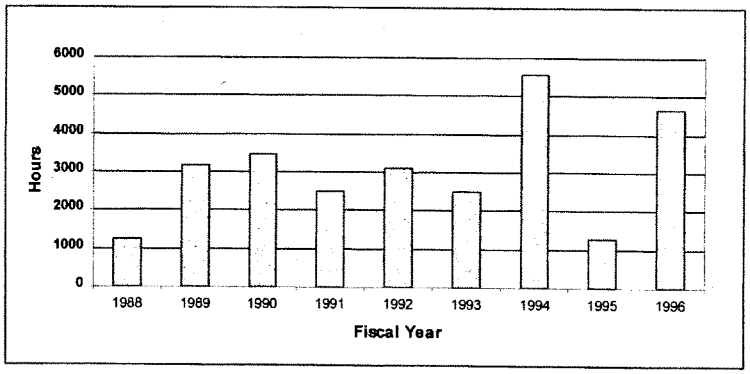


Figure 4-1

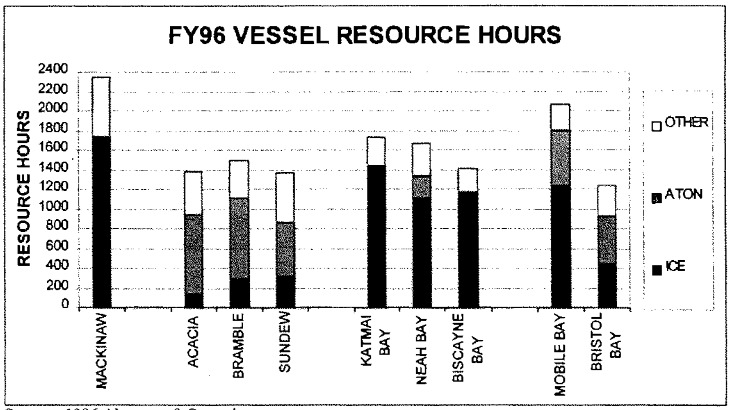
Icebreaking assets are made available to meet icebreaking mission requirements for approximately 122 days of each year (15 December through 15 April). In addition to sustaining this availability, the direct employment (resource) hours for FY93-FY95 (average) by cutter class, are provided in Table 4.4. The actual direct employment hours will vary from year to year and, for icebreaking, are a function of the severity of the ice season which can not be predicted. Cutter class contribution (%) for each mission is based on the individual mission employment compared against combined ICE and ATON hours.

Table 4.4 Average Annual Ninth District Cutter Resource Hours (FY93-95)

Vessel Class	ICE	%	AtoN	%	ICE & AtoN	TOTAL	Hrs/day
WAGB	912 hrs	100	0 hrs	0	912 hrs	1460 hrs	17.6
WTGB	594 hrs	94	40 hrs	6	634 hrs	948 hrs	11.3
WTGB w/barge	405 hrs	43	547 hrs	57	952 hrs	1240 hrs	12.7
WLB	47 hrs	6	724 hrs	94	771 hrs	1266 hrs	11.4

Source: 1993-95 Abstract of Operations

Annual employment distribution for cutters during FY96 is shown below. Hours dedicated to other missions include SAR, operational training, public affairs, marine science, cadet training, and miscellaneous missions.



Source: 1996 Abstract of Operations

Figure 4-2

4.4 Cutter Operating Costs and Authorized Billets

Mackinaw, five WTGBs, and three WLBs all have mission responsibility for domestic icebreaking. All three WLBs and two of the five WTGBs equipped with AtoN barges (*Mobile Bay* and *Bristol Bay*) also have primary mission responsibility for AtoN. The annual operating costs and authorized billets for each cutter resource assigned to the Great Lakes is provided in Table 4.5.

Table 4.5 — Annual Operating Costs of Ninth District Vessels

Vessel	Operating Costs (FY96)	Authorized Billets
Mackinaw	$4,771,907	75
Biscayne Bay	$1,352,339	17
Katmai Bay	$1,352,339	17
Neah Bay	$1,352,339	17
Bristol Bay	$1,977,365	27
Mobile Bay	$1,977,365	27
Acacia	$2,843,591	48
Bramble	$2,843,591	48
Sundew	$2,843,591	48
Total Costs	$21,314,427	

Source: G-CPA

5.0 CURRENT MISSION PERFORMANCE

5.1 Performance Standards and Measures

The following performance standards for Great Lakes icebreaking are based on the four program goals identified in Section 3.3 - *program goals*. Performance standards were developed using historical performance indicators and then sent to industry customers for comment. Specific measures required for each standard are listed in Appendix A. The standards established for Goals 3 and 4 are considered appropriate to meeting the *reasonable demands of commerce* and serve as the primary measure of icebreaking performance for this report.

Goal 1: **Extricate vessels and personnel from danger caused by ice.**

Standard: Respond to requests from people or vessels beset or stranded in ice within 2 hours of notification. Arrive on scene to assist within 6 hours of notification or first light if risk assessment determines delay beyond 6 hours is acceptable.

Goal 2: **Prevent damage due to flooding caused by ice.**

Standard: Relieve ice jams at the request of the U. S. ACOE prior to water levels exceeding flood stage with a minimum notification of 24 hours.

Goal 3: **Maintain the navigation season in ice bound areas where cost/benefit analysis and environmental impact studies indicate such services are in the Nation's interest.**

Standard: Provide icebreaking to facilitate winter shipping in critical waterways of the Great Lakes. Limit waterway closures due to ice to not more than 2 days during winters with severity index of -6.2 or milder. Limit waterway closures to not more than 8 days during severe winters (index more severe than -6.2).

Measure: Waterway closures for the following critical waterways during the open shipping season.

Critical Waterway	Open Date	Close Date
Western Lake Superior	20 Mar	15 Jan
Whitefish Bay, Upper & Lower St. Marys River	25 Mar	15 Jan
West Neebish Channel	25 Mar	15 Jan
Middle Neebish Channel	25 Mar	15 Jan
Northern Green Bay	10 Mar	31 Jan
Straits of Mackinac	year round	
St. Clair River, Lake St. Clair, Detroit River	year round	
Western Lake Erie	year round	

Goal 4: **Minimize delays to commerce caused by ice and navigation hazards.**

Standard: Provide icebreaking services to the level necessary to enable commerce to transit in ice covered waters at 3 knots or better, 90 percent of the time, during winters with severity index of -6.2 or milder. Enable commerce to move at 3 knots or better, 70 percent of the time, during severe winters (index more severe than -6.2).

Measure: Vessel transits in the St. Mary's River from the first assisted transit to the last. The period of performance for the FY96 season was defined as 12 December 1995 to 28 April 1996. Data necessary to evaluate other waterways is not available.

5.2 Icebreaking Performance

For the purposes of this analysis, icebreaking performance is evaluated based on the collective effort of existing Coast Guard, Canadian, and commercial assets to meet the current standards for goals (3) and (4) during the 1995/96 severe winter season. The 1995/96 winter season is representative of a severe winter with a severity index of -6.3. Based on 37 years of historical data, this severity level is representative of ice conditions likely to occur once every seven years and is considered a reasonable design criteria for defining icebreaking resource requirements. Supporting documentation for the icebreaking performance assessment is provided as Appendix B with the results summarized below.

Goal 3: Keep critical waterways open through the entire winter shipping season:

For the 95/96 season, the St. Mary's River was considered closed for 7 **days** of the performance period. The river was closed on 15 January and reopened on 25 March; however, the rock cut was closed for 7 days during the shipping season due to severe ice conditions with ice jams exceeding 12 feet.

Goal 4: Keep commerce moving at 3 knots or better through the St Marys River:

For the 95/96 season, icebreaking enabled commerce to transit the St. Mary's River at 3 knots or better, 83 percent of tbe time. There were 330 up-bound vessel transits and 331 down-bound transits recorded for a total of 661 transits. Of those transits, 288 up-bound and 262 down-bound vessels, for a total of 550 vessels, met or exceeded the 3 knot standard.

5.3 Other Mission Performance

Servicing aids to navigation is the only other primary mission that directly impacts the availability of current icebreaking assets. Five of the current nine cutters (three WLBs and two WTGBs with barges) are employed to service aids to navigation immediately prior to and following the icebreaking season. The five cutters are assigned primary responsibility for a total of 858 aids to navigation, of which 494 are seasonal aids.

The performance of the aids to navigation mission is primarily measured by the ability to: (1) remove (decommission) seasonal aids and then replace (commission) the same aids in accordance with their availability dates as advertised in the Great Lakes Light List; and (2) inspect all permanent aids in the Spring prior to the first week of June.

Ninth District annual statistics for the past three years indicate the current fleet has consistently commissioned aids approximately **one week later** than their scheduled commissioning dates. With the exception of the severe FY96 winter, the current fleet has been able to complete all seasonal and annual inspections **prior to the first week of June**. The aids to navigation assessment provided in Appendix C validates this performance level.

5.4 Resource Requirements

Resource requirements necessary to meet aids to navigation and icebreaking performance standards are defined in terms of both adequate capability and available capacity. Aids to navigation requirements are based on the weekly workload for seasonal and annual aids to navigation found in Appendix C. A separate analytical model was developed to define resource capability and capacity requirements for Great Lakes icebreaking. Critical inputs to the model include weekly ice conditions for a severe winter (index -6.3) and ship transit data for seven critical waterways. A description of the icebreaking model and a summary of resource requirements necessary to meet both icebreaking and AtoN performance standards is provided as Appendix D.

5.4.a Aids to Navigation

Approach Cutter capabilities and overall risk were assessed based on the depth of water reported in the District AtoN database (ATONIS) for each aid. The current fleet's capacity to meet the seasonal buoy demand was determined for each week based on the performance assessment summarized in Appendix C. Existing resources include three WLBs and two WTGBs with barges, all having a deep draft of approximately 13 feet.

Capability There are 37 buoys reported in water depths of less than 15 feet as shown in Table 5.1. The analysis did not determine how these aids are currently serviced, with or without small boat support.

Table 5.1 AtoN Depth of Water (partial)

Cutter/Depth (ft)	<14 ft	14 ft	15 ft	16 ft	17 ft	18 ft	19 ft	20 ft
ACACIA	1	0	0	1	2	4	2	5
BRAMBLE	11	1	1	0	1	6	2	6
SUNDEW	17	2	2	1	2	0	3	18
BRISTOL BAY	1	1	3	0	1	6	1	3
MOBILE BAY	1	2	3	2	1	4	4	5

Source: ATONIS database

Capacity Resource requirements indicate the capacity of the existing fleet is adequate with the exception of one week (06 May) during the Spring commissioning season. The one week deficit cannot be made up until the week of 03 June, as shown in Table 5.2.

Table 5.2 Weekly AtoN Demand (partial)

Winter Week	Scheduled AtoN (buoys)	Cutters Available	Capacity of Fleet (buoys)	Weekly AtoN Deficit (buoys)	Cumulative AtoN Deficit (buoys)
29 April	115	5	120	0	0
06 May	152	5	120	-32	-32
13 May	110	5	120	10	-22
20 May	110	5	120	10	-12
27 May	112	5	120	8	-4
03 June	112	5	120	8	4

Source: Appendix C

5.4.b Icebreaking

Approach Weekly waterway demands defined in Appendix D were compared against existing resources to assess the current capability and capacity deficiencies. Results of the analytical model were then compared to historical performance during the past three years for validation. Existing resources included *Mackinaw*, five WTGBs and three WLBs. Two Canadian icebreakers (CCGS *Risley* and *Griffon)* were also available during the entire winter shipping season, and the *Pierre Radisson* operated for one month following the opening of the Sault locks during two of the last three years.

Capability Table 5.3 provides a summary of the icebreaking analysis which indicates ice conditions during a severe winter season (index -6.3) exceed WTGB capabilities in several waterways during eight weeks of the shipping season. *Mackinaw* and two Canadian icebreakers (*Radisson* and *Risley*) all provide the heavy icebreaking capability necessary to meet these severe winter conditions.

Table 5.3 Weekly Waterway Conditions (partial)

Winter Week	Ice Covered Waterways	plate ice 13-22 (in) brash ice 2-4 (ft)	plate ice 23-29 (in) brash ice 4-6 (ft)	plate ice > 29 (in) brash ice > 6-9 (ft)
25 December	7	6	0	1
01 January	7	5	0	2
08 January	7	5	0	2
15 January	5	4	0	1
04 March	4	1	3	0
11 March	4	0	4	0
18 March	6	0	3	3
25 March	6	1	0	5
01 April	6	1	1	4
08 April	5	2	0	3
15 April	5	1	4	0
22 April	3	0	3	0

Source: Appendix D

Historical data validates the analytical model, as end of season reports indicate *Mackinaw* and two Canadian icebreakers (*Radisson* and *Risley*) were necessary to meet extreme ice conditions during past winter shipping seasons:

(1) Mild winter of 1994/95: Wind conditions jammed ice around Duluth for 30 days in April, and conditions were beyond WTGB capabilities. WTGBs were also unable to transit to western Lake Superior due to freezing spray.

(2) Severe winter of 1995/96: Three WTGBs were unable to keep the West and Middle Neebish channels open in the St Marys River from 23 December through 15 January. Again, on 13 April, a WTGB and the *CCGS Griffon* were unable to clear an ice jam in the St. Mary's River.

Capacity Analysis indicates all existing assets (five WTGBs, three WLBs, and one WAGB) were fully utilized and necessary to meet minimum performance standards during the severe FY96 winter (index -6.3). An assessment of cutter utilization is provided in Section 5.5. Table 5.1 suggests the demand for heavy icebreaking capability exceeds *Mackinaw's* capacity during four weeks of the shipping season. Historical data also indicates the current fleet, with *Mackinaw* alone, would have been inadequate for at least four weeks during two of the last three years. These periods included:

(1) Severe winter of 1993/94: Lake Superior was frozen over. *Mackinaw* and the *Pierre Radisson* were required to establish the track in Whitefish Bay and escort vessels across Lake Superior from 25 March through 20 April.

(2) Severe winter of 1995/96: Lake Superior was nearly frozen over. Ice conditions were beyond WTGB capabilities and *Mackinaw* was required to establish tracks in Whitefish Bay. Again, the *Pierre Radisson* was deployed to Lake Superior during the month of April.

5.5 Cutter Utilization Assessment

Ninth District cutter operations are unique, as the icebreaking and aids to navigation employment (90% of total annual employment) occurs during a compressed eight month (34 week) period beginning on 16 October and ending on 11 June, as shown in Figure 5-1.

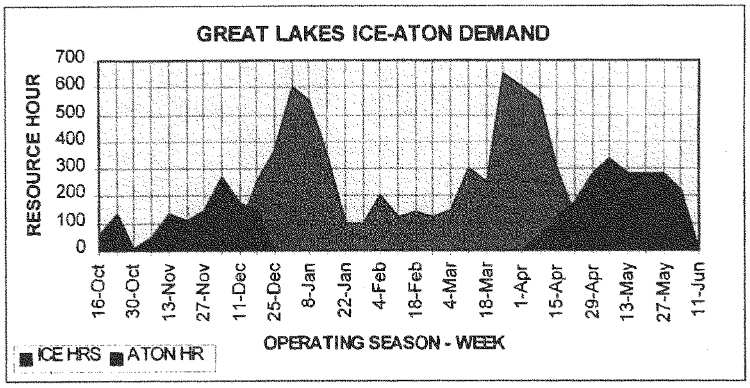


Figure 5-1

The employment capacity (opportunity) for the WAGB, WLB, and WTGB vessel varies due to their primary mission responsibility and the duration of the respective operating season. This analysis establishes "maximum employment" levels to assess current cutter utilization using resource (underway) hours as a primary indicator of employment. Workload projections and "maximum employment" levels are shown in Table 5.4.

Table 5.4 — Ninth District "Maximum Employment" Levels

Cutter Class	Primary Missions	*Season Duration	Average u/w day	Average u/w week	Weekly u/w hours	Max Employment aton-ice u/w hrs
WAGB	ICE	17 wks	18 hrs	6 days	108 hrs	1836 hrs
WTGB	ICE	17 wks	12 hrs	5 days	60 hrs	1020 hrs
WLB	ICE/ATON	25 wks	12 hrs	5 days	60 hrs	1500 hrs
WTGB/BARGE	ICE/ATON	25 wks	12 hrs	5 days	60 hrs	1500 hrs

* Icebreaking season is 17 weeks (15 December through 15 April). Season duration for ICE/ATON assets is 25 weeks: 13 weeks for AtoN and 12 weeks for icebreaking (17 week ice season reduced 5 weeks due to limited demand during the closure of the Sault locks).

While AtoN employment remains fairly consistent from year to year, icebreaking employment varies significantly in proportion to winter severity as shown in Table 5.5. During a severe winter season, demand for WTGB employment exceeds maximum employment levels.

Table 5.5 — Ninth District Employment Comparison

Cutter Class	Primary Missions	Max Employment (aton/ice missions)	FY93-95 Employment (aton/ice mission)	FY96 Employment (aton/ice mission)
WAGB	ICE	1836 hrs	912 hrs	1747 hrs
WTGB	ICE	1020 hrs	634 hrs	1313 hrs
WLB	ICE/ATON	1500 hrs	771 hrs	972 hrs
WTGB/BARGE	ICE/ATON	1500 hrs	952 hrs	1366 hrs

Source: Abstract of Operations (FY93-96)

6.0 PROJECTED FUTURE MISSION

This section assesses future icebreaking and aids to navigation mission requirements against icebreaking capabilities projected for the year 2006. A **reduced icebreaking fleet** expected by the year 2006 is defined as seven icebreaking resources including five 140' WTGBs and two 225' WLBRs. The future icebreaking fleet mix does not include existing or planned AtoN capabilities that are not suitable for operations in an ice environment (CGC *Buckthorn* and buoy boats).

6.1 Changes to Mission Requirements

There are no expected changes in the statutes and regulations that govern both the aids to navigation and icebreaking missions for the Great Lakes. The current icebreaking performance standards stated in Section 5.1 remain valid.

6.2 Historical Trends and Demand Projections

While seasonal demands for icebreaking vary significantly due to the severity of winter ice conditions, historical trends indicate shipping demand will remain strong and require the current 42 week shipping season. Year round shipping in the lower lakes remains necessary to deliver critical cargo and raw materials to Great Lakes ports.

During the past fifty years, increased use of electronic navigation (such as radar and LORAN) has reduced the need to rely solely on visible AtoN. At the same time, the needs of maritime commerce and the size of the ships have grown. These two impacts have balanced relatively well, resulting in a modest average growth in the number of AtoN since 1980 of 1% a year. A majority of new aids are private aids which are not operated or maintained by the Coast Guard. A significant reduction to the current AtoN population is not expected in the next 5-10 years.

6.3 Future Icebreaking Fleet Mix

290' Mackinaw WAGB: *CGC Mackinaw* represents the largest and most capable icebreaker in the Coast Guard's current inventory of Great Lakes icebreakers. *Mackinaw* has been in service for more than 50 years and is not expected to continue service beyond 2006 without a major service life extension.

180' Seagoing Buoy Tender WLB: The three buoy tenders currently assigned to the Great Lakes (*Acacia, Bramble,* and *Sundew*) have also served more than 50 years and are planned to be taken out of service by the year 2002. While these vessels do not typically provide significant icebreaking employment hours, they offer unique capabilities servicing aids to navigation during the winter shipping season, assisting passenger ferry service, conducting search and rescue in heavy weather, and assisting flood relief efforts. These missions would otherwise divert other more capable icebreaking resources.

225' Seagoing Buoy Tender WLBR: Two replacement WLBs, known as the new "*Juniper*" class of Coast Guard vessels, referred as WLBR in this report, are scheduled for assignment to the Ninth District to replace the three current WLBs. The *Juniper* is designed to be as ice-capable as the current 180-foot WLB, and it will have more horsepower (6,000) and a wider beam (45 feet). Initial operational testing performed in Green Bay indicates the new class vessel will exceed the design capability of 14 inches and perform at 3 knots in 24 inches of plate ice with some minor ice strengthening modifications; however, the ship remains limited in its ability to maneuver and back in ice greater than 12 inches.[6] Improved icebreaking capabilities of future *Juniper* class vessels may be possible using design options incorporated in the full production contract. For the purpose of this analysis, the new class buoy tender is considered to have equivalent icebreaking capability as the existing WLB.

140' Bay Class WTGB: The five icebreaking tugs are approaching 20 years of service with a life expectancy of 30 years, and should remain in service well past the year 2010. All five vessels recently underwent center section overhauls of main diesel engines and replacement of ship service generators to improve their overall reliability.

Canadian Icebreakers: The future presence of Canadian Coast Guard icebreaking resources on the Great Lakes is not a certainty at this time. Facing severe budget constraints, the Canadian government is considering opportunities to cut cost by implementing user fees or reducing the role oficebreaking on the Great Lakes - to include the seasonal lay-up of icebreaking resources. At least one icebreaker (CCGS *Risley*) is expected to be in operation through the entire winter season, and a second vessel (CCGS *Griffon*) is expected to be available 50 to 100 percent of the winter season. Despite the transfer of *Pierre Radisson* to the Great Lakes during past winters, continued availability of a heavy (1200 class) icebreaker has not been committed for future operation on the Great Lakes and is not planned for in the future fleet mix.

6.4 Future Resource Deficiencies

Table 6.1 summarizes Great Lakes icebreaking and aids to navigation resource deficiencies for a **reduced icebreaking fleet** expected by the year 2006. The **"reduced icebreaking fleet"** is defined as seven icebreaking resources including five 140 WTGBs and two 225 WLBRs. Icebreaking resource deficiencies are defined in terms of a heavy icebreaking capability, medium icebreaking capability, or light icebreaking capability as defined in Appendix D. The impact to mission performance is defined as the number of ship transits delayed due to icebreaking deficiencies. Expected ice conditions during the deficit weeks are identified to establish heavy icebreaking requirements. Projected AtoN deficits totaling 149 floating aids represents the AtoN resource shortfall identified in the SFM2000 report. To reduce this deficit, the report identified 194 buoys in Lake Superior available for reassignment to smaller more efficient buoy boats.

Table 6.1 Future Resource Deficiencies

Winter Week	AtoN Deficit (buoys)	Delayed Transits (vessels)	Expected Plate Ice (in)	Expected Brash Ice (ft)	Resource Gaps (number of assets) ICEBREAKING ASSETS (heavy)	(medium)	(light)	ATON
04 Dec	12							1
11 Dec		15	12				1	
18 Dec		48	12				2	
01 Jan		42		8-12	1			
08 Jan		24		8-12	1	1		
15 Jan		06		8-12	1			
04 Mar		02	22			1		
11 Mar		02	22			1		
18 Mar		10	32		1	2		
25 Mar		33	32		2	1		
01 Apr		51	33		2	1		
08 Apr		74		8-12	2			
15 Apr		54		8-12	1			
29 Apr	19							1
06 May	56							2
13 May	14							1
20 May	16							1
27 May	16							1
03 Jun	16							1

7.0 PROBLEM STATEMENT

7.1 Aging Fleet

Currently, the Canadian icebreakers combined with the Coast Guard's *Mackinaw*, five WTGBs, and three WLBs provide a diverse mix of icebreaking capability that work in close coordination to best meet all of the winter shipping demands on the Great Lakes. ***Mackinaw* is the only heavy icebreaking capability on the Great Lakes and at 53 years of service, there are no existing plans for a heavy icebreaker replacement. The reliability and readiness of *Mackinaw* will become a risk and unacceptable cost to mission performance.** The three aging WLBs have also served more than 50 years and are scheduled for replacement and fleet reduction (2 WLBRs) by 2002, as shown in Figure 7-1.

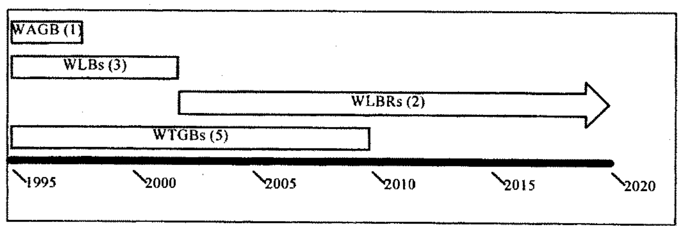


Figure 7-1

7.2 Mission Performance

While performance indicators for the FY96 severe winter season indicate the current level of service meets minimum performance standards, a future *reduced icebreaking fleet* of five WTGBs and two WLBRs cannot meet the following minimum performance standards for the Great Lakes.

(1) A *reduced icebreaking fleet* cannot maintain the current 42 week shipping season during a severe winter (severity index -6.2) likely to occur once every seven years. A reduced fleet can maintain a 37 week shipping season beginning on 15 April and ending on 1 January of each year. *The Volpe study concluded a reduced shipping season of 39 weeks could be maintained based on the analysis of only the FY94 season.*

(2) A *reduced icebreaking fleet* cannot provide adequate icebreaking services to enable commerce to transit in ice covered waters at 3 knots or better, 90 percent of the time, during a severe winter (severity index of -6.2). The reduced fleet can enable commerce to transit in ice covered waters at 3 knots or better, 90 percent of the time, during a 37 week shipping season which would begin on 15 April and end on 1 January of each year.

(3) A *reduced icebreaking fleet* cannot relieve severe ice jams in the St Clair River prior to water levels exceeding flood stage. The relatively narrow beam and shallow draft of the WTGB limits its ability to clear severe ice jams. WTGBs also frequently experience loss of main propulsion when brash levels exceed 9 feet due to their relatively shallow (12 ft) draft.

(4) A *reduced icebreaking fleet* cannot meet the seasonal commissioning dates for AtoN currently assigned to three WLBs and two WTGBs with barges. Mariners will experience a delay of 2-3 weeks during the Spring commissioning season.

7.3 Customer Impact

A reduced icebreaking fleet, without a heavy icebreaking capability, will require a shortened winter shipping season of at least five weeks. Assuming no excess shipping capacity and a gradual build-up and draw-down period for Great Lakes shipping, a five week closure will reduce total shipments on the Great Lakes by approximately 10 percent or 15 million tons of raw materials. Catastrophic flooding is also likely to occur without a heavy icebreaking capability available to relieve severe ice jams.

Using the severe (-6.3) winter ice season scenario may appear to overstate the needs of commerce; however, industry cannot plan ahead nor compensate for an unexpected severe winter without adequate icebreaking resources. With a significant reduction in icebreaking services, each company would have to assess the risk and length of shipping season which they can reasonably expect to operate in. Meteorological records for the past 37 years show that, on average, such winters occur once every seven years. Regardless, given the recency of the two severe ice seasons, industry's inventory managers would give them significant weight in planning their inventory needs in the absence of a heavy icebreaking capability. If they assumed a non-conservative approach and their projections were wrong, possible outcomes could include mills temporarily shutting down or home heating oil deliveries being jeopardized.[7]

7.4 Resource Inadequacies

Great Lakes icebreaking and aids to navigation fleet mix requirements are provided in Appendix D. Heavy Icebreaking requirements, based on industry agreed performance standards, are defined in Appendix E. Mission performance relies heavily on both adequate heavy icebreaking capability and available icebreaking capacity. A *reduced icebreaking fleet* will fall short on both accounts:

(1) The WTGB vessel (working alone or in tandem) does not meet heavy icebreaking requirements for the Great Lakes;

(2) Existing commercial icebreaking resources are neither adequate nor available to replace Coast Guard medium or heavy icebreaking resources.

(3) The ice strengthened *Juniper* class buoy tender (working alone or in tandem) does not meet the heavy icebreaking requirements for the Great Lakes. While the new buoy tender can exceed its designed icebreaking capability in plate ice, the vessel does not have the maneuvering capability to back in plate ice exceeding 12 inches.

(4) *Mackinaw* has exceeded its useful service life, maintenance costs are increasing, and operational readiness is at risk. Acceptable mission performance relies excessively on one heavy icebreaking capability leaving the icebreaking fleet vulnerable to failure if *Mackinaw* is not always ready. Mission performance will suffer and operating expenses will become cost prohibitive without a service life extension and modernization project. A project of this magnitude is estimated to cost $93 million. Approximately $3.5 million in funding, above the current support level, is required over the next three years to keep *Mackinaw* in service until 2006.[8]

Mackinaw maintenance AFC45 funding trend (standard funding support level is $800,000):

FY92	$ 593,257
FY93	$ 175,843
FY94	$ 788,000
FY95	$1,365,000
FY96	$2,028,066

8.0 NON-MATERIAL ALTERNATIVES EXPLORED

8.1 Shortened Winter Shipping Season

During eight weeks of winter shipping from 15 December through 15 April, approximately 11.8 million tons of cargo, of which 7.3 million tons of iron ore is currently shipped by U.S. flag vessels with the assistance of Great Lakes icebreaking. During a severe winter, icebreaking is required for an additional four weeks. Extending the shipping season 8-12 weeks enables industry to take advantage of cheaper costs of waterborne transportation and to minimize inventory stockpiling.

Two separate models, the Volpe study and the Environmental Impact Statement (EIS), were developed to assess the cost to industry of a shortened 34 week shipping season ending 15 December and starting 15 April with no icebreaking provided. The models differed significantly in their estimate of the shipping fleet's excess capacity for delivering additional cargo in a shorter season. The Volpe study accounted for no excess shipping capacity and contributed all 11.8 million tons of cargo for their analysis. The EIS determined a theoretical maximum excess shipping capacity of approximately 5.5 million tons. Their model included only the 7.3 million tons of iron ore cargo and assumed excess shipping capacity could cover the additional 4.5 million tons of other cargo. While the LCA claims there is no excess shipping capacity, confirming the current fleet to be operating at full capacity is difficult. The models included three alternatives to meeting industry demand within the reduced 34 week shipping season including **increased stockpiling, shipment via rail,** and **foreign supply**.

Outputs from the models show industry's least cost alternative to reliance on Coast Guard icebreaking (reducing the 42 week shipping season to 34 weeks) is **increased stockpiling** - for a total annual benefit of **$49-$78 million**. A summary of each model is provided in Appendix F.

Given the high cost of the alternative suggested above compared to the relatively inexpensive cost of Great Lakes icebreaking ($8.5 million), industry would most likely opt to establish and pay for commercial icebreaking service necessary to maintain the current performance standards.

8.2 Non-material Acquisition (Service Options)

The Coast Guard is the sole federal agency responsible for providing icebreaking services and has provided domestic icebreaking on the Great Lakes for more than 50 years. While the Coast Guard is expected to retain this responsibility, other service providers were considered including commercial icebreaking providers and the Canadian Coast Guard.

Commercial Icebreaking While current federal policy prohibits the Coast Guard from interfering with the interests of commercial icebreaking, heavy icebreaking services are not readily available in the private sector. Several tug boat companies (Selvick, Malcolm, Basic Marine, Great Lakes Towing) operate multi-purpose commercial tugs in moderate ice conditions up to 12-18 inches thick. The smaller tugs have excellent maneuvering characteristics and are routinely used to assist within harbor limits clearing ice and assisting vessels during docking evolutions. Market surveys indicate there is an interest to provide commercial heavy icebreaking capability at an estimated annual cost of $3.8 million dollars. **Without a federal subsidy program or a signal to reduce federal icebreaking responsibility, a heavy icebreaking capability is not likely to be available in the private sector due to high capital investment, financial risks, and the uncertainty associated with icebreaking services.**

Lease Canadian 1200 Class Icebreaker: The Canadian government currently has excess heavy icebreaking capability. A 1200 class icebreaker can be made available fully crewed for five months from 1 December through 30 April at an estimated annual cost of $3.0 million, not including fuel costs.[9] A lease is considered feasible only as a short term option (less than five years) to allow the *Mackinaw* to be taken out of service for retrofit and overhaul, if necessary. While the Canadian Coast Guard may have adequate and readily available heavy icebreaking assets, they cannot satisfy the U. S. Coast Guard's federal responsibility and long term assurance to provide adequate icebreaking services for the Great Lakes. In addition, the U.S. shipping fleet does not care to rely on a Canadian icebreaker for its long-term needs.[10] **Without a signal to reduce federal icebreaking responsibilities, this option is not acceptable as a long term solution.**

8.3 Redistribute Existing Icebreaking Assets

There are no excess heavy icebreaking assets in the Coast Guard's current inventory of cutters; however, there are four 140' WTGBs assigned to the East Coast. While the WTGB does not fill the critical heavy icebreaking resource gap, it would substantially fill medium icebreaking resource deficiencies projected as the result of the planned buoy tender replacement and fleet reduction for the Great Lakes. **This option is available for consideration pending the results of the *East Coast Domestic Icebreaking Mission Analysis Report* currently under review.**

8.4 Aids to Navigation Mission Alternatives

The resource gaps identified for the aids to navigation mission may be resolved by rescheduling commissioning dates or shifting aid responsibility to shore units having buoy boat capabilities, as recommended in the SFM2000. Some reduction to the current floating AtoN population may also be possible as the result of improved electronic navigation systems (DGPS). Computer modeling to conduct waterway risk assessments will be critical to prioritizing floating AtoN and optimizing seasonal commissioning dates. Further optimization of Canadian and United States Coast Guard assets may also be possible through international agreements similar to those made for the icebreaking mission. The Ninth District is already actively negotiating with Canada to gain efficiencies with existing assets.[11]

PART II

9.0 RANGE OF ALTERNATIVES

9.1 Alternatives Selection Criteria

This section identifies preliminary select options available to meet the heavy icebreaking requirements on the Great Lakes and possibly satisfy additional aids to navigation mission requirements. Each option is briefly described and then assessed based on the following criteria:

- *Operational capability*: The option's ability to meet functional requirements for heavy icebreaking.
- *Other Mission Opportunity*: The option's ability to meet other mission requirements.
- *Availability*: The time required to bring the option on line. Assume earliest availability for major acquisition is 2006.
- *Life Expectancy*: Total years of service.
- *Acquisition Cost*: Estimated acquisition cost.
- *Project Risk:* Schedule, cost, technical, and operational risks.

9.2 Status Quo

Continue operating *Mackinaw* with existing crew: *Mackinaw* can continue to operate until 2006 under its current configuration with a series of minor maintenance contracts performed between FY98 and FY00. *Mackinaw* meets or exceeds all heavy icebreaking requirements and remains primarily a single mission icebreaking asset. Vessel availability is limited to the winter shipping season only through FY2000. During FY98 through FY00, major maintenance contracts would be scheduled during the summer months. This is a short term option to extend the service life approximately ten years at an estimated cost of $3.5 million above the standard support level. Schedule and technical risk are low; cost risk is medium, as cost growth is likely due to the poor condition of equipment; operational risk is also medium, as equipment failure is not significantly reduced with only minor improvements made to equipment more than 50 years old.[12]

9.3 Extend Service Life or Enhance Existing Assets

Enhance *Juniper* class WLB: Performance evaluations were conducted on *Juniper* in 1996 to evaluate its safe and effective icebreaking capability. The final report concluded the vessel can safely operate in up to 24 inches of plate ice with two modifications at an estimated cost of $1.1 million; however, the ship would be unable to break 12 inches of ice when backing. Schedule, cost, and technical risk are all low; operational risk is high, as the modifications would not provide a heavy icebreaking capability.[13] Further enhancements necessary to meet heavy icebreaking capabilities are being considered, but are not likely to be feasible without significant design changes that would require a major acquisition approval.

Retrofit *Mackinaw* with crew reductions: Retrofit *Mackinaw* to extend its service life 20 years, and reduce the current crew complement of 75 people. *Mackinaw* would meet or exceed all heavy icebreaking requirements and remain primarily a single mission icebreaking asset. The vessel would be taken out of service for a minimum of one icebreaking season to perform retrofit. The acquisition cost is estimated to be $93 million with an availability date of 2006. Schedule and cost risk are high due to the likely event of discovering unknown damage during retrofit; technical risk is medium, as state of the art technology will be integrated with 50 year old technology; operational risk is also medium due to the continued use of original equipment (not all systems will be renewed).[14]

9.4 Acquisition of New Assets

Heavy Icebreaking Buoy Tender: Design and build a fleet mix of icebreaking buoy tenders (dual draft) to replace *Mackinaw* and three WLBs. The vessels would be designed to meet both heavy icebreaking and seagoing aids to navigation requirements on the Great Lakes. Some compromise may be required due to conflicting requirements for draft (displacement) and overall length. The acquisition costs is estimated to be $98 million for the lead ship. A life expectancy of 30+ years is planned with an asset availability date of 2006. The planned acquisition of two Juniper Class buoy tenders would be canceled with funding reprogrammed for this project. Schedule, cost, technical, and operational risks are all low.[15]

Heavy Icebreaker Replacement: Design and build a heavy icebreaker replacement similar in size and capability to the *Mackinaw*. The vessel would meet all heavy icebreaking requirements and be designed as a single mission icebreaking asset. The acquisition cost is estimated to be $130 million with a life expectancy of 30+ years and an availability date of 2006. Schedule, cost, technical, and operational risks are all low.[16]

Composite Unit - Buoy Tender with Icebreaking Barge: Design and build an ice capable buoy tender designed to be composite with an integrated icebreaking barge (IIB). The vessel would be designed to meet both heavy icebreaking and AtoN requirements on the Great Lakes. The acquisition cost, life expectancy, and availability date for the composite unit is estimated to be similar to the heavyicebreaking buoy tender option. Schedule risk is medium; cost and technical risk is high; and operational risk is very high.[17]

10.0 JUSTIFICATION FOR MAJOR SYSTEMS ACQUISITION

10.1 Summary of Rationale for Acquisition

Mackinaw is the only heavy icebreaking capability on the Great Lakes, and at 53 years of service has exceeded its effective useful service life. The costs of assuring *Mackinaw's* mission readiness are escalating and cannot be sustained beyond 2006. The option to extend the service life of *Mackinaw* or enhance the icebreaking capability of the future *Juniper* class WLB were considered. Neither are feasible without major acquisition funding.

Non-material options were also considered. Existing commercial icebreaking resources are neither adequate nor available to replace Coast Guard medium or heavy icebreaking assets. Without a federal subsidy program or a signal that federal icebreaking responsibility will be reduced, a heavy icebreaking capability is not likely to be available in the private sector due to high capital investment, financial risks, and the uncertainty associated with icebreaking services. Leasing a Canadian 1200 class icebeaker is not an acceptable long term solution to meeting the Coast Guard's icebreaking responsibilities for the Great Lakes region.

10.2 Impact of Status Quo

Mission performance will become unacceptable and operating expenses will become cost prohibitive without a service life extension and modernization of *Mackinaw*. A service life extension of 20 years is estimated to cost $93 million. Approximately $3.5 million in funding, above the current support level, is required over the next three years just to keep *Mackinaw* in service until 2006. The WTGB class vessel and the future ice strengthened *Juniper* class buoy tender (working alone or in tandem) do not meet the heavy icebreaking requirements for the Great Lakes.

A future *reduced icebreaking fleet* of five WTGBs and two WLBRs expected by 2006 cannot meet the minimum performance standards for icebreaking on the Great Lakes. Mission performance relies heavily on both adequate heavy icebreaking capability and available icebreaking capacity. A *reduced icebreaking fleet* will fall short on both accounts.

A *reduced icebreaking fleet*, without a heavy icebreaking capability, will result in a shortened winter shipping season of at least five weeks. Assuming no excess shipping capacity and a gradual build-up and draw-down period for Great Lakes shipping; a five week closure will reduce total shipments on the Great Lakes by approximately 10 percent or 15 million tons of raw materials. Economic cost/benefit analysis determined industry's least cost alternative to reliance on Coast Guard icebreaking (reducing the 42 week shipping season to 34 weeks) is increased stockpiling - at a total annual direct cost of $49-$78 million. In addition, catastrophic flooding is likely to occur without a heavy icebreaking capability available to relieve severe ice jams.

10.3 Resource Estimate

Considering the options defined in Section 9, a lead ship replacement or modernization is estimated to cost **$93-$130 million**. Assuming a fleet mix of three vessels, the total system acquisition cost is estimated to be **$174-$233 million**.

End Notes

[1] Lake Carriers' Association, *Annual Reports* (1994-1996).

[2] Brown & Root Environmental, *Draft Environmental Impact Statement* (October 1996), p. 3-22.

[3] Lake Carriers' Association, *Vessel Roster Listing* (1996).

[4] Ninth District, *End of Season Reports* (1994 and 1996).

[5] Canadian and United States Coast Guard, *Memorandum of Understanding-Icebreaking* (1980).

[6] U.S. Coast Guard, Engineering Logistics Center (ELC), *Performance Evaluation of the USCG Buoy Tender Juniper in Ice* (December 1996).

[7] Volpe NTSC, *Analysis of Great Lakes Icebreaking Requirements*

[8] U.S. Coast Guard, Comdt (G-SEN), *Great Lakes Icebreaking Resource Requirements* (4 Dec 1996).

[9] Canadian Coast Guard, *1200 Class Icebreaker Lease Proposal* (1996).

[10] Lake Carriers' Association, Discussions with Mr. George Ryan, President (1997).

[11] Canadian and United States Coast Guard, *Draft Memorandum of Understanding between the U.S. Coast Guard and the Canadian Coast Guard for Marine Aids to Navigation Program Delivery* (1997).

[12] U.S. Coast Guard, Office of Naval Engineering (G-SEN-2), *Great Lakes Icebreaking Resource Requirements*, memo (4 December 1996).

[13] U.S. Coast Guard, Office of Naval Engineering (G-SEN-2), *Juniper Class Enhanced Icebreaking Requirements*, memo (21 February 1997).

[14] U.S. Coast Guard, Engineering Logistics Center (ELC), *USCGC Mackinaw Modernization Plan and Cost Estimate*, rpt (December 1996).

[15] U.S. Coast Guard, Office of Naval Engineering (G-SEN-2), *Great Lakes Icebreaking Resource Requirements*, memo (4 December 1996).

[16] U.S. Coast Guard, Office of Naval Engineering (G-SEN-2), *Great Lakes Icebreaking Resource Requirements*, memo (4 December 1996).

[17] U.S. Coast Guard, Office of Naval Engineering (G-SEN-2), *Great Lakes Icebreaking Resource Requirements*, memo (4 December 1996).

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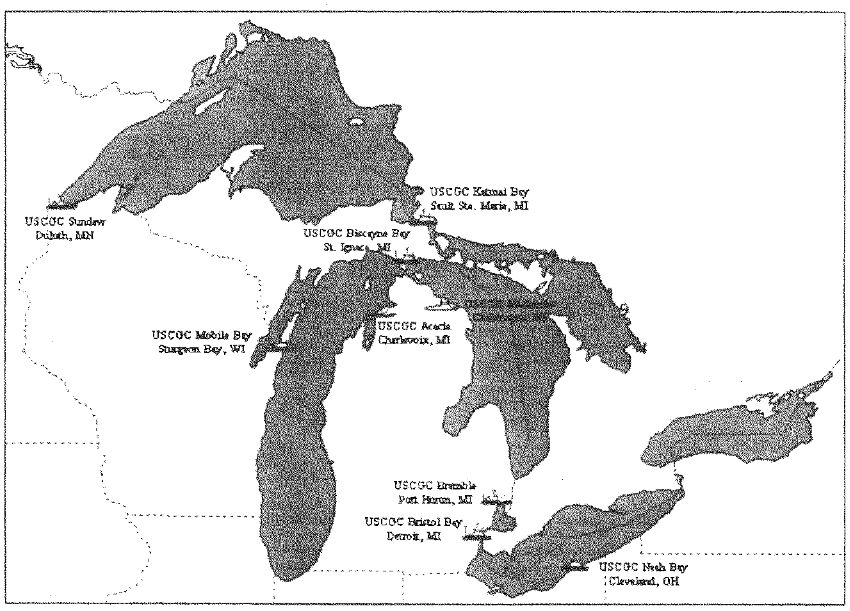
GREAT LAKES ICEBREAKING MISSION ANALYSIS REPORT

5 June 1997

APPENDICES

A. Icebreaking Performance Standards & Requirements
B. Icebreaking Performance
C. Aids to Navigation Performance
D. Resource Requirements
E. Heavy Icebreaking Requirements
F. Great Lakes Icebreaking Economic Benefits

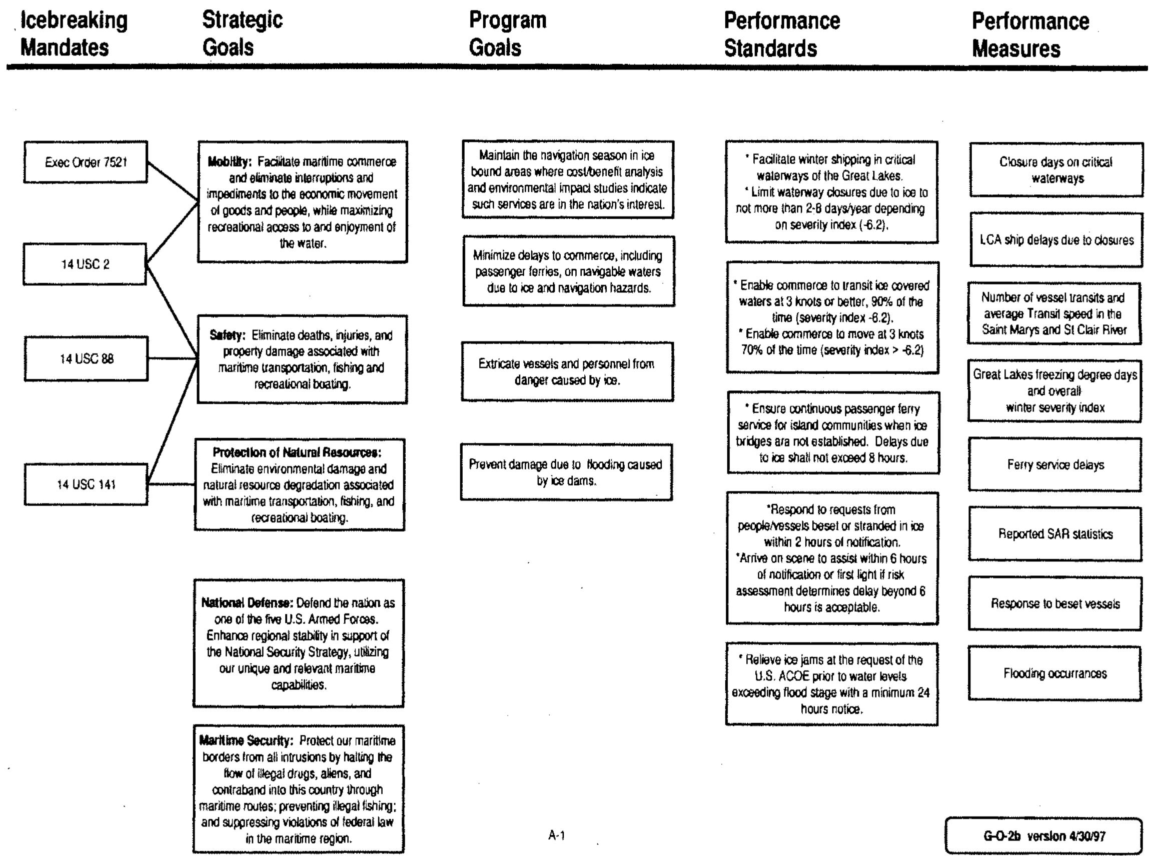


APPENDIX A

Icebreaking Performance Standards & Requirements

The following chart illustrates the development of mission functional requirements from the federal mandates that define the Coast Guard's icebreaking mission. Key elements of the chart include:

Mission mandates .... federal laws, statutes, treaties, or executive orders.
Strategic goals...................... Commandant's strategic goals.
Program goals.......................operating program goals & objectives which support mission mandates and strategic goals.
Performance standards........"outcome" based performance standards stated in terms of a one or more performance measures with an expected level of performance.
Performance measures.........measurable indices used to define and assess mission performance.
Operational strategies..........general operating tasks necessary to achieve program goals.
Activity measures................. "output" based measures of activity which capture indicators of employment and services provided.
Operating conditions............environmental conditions that impact operational strategies.
Functional requirements......mission specific operating requirements stated in terms of an operational strategy (task) and operating conditions necessary to achieve performance standards..
Operating requirements.......general operating requirements stated in terms of an operational strategy (task) and operating conditions necessary to routine operations in support of program goals.


Icebreaking Mandates
Strategic Goals
Program Goals
Performance Standards
Performance Measures
Exec Order 7521
14 USC 2
14 USC 88
14 USC 141
Mobility: Facilitate maritime commerce and eliminate interruptions and impediments to the economic movement of goods and people, while maximizing recreational access to and enjoyment of the water.
Safety: Eliminate deaths, injuries, and property damage associated with maritime transportation, fishing and recreational boating.
Protection of Natural Resources: Eliminate environmental damage and natural resource degradation associated with maritime transportation, fishing, and recreational boating.
National Defense: Defend the nation as one of the five U.S. Armed Forces. Enhance regional stability in support of the National Security Strategy, utilizing our unique and relevant maritime capabilities.
Maritime Security: Protect our maritime borders from all intrusions by halting the flow of illegal drugs, aliens, and contraband into this country through maritime routes; preventing illegal fishing; and suppressing violations of federal law in the maritime region.
Maintain the navigation season in ice bound areas where cost/benefit analysis and environmental impact studies indicate such services are in the nation's interest.
Minimize delays to commerce, including passenger ferries, on navigable waters due to ice and navigation hazards.
Extricate vessels and personnel from danger caused by ice.
Prevent damage due to flooding caused by ice dams.
* Facilitate winter shipping in critical waterways of the Great Lakes.
* Limit waterway closures due to ice to not more than 2-8 days/year depending on severity index (-6.2).
* Enable commerce to transit ice covered waters at 3 knots or better, 90% of the time (severity index -6.2).
* Enable commerce to move at 3 knots 70% of the time (severity index > -6.2)
* Ensure continuous passenger ferry service for island communities when ice bridges are not established. Delays due to ice shall not exceed 8 hours.
*Respond to requests from people/vessels beset or stranded in ice within 2 hours of notification.
*Arrive on scene to assist within 6 hours of notification or first light if risk assessment determines delay beyond 6 hours is acceptable.
* Relieve ice jams at the request of the U.S. ACOE prior to water levels exceeding flood stage with a minimum 24 hours notice.
Closure days on critical waterways
LCA ship delays due to closures
Number of vessel transits and average Transit speed in the Saint Marys and St Clair River
Great Lakes freezing degree days and overall winter severity index
Ferry service delays
Reported SAR statistics
Response to beset vessels
Flooding occurrances
G-O-2b version 4/30/97

Operational Strategies	Activity Measures	Operating Conditions	Functional Requirements	Operating Requirements
Establish and Maintain tracks in critical waterways	Resource hours dedicated to track maintenance	thickness of ice	Establish tracks in plate ice 12-32 inches thick with pressure ridges of 3-12 feet.	extract own vessel in 36 inch ice or brash/ridging to 12 feet
Remove hazards to navigation	Resource hours dedicated to transit or hove to	type of ice	Maintain existing tracks in refrozen brash 12-60 inches thick or brash 3-9 feet.	endurance and onscene time 24 hrs x10 days continuous
Escort vessels through ice covered waterways	Resource hours dedicated to direct assistance or escorts	pressure ridging	Escort vessels at 3 knots in new ice 12-32 inches thick with pressure ridges 3-9 feet.	maneuver alongside piers and vessels in 32 inch ice
Asist residents of island communiteis	Resource hours dedicated to ferry assistance	minimum width of channel	Escort vessels at 3 knots in an existing or refrozen track with brash 3-9 feet.	casting in 32 inch ice within channel width of 300 ft or
Rescue and assist personnel in distress	Number of vessels assisted/escorted	control depth of channel	Recover aton and other hazards in refrozen brash 12-48 inches thick and brash 3-9 feet.	backing in existing track with 3-9 feet of brash
Break free and assist vessels beset in ice	Observed ice coverage, thickness, and formation	traffic demand and vessel characteristics	Transport passengers of island communities when ferry service is impeded by ice.	identify other vessels, hazards, ice conditions
Maintain a bravo lake SAR vessel (4 lakes)	Number of SAR cases	number of waterways	Recover personnel from ice covered waters and provide emergency medical assistance.	communicate with other vessels, aircraft, shore
Relieve ice jams that cause flooding	High readiness hours dedicated to winter shipping	operating season	Tow vessels/aton in an existing track.	escort and assist in reduced visibility and at night
	Resource hours dedicated to flood relief		Assist/free beset vessels in 3-12 feet of brash ice or 12-32 inches of plate ice.	transit in restricted waters with 150 foot channel width and 19 foot control depth
			Relieve ice jams 6-12 feet deep in restricted channels.	transit in open waters during icing conditions with winds to 45 knots, seas to 12 feet.

G-O-2b version 4/30/97

APPENDIX B

Icebreaking Performance

Appendix B-1: Icebreaking Performance Assessment

This appendix provides an assessment of icebreaking performance for the severe 1995/96 winter season.

Appendix B-2: St. Mary's River Weekly Transits vs. Ice Thickness

The chart depicts a summary of ice conditions, weekly traffic, accumulated freezing degree days (AFDD), and transit delays recorded for the St. Mary's River during the 1995/96 winter season.

Appendix B-3: St. Mary's River Transit Delays

The table provides a weekly summary of vessel traffic demand and transit delays recorded for the St. Mary's River during the 1995/96 winter season.

Appendix B-4: Ice Charts

Ice charts are provided to show observed ice conditions reported during the severe 1993/94 winter season (severity index -6.4). Ice observations for FY96 were not available for this analysis.

Appendix B-5: Accumulated Freezing Degree Day (AFDD) Charts

Annual accumulated freezing degree day charts for the 1993/94 and 1995/96 severe winter seasons are provided to estimate plate conditions where no ice observations were reported.

Appendix B-1

Icebreaking Performance Assessment

For the purposes of this analysis, icebreaking performance during the severe 1995/96 ice season was evaluated based on the collective effort of all Coast Guard, Canadian, and commercial assets to meet two primary goals:

- Goal 3: Keep all critical waterways open through the entire extended winter shipping season;

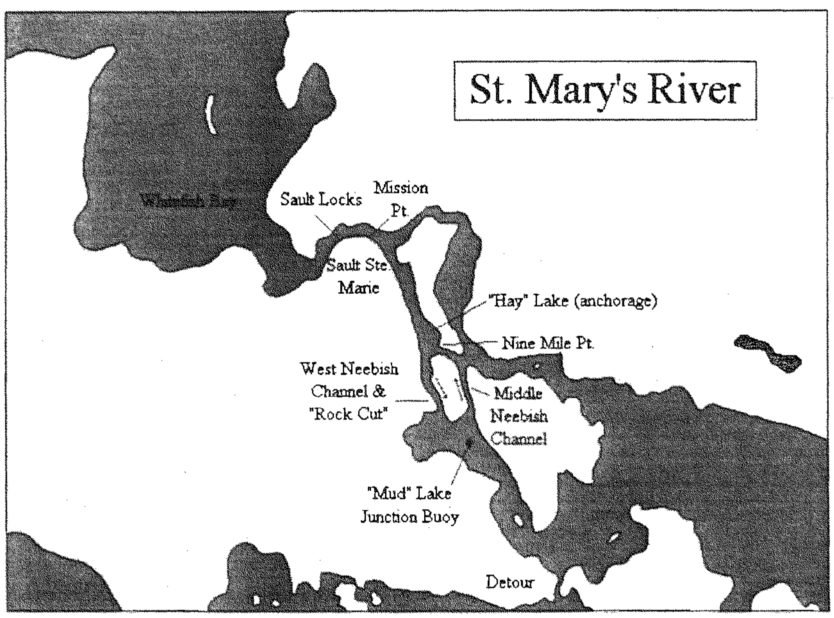
- Goal 4: Keep commerce moving at 3 knots or better through the St Mary's River.

Approach:

(1) Coast Guard Ninth District End of Season reports were reviewed to identify key closure and opening dates for the St Mary's River for the 95/96 ice season.

(2) VTS records were reviewed for all transits through the St Mary's River during the 95/96 season.

(3) Transit speeds were measured between Mission Point and the Mud Lake check points.



Assumptions:

(1) The 1995/96 winter season is representative of a severe winter with a severity index of -6.3. Based on 37 years of historical data, this severity level is representative of the most severe ice conditions likely to occur once every seven years and is considered a reasonable design criteria for assessing icebreaking performance.

(2) Overall icebreaking performance can be estimated by measuring performance in a representative area. For this analysis, performance in the St Mary's River was evaluated between Mud Lake and Mission Point, a distance of 22 nautical miles. The greatest amount of icebreaking effort was performed in this area, and approximately 90% of all winter shipping transits this waterway. Performance data for this waterway is accurately recorded by the VTS Sault Ste Marie and the U. S. Army Corps of Engineers located in Sault Ste Marie, Michigan.

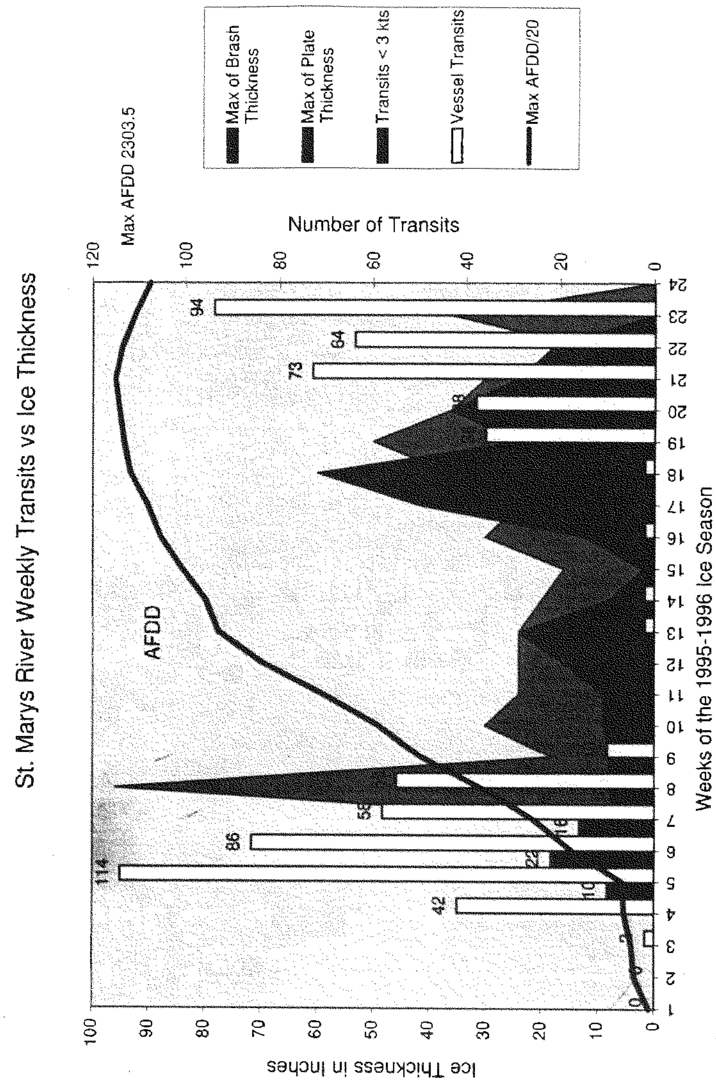
(3) The performance period (70 days) was defined as **12 December through 28 April**, and does not include the lock closure period from 16 January to 24 March. Reported transit delays include all cases regardless of reason for delay, including upbound vessels awaiting lock assignments.

(4) The closure and opening date for the river is based on the availability of 2 way traffic around the Neebish Island. The river is also considered closed when shipping is stopped for more than 24 hours.

Results:

(1) For the 95/96 season, the St. Mary's River was considered open 90 percent of the performance period. The river was closed on 15 January and reopened on 25 March; however, the rock cut was closed for 7 days during the shipping season due to severe ice conditions.

(2) For the 95/96 season, icebreaking enabled commerce to transit the river at 3 knots or better, 83 percent of the time. There were 330 up-bound vessel transits and 331 down-bound transits recorded for a total of 661 transits. Of those transits, 288 up-bound and 262 down-bound vessels, for a total of 550 vessels, met or exceeded the 3 knot standard.


St. Marys River Weekly Transits vs Ice Thickness
Ice Thickness in Inches
Number of Transits
Max AFDD 2303.5
AFDD
Weeks of the 1995-1996 Ice Season
Max of Brash Thickness
Max of Plate Thickness
Transits < 3 kts
Vessel Transits
Max AFDD/20
114
86
58
42
22
10
16
94
73
64

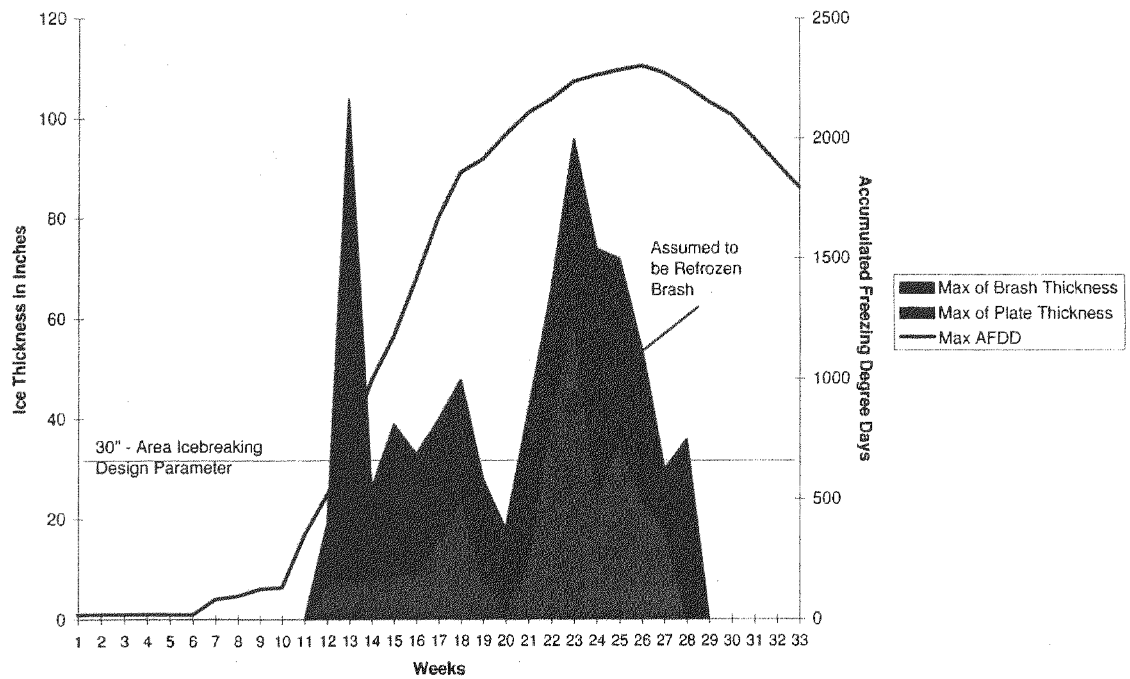
Appendix B-3

St Mary's River Transit Delays

	Start Date	Number of Vessel Transits	Average Speed	Number Delayed	Percent of Total Number Delayed (%)	Anchor (%)	Await Escort (%)	Await Locks (%)	Hove To (%)	I/O (%)	Moored (%)	River Closed (%)	Superior (%)	Traffic (%)	Visibility (%)	? (%)
1	17 Nov 95	0														
2	24 Nov 95	0														
3	1-Dec-95	2			0.0											
4	8-Dec-95	42	4.65	8	19.0	16.7			2.4							
5	15-Dec-95	114	5.33	10	8.8	2.6				1.8		1.8		0.9		1.8
6	22-Dec-95	86	4.57	22	25.6	11.6			1.2		1.2	4.7		1.2	1.2	4.7
7	29-Dec-95	58	3.94	16	27.6	5.2			15.5		1.7		1.7			3.4
8	5-Jan-96	55	2.42	8	14.5				11							4
9	12-Jan-96	10	5.12	2	20.0				20							
10	19-Jan-96	0														
11	26-Jan-96	0														
12	2-Feb-96	0														
13	9-Feb-96	2			0.0											
14	16-Feb-96	2			0.0											
15	23-Feb-96	0														
16	2-Mar-96	2			0.0											
17	9-Mar-96	0														
18	16-Mar-96	2			0.0											
19	22-Mar-96	36	1.19	5	13.9	8.3		5.6	8.3							
20	29-Mar-96	38	3.67	3	7.9	26.3			2.6							
21	5-Apr-96	73	5.24	2	2.7	4.1										
22	12-Apr-96	64	6.07	2	3.1											1.6
23	19-Apr-96	94	6.51	2	2.1											
24	26-Apr-96	37	7.01		0.0											

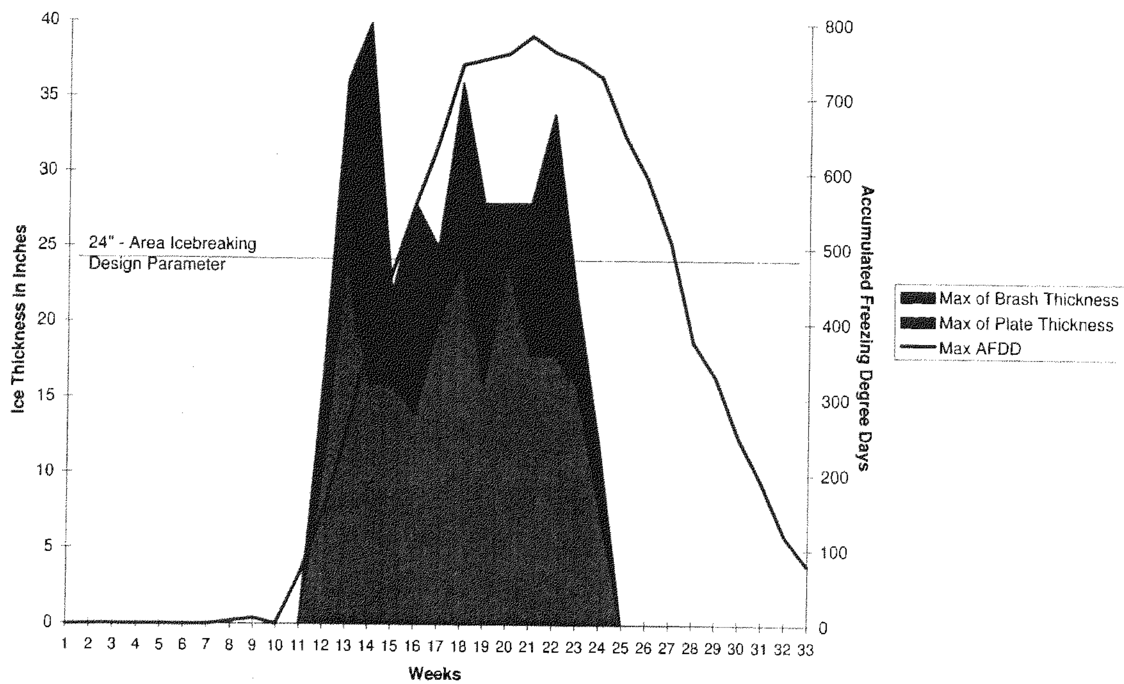
Appendix B-4

St.Marys River Observed Ice and AFDD



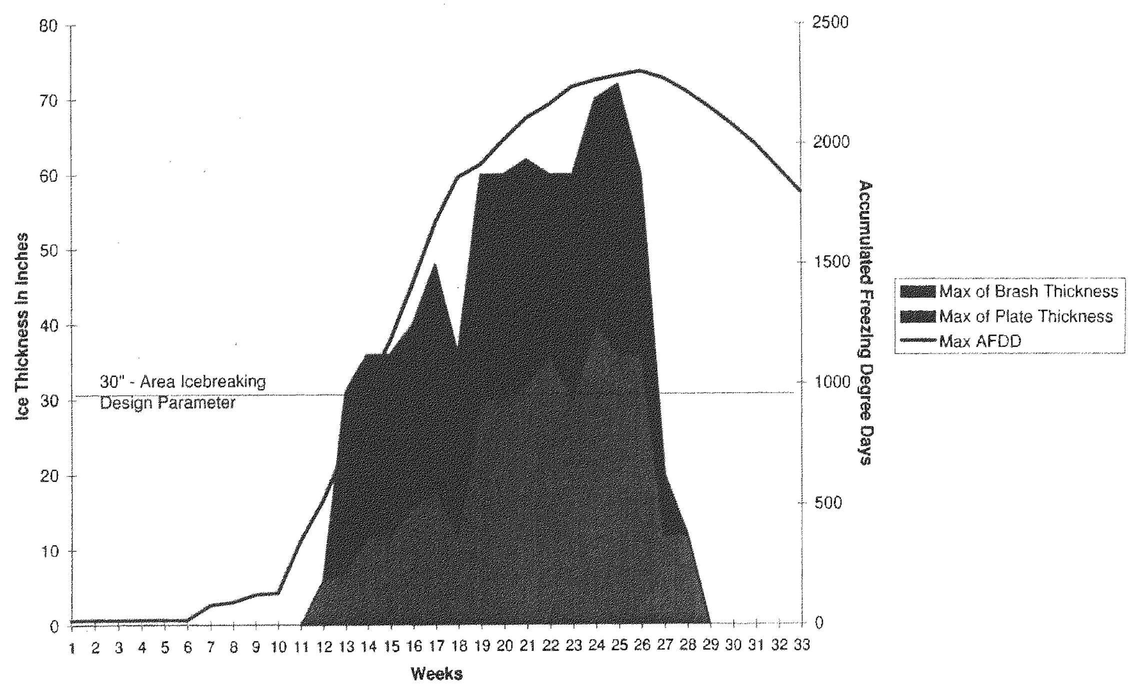
Appendix B-4

St. Clair River Observed Ice and AFDD



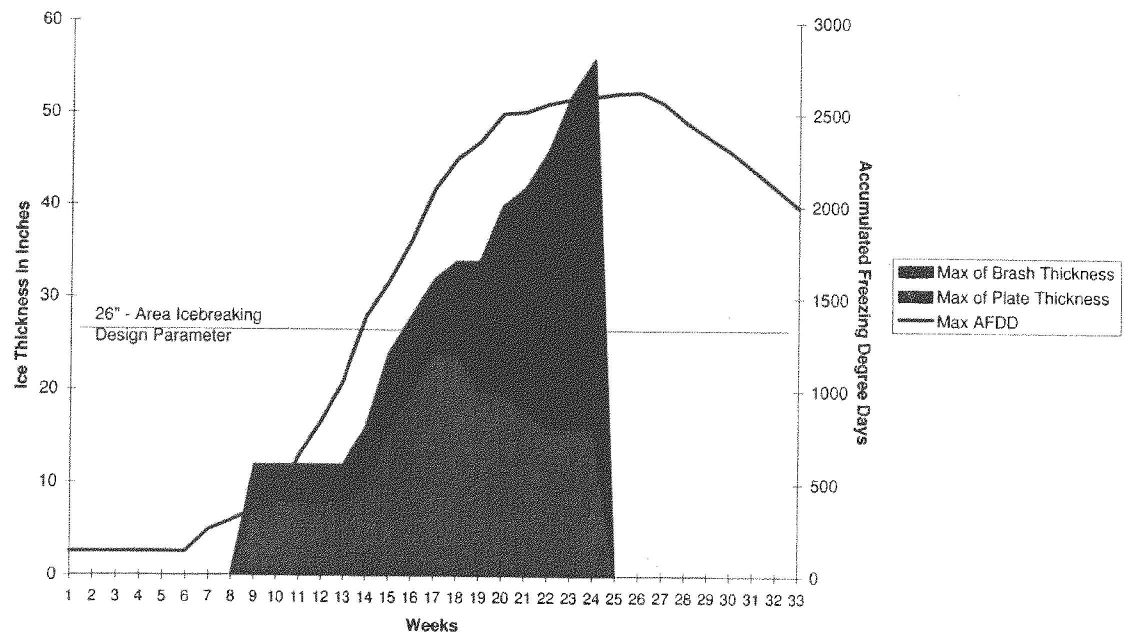
Appendix B-4

Straits of Mackinac Observed Ice and AFDD



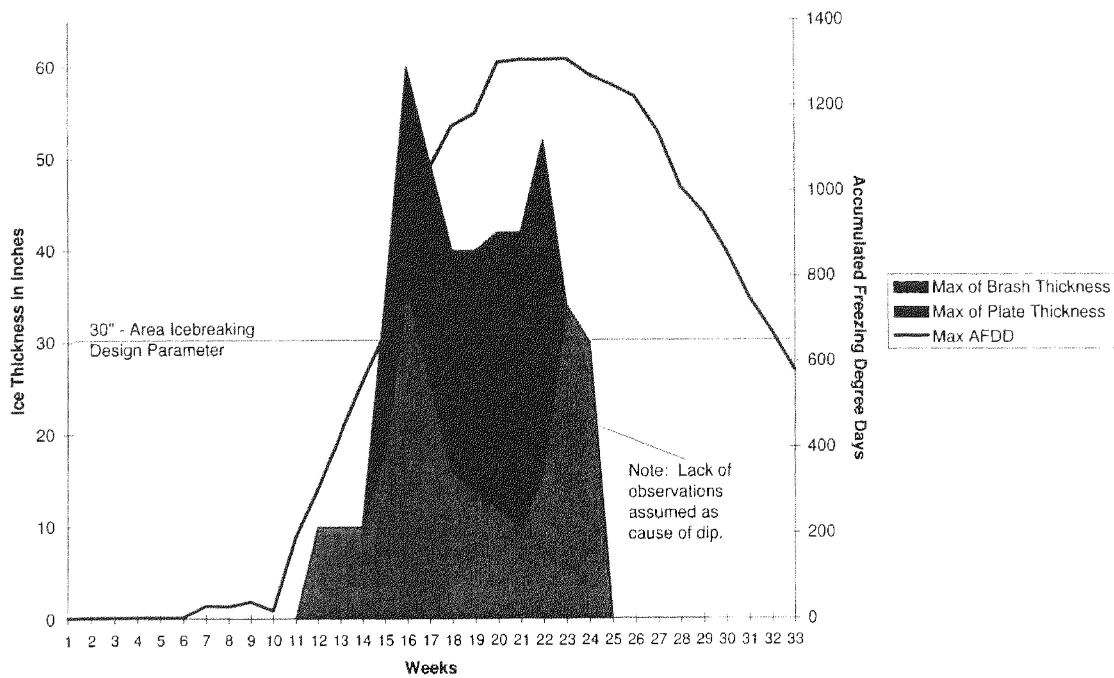
Appendix B-4

Duluth Observed Ice and AFDD



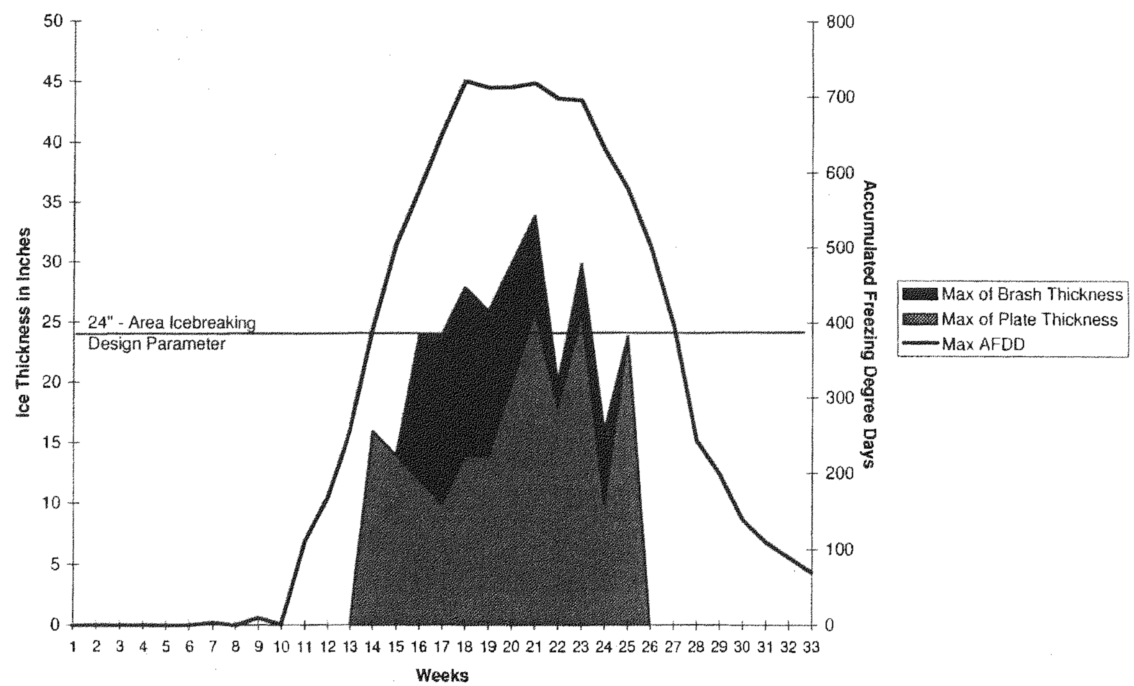
Appendix B-4

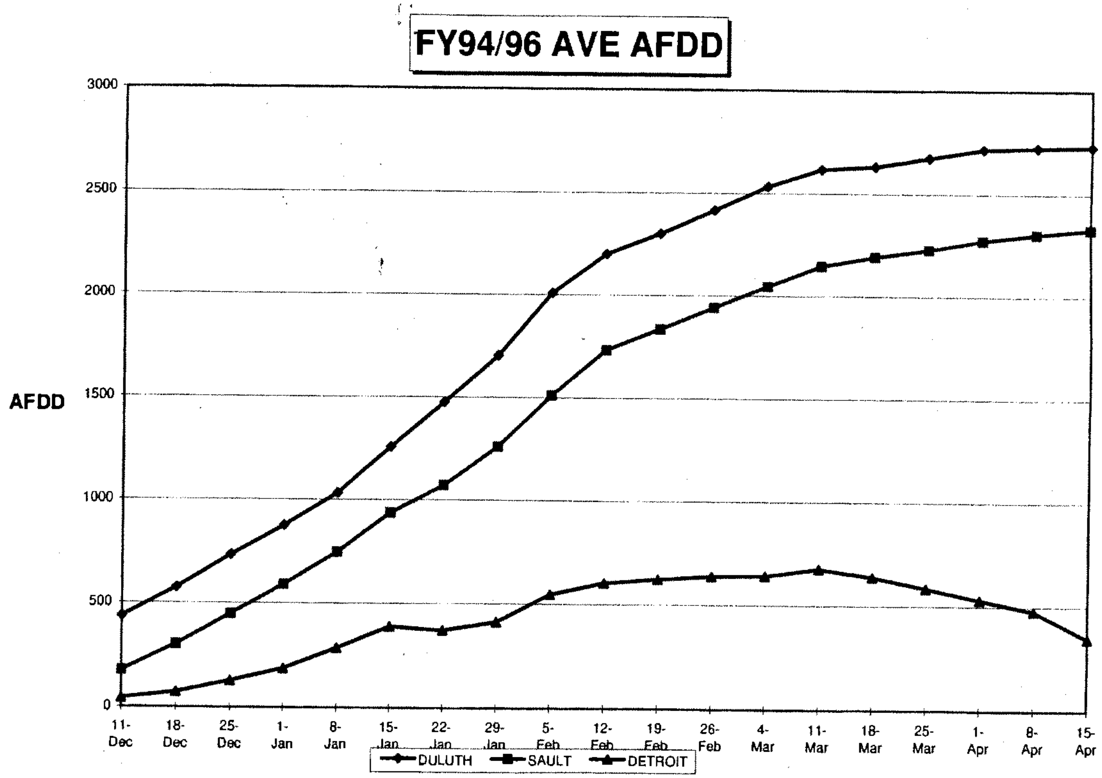
Escanaba Observed Ice and AFDD



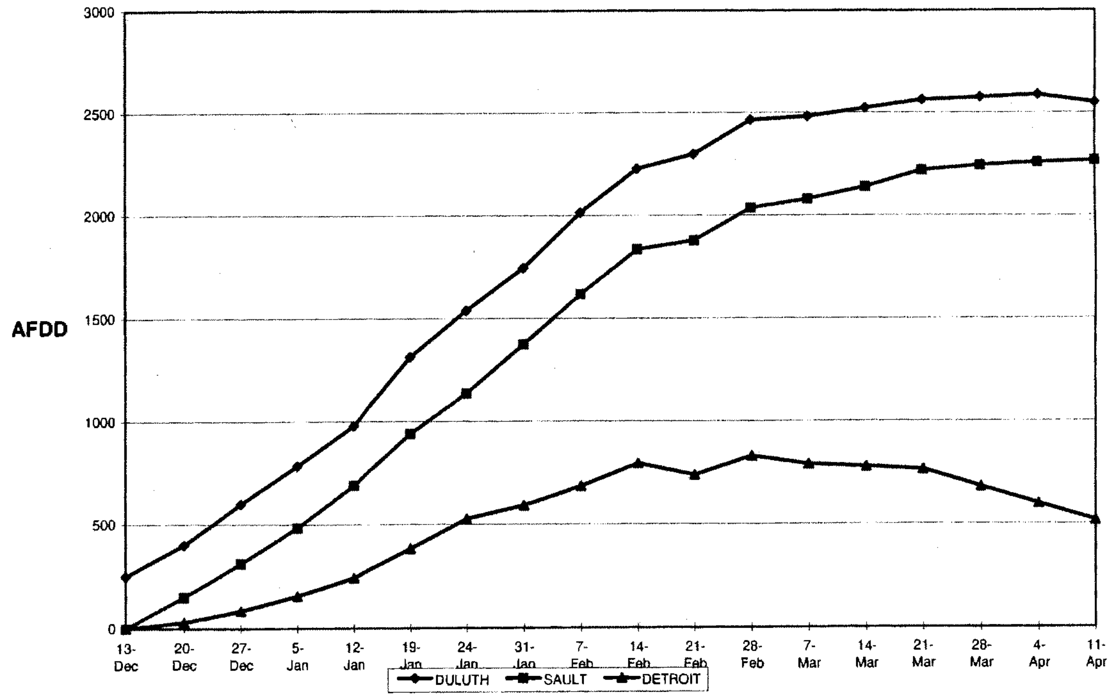
Appendix B-4

Lake Erie Observed Ice and AFDD

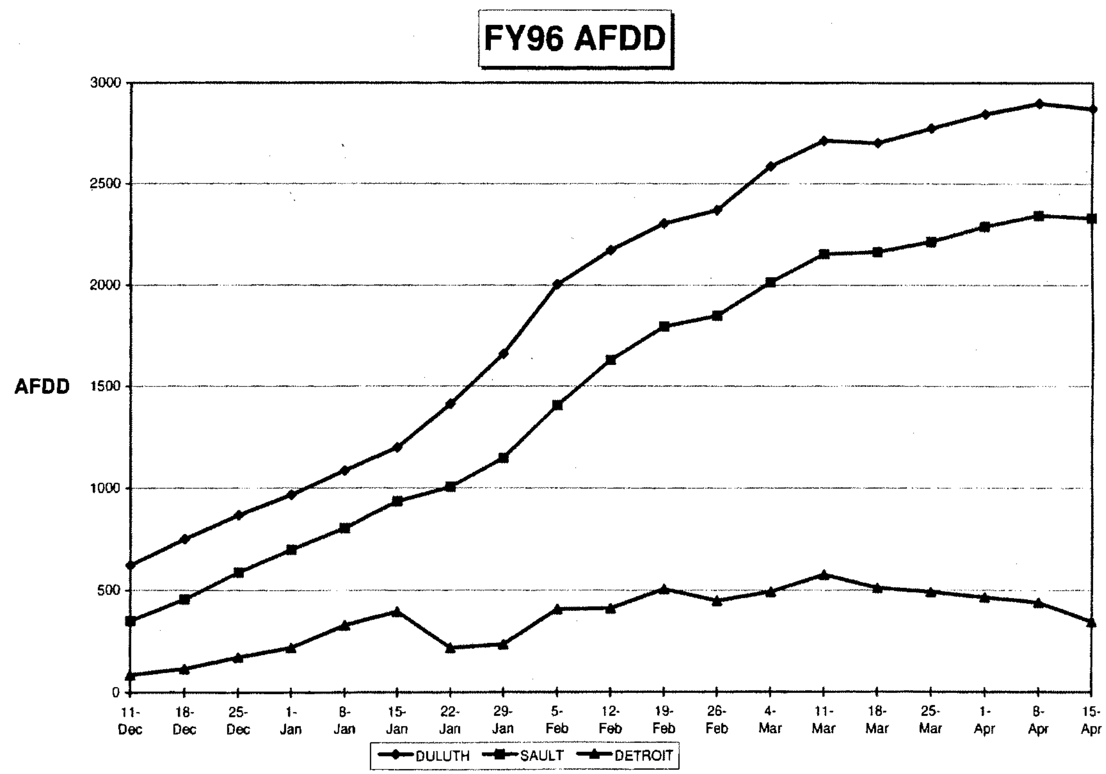



FY94/96 AVE AFDD
AFDD
3000
2500
2000
1500
1000
500
0
11-Dec
18-Dec
25-Dec
1-Jan
8-Jan
15-Jan
22-Jan
29-Jan
5-Feb
12-Feb
19-Feb
26-Feb
4-Mar
11-Mar
18-Mar
25-Mar
1-Apr
8-Apr
15-Apr
DULUTH
SAULT
DETROIT

FY94 AFDD


AFDD
3000
2500
2000
1500
1000
500
0
13-
Dec
20-
Dec
27-
Dec
5-
Jan
12-
Jan
19-
Jan
24-
Jan
31-
Jan
7-
Feb
14-
Feb
21-
Feb
28-
Feb
7-
Mar
14-
Mar
21-
Mar
28-
Mar
4-
Apr
11-
Apr
DULUTH
SAULT
DETROIT

Appendix B-5


FY96 AFDD
AFDD
3000
2500
2000
1500
1000
500
0
11-Dec
18-Dec
25-Dec
1-Jan
8-Jan
15-Jan
22-Jan
29-Jan
5-Feb
12-Feb
19-Feb
26-Feb
4-Mar
11-Mar
18-Mar
25-Mar
1-Apr
8-Apr
15-Apr
DULUTH
SAULT
DETROIT

APPENDIX C

Aids to Navigation Performance

Appendix C-1: Performance Assessment

An assessment of the aids to navigation mission is provided to identify resource inadequacies of the current and future fleet mix. The SFM2000 assessed resource requirements based on total annual employment effort and found the seasonal nature of the aids to navigation mission on the Great Lakes may impose workload demands which exceed the capacity of two WLBRs. The report identified 194 buoys in Lake Superior available for reassignment to smaller more efficient buoy boats. This analysis augments the SFM2000 model by assessing the weekly seasonal aton demand to identify current and projected mission deficiencies and resource gaps.

Appendix C-2: Great Lakes AtoN Demand

The chart displays weekly AtoN demand based on the seasonal commissioning and decommissioning dates as advertised in the Great Lakes Light List.

Appendix C-3: Historical Performance Trends

Historical performance trends for the past three years were recorded to compare against the performance assessment provided in Appendix C-1.

Appendix C-4: Water Depths

Water depths for all floating AtoN are listed for each vessel to assess cutter draft limitations.

Appendix C-1

Current Aids to Navigation (AtoN) Mission Performance Assessment

Approach: The current fleet's capacity to meet the seasonal buoy demand was determined for each week based on the advertised Light List dates. Weekly capacity of cutters was determined using historical data and estimates provided in the SFM2000 decision model. Results were then compared to historical performance for validation.

Assumptions:

(1) Seasonal aids are scheduled one week after their assigned commissioning date to represent a typical severe winter season. The 7-day grace period is authorized per Ninth District policy.

(2) Existing resources include three WLBs and two WTGBs with barges.

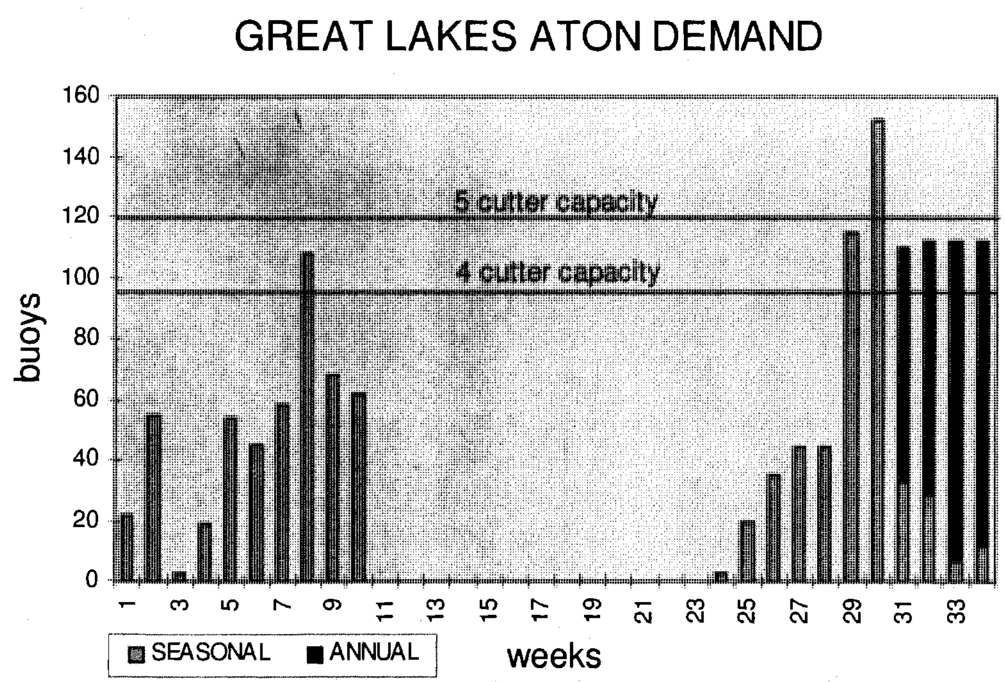
(3) Annual buoys serviced in the Spring are not worked until after May 1 and can be scheduled to level the fleet workload.

(4) On average, each cutter will work 24 buoys per week.

Results:

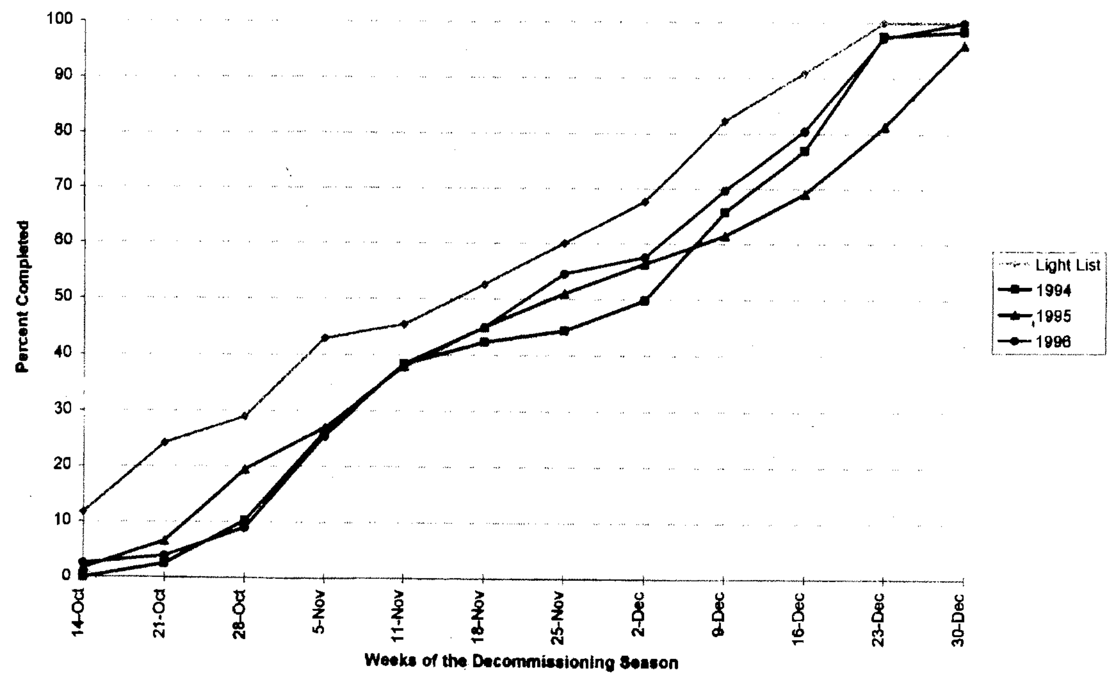
(1) Weekly AtoN demand exceeds the current fleet capacity from 06 May until 01 June. Ninth District historical data provided in Appendix C-3 compares well to these results.

Winter Week	Seasonal Aids Scheduled	Cutters Available	Capacity of AtoN Fleet	Weekly AtoN Deficit	Cumulative AtoN Deficit
14 October	22	5	120	0	0
21 October	55	5	120	0	0
28 October	3	5	120	0	0
06 November	19	5	120	0	0
13 November	54	5	120	0	0
20 November	45	5	120	0	0
27 November	58	5	120	0	0
04 December	108	5	120	0	0
11 December	68	5	120	0	0
18 December	62	5	120	0	0
01 April	23	2	48	0	0
08 April	35	2	48	0	0
15 April	44	2	48	0	0
22 April	44	3	72	0	0
29 April	115	5	120	0	0
06 May	152	5	120	**-32**	**-32**
13 May	110	5	120	**+10**	**-22**
20 May	110	5	120	**+10**	**-12**
27 May	112	5	120	**+8**	**-4**
03 June	112	5	120	**+8**	**0**


GREAT LAKES ATON DEMAND
buoys
160
140
120
100
80
60
40
20
0
5 cutter capacity
4 cutter capacity
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
weeks
SEASONAL
ANNUAL

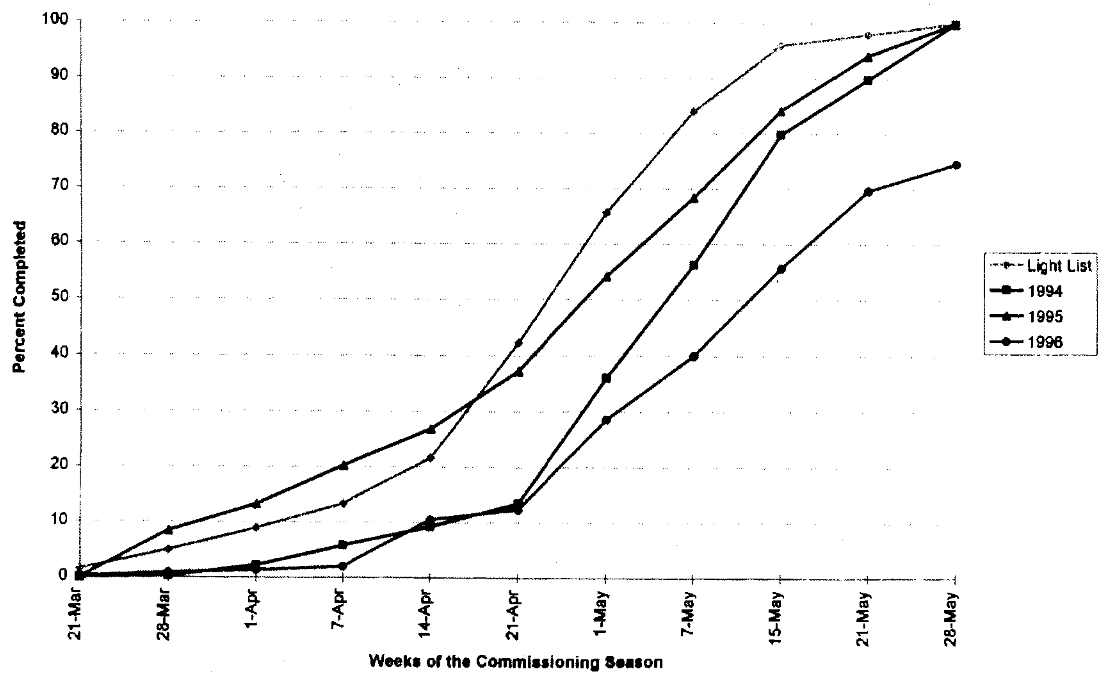
Appendix C-3

Ninth District Historical Percentage of ATON Decommissioned



Appendix C-3

Ninth District Historical Percentage of ATON Commissioned



Appendix C-4

AtoN Depths

ATONIS Depth (feet)	0 (?)		6	7	8	9	10	11	12	13	14	15	16	17		18	19	20	21	22	23	24	25	>25, <=50	> 50	LTs
ACACIA	1									1			1	2		4	2	5	4	5	2	9	6	75	17	
Cumulative	1		0	0	0	0	0	0	0	1	1	1	2	4		8	10	15	19	24	26	35	41	116	133	
BRAMBLE	28		4	1	3		1		2		1	1		1		6	2	6	5	14	16	21	9	93	2	
Cumulative	28		4	5	8	8	9	9	11	11	12	13	13	14		20	22	28	33	47	63	84	93	186	188	28
BRISTOL BAY										1	1	3		1		6	1	3	5	5	12	13	15	99		
Cumulative	0		0	0	0	0	0	0	0	1	2	5	5	6		12	13	16	21	26	38	51	66	165	165	
BUCKTHORN	1				6	13	5	9	2	7	14	6	11	4		5	5	3	3	4	1	7	4	156	1	
Cumulative	1		0	0	6	19	24	33	35	42	56	62	73	77		82	87	90	93	97	98	105	109	265	266	
MOBILE BAY	2		1								2	3	2	1		4	4	5	3	7	5	9	13	50	10	
Cumulative	2		1	1	1	1	1	1	1	1	3	6	8	9		13	17	22	25	32	37	46	59	109	119	
SUNDEW	7			2	6	4	3		2		2	2	1	2			3	18	8	5	3	8	14	124	13	
Cumulative	7		0	2	8	12	15	15	17	17	19	21	22	24		24	27	45	53	58	61	69	83	207	220	
SFM 2000 Juniper Draft Limit:							**18 feet**																			
(or, if currently assigned to a WLB, then it was assumed Juniper could also service.)																										

APPENDIX D

Resource Requirements

Appendix D-1: Icebreaking Analytical Model

A description of the analytical model used to define resource requirements for a severe winter (severity index -6.3) is provided.

Appendix D-2: Icebreaking Resource Allocation Matrix

The enclosed allocation matrix was used to define weekly resource requirements.

Appendix D-3: Ice-AtoN Requirements Matrix

The enclosed matrix provides a one page summary of combined icebreaking and aids to navigation mission requirements. The table identifies weekly demand by waterway based on vessel transits, ice conditions, and scheduled AtoN. Resource capability and capacity requirements are based on assumptions validated in Appendices B-1 and C-1.

Appendix D-4: Ice-Aton Resource Requirements

Resource requirements are summarized based on weekly icebreaking and aids to navigation mission requirements documented in Appendix D-3.

Appendix D-5: Current Fleet Mix - Resource Requirements

The enclosed table identifies resource gaps based on weekly resource requirements defined in Appendix D-4 assuming an existing cutter fleet of one WAGB, five WTGBs, 3 WLBs, and two Canadian icebreaking tenders (*Risley* and *Griffon*).

Appendix D-6: Future Fleet Mix - Resource Requirements

The enclosed table identifies resource gaps based on weekly resource requirements defined in Appendix D-4 assuming a future fleet of five WTGBs, two WLBRs, and two Canadian icebreaking tenders (*Risley* and *Griffon*). This reduced fleet is projected for the year 2006. Resource gaps for the AtoN mission do not take into account SFM2000 recommendations to reassign buoys in Lake Superior to smaller more efficient buoy boats.

Appendix D-1

Icebreaking Analytical Model

Approach:

(1) Weekly ice conditions for a severe winter and vessel transits for each waterway are defined to determine resource requirements.

(2) Ice conditions and icebreaking demand are compared against existing assets to identify capability and capacity deficiencies. Results are compared to previous studies and historical performance for validation.

(3) The model is then used to define resource requirements necessary to meet minimum performance standards.

(4) Icebreaking assets are compared against resource requirements to identify existing and future resource gaps.

Assumptions:

(1) Existing resources include *Mackinaw*, five WTGBs and three WLBs. Two Canadian icebreakers (CCGS *Risley* and *Griffon)* will also be available for full employment through the entire winter shipping season. Despite the availability of the CCGS *Radisson* during two of the last three years, this vessel is not included as part of the existing fleet. The commercial tug in Escanaba provides minimal contribution to the overall icebreaking effort.

(2) Ice conditions by week for each waterway are predicted based on accumulated freezing degree days (AFDD) and ice observations normalized for the severe FY94 and FY96 winter seasons. Maximum ice conditions are based on the 90 percent report probability for the two years observed. The design criteria for ice conditions are based on a winter severity index of -6.3. This design winter severity has occurred on average once every seven years.

(3) Traffic volume for each waterway is based on traffic observations taken during FY96.

(4) The analysis is limited to seven critical waterways defined in Chapter 2.3 of the report.

(5) Lake carriers can operate without assistance in up to 12 inches of ice.

(6) Due to critical "choke points," the St. Mary's River and the St. Clair River each require a minimum of two icebreakers, including the Canadian resources.

(7) If certain waterways must be chosen for icebreaking services over others, Escanaba will be the first to lose resources (a commercial icebreaker exists there), and the Straits of Mackinac will be the second (because of the limited number of transits).

(8) The Canadian icebreakers are assigned to the St. Clair River and port of Thunder Bay. The *Risley* may be assigned to other areas; however, a WTGB or WLB must assume responsibility for Thunder Bay.

(9) Effective icebreaking capabilities for vessels are defined in chapter 4.1 of the report and summarized below.

Effective Icebreaking Capabilities

Vessel Class/Combination	Plate Ice	Brash Ice
WAGB	36 in	9-12 ft
WTGB (1)	22 in	4-6 ft
WTGB (2)	29 in	6-9 ft
WLB	14 in	3-5 ft

Results

(1) Appendix D-2 defines weekly ice conditions, transit data, and icebreaking resource requirements. Shaded blocks under the "icebreaker required" column indicates the need for a heavy icebreaking capability in addition to a WTGB.

(2) Appendix D-3 provides a one page summary of combined icebreaking and aids to navigation requirements.

(3) Appendix D-4 summarizes weekly Ice-AtoN resource requirements.

(4) Appendix D-5 identifies the current fleet resource gaps based on resource requirements.

(5) Appendix D-6 identifies the future reduced fleet resource gaps projected for the year 2006.

Appendix D-2

Icebreaking Resource Allocation Matrix

Week: 11-17 December										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	43	9				47	9%	1 WLB		
St. Clair River	43	9				65	0%			
Straits of Mackinac	176	12			light	15	0%	1 WLB		
Lower St. Mary's River	176	12		snow	medium	93	21%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	176	13		snow	medium	93	1%	1 WTGB		
Western Lake Superior & Duluth	437	12			light	41	0%	1 WLB		
North Lake Michigan & Escanaba	176	12			light	35	3%	1 WLB	Commercial	

- Commercial asset adequate for Escanaba

Week: 18-24 December										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	73	11			light	48	6%	1 WLB		
St. Clair River	73	11			light	77	14%	1 WLB	Griffon	
Straits of Mackinac	303	13			light	14	0%	1 WLB		
Lower St. Mary's River	303	13	5 ft	jam	medium	103	42%	2 WTGB		
Upper St. Mary's River & Whitefish Bay	303	15			medium	103	2%	1 WTGB		
Western Lake Superior & Duluth	576	13			light	49	0%	1 WLB		
North Lake Michigan & Escanaba	303	13			light	32	0%	1 WLB	Commercial	

- Commercial asset adequate for Escanaba

Week: 25-31 December										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	128	13			light	28	0%	1 WLB		
St. Clair River	128	13	6-9 ft	jam	medium	52	62%	2 WTGB	Griffon	
Straits of Mackinac	450	15			medium	13	0%	1 WLB		
Lower St. Marys River	450	15	6-9 ft	jam	medium+	78	102%	2 WTGB		
Upper St. Mary's River & Whitefish Bay	450	17			medium	78	5%	1 WTGB		
Western Lake Superior & Duluth	733	14			light	26	0%	1 WLB		
North Lake Michigan & Escanaba	450	15			medium	31	0%	1 WTGB	Commercial	

- WTGB in Upper St. Mary's River can assist WTGBs in lower river.
- Commercial asset adequate for Escanaba

Week: 01-07 January										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	188	14			light	12	0%	1 WLB		
St. Clair River	188	14	9-12 ft	jam	heavy	17	76%	2 WTGB	Griffon	
Straits of Mackinac	591	17			medium	5	0%	1 WLB		
Lower St. Mary's River	591	17	9-12 ft	jam	heavy	42	138%	2 WTGB		
Upper St. Mary's River & Whitefish Bay	591	18			medium	42	7%	1 WTGB		
Western Lake Superior & Duluth	875	15			medium	24	0%	1 WTGB		
North Lake Michigan & Escanaba	591	17			medium	21	0%	1 WTGB	Commercial	

- CCGS Risley employed in Thunder Bay.
- Ice jam in Lower St Marys River and St Clair River requires WAGB capability.
- WTGB in Upper St. Mary's River can assist WTGBs in lower river
- Commercial asset adequate for Escanaba

Week: 08-14 January										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	287	14			light	8	0%	1 WLB		
St. Clair River	287	14	9-12 ft	jam	heavy	13	200%	2 WTGB	Griffon	
Straits of Mackinac	747	18			medium	3	233%	1 WTGB		
Lower St. Mary's River	747	18	9-12 ft	jam	heavy	24	170%	2 WTGB		
Upper St. Mary's River & Whitefish Bay	747	20			medium	24	9%	1 WTGB		
Western Lake Superior & Duluth	1032	16			medium	9	0%	1 WTGB		
North Lake Michigan & Escanaba	747	18			medium	17	0%	1 WTGB	Commercial	

- CCGS Risley employed in Thunder Bay.
- Ice jam in Lower St Marys River and St Clair River requires WAGB capability.
- Commercial asset adequate for Escanaba

Week: 15-21 January										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	390	15			medium	0	NA			
St. Clair River	390	15	9-12 ft	jam	heavy	6	100%	2 WTGB	Risley Griffon	
Straits of Mackinac	937	19	6-9 ft	wind	medium+	7	157%	2 WTGB		
Lower St. Marys River	937	19			medium	2	100%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	937	21			medium	0	NA			
Western Lake Superior & Duluth	1256	17			medium	0	NA			
North Lake Michigan & Escanaba	937	19		wind	medium+	19	0%	2 WTGB	Commercial	

- Ice jam in Lower St Clair River requires WAGB capability.
- 1 WTGB required in Escanaba to assist commercial asset.

Week: 22-28 January										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	372	18			medium	0	NA			
St. Clair River	372	18			medium	2	100%	1 WTGB	Griffon	
Straits of Mackinac	1070	20		wind	medium+	4	200%	2 WTGB		
Lower St. Mary's River	1070	20			medium	1	100%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	1070	22			medium	0	NA			
Western Lake Superior & Duluth	1476	18			medium	0	NA			
North Lake Michigan & Escanaba	1070	20		wind	medium+	14	29%	2 WTGB	Commercial	

- 1 WTGB effective in Lower St. Mary's River due to low traffic volume and existence of established tracks.
- 1 WTGB required in Escanaba to assist commercial asset.

Week: 29 January - 04 February										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	413	19			medium	0	NA			
St. Clair River	413	19			medium	2	0%	1 WTGB	Griffon	
Straits of Mackinac	1261	21		wind	medium+	7	171%	2 WTGB		
Lower St. Mary's River	1261	21			medium	1	100%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	1261	23			medium+	0	NA			
Western Lake Superior & Duluth	1702	20			medium	0	NA			
North Lake Michigan & Escanaba	1261	21		wind	medium+	15	47%	2 WTGB	Commercial	

- 1 WTGB effective in Lower St. Mary's River due to low traffic volume and existence of established tracks.

Week: 05-11 February										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	547	20			medium	0	NA			
St. Clair River	547	20			medium	2	0%	1 WTGB	Griffon	
Straits of Mackinac	1512	23			medium+	6	117%	2 WTGB		
Lower St. Mary's River	1512	23			medium+	1	100%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	1512	26			medium+	0	NA			
Western Lake Superior & Duluth	2010	22			medium	0	NA			
North Lake Michigan & Escanaba	1512	23			medium+	10	30%	2 WTGB	Commercial	

- 1 WTGB effective in Lower St. Mary's River due to low traffic volume and existence of established tracks.

Week: 12-18 February										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	604	20			medium	1	0%	1 WTGB		
St. Clair River	604	20			medium	0	NA		Griffon	
Straits of Mackinac	1733	25			medium+	1	100%	2 WTGB		
Lower St. Mary's River	1733	25			medium+	1	100%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	1733	28			heavy	0	NA			
Western Lake Superior & Duluth	2201	23			medium+	0	NA			
North Lake Michigan & Escanaba	1733	25			medium+	1	100%	2 WTGB	Commercial	

- 1 WTGB with commercial asset effective in Northern Lake Michigan .
- 1 WTGB effective in St Marys River due to low traffic volume and existence of established tracks.

Week: 19-25 February										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	623	22			medium	0	NA			
St. Clair River	623	22			medium	1	100%	1 WTGB	Griffon	
Straits of Mackinac	1837	27			medium+	2	100%	2 WTGB		
Lower St. Mary's River	1837	27			medium+	1	100%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	1837	29			heavy	0	NA			
Western Lake Superior & Duluth	2302	23			medium+	0	NA			
North Lake Michigan & Escanaba	1837	27			medium+	0	NA		Commercial	

- 1 WTGB effective in Lower St. Mary's River due to low traffic volume and existence of established tracks.

Week: 26 February - 03 March										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	639	21			medium	0	NA			
St. Clair River	639	21			medium	1	100%	1 WTGB	Griffon	
Straits of Mackinac	1943	27			medium+	1	200%	2 WTGB		
Lower St. Mary's River	1943	27			medium+	1	100%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	1943	30			heavy	0	NA			
Western Lake Superior & Duluth	2417	23			medium+	0	NA			
North Lake Michigan & Escanaba	1943	27			medium+	0	NA		Commercial	

- 1 WTGB effective in Lower St. Mary's River due to low traffic volume and existence of established tracks.

Week: 04-10 March										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	642	22			medium	0	NA			
St. Clair River	642	22			medium	1	0%	1 WTGB	Griffon	
Straits of Mackinac	2047	28			medium+	2	200%	2 WTGB		
Lower St. Mary's River	2047	28			medium+	1	100%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	2047	31			heavy	0	NA			
Western Lake Superior & Duluth	2534	25			medium+	0	NA			
North Lake Michigan & Escanaba	2047	28			medium+	2	50%	3 WTGB	Commercial	

- 1 WTGB effective in Lower St. Mary's River due to low traffic volume and existence of established tracks.
- 2 WTGBs effective in Straits of Mackinac due to low traffic volume.
- 2 WTGB with commercial asset required in Northern Green Bay to establish track.

Week: 11-17 March										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	678	24			medium+	0	NA			
St. Clair River	678	24			medium+	1	0%	2 WTGB	Griffon	
Straits of Mackinac	2147	29		wind	medium+	3	133%	2 WTGB		
Lower St. Mary's River	2147	29			medium+	1	100%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	2147	32			heavy	0	NA			
Western Lake Superior & Duluth	2617	25			medium+	0	NA			
North Lake Michigan & Escanaba	2147	29			medium+	11	0%	2 WTGB	Commercial	

- 1 WTGB effective in Lower St. Mary's River due to low traffic volume and existence of established tracks.
- 2 WTGBs effective in Straits of Mackinac due to low traffic volume.
- 1 WTGB and commercial resource effective in Escanaba due to stability of previously established track.

Week: 18-24 March										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	639	22			medium	0	NA			
St. Clair River	639	22	6-9 ft		medium	1	200%	2 WTGB	Griffon	
Straits of Mackinac	2193	29	6-9 ft	wind	medium+	5	100%	1 WTGB		
Lower St. Mary's River	2193	29	4-5 ft rfzn		medium+	1	100%	2 WTGB		
Upper St. Mary's River & Whitefish Bay	2193	32	8-12 ft		heavy	1	100%	1 WTGB		
Western Lake Superior & Duluth	2631	25	8-12 ft		heavy	5	100%	1 WTGB		
North Lake Michigan & Escanaba	2193	29	6-9 ft	wind	medium+	15	20%	2 WTGB	Commercial	

- 1 WTGB with commercial resource effective in Escanaba.
- WTGB from SMR or Escanaba can assist WTGB in Straits.
- 2 WTGBs required in Lower St. Mary's River to re-establish tracks in preparation of lock opening.
- 1 WAGB required in Western Superior and Whitefish Bay in preparation for lock opening.

Week: 25-31 March										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	586	22			medium	8	88%	1 WTGB		
St. Clair River	586	22			medium	11	0%	1 WTGB	Griffon	
Straits of Mackinac	2230	29	8-12 ft	wind	heavy	8	88%			
Lower St. Mary's River	2230	29			medium+	33	39%	2 WTGB		
Upper St. Mary's River & Whitefish Bay	2230	32			heavy	33	39%	1 WTGB		
Western Lake Superior & Duluth	2674	25	8-12 ft	wind	heavy	20	35%	1 WTGB		
North Lake Michigan & Escanaba	2230	29			medium+	22	14%	2 WTGB	Commercial	

- **WAGB required for Straits of Mackinac and/or Lower St. Mary's River (also cover lower lakes).**
- **WAGB required in Lake Superior.**
- Risley or WTGB assigned to Thunder Bay.

Week: 01-07 April										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	532	n/a			light	13	0%			
St. Clair River	532	n/a	8-12 ft	jam	heavy	24	0%	2 WTGB	Griffon	
Straits of Mackinac	2275	n/a	5-9 ft		medium+	8	0%	1 WTGB		
Lower St. Mary's River	2275	n/a	6-9 ft		medium+	51	27%	2 WTGB		
Upper St. Mary's River & Whitefish Bay	2275	33	8-12 ft		heavy	51	27%	1 WTGB		
Western Lake Superior & Duluth	2716	26	8-12 ft		heavy	23	22%	1 WTGB		
North Lake Michigan & Escanaba	2275	n/a	2-4 ft		medium	20	16%	1 WTGB	Commercial	

- **WAGB required for Straits of Mackinac and/or Lower St. Mary's River (also cover lower lakes).**
- **WAGB required in Lake Superior.**
- Risley or WTGB assigned to Thunder Bay. Commercial resource capable in Escanaba.

Week: 08-14 April										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	479	n/a				31	0%			
St. Clair River	479	n/a	8-12 ft	jam	heavy	48	31%	2 WTGB	Griffon Risley	
Straits of Mackinac	2306	n/a	4-6 ft		medium	10	0%	1 WTGB		
Lower St. Mary's River	2306	n/a	4-6 ft		medium+	74	17%	2 WTGB		
Upper St. Mary's River & Whitefish Bay	2306	33	8-12 ft		heavy	74	17%	1 WTGB		
Western Lake Superior & Duluth	2724	26	8-12 ft		heavy	37	0%	1 WTGB		
North Lake Michigan & Escanaba	2306	n/a	2-4 ft		light	22	9%	1 WTGB	Commercial	

- **General warming trend causes tracks to loosen and floes to break apart. In general, WAGB capability may be required in Lake Superior due to ice packing driven by prevailing winds. Also, wide beamed resource required in St. Clair River for flushing operations of ice jams.**

Week: 15-21 April										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie	347	n/a				22	0%			
St. Clair River	347	n/a	8-12 ft	jam	heavy	31	52%	2 WTGB	Griffon Risley	
Straits of Mackinac	2331	n/a	2-4 ft		light	15	0%	1 WTGB		
Lower St. Mary's River	2331	n/a	4-6 ft		medium	54	19%	1 WTGB		
Upper St. Mary's River & Whitefish Bay	2331	n/a	6-9 ft		medium+	54	19%	1 WTGB		
Western Lake Superior & Duluth	2730	n/a	4-6 ft		medium	33	0%	1 WTGB		
North Lake Michigan & Escanaba	2331	n/a				27	0%		Commercial	

- WAGB capability may be required in Lake Superior due to ice packing driven by prevailing winds. Also, wide beam vessels required in St. Clair River for flushing operations of ice jams.

Week: 22-28 April										
Waterway	Freezing Degree Days	Plate Thickness	Brash Thickness	Other Factors: (wind, snow, ice-jams, etc.)	Projected Capability Level	Number of Vessel Transits	% Transits Requiring Assistance	Icebreakers Required	Icebreakers Assigned	Transits Impacted
Lake Erie						33	0%			
St. Clair River						60	0%			
Straits of Mackinac						17	0%			
Lower St. Mary's River			3-5 ft		medium	111	14%	1 WTGB		
Upper St. Mary's River & Whitefish Bay			3-5 ft		medium	111	14%	1 WTGB		
Western Lake Superior & Duluth						52	2%			
North Lake Michigan & Escanaba						29	0%		Commercial	

- Accelerated melting leaves open areas free of large ice floes. Some accumulation of brash in bottlenecks requires assistance to low powered vessels.

Appendix D-3

Great Lakes Ice-Aton Requirements Matrix

Severe Winter (Index -6.3)

DRAFT 6/3/1997	OCT			NOV				DEC				JAN					FEB				MAR				APR					MAY				JU
DATE	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	4	11	18	25	1	8	15	22	29	6	13	20	27	3
WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
VESSEL TRANSITS																																		
LAKE ERIE	ice > 11 inches								47	48	28	12	8	0	0	0	0	0	0	0	0	0	0	8	13	31	22	33						
ST CLAIR RIVER	# = number of transits								65	77	52	17	13	6	2	2	1	1	1	1	1	1	1	11	24	48	31	60						
STRAITS OF MAC									15	14	13	5	3	7	4	7	2	2	2	2	2	3	5	8	8	10	15	17						
ST MARYS RIVER									93	103	78	42	24	2	1	1	1	1	1	1	1	1	1	33	51	74	54	111						
WHITEFISH BAY									93	103	78	42	24	0	0	0	0	0	0	0	0	0	1	33	51	74	54	111						
DULUTH									41	49	26	24	9	0	0	0	0	0	0	0	0	0	5	20	23	37	33	52						
ESCANABA									35	32	31	21	17	19	14	15	10	1	0	0	2	11	15	22	20	22	27	29						
TOTAL TRANSITS									389	426	306	163	98	34	21	25	14	5	4	4	6	16	28	135	190	296	236	413						
WTGBs REQUIRED																																		
LAKE ERIE	ice > 11 inches								1	1	1	1	1											1										
ST CLAIR RIVER	# = number of WTGBs										1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0							
STRAITS OF MAC									1	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1							
ST MARYS RIVER									1	2	2	2	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1						
WHITEFISH BAY									1	1	1	1	1										1	1	1	1	1	1						
DULUTH									1	1	1	1	1										1	1	1	1	1							
ESCANABA									0	0	0	0	0	1	1	1	1	1			2	1	1	1	0	0								
TOTAL WTGBs									5	6	7	7	7	5	5	5	5	5	4	4	6	6	7	6	6	5	4	2						
WAGBs REQUIRED																																		
ST CLAIR RIVER	ice > 11 inches											1	1	1											1	1	1							
STRAITS OF MAC	# = number of WAGBs																							1										
ST MARY'S RIVER												1	1																					
WHITEFISH BAY																							1	1	1	1	1							
DULUTH																							1	1	1	1								
TOTAL WAGBs												1	1	1									1	2	2	2	1							
SEASONAL ATON	decommissioning season																							commissioning season (delayed 1 week)										
ACACIA	0	0	0	2	18	1	18	24	14	0														3	8	2	0	11	12	28	7	1	0	0
MOBILE BAY	0	0	0	1	8	19	35	0	0	0														0	0	0	0	0	36	26	1	5	0	0
SUNDEW	22	51	3	0	12	5	0	18	7	7														0	0	3	0	0	11	70	3	17	7	12
BRAMBLE	0	0	0	14	10	2	3	64	5	27														0	0	28	5	0	44	21	22	5	0	0
BRISTOL BAY	0	4	0	2	6	18	2	4	42	28														0	12	2	39	33	12	7	0	1	0	0
additional annual aton																															77	93	105	100
TOTAL BUOYS	22	55	3	19	54	45	58	108	68	62														3	20	35	44	44	115	152	110	112	112	112
ATON ASSETS REQUIRED	(one asset for every 24 buoys on average)																																	
ATON ASSETS	1	1	1	2	2	2	3	4	3	3														0	1	2	2	2	5	6	5	5	5	5

(shaded) **primary aton season**

 # = number of floating aton

Appendix D-4

ICE - ATON RESOURCE REQUIREMENTS

Effective Icebreaking Capability	Plate Ice	Brash Ice
Heavy	29-33 inches	8-12 ft
Medium	15-28 inches	4-9 ft
Light	10-14 inches	0-5 ft

Week	Date	Heavy Icebreaker	Medium Icebreaker	Light Icebreaker	AtoN Asset	Total Assets
1	16 Oct				1	1
2	23 Oct				1	1
3	30 Oct				1	1
4	06 Nov				2	2
5	13 Nov				2	2
6	20 Nov				2	2
7	27 Nov				3	3
8	04 Dec				4	5
9	11 Dec		3	2	3	8
10	18 Dec		3	3	3	9
11	25 Dec		4	3		7
12	01 Jan	1	5	2		8
13	08 Jan	1	6	1		8
14	15 Jan	1	5			6
15	22 Jan		5			5
16	29 Jan		5			5
17	05 Feb		5			5
18	12 Feb		5			5
19	19 Feb		4			4
20	26 Feb		4			4
21	04 Mar		6			6
22	11 Mar		6			6
23	18 Mar	1	7			8
24	25 Mar	2	6			8
25	01 Apr	2	6		1	9
26	08 Apr	2	5		2	9
27	15 Apr	1	4		2	7
28	22 Apr		2		2	4
29	29 Apr				5	5
30	06 May				6	6
31	13 May				5	5
32	20 May				5	5
33	27 May				5	5
34	03 Jun				5	5

Note:
Resource Requirements are based on Ice-AtoN Requirements Matrix (Appendix D-3).

Appendix D-5

CURRENT FLEET MIX - RESOURCE REQUIREMENTS
(resource gaps are highlighted - see notes at bottom of page)

Week	Date	Heavy Icebreaker	Medium Icebreaker	Light Icebreaker	AtoN Asset	Total Assets
1	16 Oct				1	1
2	23 Oct				1	1
3	30 Oct				1	1
4	06 Nov				2	2
5	13 Nov				2	2
6	20 Nov				2	2
7	27 Nov				3	3
8	04 Dec				4	5
9	11 Dec		3	2	3	8
10	18 Dec		4	3	3	9
11	25 Dec		4	3		7
12	01 Jan	1	5	2		8
13	08 Jan	1	6	1		8
14	15 Jan	1	5			6
15	22 Jan		5			5
16	29 Jan		5			5
17	05 Feb		5			5
18	12 Feb		5			5
19	19 Feb		4			4
20	26 Feb		4			4
21	04 Mar		6			6
22	11 Mar		6			6
23	18 Mar	1	[illegible]			8
24	25 Mar	2	6			8
25	01 Apr	2	6		1	9
26	08 Apr	2	5		2	9
27	15 Apr	1	4		2	7
28	22 Apr		2		2	4
29	29 Apr				5	5
30	06 May				6	6
31	13 May				5	5
32	20 May				5	5
33	27 May				5	5
34	03 Jun				5	5
(light shading)	one resource deficiency					
(dark shading)	two resource deficiency					

Notes:
Number of assets noted by week are based on Ice-AtoN Resource Requirements (Appendix D-4). Current fleet consists of one WAGB, five WTGB, two WLBR, two Canadian Icebreakers (*Risley* and *Griffon*). Resource deficiencies (capability and capacity) are identified by shaded blocks.

Appendix D-6

FUTURE FLEET MIX - RESOURCE REQUIREMENTS
(resource gaps are highlighted - see notes at bottom of page)

Week	Date	Heavy Icebreaker	Medium Icebreaker	Light Icebreaker	Buoy Tender	Total Assets
1	16 Oct				1	1
2	23 Oct				1	1
3	30 Oct				1	1
4	06 Nov				2	2
5	13 Nov				2	2
6	20 Nov				2	2
7	27 Nov				3	3
8	04 Dec				4	4
9	11 Dec		3	2	3	8
10	18 Dec		3	[illegible]	3	[illegible]
11	25 Dec		4	3		7
12	01 Jan	1	5	2		8
13	08 Jan	1	6	1		8
14	15 Jan	1	5			6
15	22 Jan		5			5
16	29 Jan		5			5
17	05 Feb		5			5
18	12 Feb		5			5
19	19 Feb		4			4
20	26 Feb		4			4
21	04 Mar		6			6
22	11 Mar		6			6
23	18 Mar	1	[illegible]			8
24	25 Mar	[illegible]	6			8
25	01 Apr	[illegible]	6		1	[illegible]
26	08 Apr	[illegible]	5		2	[illegible]
27	15 Apr	1	4		2	7
28	22 Apr		2		2	4
29	29 Apr				5	5
30	06 May				[illegible]	6
31	13 May				5	5
32	20 May				5	5
33	27 May				5	5
34	03 Jun				5	5
(light shading)	one resource deficiency					
(dark shading)	two resource deficiency					

Notes:
Number of assets noted by week are based on Ice-AtoN Resource Requirements (Appendix D-4).
Future fleet consists of five WTGB, two WLBR, two Canadian Icebreakers (*Risley* and *Griffon*).
Resource deficiencies (capability and capacity) are identified by shaded blocks.

APPENDIX E

Heavy Icebreaking Requirements

Appendix E-1: Heavy Icebreaking - Functional Rquirements

Heavy icebreaking capabilities for the Great Lakes should be designed to meet the functional requirements identified in this Appendix. Heavy icebreaking requirements are those needed above and beyond the WTGB capability necessary to meet minimum icebreaking performance standards.

Appendix E-1

Heavy Icebreaking - Functional Requirements

(1) Establish Tracks in very thick plate ice 30-32 inches thick with pressure ridges of 8-12 feet or refrozen brash 48-60 inches thick. The vessel must be capable of ramming ice/pressure ridges exceeding 12 feet without damage and safely backing itself free from a beset condition.

(2) Transit in open waters across lakes in gale wind conditions to 45 knots and seas 8-12 feet. In addition to this improved seakeeping capability, the vessel must withstand severe icing conditions in similar wind/sea state.

(3) Deploy for 24 hours per day for a minimum of 10 continuous days.

(4) Escort vessels (in tandem if necessary) at 3 knots or better in very thick ice 30-32 inches thick with pressure ridges of 6-9 feet. Escort vessels at 3 knots or better while operating in an existing track 6-9 feet thick.

(5) Maintain continuous forward motion through dense brash 8-12 feet deep, in restricted waterways.

(6) Maneuver alongside and free vessels beset or stranded in 8-12 feet of brash ice and or 30-32 inch plate ice under excessive wind (to 45 knots) or strong currents (to 3 knots).

(7) Operate in restricted waters with a minimum channel width of 150 feet and minimum control depth of 19 feet of water.

(8) Escort and transit restricted waters during reduced visibility and at night.

(9) Maneuver alongside piers in 30-32 inch plate ice or refrozen brash 48-60 inches thick.

(10) Cast or back (reverse direction) in 30-32 inch plate ice or an existing track with 6-9 feet of brash ice. Cast or back in 6-9 feet of brash ice within a confined channel width of 300 feet.

(11) Communicate with other vessels, aircraft, and shore stations when underway and inport.

(12) Identify other vessels, hazards to navigation, and ice conditions while operating in unlimited and reduced visibility, including night.

APPENDIX F

Great Lakes Icebreaking Economic Benefits

Appendix F-1: Great Lakes Icebreaking Economic Benefits

An economic analysis of the Great Lakes icebreaking mission was completed in two previous studies. This Appendix provides a summary of the assumptions and results of those studies.

Appendix F-1

Great Lakes Icebreaking Economic Benefits Summary

Introduction: The economic benefits of domestic icebreaking can be estimated based on the least cost alternative: reducing the current shipping season from 297 calendar days to 244 days. In response to the no icebreaking alternative; additional shipping, stockpiling, storage and handling is required to accommodate the shorter shipping season. Volpe National Transportation Systems Center (Volpe 95) and Brown and Root Environmental (EIS 96) completed separate economic analysis. Their assumptions and findings are summarized below:

Assumptions: The EIS 96 assumed additional costs would accrue for the shipping, stockpiling, storage and handling of winter iron ore and coal. The Volpe 95 study assumed additional costs would accrue for the shipping, stockpiling, storage and handling of winter iron ore, coal, and all other cargo. Specific assumptions for both studies include:

	Volpe 95	EIS 96
discount rate for cost of capital	7%	8.5%
capitalization period	40 years	40 years
expression for additional transportation costs	present value reduced by inflation (3.5%)	present value
current winter closure period	68 days	68 days
additional closure period required	53 days	53 days
winter cargo demand - iron ore	7,261,230 tons	7,261,230 tons
coal	1,377,463 tons	1,377,463 tons
other	3,177,611 tons	3,177,611 tons
current excess shipping capacity [1]		555,074 tons
additional 1000 ft ships required for iron ore	2.6	2.6
additional 1000 ft ships required for other cargo	*1.6*	*none*

Economic Analysis - Iron Ore	Volpe 95	EIS 96
opportunity cost of increased stockpiling	$18,806,584	$16,379,500
additional storage costs	$ 139,194	$ 93,358
additional handling cost	$ 4,084,940	$ 4,813,268
additional transportation costs	$24,977,009	$14,857,393
uncertainty costs	$ 0	$ 7,261,230
Total ***iron ore*** *benefit*	**$48,007,727**	**$43,404,749**

Economic Analysis - Coal and Other Cargo	Volpe 95	EIS 96
total benefits- coal	$ 9,099,273	$ 5,436,600
total benefits - other cargo	$20,990,727	$ 0
Total ***coal and other cargo*** *benefit*	**$30,090,000**	**$ 5,436,600**
Total Economic Benefits	**$78.10 million**	**$48.84 million**

[1] **The Lake Carriers Association (LCA) supports the findings of the Volpe 95 study and strongly disputes the EIS 96 findings due to assumptions concerning excess shipping capacity. The two figures ($48-$78 million) most likely bound the upper and lower range of the direct economic benefits of Great Lakes icebreaking.**

Testimony of
Dr. Arden L. Bement, Jr., Director
National Science Foundation

Before the
House Committee on Transportation and Infrastructure
Subcommittee on Coast Guard
and
Maritime Transportation

July 16, 2008

Chairman Cummings, Ranking Member LaTourette, and distinguished members of the Committee, I am pleased to appear before the Subcommittee again to speak on behalf of the National Science Foundation. NSF is an extraordinary agency, with an equally extraordinary mission of enabling discovery, supporting education, and driving innovation – all in service to society and the nation.

INTRODUCTION

The National Science Foundation was established in 1950 to initiate and support basic scientific research and programs, to strengthen scientific research potential and science education programs at all levels in the mathematical, physical, medical, biological, social, and other sciences, and to initiate and support research fundamental to the engineering process and programs to strengthen engineering research potential and engineering education programs at all levels in the various fields of engineering (NSF Act of 1950; 42 USC 1861 *et seq*).

The Agency also chairs the Interagency Arctic Research Policy Committee (IARPC), created under federal statute to coordinate Arctic research sponsored by federal agencies, and it manages the U.S. Antarctic Program on behalf of the U.S. government as directed by Presidential Memorandum 6646 (1982).

The Arctic and Antarctic are premier natural laboratories whose extreme environments and geographically unique settings enable research on fundamental phenomena and processes not feasible elsewhere. In addition, climate changes now being observed in the earth's Polar Regions require careful study in view of their possible implications for northern residents and for those living in the mid-latitudes. Changes in Polar Regions are tightly coupled to the global earth system, with changes in one strongly impacting the other.

Polar research depends heavily on ships capable of operating in ice-covered regions, either as research platforms in the Arctic and Southern Oceans or as key components of the logistics chain supporting on-continent research in Antarctica. Many areas in the Arctic and Antarctic are only accessible by ship. As the primary U.S. supporter of fundamental research in these regions, NSF is the primary customer of polar icebreaker and ice-strengthened vessel services for scientific research purposes.

NSF responsibilities in the Arctic and in Antarctica take somewhat different forms, and with the Committee's indulgence I'll explain briefly how they differ with respect to icebreaker requirements. *But in both cases the question of how best to meet those responsibilities boils down to consideration of three factors: cost, performance, and policy.*

NSF REQUIREMENTS IN THE ARCTIC

NSF supports research on the Arctic Ocean, atmosphere, and land areas, including marine and terrestrial ecosystems and their relationships to the well-being of local populations. In addition to research in individual disciplines, support is provided for interdisciplinary approaches to understanding the Arctic region, including its role in global climate. Over the last decade, changes have been measured in the distribution of polar ice cover, in atmospheric composition, Arctic Ocean conditions, some terrestrial parameters, as well as in northern ecosystems. Residents of the North are seeing these environmental changes affect their lives. It is important to determine whether these changes correlate to a short-term shift in regional atmospheric or ocean processes or whether they are the result of longer-term global change.

In the Arctic, science on land and in coastal areas tends to be based at a few sparsely distributed, remote outposts, and in many cases access by ship is the most advantageous means, even for projects that are not inherently oceanographic. In its few years of service, the Coast Guard icebreaker *Healy* has supported research in a variety of areas including biology, sea ice, marine geology and geophysics, cartography, physical and chemical oceanography and atmospheric science.

As research has advanced and become more technologically sophisticated, NSF has increasingly relied on coordinated international multi-ship expeditions to access the Arctic region and laboratory facilities. For example, while the USCGC *Healy* does have the capability to work alone in the deep Arctic during summer, any vessel by itself is more risky, making multi-ship arrangements necessary in lieu of an icebreaker research platform with more robust capabilities. The USCG *Polar Sea* and *Polar Star* have sufficient icebreaking capability to operate in the deep Arctic, but they have limited research capabilities, by design, and have been needed in the Antarctic. International collaborations also have become necessary, as the demands for research aboard the *Healy* have intensified. Recent international partnerships with Sweden involving their icebreaker, the *Oden*; and with Germany and their icebreaker, the *Polarstern*; have been highly successful, as have collaborations by NSF, National Oceanic and Atmospheric

Administration (NOAA) and other agencies with various Canadian, Chinese, Russian and other ships.

Arctic Requirements: Ship Cost and Reliability

According to information provided by the Coast Guard, over the past decade NSF has typically used approximately 90 percent of the 185-200 days current USCG deployment standards allow *Healy* to spend at sea. Science programs are limited by the ship time available on the USCGC *Healy* and also by the number of berths available for science. *Healy* can accommodate up to 50 scientific personnel in addition to its operational Coast Guard crew of about 80. Other nations' research icebreakers with comparable icebreaking capability typically operate with crews half the size of Healy's, with comparably greater numbers of scientist berths.

The *Healy* also faces limitations in its icebreaking capacity, especially during the spring when the ice coverage north of Alaska has been thick enough in some years (2004, 2005) to beset the ship for several days.

Under the current arrangement, NSF is responsible for funding *Healy* operations and maintenance while the Coast Guard is responsible for operating the ship and carrying out its maintenance program. Coordination between the two agencies is arranged under an MOA in which NSF provides the Coast Guard with a set of operational requirements annually based on an interagency call for icebreaker needs and the Coast Guard responds with an operational plan and cost estimate based on those requirements. Total *Healy* costs are approximately $24 million annually, or about $130,000 per day at sea in 2007.

I will return to the issues of cost, availability and policy shortly.

Plans have been underway for several years to construct a new ice-strengthened ship that could support scientific studies in the waters around Alaska. NSF has assigned high priority to building this ship, the Alaska Region Research Vessel (ARRV), and construction funds were included in the President's FY08 budget request for acquisition planning. It is estimated that it will take 2.5 years to construct and deploy the ship once a shipyard contract has been issued. The ship will be operated by the University-National Oceanographic Laboratory System (UNOLS) which operates a number of research vessels. The ARRV, which will replace the *Alpha Helix,* will be designed to work in up to 3 feet of ice. The ARRV will thus be able to conduct research cruises year round in the Gulf of Alaska and the southern Bering Sea; and in the summer, as far north as the Chukchi and Beaufort Seas during minimum ice cover. During heavy ice periods in the Bering Sea, the ARRV would probably need the assistance of the *Healy.* Estimated operating costs are about $20K – $30K/day. Arctic sea ice has diminished significantly since the ARRV design was established and thus ARRV's reach now extends farther into the Arctic Ocean than had been anticipated, making the ship even more valuable to the research community.

Finally, we need better access to the deep ocean in the Arctic. Options for supporting research in the deep Arctic should be integral to any study of future icebreaker needs.

In conclusion, the *Healy* is a capable and relatively new ship that can be the mainstay of U.S. Arctic Ocean research for years to come. However, under the current operational model the operating costs are significantly higher than non-military research icebreakers and its capability as an all-seasons deep arctic research platform is also limited.

NSF REQUIREMENTS IN ANTARCTICA

NSF provides approximately 85 percent of the U.S. funding for fundamental research in the Antarctic and the southern ocean. This research addresses a wide array of topics across many disciplines. For instance, researchers are studying topics as wide-ranging as the evolution of the ozone hole; the impact of extreme environments on gene expression; the effects of ultraviolet radiation on living organisms; the relationship between changes in the ice sheet and global sea level; global weather, climate, and ocean circulation; the role of Antarctica in global tectonics and the evolution of life through geologic time; and the early evolution of our universe, as well as its current composition.

This research requires access to ships serving *two quite different functions:* multi-purpose icebreakers that can operate in the Southern Ocean as research platforms that also resupply our coastal Palmer Station on the Antarctic Peninsula; and heavy-duty icebreakers that can open a resupply channel through fast ice to McMurdo Station. From McMurdo, supplies are transferred to the U.S. research station at the South Pole and to temporary remote field stations at various points on the continent. These two requirements are met in quite different ways.

Antarctic Ship-Based Research Platforms: Ship Cost, Availability and Policy

U.S. Antarctic Program ship-based research and Palmer Station resupply depend primarily on two privately-owned vessels, the *Laurence M. Gould* (LMG) and the *Nathaniel B. Palmer* (NBP).

The NBP is leased by NSF's prime contractor, currently Raytheon Polar Services Company (RPSC), from the Louisiana-based shipping company, Edison Chouest Offshore (ECO). The vessel was built to specifications developed on the basis of input from the science community. The ship is an ABS A2 icebreaker capable of breaking 3 feet of level ice continuously at 3 knots, with 13,000 shaft horsepower and a displacement of 6,800 long tons. It is outfitted with all of the winches and A-frames necessary for deploying and retrieving oceanographic instrumentation. The vessel is fully outfitted with on-board oceanographic instrumentation and a networked computer suite, including multi-beam sonar, and has 5,900 ft^2 of lab space and 4,076 ft^2 of open deck space for oceanographic work and staging and a helicopter pad and hanger.

The NBP averages 300 days a year underway in support of science.

As is the case for the NBP, the *Laurence M. Gould* is leased by Raytheon from Edison Chouest Offshore (ECO). Also like the NBP, the vessel was designed and built on the basis of input from the science community. The ship is smaller than the NBP and has less ice breaking capability, as it was designed to operate in the more benign ice regions surrounding the Antarctic

Peninsula. The ship is an ABS A1 ice-strengthened vessel with 4,600 shaft horsepower and a displacement of 3,400 long tons and can break one foot of level ice at a continuous 3 knots. It is fully instrumented with on-board oceanographic instruments and a networked computer suite. The LMG has the dual purpose of supporting oceanographic science and providing re-supply to Palmer Station, located on the Antarctic Peninsula. It should be noted, however, that the LMG will soon be at the end of its service contract. NSF recently issued a request for proposals to procure a replacement for the LMG.

The LMG averages 320 days a year underway in support of scientific research and associated logistics.

Annual costs for the NPB and LMG in 2007 were $16.3M and $7.5M, respectively, resulting in respective day costs of $54.3K and $23.4K for these ships.

Antarctic Station Resupply: Ship Cost, Reliability and Policy

As noted above, the resupply of the McMurdo and South Pole Stations, as well as of temporary remote field stations in Antarctica, depends on gaining access to the McMurdo pier through the ice in McMurdo Sound. Since 1988 the channel was opened by one U.S. Coast Guard Polar Class vessel (either the *Polar Star* or the *Polar Sea*), but more recently two icebreaking vessels have been needed due to extreme ice conditions and concerns about the reliability of the aging Polar Class vessels.

After opening the channel, the icebreaker escorts two resupply vessels, a government-owned tanker and a chartered freighter, to and from the ice pier at McMurdo. These resupply vessels are ice-strengthened vessels under the operational control of U.S. Transportation Command's (USTRANSCOM) Component Command, Military Sealift Command. (Military Sealift Command utilizes commercial contracts for construction, maintenance and staffing of vessels. As a result, MSC operates a fleet of cargo ships and tankers that are contractor-owned and operated or government-owned and contractor-operated.)

In FY05, acting on advice from the Coast Guard that a second icebreaker should be brought in to assist the *Polar Star* due to extreme ice conditions in McMurdo sound, NSF chartered the Russian icebreaker *Krasin* for the purpose. The Coast Guard's *Polar Sea* was undergoing repairs and no other U.S. icebreakers were available, as the *Healy* was needed in the Arctic to support research. Italso lacks both the maneuverability and performance for the McMurdo break in. In FY06 the *Polar Sea* was undergoing extensive repair. NSF again chartered the Russian icebreaker *Krasin* and held *Polar Star* in reserve (and eventually brought it in to assist in the final stages of the break-in). The situation was similar in FY07. *Polar Sea* was ready for duty but the Coast Guard recommended that a backup vessel again be employed due to continuing extreme ice conditions. NSF therefore arranged to use a Swedish research icebreaker (the *Oden)* under the auspices of the U.S. - Sweden S&T Agreement, both to open the channel to McMurdo Station and to host a joint U.S. - Swedish research expedition aboard the ship in the Southern Ocean. Polar Sea assisted with the final stages of the McMurdo break in. Based on the excellent performance of *Oden* in FY07 and the success of the joint research program, NSF elected to use the *Oden* again in FY08, this time as the primary icebreaker, holding the *Polar Sea* in reserve where it could also respond to any needs for its services in the Arctic. The *Polar Sea* deployed to the Arctic in FY08 in order to maintain crew proficiency.

The USCG has performed its icebreaking mission in Antarctica with distinction for many decades, but with increasing difficulty in recent years. Its two Polar Class icebreakers are nearing the end of their estimated service lives and are becoming increasingly difficult and costly to keep in service. According to the USCG, there are several years of service life in the *Polar Sea*, but the *Polar Star* has now been placed in caretaker status per agreement with USCG in view of the decreasing need for her services and the high cost of putting her back into service. The need to rely, first on the *Krasin* and then on the *Oden* has already been mentioned as has the need to keep the *Polar Sea* available to meet the needs in the Arctic and perhaps as occasional backup for the annual McMurdo Station break-in. Given this state of affairs, NSF has given careful consideration to how best to meet the needs of the scientific community over the long-term.

Under the current arrangement between NSF and the Coast Guard, NSF provides all the funding for USCG icebreaker operations and maintenance in support of scientific research, and the Coast Guard carries out those duties. NSF provided just under $54M for operation of the USCG polar class icebreakers in 2007. In addition, NSF provided approximately $7.5 million out of its base budget for fuel and charter of *Oden*. When chartering commercial vessels such as the *Krasin* and the *Oden*, NSF pays only for the time that the ships are under charter.

USE OF COMMERCIAL SHIPS AND MODELS/MODES OF OPERATION

As noted above, NSF has met the research community's need for research platforms in the Southern Ocean through long-term contracts with private firms for ice-strengthened ships and icebreakers and through partnerships that provide access to other country's research vessels. For resupply of McMurdo and South Pole Stations, NSF has depended until recently entirely on U.S. Coast Guard icebreakers secured through reimbursement arrangements, and on chartered Military Sealift Command capabilities. More recently, NSF has had to arrange for chartered vessels to complement USCG capabilities. In the Arctic, NSF has relied on the Coast Guard's *Healy* and on partnerships with other countries. Once constructed and commissioned, the Arctic Regional Research Vessel (ARRV) will significantly increase the capacity for ship-based research in the coastal Arctic regions and where ice cover is relatively thin.

A variety of models have been and are being used by the U.S and other countries for meeting polar icebreaker needs. The U.S. Coast Guard and the Chilean and Argentinean Navies operate their icebreakers using military personnel. Some countries build their ships to meet military specifications and others do not. The German research icebreaker, the *Polarstern,* is owned by the government but operated by a private contractor. The Swedish government's operational arrangements for the *Oden* are similar to the German model. Both the *Oden* and the *Polarstern* are able to operate more than 300 days annually as a consequence of ship design and mode of operation. The Arctic Regional Research Vessel (ARRV) will be operated by civilian crews under contract to the University-National Oceanographic Laboratory Systems (UNOLS).

As noted above, NSF employs a contractor to operate and maintain the privately-owned *Laurence M. Gould* and *Nathanial B. Palmer.* The ships were built under a long-term lease agreement between the ship-owners and the Federal government, such that the construction costs are partially amortized over the duration of the lease (with the ship reverting to the owner at the government's option at the end of the lease). These ships also operate more than 300 days annually.

Finally, and as noted previously, the Military Sealift Command meets its needs (and those of NSF's for transport to McMurdo Station) either through commercial charters for ships and crews, or through government-owned, contractor-operated arrangements.

MEETING FUTURE NEEDS

International cooperation to provide icebreaker research platforms is expected to increase, both in arranging multi-ship expeditions and in sharing platforms. Certainly as Germany and the European community move forward in constructing the planned *Aurora Borealis*, NSF will work to establish mutually beneficial partnerships.

NSF's commitment to polar research and its responsibility for management of the U.S. Antarctic Program remains constant and therefore perpetuates the need for an icebreaker to open the shipping channel through the Ross Sea to enable resupply of the McMurdo and South Pole stations. Because opening the channel to McMurdo requires only a fraction of the time a modern icebreaker can operate annually, there may be interest among shipbuilders in providing icebreaker services to NSF under a contract in which the builder can lease the ship to others (other countries or private firms) during the remainder of the year.

An interagency working group co-led by the Department of State and the National Security Council is currently reviewing U.S. Arctic policy, and icebreaking needs will likely figure into the new policy. Clearly, the economics and efficiencies of the various acquisition and operating models merit further study and will depend on the suite of validated requirements put forth in the policy review. For research in the Arctic, the *Healy* should be a mainstay for many years to come, though its utility is restricted by its 200-day operational limitation. The *Healy's* inability to access the deep Arctic during periods of heavy ice cover is another limitation. These limitations, combined with a military deployment mode, make the *Healy* as currently operated, a very expensive way to meet the needs of the research community.

And as noted above, once in service the *ARRV* will be a valuable additional resource for Arctic research.

For Antarctic research the issues are different. The two existing Coast Guard Polar Class ships are at or close to the end of their service life. The Polar Star is in caretaker status, and the Polar Sea is expensive to maintain relative to the costs for the use of foreign, non-military ice breakers over the past several years such as the Russian *Krasin* and Swedish *Oden*. The overriding question is how to open the channel through the ice to McMurdo Station so that year-round operation of the nation's McMurdo and South Pole stations can continue. This year-round occupation is central to demonstrating the "active and influential presence" which is the cornerstone of U.S. policy in Antarctica as articulated in Presidential Memorandum No. 6646 on U.S. Antarctic Policy and Programs (February 5, 1982). Other factors contributing to this presence are the 600 days annually that NSF's research vessels, the *LM Gould* and the *NB Palmer*, operate in Antarctic waters; the approximately twenty C-17 Air Force flights annually that fly passengers and cargo between New Zealand and McMurdo; and the more than 400 Air National Guard LC-130 flights annually that provide transportation for people and equipment throughout the continent. Furthermore, NOAA charters the Russian *R/V Yuzhmorgeologiya* approximately 100 sea days per year in support of its Antarctic program. This program focuses on living marine resources at the Antarctic Peninsula in support of U.S. interests at the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) to which the United States is signatory.

In considering how best to insure the continued annual resupply of McMurdo Station and to meet our responsibility for the entire U.S. Antarctic Program, NSF operates in accordance with U.S. Policy and the instructions contained in Presidential Memorandum No. 6646, that "Every effort shall be made to manage the program in a manner that maximizes cost effectiveness and return on investment."

The Arctic policy review will certainly help inform future icebreaker discussions, but even if a decision were made today to build or refurbish an icebreaker, it would be years before the ship got underway. Accordingly, to meet its ongoing requirements in a cost-effective means, NSF has made arrangements to lease an icebreaker from Sweden (NSF signed a 5-year agreement with Sweden for a joint research program in the Southern Ocean with Sweden additionally providing break in services for the USAP.). NSF sees a need to keep the USCGC Polar Sea available to meet needs in the Arctic and perhaps as occasional backup for the break-in to McMurdo Sound. This, however, is clearly only a short-term solution. With an eye looking to the long-term, and after consultations with officials in OSTP and OMB, I wrote on May 31, 2006, to the chair of the NAS/NRC icebreaker study, Dr. Anita Jones, as follows: "Given the rapidly escalating costs of government providers for icebreaking services and the uncertain availability of USCG icebreakers beyond the next two years, it is NSF's intention to ... [seek] competitive bids for icebreaking services that support the broad goals of the USAP. This competition will be open to commercial, government, and international service providers." The request for proposals will not be for ships but rather for services and we would expect the service providers to use their ships for other purposes when not in service to meet NSF needs. Thus the cost to the Foundation could be substantially reduced.

Mr. Chairman, I appreciate the opportunity to appear before the Subcommittee to speak on behalf of the National Science Foundation on this important issue. I would be pleased to answer any questions that you may have.

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STATE OF ALASKA
OFFICE OF THE GOVERNOR
JUNEAU

March 18, 2008

The President
The White House
Washington, DC 20500

Dear Mr. President:

I write in support of new icebreakers for the U.S. Coast Guard. The nation's only two icebreakers built to handle heavy sea ice are more than 30 years old and nearing the end of their service lives. Yet at the same time as our icebreakers are hobbled by years of hard service and lack of maintenance funds, more freighters and cruise ships than ever before are traveling through the Arctic – with many more on the way to U.S. waters. Oil and gas explorers are spending billions of dollars in the Arctic to find the energy resources our nation needs to power its homes and businesses. Similar commercial work is under way on both sides of the U.S. Arctic borders, moving ahead while our nation remains tied up at the dock.

All the while our country needs more access and more research into the science of climate change and its effects, especially in remote polar waters. For the sake of commerce, our energy and national security, and to protect our residents and resources, it's time for the United States to build a pair of new polar icebreakers.

The U.S. Coast Guard's two major icebreakers – the Polar Sea and Polar Star – are in poor shape and the United States has become a poor cousin to Russia and Norway, which recognize the high importance of dependable access to polar waters. Yes, committing to design and construction of new icebreakers is a costly endeavor, but the United States cannot afford to ignore its Arctic coastline, oil and gas resources, and national security.

The state of Alaska is not alone in this quest. The United States Arctic Research Commission is calling for new icebreakers, as is the National Academy of Sciences. In a report last year to Congress, the National Academy stated the case very well: "The U.S. icebreaking capacity is now at risk of being unable to support national interests in the north and south. Deferred long-term maintenance and failure to execute a plan for replacement or refurbishment of the nation's icebreaking ships have placed national interests in the polar regions at risk."

The President
March 18, 2008
Page 2

Possible ratification of the Law of the Sea Treaty will require the United States to embark on an extensive effort to collect data to prove its claims to polar waters and seabeds, and to defend against excessive claims by other nations. Mapping the outer continental shelf off Alaska is an essential piece of that effort, one that cannot be done in a safe and timely manner without dependable icebreakers on the job. The best way to get that data to defend our national interests is with two new polar-class icebreakers. To ignore that responsibility could be very costly to the future of our country.

A more immediate issue is the rapid and strong growth in Arctic shipping and tourism. Retreating sea ice is opening up shorter shipping routes through northern waters. The famed Northwest Passage is becoming a reality, and the Coast Guard needs to be vigilant in patrolling and protecting our coastline.

As retreating sea ice opens up new shipping lanes, it also opens up new problems. "(It) has enormous economic implications, and commerce is going to push this ecological zone to the limit," Rear Admiral Timothy McGee, head of the U.S. Navy's Meteorology and Oceanography Command, said in a recent Reuters interview.

But the Coast Guard cannot do its job with 32-year-old ships shut down for repairs. With steadily growing freighter and cruise traffic comes the risk of accidents and pollution and the need for search and rescue missions. It is essential that our nation have available modern icebreakers to respond to whatever emergency may arise.

Everything points to the need for an expanded U.S. presence in the polar regions, not less. Everything points to the need for new icebreakers to show and enforce that presence.

Please let me know if I can help in this endeavor. The Coast Guard needs the ships to do its job.

Sincerely,

Sarah Palin

Sarah Palin
Governor
State of Alaska

The President
March 18, 2008
Page 3

cc: Jim Nussle, Director, U.S. Office of Management and Budget
The Honorable Condoleezza Rice, Secretary, U.S. Department of State
The Honorable Michael Chertoff, Secretary, U.S. Department of Homeland Security
The Honorable Robert Gates, Secretary, U.S. Department of Defense
Admiral Thad W. Allen, Commandant, United States Coast Guard
The Honorable Ted Stevens, United States Senator
The Honorable Lisa Murkowski, United States Senator
The Honorable Don Young, United States Representative
John Katz, Director, State and Federal Relations, Office of the Governor

Testimony by Mead Treadwell, Chair
U.S. Arctic Research Commission
"Is America Prepared For An Accessible Arctic?"
Subcommittee on Coast Guard and Maritime Transportation
Rayburn House Office Building Room 2167, Washington, DC
2:00 pm, July 16, 2008

Good afternoon, Mr. Chairman, members of the Committee. My name is Mead Treadwell. Since 2002 I have been a member, and since 2006, I have chaired the U.S. Arctic Research Commission (USARC).[1] As a senior fellow at the Institute of the North, based in Anchorage, Alaska, and in the private sector, I have worked for much of my career on the economics, feasibility, and sustainability of Arctic transportation in shipping, pipelines, railroads, tourism and aviation.[2]

On behalf of my fellow Commissioners, thank you for your invitation to be here today. My testimony, I need to make clear, represents the view of the U.S. Arctic Research Commission, an advisory body to the Executive Branch and Congress. The Commission formulates its positions in public meetings. The recommendations made by the Commission do not necessarily represent the views of the Administration. Nevertheless, I am proud to report that every relevant office we work with in the White House, and every relevant agency we work with in the Executive Branch is taking the changes that are happening in the Arctic quite seriously. The Administration's position on the need for new icebreakers, and how it will meet that need if it determines there is one, will be enunciated by an ongoing, comprehensive interagency policy process. Nevertheless, I can and will report, that the tremendous homework to prepare for an accessible Arctic Ocean, the "new Mediterranean" once predicted by Arctic explorer Vilhjalmur Stefansson, has certainly begun.

The Arctic component to this hearing is essential. During this International Polar Year, the United States and other nations are laying down an Arctic Observing Network[3] to

[1] Under the Arctic Research and Policy Act of 1984, the seven Commissioners of the USARC are appointed by the President and report to the President and the Congress on goals and priorities for the U.S. Arctic Research Program. That program is coordinated by the Interagency Arctic Research Policy Committee, (IARPC) chaired by National Science Foundation Director Dr. Arden Bement, who is also an *ex-officio* member of the Commission. See www.arctic.gov for Commission publications, including the Commission's 2007 Goals Report.

[2] The Institute of the North, www.institutenorth.org, founded by former Alaska Governor and U.S. Interior Secretary Walter J. Hickel, has programs that focus on economics and policy related to management of common resources, onshore and offshore. The Institute's work in Arctic infrastructure (including energy, transportation and telecommunication) supports the work of the eight-nation Arctic Council and the circumpolar, regional governments of the Northern Forum. The Institute's defense, security and geography studies stem from Alaska's unique, strategic location.

[3] AON report is found at: http://www.nsf.gov/od/opp/arctic/iarpc/start.jsp Pending legislation to support the Integrated Ocean Observing System will help assure that studies of Arctic climate changes will be initialized and maintained. These are important to understand the processes that affect the ice cover and circulation of the Arctic Ocean and thus operational environments for icebreakers and other ships.

better understand, model and predict the vast changes coming to the northern part of the globe. The Arctic Council's eight nations, with indigenous participants and the global shipping industry, are conducting the Arctic Marine Shipping Assessment (AMSA), due to be published in 2009.[4] While science is finding most of the Arctic Ocean to be suddenly, and surprisingly accessible in summer, our assessment is finding that regular Arctic Ocean shipping in all coastal seas, tied to specific resource development projects, tourism, or serving the needs of Arctic communities, is large now and is growing.[5] However, winter access remains a challenge except for the most capable of icebreaking ships. New Arctic capable ships are under construction in Southeast Asia and Europe. Research the Commission has supported for AMSA reveals there are approximately 7800 ice class ships in the world today ~ 4.5% of the world fleet. This percentage is expected to increase to 10% as more ships are built for polar use. This trend brings with it the need for new policies – rulemaking, research, and investment – by governments of the Arctic region.

In the United States, it is necessary to recognize that the Alaska Purchase in 1867 made us an Arctic nation. Our ocean boundaries include more than the Atlantic and Pacific. In the 20th century, the advent of aircraft, missiles, and missile defense made the Arctic region a major venue for projection of power and a frontier for protecting the security of North America, Asia and Europe. Great circle air routes through the Arctic currently carry the bulk of travelers and air cargo between these continents. Today's Arctic infrastructure is global infrastructure. In the 21st century, Arctic seaways have the potential to serve as a major venue for shipping between these continents, as explorers envisioned as early as 500 years ago.

Much of the U.S. Arctic Research Commission's work is to encourage the U.S. government to do its homework – homework that is necessary in response to an accessible Arctic Ocean[6]. Our Commission's purview is determining and recommending goals for U.S. research in the Arctic. Those goals cover a wide range of subjects, ranging from Arctic natural resources, the needs of Arctic people, and the needs of the nation in this region. We look at basic research, applied science, and social research needs. In today's testimony, I will focus on five key points related to changes in the Arctic, discuss the public recommendations we have made regarding icebreakers, and direct the Committee to sources of additional information.

First, the Arctic is more accessible. The observed, historic sea ice cover – sea ice extent and thickness – is receding. The rates of these changes are faster than our

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[4] AMSA is led by the U.S., Canada, and Finland, and is Chaired by Dr. Lawson Brigham, Deputy Director of the U.S. Arctic Research Commission, a former U.S. Coast Guard icebreaker captain. For details on AMSA. See: http://arcticportal.org/pame/amsa

[5] For a review of ice conditions and current views of the shipping industry, see website for June 5, 2008 Arctic Transportation Conference sponsored by DOT/MARAD, http://www.marad.dot.gov/Arctic%20Conference/Arctic%20index.html

[6] See USARC's summary report on goals and objectives for Arctic research 2007 for the U.S. Arctic Research Plan, www.arctic.gov

climate models predict.[7] This, combined with the advent of more efficient icebreaking technology, and global demand for Arctic resources, works to make Arctic shipping, Arctic fishing, and Arctic resource development more economically feasible and attractive to investors.

Second, Arctic residents, governments and industry are assessing both the opportunities and the challenges of an accessible Arctic.[8] Within these assessments is a fundamental question: Will trans-Arctic seaways be as important to global shipping as the Panama and Suez Canals? Or, will the Arctic Ocean continue more as venue for shipping in and out of the Arctic itself, for tourism, local needs, and for bringing natural resources to market? Other assessments, domestic and international, are looking at the energy potential of the Arctic, the security and cooperation needs presented by an accessible Arctic, and so forth.

Third, policies are being conceived, developed and implemented toward a goal of ensuring that shipping in the Arctic is, to quote my colleague at the Department of State, Assistant Secretary Dan Sullivan, "safe, secure and reliable."[9] To me, those three words have large meaning. Safe refers to protecting human life, and mitigating any ill effects shipping will have on the environment, biodiversity, cultures and traditions of the Arctic. Likewise, navies and coast guards must examine their capacity to ensure security for those ships, particularly those carrying strategic commodities. Finally, the word reliable refers to issues raised by the shipping industry. In AMSA's workshops as well as conferences convened by maritime organizations such as MARAD, Lloyds, and the U.S. National Ice Center, industry has said the Arctic Ocean is a "patchwork quilt" of tolls and regulations by several coastal nations. Arctic shipping will grow when rules are certain and when products can be delivered competitively with other routes. This means on a time and cost basis, not just on shorter distances.

Mr. Chairman, a regime for safe, secure, and reliable shipping is something our nation can lead in developing, through existing mechanisms like the International Maritime Organization, the Arctic Council, and –when acceded to by the U.S. – via the Law of the Sea convention. The U.S. Arctic Research Commission continues to urge the Senate to accede to this convention.

The United States last revised its Arctic policy in 1994. While environmental protection was then made a principal objective, climate change and growth in Arctic shipping were

[7] See National Snow and Ice Data Center's website at: http://nsidc.org/arcticseaicenews/

[8] See AMSA: http://arcticportal.org/pame/amsa and Arctic Shuttle Container Link Study conducted for the State of Alaska and the Port of Adak by the Institute of the North and Aker Arctic. See: http://www.institutenorth.org/servlet/content/studies.html. Also see the Sept. 2004 Arctic Marine Transport Workshop report here: http://www.institutenorth.org/servlet/content/reports.html.

[9] See Sullivan's speech to the Arctic Energy Summit quoted in the New York Times: http://www.nytimes.com/2007/10/19/us/19arctic.html?_r=1&scp=1&sq=shipping%20Arctic%20sullivan&st=cse&oref=slogin

not contemplated.[10] As the Executive Branch currently conducts a review of U.S. Arctic policy, the Commission has urged consideration of policies to ensure safe, secure, and reliable shipping.

Fourth, strong research programs are needed in the Arctic Ocean, and some of that research is on deadline. The U.S. Arctic Research Commission has developed a set of research goals related to shipping, and those goals will be included in the report due to the President and Congress in 2009. Decisions to be made by governments on climate issues require understanding of what is happening in the Arctic Ocean, the Greenland icecap, in the changing heat, freshwater and greenhouse gas budgets of the earth. The Commission, at its meeting earlier this month in Fairbanks, decided to press federal agencies to better coordinate research and monitoring of the living ecosystem of the Arctic Ocean as the nation moves to install a moratorium on fishing in the U.S. Arctic Ocean Exclusive Economic Zone, as oil exploration moves further offshore, and as a number of species are considered for listing under the Endangered Species Act.

Several "wild card" issues related to Arctic shipping have been identified through the AMSA process and will be included in the Commission's goals for shipping research as part of our regular 2009 report to the President and Congress. These shipping research objectives include understanding the effects of air pollution and noise from ships on the Arctic ecosystem. As well, the tradeoff between warming effects of ship emissions in the Arctic and potential reduced emissions from shipping worldwide, due to shorter routes, is a goal of study. Also, the U.S. and Iceland are cooperating on development of hydrogen technologies. The prospect of hydrogen-powered ships, under development by Iceland, is of interest to the entire Arctic community.

The Interagency Arctic Research Policy Committee, acting on the USARC's recommendation, has commissioned an interagency research plan on Arctic infrastructure, in light of climate change. This will cover many climate impacts on transportation in the Arctic, including roads, maritime transport, and the need for improved oil spill research in ice-covered waters.[11]

Nations are mustering bathymetric and seismic expeditions to delineate the extended continental shelf of the Arctic region, for new territorial claims allowed under the United Nations Convention on the Law of the Sea (UNCLOS). And as those claims by some nations could make parts of the Arctic Ocean legally less accessible to research, the science community is pressing Arctic states, through the diplomatic community, to ensure greater access for research.[12]

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[10] The current State Department summary on Arctic Policy, based on the interagency process completed in 1994, lists the six principal objectives of Arctic Policy See: http://www.state.gov/g/oes/ocns/arc/

[11] Under the leadership of the U.S. Army Corps of Engineers' Cold Region Research and Engineering Laboratory, in Hanover, N.H., the plan will cover research and development goals for civil works and housing (including permafrost and shoreline erosion), oil spills, energy use, and marine transportation.

[12] The USARC has been informed by the Department of State that applications from the U.S. to Russia for approval to conduct marine scientific research in Russia's Exclusive Economic Zone was denied 11 of the

Fifth and finally, the Commission believes that an accessible Arctic will lead the United States and other nations to consider further investment in this region. Those investments have begun, with the observing networks we mentioned previously and the inclusion of the Arctic Ocean in U.S. provision of notices to mariners. This summer operations (seasonal) of the U.S. Coast Guard have moved north and our Arctic neighbors are taking similar actions. Your Committee, Mr. Chairman, has reported legislation which passed the House, calling for a feasibility study that would determine the basic requirements for new icebreaking capacity to support Arctic and Antarctic

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13 times requested between 1996 and 2006, and 6 of the 14 times between 1992 and 1995 (Personal communication to the Chair and Executive Director of the USARC, April 7, 2008). While the Commission supports ratification of the Law of the Sea, and has helped initiate and shape the research program to develop a U.S. extended continental shelf claim in the Arctic Ocean, the Commission has also sought greater guarantees of access for research in all waters of the Arctic Ocean, regardless of sovereign jurisdiction of waters or the seabed.
See also this appeal, submitted by the USARC, and others, to the U.S. Department of State.

Appeal to the U.S. Department of State
In anticipation of the meeting of ministers from the five Arctic coastal nations
In Ilulisat, Greenland, on May 28, 2008

As you, representing the United States, meet with representatives from other Arctic coastal states, to discuss the future of the Arctic Ocean, we, representing the U.S. science community working in this region, make this appeal: please take all necessary effort to enable research to thrive by ensuring free and open scientific access to the Arctic. The open nature of the Antarctic Treaty, and the free support of and exchanges in science, have been the hallmark of international cooperation on that continent for 50 years. The Arctic also would benefit from such openness.

We especially urge the coastal Arctic states to remove obstacles to ship access for research in the Arctic Ocean. In recent years, important scientific expeditions have been cancelled through parts of the Arctic due to the expense and complications of national rules for foreign ships wishing to enter the Exclusive Economic Zone of certain Arctic nations. Further, some ships – whose voyages were solely dedicated to research – have been categorically denied access. We are concerned that Arctic nations' expanded jurisdiction of the ocean floor, that will come about through Law of the Sea claims, threatens to further limit the full range of customary research activities that need to be conducted by scientists in the Arctic. Although it may be useful to ensure rights of inspection for such vessels, there are many benefits to be derived from open access for scientific purposes.

Second, please address the well-documented need for sharing of data that has been, or will be, collected in the Arctic Ocean region. We appeal to nations to continue to make available previously collected data, and to commit to further sharing of new data collected within jurisdictional borders.

Knowledge gained from Arctic research is important to the entire world. Policy decisions on climate change, energy, environment, human health, security, commerce, and other subjects will be made by many nations based on this knowledge. Scientific research should be based on sound conclusions drawn from valid data, unfettered by national borders.

Thank you for your attention to these issues. We wish you a productive meeting.

Signed by the following four organizations:

- **Arctic Research Consortium** of the U.S. (www.arcus.org), representing over 5,000 scientists worldwide from 51 member institutions
- **Consortium for Ocean Leadership** (www.oceanleadership.org) representing over 10,000 scientists from 95 member institutions in the U.S. and Canada
- **Marine Mammal Commission** (www.mmc.gov)
- **U.S. Arctic Research Commission** (www.arctic.gov)

region national needs.[13] And, we believe all modern icebreaker hull designs and propulsion systems should be fully evaluated in these studies for any new U.S. polar icebreakers.

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[13] **See the two different approaches to future icebreaker needs in USCG authorization bills. H.R. 2830 has passed the House; S. 1892 awaits floor action in the Senate.**

H.R.2830

To authorize appropriations for the Coast Guard for fiscal year 2008, to amend the Immigration and Nationality Act and title 18, United States Code, to combat the crime of alien smuggling... (Engrossed as Agreed to or Passed by House)

SEC. 422. ASSESSMENT OF NEEDS FOR ADDITIONAL COAST GUARD PRESENCE IN HIGH LATITUDE REGIONS.

Within 270 days after the date of enactment of this Act, the Secretary of the department in which the Coast Guard is operating shall submit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Transportation and Infrastructure of the House of Representatives assessing the need for additional Coast Guard prevention and response capability in the high latitude regions. The assessment shall address needs for all Coast Guard mission areas, including search and rescue, marine pollution response and prevention, fisheries enforcement, and maritime commerce. The Secretary shall include in the report--

(1) an assessment of the high latitude operating capabilities of all current Coast Guard assets, including assets acquired under the Deepwater program;

(2) an assessment of projected needs for Coast Guard forward operating bases in the high latitude regions;

(3) an assessment of shore infrastructure, personnel, logistics, communications, and resources requirements to support Coast Guard forward operating bases in the high latitude regions;

(4) an assessment of the need for high latitude icebreaking capability and the capability of the current high latitude icebreaking assets of the Coast Guard, including--

(A) whether the Coast Guard's high latitude icebreaking fleet is meeting current mission performance goals;

(B) whether the fleet is capable of meeting projected mission performance goals; and

(C) an assessment of the material condition, safety, and working conditions aboard high latitude icebreaking assets, including the effect of those conditions on mission performance;

(5) a detailed estimate of acquisition costs for each of the assets (including shore infrastructure) necessary for additional prevention and response capability in high latitude regions for all Coast Guard mission areas, and an estimate of operations and maintenance costs for such assets for the initial 10-year period of operations; and

(6) detailed cost estimates (including operating and maintenance for a period of 10 years) for high latitude icebreaking capability to ensure current and projected future mission performance goals are met, including estimates of the costs to--

(A) renovate and modernize the Coast Guard's existing high latitude icebreaking fleet; and

(B) replace the Coast Guard's existing high latitude icebreaking fleet.

S.1892

Coast Guard Authorization Act for Fiscal Year 2008 (Reported in Senate)

SEC. 917. ICEBREAKERS.

(a) IN GENERAL- The Secretary of the department in which the Coast Guard is operating shall acquire or construct 2 polar icebreakers for operation by the Coast Guard in addition to its existing fleet of polar icebreakers.

Following a 2006 report delivered by the National Research Council which this Committee requested, the U.S. Arctic Research Commission has urged the President and Congress to move expeditiously in building and maintaining new ships. We have been guided by the NRC's conclusion that two, Polar Class, ships are necessary, and while we have heard witnesses who have conducted some qualitative analysis on issues related to shipping potential in the Arctic, and future ice states, we have not conducted a specific analysis which links those forecasts to exact icebreaker needs and specifications. We are aware of a number of efforts within the government to address those questions and believe such an analysis is timely.

In the end, however, we believe the nation will realize it has a need for this maritime capability. We foresee that U.S. Coast Guard Arctic icebreakers will be used as they are now –as research platforms and as the visible U.S. maritime presence in both polar regions. But the advent of Arctic transportation means we expect the other, more traditional missions of the Coast Guard will take center stage. These national assets, polar icebreakers operated by the Coast Guard, are needed in the future to provide the same protections the Coast Guard affords the rest of the nation: search and rescue, law enforcement, border protection, environmental protection and oil spill response[14].

Aid to commerce is an important mission of our Great Lakes icebreakers. Under a regime worked out with Canada, the St. Lawrence Seaway/Great Lakes system has become an important part of the global transportation network. The Executive Order signed by President Franklin Roosevelt, committing icebreakers to support U.S. maritime commerce is not limited by geography, and while there is not a call at the present time, some observers suggest icebreakers may be needed to support

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(b) NECESSARY MEASURES- The Secretary shall take all necessary measures, including the provision of necessary operation and maintenance funding, to ensure that–

(1) the Coast Guard maintains, at a minimum, its current vessel capacity for carrying out ice breaking in the Arctic and Antarctic, Great Lakes, and New England regions; and

(2) any such vessels that are not fully operational are brought up to, and maintained at full operational capability.

(c) REIMBURSEMENT- Nothing in this section shall preclude the Secretary from seeking reimbursement for operation and maintenance costs of such polar icebreakers from other Federal agencies and entities, including foreign countries, that benefit from the use of the icebreakers.

(d) AUTHORIZATION OF APPROPRIATIONS- There are authorized to be appropriated for fiscal year 2008 to the Secretary of the department in which the Coast Guard is operating such sums as may be necessary to acquire the icebreakers authorized by subsection (a), as well as maintaining and operating the icebreaker fleet as authorized in subsection (b).

http://www.cbo.gov/ftpdocs/87xx/doc8704/s1892.pdf is a CBO estimate which projects $1.525 Billion in additional federal spending to meet the icebreaker construction objectives of the Senate Bill.

The 2006 National Research Council's study "Polar Icebreakers in a Changing World: An Assessment of U.S. Needs" can be accessed here: http://www.nap.edu/catalog.php?recrod_id=11753

[14] See attached letter March 18, 2008 from Alaska Governor Sarah Palin to President Bush. See also the attached memorandum for the Joint Chiefs of Staff that was received by the USARC on June 8, 2008. Both documents refer to national needs for new icebreaker capacity.

commercial shipping in U.S. Arctic waters[15]. The U.S. has much at stake from both shipping and resource development in the Arctic, and would be well advised to include the potential for Arctic commerce in any icebreaker needs analysis.

Polar class icebreakers were commissioned to support the essential mission of visible national presence in the Arctic and the Antarctic, both in maintaining our position and in supporting freedom of navigation. A polar class icebreaker gives this nation a unique, year-round maritime capability. Polar class icebreakers are the largest and most capable of ice-going ships. Indeed, an accessible Arctic Ocean also means new or expanded routes for the U.S. military sealift to move assets from one part of the world to another. The Commission believes polar icebreakers are an essential maritime component to guarantee that this U.S. polar mobility exists.

Shipping and research activities in the Arctic depend today on a strong system to predict ice conditions, provided by satellites above, and analysis by our Navy/NOAA/Coast Guard National Ice Center, near here in Suitland, Maryland. Current activity in the Arctic depends on good meteorology, developed in cooperation with our neighbors. Throughout the Arctic, spill response and search and rescue capabilities may need to be improved. My predecessor, George Newton, as Chair of the USARC has spoken of the necessity for an "Arctic 911" capability, and led the effort to encourage the National Geospatial Intelligence Agency (NGA) to add the Arctic region to the oceans of the world supported by notices to mariners. The question of where we need new port facilities, as safe harbors and transshipping points, is yet to be fully addressed.

At the same time the icebreaker question is being studied throughout the government, the U.S. is preparing to embark on construction of the long-sought Alaska Region Research Vessel, through the National Science Foundation. The Commission received a briefing on the status of this work in Fairbanks earlier this month from Dr. Denis Wiesenburg, Dean of the School of Fisheries and Ocean Sciences at the University of Alaska. The University of Alaska is completing a process of design review with the National Science Board, and the Commission is hopeful that review will allow the project, long on the drawing boards, to move forward next year. All indications tell us that a changing Bering Sea and Arctic Ocean means changing fish stocks, and research into fisheries will certainly be part of the requirements of this new vessel.

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[15] See: http://www.conservativeusa.org/eo/1936/eo7521.htm
EX. ORD. NO. 7521. USE OF VESSELS FOR ICE-BREAKING OPERATIONS IN CHANNELS AND HARBORS. Ex. Ord. No. 7521, Dec. 21, 1936, 1 F.R. 2527, provided: 1. The Coast Guard, operating under the direction of the Secretary of the Treasury, is hereby directed to assist in keeping open to navigation by means of ice-breaking operations, in so far as practicable and as the exigencies may require, channels and harbors in accordance with the reasonable demands of commerce; and to use for that purpose such vessels subject to its control and jurisdiction or which may be made available to it under paragraph 2 hereof as are necessary and are reasonably suitable for such operations. 2. The Secretary of War (Army), the Secretary of the Navy, and the Secretary of Commerce are hereby directed to cooperate with the Coast Guard in such ice-breaking operations, and to furnish the Coast Guard, upon the request of the Commandant thereof, for this service such vessels under their jurisdiction and control as in the opinion of the Commandant, with the concurrence of the head of the Department concerned, are available and are, or may readily be made, suitable for this service.

To summarize, changing ice conditions do not obviate the advantages of having polar class icebreakers. First, while scientists are reporting that Arctic sea ice is becoming scarcer and thinner over time, they are also predicting tougher operating conditions and higher sea states due to the absence of ice and changing wind/weather patterns. Further, as year-round activities such as oil exploration and production proceed in many parts of the Arctic Ocean, difficult ice ridges and moving pack ice will certainly continue as a hazard.

Second, we believe that broad Coast Guard missions will be necessary. While the primary uses of the Polar class icebreakers in the past 40 years have been logistics support (icebreaking escort) to the U.S. Antarctic program and research missions in both polar regions, it is unlikely that the next 40 years in the Arctic will see activity so limited. Already, we see a number of Arctic-capable commercial ships planned or in operation. National needs, from research to national presence to law enforcement, environmental protection, and national/homeland security will continue to call for an all-hazards, all-Ocean, all-seasons national icebreaker capability. While some of these national research needs can be met by other vessels than those of the U.S. Coast Guard, the Commission believes there will be times that the nation itself wants to be sure it commands and controls that capability.[16]

Third, Arctic icebreakers are nothing if not expensive – to build and to operate. Mr. Chairman, against that expense are national interests in the Arctic which the Commission believes total billions, if not trillions of dollars in revenue to the U.S. budget and economic activity of our nation. The subsea land we stand to acquire in the Arctic is part of a claim under the Law of the Sea that the State Department estimates to be larger than the State of California; the value of the energy and mineral resources alone in the potential U.S. claim will likely be huge.[17] The energy potential of the Arctic Region is again being assessed by the U.S. Geological Survey. While the results are forthcoming, here is what is known today: the eight Arctic nations' today, from their Arctic regions, produce and export energy as a mainstay of the economies of northern Russia, Norway, Alaska, and Canada. Iceland, with geothermal and hydro energy used to smelt aluminum, gains close to a third of its exports from that activity, and is now looking offshore for oil and gas. Terms of self-governance for Greenland being established by the Danish Parliament likewise are expecting that region to realize major oil and gas potential. By any estimate, energy development in the North, including

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[16] The Commission has worked with federal agencies and the science community to support an Arctic Icebreaker Coordinating Committee to schedule science missions in conjunction with other missions of Coast Guard vessels. Similarly, we have worked to reinvigorate the SCICEX Committee, a similar interface, to allow instruments to be placed aboard U.S. submarines operating in the Arctic. We are working with the Navy on declassification of data collected on U.S. Arctic submarine missions. We are encouraging agencies of the U.S. and the research community to take advantage of Arctic ice camps established in the Beaufort Sea, next scheduled by the Navy for 2009. We work to support international cooperation in Arctic Ocean research, including NOAA's joint work with Russia, and international ocean drilling programs or research missions with icebreakers of several nations.

[17] According to testimony received in 2007 by the Commission from the co-chair of the U.S. Extended Continental Shelf Task Force, an interagency initiative, the entire extended continental shelf includes energy and mineral resources with an estimated value in excess of $1 trillion. See http://www.ngdc.noaa.gov/mgg/ecs/unclos.html and http://www.doi.gov/initiatives/oceanfr.html for further information.

renewable energy, is a major economic, environmental and security issue. If Arctic seaways become a venue for global trade, the economic impact again is in the billions of dollars. Mineral developments on the drawing board in Alaska and Canada, and current developments in northwest Russia, may already reach that magnitude.[18] Food production in the U.S. Arctic and Bering Sea, where fishing vessels operate in or near the seasonal sea ice edge, is a billion dollar industry.

To that, Mr. Chairman, are the costs our nation and others are expected to incur in responding to global climate change. The potential of the Arctic's natural system to contribute – through a process scientists call feedback – is itself a trillion dollar issue for those planning the means and methods to meet our climate goals. Finally, Mr. Chairman, the Arctic has resources and values we cannot put a price tag on. Humans live in the Arctic and maintain a subsistence lifestyle practiced by these cultures for thousands of years. The need to understand and protect the marine mammals of this region is well established in U.S. law. To support research in all polar conditions, the United States Arctic Research Commission has urged this nation to maintain polar class icebreaking capability.

We understand it is this nation's goal –expressed with other nations – to reverse the trend of climate change caused by humans. In the Arctic, research to support adaptation to and mitigation of climate change is high on our agenda. But as more forces than climate are working to produce an accessible Arctic, it is essential that our nation act now. Baseline marine studies (in response to expanded Arctic marine development), basic research, policies and coordinated investment in infrastructure will ensure safe, secure, and reliable Arctic shipping. Under the principle of freedom of navigation, global shipping can come to our doorstep whether we invite it or not. Whether you envision the Arctic Ocean as a new seaway, for trans-Arctic shipping, competitive with the Panama and Suez Canals, or only foresee an expansion of the current shipping in and out of the Arctic, the time to prepare is now.

Thank you very much.

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[18] The Western Arctic Coal Project is assessing the potential for coal exports from Northwestern Alaska, under a joint agreement between BHP Billiton and Arctic Slope Regional Corporation http://bhpbilliton.com/bb/ourBusinesses/energyCoal/westernArcticCoalProject.jsp. See also www.baffinland.com for information about Nunavut, Canada's $C4.1 billion proposed Mary River Project, which from 2014. would mine and ship iron ore on a year round basis to European markets. According to the website, "A comprehensive review of ice conditions and the results of site specific bathymetry studies have been used to establish appropriate shipping lanes, and to recommend the required "ice class" for the dedicated ore carriers. Fednav has designed a cape-size ore carrier, Polar Class 4, of 135,000 dead weight tonnes (dwt) capacity, suitable for dedicated operations between Steensby Port and Europe over a 12-month operating period each year. A fleet of eight vessels will be required to fully service the project requirements, according to the results of detailed ice transit simulation studies."

UNITED STATES TRANSPORTATION COMMAND
508 SCOTT DRIVE
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MEMORANDUM FOR CHAIRMAN, JOINT CHIEFS OF STAFF

FROM: CDR USPACOM / CDR USTRANSCOM / CDR USNORTHCOM

SUBJECT: Icebreaker Support

1. The United States has enduring national, strategic, and economic interests in the Arctic and Antarctic. In the north, the United States is an Arctic nation with broad and fundamental national security interests. In addition to the essential requirements for homeland security and maritime domain awareness, the effects of climate change and increasing economic activity require a more active presence in this maritime domain. In the south, the United States maintains three scientific stations. While the mission of the stations is largely scientific, their presence secures the United States' influential role in the Antarctic Treaty decision making process and maintains the balance necessary to maintain our position on Antarctic sovereignty.

2. To assert our interests in these regions, the United States needs assured access with reliable icebreaking ships. Today, however, two of the three Coast Guard icebreakers are nearing the end of their service lives, with one relegated to caretaker status. Over the past 10 years some routine maintenance has been deferred and there is no service life extension program for these ships. As a result, the nation's icebreaking capability has diminished substantially and is at risk of being unable to support our national interests in the Arctic regions. An example of our reduced icebreaking capability is last season's McMurdo Station resupply mission where USNS GIANELLA spent 50 hours in pack-ice awaiting escort from a leased Swedish icebreaker.

3. In summary, icebreakers are essential instruments of United States policy in the polar regions. We therefore recommend Joint Chiefs of Staff support for the following:

- A program for the construction of new polar icebreakers to be operated by the Coast Guard.
- Coast Guard funding to keep existing icebreakers viable until the new ships enter service.
- Sufficient Coast Guard operations funding to provide increased, regular and reliable icebreaker presence in the polar regions.

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Before the Subcommittee on Coast Guard and Maritime Transportation
United States House of Representatives

COAST GUARD ICEBREAKERS

Rayburn House Office Building – Room 2167
July 16, 2008 – 2:00 p.m.

Lake Carriers' Association represents 16 American corporations that operate 63 U.S.-Flag vessels exclusively on the Great Lakes. These vessels ("Lakers") move the raw materials that drive the U.S. economy: iron ore for steel production, coal for power generation, limestone and cement for the construction industry, ... When high water levels offset the lack of adequate dredging on the Great Lakes, LCA's members can move more than 115 million tons of cargo in a given year.

Great Lakes Maritime Task Force represents more than 80 organizations, including dock operators, labor unions, vessel operators, steel producers, power generators, port authorities, dredging contractors, and limestone producers. Founded in 1992, it promotes Great Lakes Marine Transportation.

Every day the 2,500 professional American mariners sailing on the Great Lakes risk their lives and their livelihoods to feed the economic engine that drives the North American Heartland. They deserve the respect and the resources needed to ensure safe and efficient passage. Without adequate U.S. Coast Guard resources, particularly icebreaking capacity, the gears of this economic engine could come to a grinding halt. As President of Lake Carriers' Association and a Vice President of Great Lakes Maritime Task Force, I have the privilege of testifying on behalf of those mariners and the U.S.-Flag vessels operating on the Great Lakes. With each cargo, we deliver iron ore for steel production, limestone and cement for construction, coal for power generation ... and jobs.

Three days after the 9/11 attack, I was recalled to active duty and served for a year at the Ninth Coast Guard District Headquarters in Cleveland. I recently retired as a United States Coast Guard Officer with more than 23 years of combined active duty and reserve service. For sixteen of those years, I served on the Great Lakes and I can tell you, without a doubt, that some of the active sailors, reservists, and civilians working at Great Lakes Commands are among the most dedicated public servants you will ever meet. There is, however, one aspect of their job that no amount of talent and dedication can overcome: a lack of appropriate resources. Sailors need ships.

Since 2004, Lake Carriers' Association has strongly advocated for additional deep-draft icebreaking and ice-capable U.S. Coast Guard vessels for the Great Lakes. Our requests (and prayers) have gone unanswered. We need one additional 140-foot-long Icebreaking Tug (WTGB) assigned to Duluth, Minnesota, to support operations on Lake Superior and an additional ice-strengthened 225-foot-long Seagoing Buoy Tender (WLB) assigned to Charlevoix, Michigan, to support operations on Lake Michigan and the Straits of Mackinac. I have attached copies of our correspondence with the U.S. Coast Guard for the record. Thank you for allowing me to make our case before this Subcommittee.

Just as America's northern interstates and roadways need to be plowed in the winter to facilitate traffic, our waterways need sufficient assets to remain conduits for waterborne commerce. Just as our cities and states use a mix of snowplows and police cruisers to serve the public and the public good, our U.S. Coast Guard uses a mix of vessels designed with a primary purpose, yet capable of multiple missions.

Statement by Mr. James H.I. Weakley
President, Lake Carriers' Association • Vice President, Great Lakes Maritime Task Force
Suite 915 • 614 West Superior Avenue • Cleveland, Ohio 44113

Before the Subcommittee on Coast Guard and Maritime Transportation • United States House of Representatives

Hearing on
COAST GUARD ICEBREAKERS
July 16, 2008 – 2:00 p.m. • Rayburn House Office Building – Room 2167

We need to make sure sufficient nautical snowplows are stationed where the snow and ice are, and ensure there are enough waterborne squad cars to provide maritime security when and where it is needed.

The Great Lakes form a marine highway on which moves as much as 200 million tons of cargo a year, when water levels and economic conditions allow. 66 U.S.-Flag Lakers moved 104 million tons in 2007; of that total, 15 million tons – or 14% – were delivered between December 15th and April 15th; this timeframe is generally considered the "ice season." Valued at $1.1 billion, the majority of that cargo moved before the Locks at Sault Ste. Marie, Michigan, closed on January 15th and after it reopened on March 25th. Some cargo will continue to move on the Lower Lakes, but after the Welland Canal closes at the end of December, the Great Lakes become a closed system — and Lake Superior becomes a closed system within a closed system. Some areas are considered "critical waterways": Whitefish Bay, the St. Marys River, the Straits of Mackinac, and the Detroit/St. Clair River system. The eight U.S. Coast Guard vessels and two Canadian Coast Guard vessels provide icebreaking services in those areas and others, as resources allow. Much like driveways and private roads, docks and "non-critical" waterways often receive icebreaking services from commercial providers

The winter of 2007-2008 was considered "normal" when compared to the past thirty winters. It was, nonetheless, the most severe winter we've experienced since 2003. It clearly demonstrated the abysmal impact a lack of icebreaking resources can have on our industry. Due to a lack of capacity, capability, and reliability by both the U.S. and Canadian Coast Guards, much of the Great Lakes and Connecting Channels remained abandoned to the elements. The price tag for just three Lake Carriers' Association members exceeded $1.3 million in vessel damages. Lives were unnecessarily risked when the U.S. Coast Guard failed, because of inadequate resources, to answer the call.

I would like to briefly compare and contrast the distribution of U.S. Coast Guard vessels 65 feet and greater in length on Lake Michigan with the East Coast of the United States. Lake Michigan is 307 miles long and 118 miles wide; it encompasses more than 67,900 square miles and is as deep as 923 feet. It boasts more than 1,640 miles of coastline. 1,640 miles is the distance from Portland, Maine, to Homestead, Florida (just south of Miami). Currently, the Lake is home to one 140-foot-long Icebreaking Tug (USCGC Mobile Bay, homeported in Green Bay, Wisconsin) and its attached buoy tending barge. The equivalent shoreline of the East Coast has 90 U.S. Coast Guard vessels homeported along it.

A U.S. Coast Guard representative once informed me that six Coast Guard vessels provide icebreaking services for a 150-mile stretch of the Hudson River. By contrast, on the Great Lakes we have six icebreakers (USCGC Mackinaw and five WTGBs) and two "ice strengthened" buoy tenders (225-foot-long WLBs) for the entire Great Lakes. I certainly understand the need for icebreaking on the Hudson River and other Coast Guard missions on the East Coast. To be clear, I am not asking for parity, I am seeking equity.

The attached graph illustrates that the U.S. Coast Guard uses its icebreakers on the East Coast primarily for security missions. I believe this is not the best resource for the job. It is the nautical equivalent of putting a blue light on a snowplow. It can be done, but it is not the best allocation of resources for traffic management or for law enforcement. The U.S. Coast Guard also keeps a 140-foot-long icebreaker stationed at its Academy for use as a training platform. Again, I don't mean to diminish the importance of the mission, but rather question the asset allocation.

The graph details the average number of hours spent by an East Coast Icebreaking Tug (140-foot WTGB) and one homeported on the Great Lakes. First District vessels (East Coast), for example, will spend an estimated 157 hours breaking ice compared to 870 hours for the Great Lakes 140-foot-long WTGBs. Contrast the 101 hours the Great Lakes vessels will spend on security with the 900 hours conducted by the average First District icebreaker.

Historically, there were as many as five 180-foot-long buoy tenders stationed on the Great Lakes; as recently as 2006, there were three. Those three have since been replaced with two 225s. Some in the U.S. Coast Guard have argued the 225-foot-long class of vessel is of higher horsepower and more efficient. This argument ignores the fact that there is a natural tension between icebreaking and buoy tending. Buoys are pulled as the ice season begins and need to be reset as the need for icebreaking ends. Vessels can't perform both missions at the same time. I must also point out that even though the 225s may have a higher horsepower, they can't use it in the ice because they are not built as structurally sound as the 180-foot class. In fact, the two 225s on the Great Lakes had to be reinforced in the bow and still remain reined in. The 225s also have proven to be the most unreliable vessels in the Coast Guard fleet. They are prone to leaking oil from their propellers and other engineering failures. These repairs are being made during critical icebreaking operations, and have required dry-docking outside of the Lakes. More operational days have been lost by the aging 140-foot-long fleet and the unreliable 225-foot-long fleet than anyone could have imagined.

I appreciate the difficult decisions U.S. Coast Guard policymakers and resource allocators have to make — particularly in today's resource constrained, yet demanding operational environment. A better understanding of the operational environment on the Great Lakes and our mission needs by those decisionmakers and their Congressional oversight committee could result in a better geographical distribution of icebreakers and a better allocation of vessels based on mission requirements and vessel performance parameters. Providing the Great Lakes with one additional 140-foot-long Icebreaking Tug and one additional 225-foot-long Seagoing Buoy Tender would have a tremendous impact on the Great Lakes shipping industry's ability to meet the needs of commerce and would not hinder the U.S. Coast Guard's ability to perform its mission in the rest of the United States. Let me emphasize again, I am not asking for parity, but believe there should be more equity. There needs to be a better geographical distribution of icebreakers and a better allocation of vessels, based on mission requirements and vessel performance parameters.

Thank you for the opportunity to address this hearing. I will do my best to answer any questions you might have.

Attachments:

- U.S. Coast Guard Correspondence
  - (A) 04/06/2004 – Lake Carriers' Association Letter to VADM James D. Hull, Commander-Atlantic Region, USCG
  - (B) 07/09/2004 – VADM James D. Hull, Commander-Atlantic Region, USCG Letter to Lake Carriers' Association
  - (C) 10/03/2005 – VADM V.S. Crea, Commander-Atlantic Region, USCG Letter to Mayor Norman L. Carlson, Jr. (Charlevoix, MI)
  - (D) 10/12/2005 – J.X. Monaghan, Chief-Office of Cutter Forces, by Direction of ADM Collins, Commandant, USCG Letter to Mayor Carlson
  - (E) 10/19/2005 – RADM Robert J. Papp, Jr., Commander-Ninth Coast Guard District, Letter to Mayor Carlson
  - (F) 11/04/2005 – Lake Carriers' Association Letter to Admiral Thomas H. Collins, Commandant, USCG
  - (G) 12/30/2005 – VADM Terry M. Cross, Acting Commandant, USCG, Letter to Lake Carriers' Association
- (H) Lake Michigan USCG Vessel Asset Comparison
- (I) Graph: Average WTGB Vessel Usage
- (J) PowerPoint Presentation

Lake Carriers' Association®

The Greatest Ships on the Great Lakes

JAMES H. I. WEAKLEY, PRESIDENT
216-861-0590 • weakley@lcaships.com

April 6, 2004

VADM James D. Hull
Commander, Atlantic Area
United States Coast Guard
431 Crawford Street
Portsmouth, VA 23705

Dear Admiral Hull:

Lake Carriers' Association represents 15 American corporations operating 57 U.S.-flag vessels on the Great Lakes. These vessels annually carry as much as 115 million tons of cargo, such as iron ore for the steel industry, limestone for the construction industry, coal for utilities, ... These cargos drive the region's and the nation's economy.

I am writing to request the United States Coast Guard assign another 140-foot icebreaking buoy tender to the Great Lakes. The Coast Guard's current complement of assets capable of icebreaking is being strained by mission demands and the affects of age. Any casualty or a repeat of the extreme ice conditions that characterized the opening and closing of the 2003 navigation season could well leave the commercial fleet unable to meet customers' requirements. Major employers would then face the unpleasant choice of either reducing production or utilizing costlier means of delivery — neither scenario is in our nation's best interests.

The genesis of the United States Coast Guard's icebreaking mission testifies to its importance. The Coast Guard was charged with icebreaking to meet the needs of commerce by an Executive Order signed by President Franklin D. Roosevelt in 1936. U.S.-flag Great Lakes vessel operators move significant amounts of cargo during periods of ice cover. Our customers are engaged in global competition, so their stockpiling costs must be kept to the bare minimum. This means iron ore, coal, and cement move from early March until late January. In periods of peak demand, iron ore has been shipped from Escanaba, Michigan, until the middle of February. There also have been several occasions when coal continued to move from Lake Erie ports well into February.[1]

Cargo moved during the ice season (December 15 – April 15) represents a considerable amount of the annual float. Iron ore cargos carried during this period can approach 20 percent of the yearly total. Coal loaded during this timeframe can amount to 10 percent of the trade's year-end total.

Continued . . . /

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Representing Operators of U.S.-Flag Vessels on the Great Lakes Since 1880

[1] Although not on the scale of the dry-bulk trades, heating oil moves year-round.

The jobs that depend on these cargos being delivered are significant. The iron ore mines and steel mills that rely on U.S.-flag Great Lakes vessels generate direct employment for approximately 100,000 Americans. When the United States Coast Guard studied the need to replace the Cutter MACKINAW in the mid-1990s, it estimated that direct and indirect employment related to steel totaled 400,000 jobs.

While the sheer volume of jobs dependent on Great Lakes shipping is impressive, it is also important to remember these jobs pay family-sustaining wages and provide important benefits, such as health care coverage and retirement savings.

One cannot overestimate the importance of Great Lakes basin industry to the nation's economy. Roughly 70 percent of our nation's steelmaking and auto manufacturing capacity is located in this region.

The national defense impacts of Great Lakes shipping must also be taken into consideration. While our military has many hi-tech weapons at its disposal, prolonged conflicts still require tanks and mortars and other materiel made of steel to accomplish its mission of defending America's interests worldwide.

Before addressing our specific concerns about the Coast Guard's icebreaking assets on the Great Lakes, let me stress there is no deficiency in terms of crews' skills or dedication. As a former member of the United States Coast Guard, I know from personal experience that the men and women assigned to the Great Lakes rank among the service's finest.

There are, however, undeniable shortcomings with the current complement of assets capable of performing icebreaking missions. Age is a major concern. The youngest icebreaking asset is 23 years old. Icebreaking itself places major stresses on a hull and equipment, but these vessels perform other missions year-round, and may take on new Homeland Security responsibilities. Each passing year increases the potential for casualties requiring lengthy repairs and reduces the availability of spare parts for veteran hulls.

Two Lakes assets will be retired in the near future. The SUNDEW will be decommissioned this May. The ACACIA will leave the fleet in the spring of 2006. The Lakes-bound replacement, the ADLER, will not arrive on station until this fall. Since three 180' WLB's are being replaced with two 225' WLB's the Lakes Fleet will have one less hull available.

There is a long history of partnership and cooperation between the U.S. and Canadian Coast Guards, but Canada has only two icebreakers to patrol its waters, so the U.S. Coast Guard must perform the bulk of icebreaking on the Lakes.

Our most serious concern is that 225-foot-long buoy tenders (of which the ALDER is one) have shown themselves unable to perform in all ice conditions. That fact alone justifies the addition of a proven 140-foot-long buoy tender to the Lakes icebreaking fleet.

In summation then, the ability to reliably move cargo on the Great Lakes during periods of ice cover is crucial to the revival and growth of our nation's industrial heartland. The U.S. Coast Guard must assign another 140-foot-long icebreaking buoy tender to the Great Lakes to ensure that waterborne commerce continues uninterrupted during periods of ice cover.

Sincerely,

James H. I. Weakley
President

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cc: RADM Ronald F. Silva, Commander, Ninth Coast Guard District
Members – LCA Advisory Committee
Members – LCA Navigation Committee

(B)

U.S. Department of Homeland Security
United States Coast Guard

Commander
United States Coast Guard
Atlantic Area

431 Crawford St
Portsmouth, VA 23704-5004
Staff Symbol: A
Phone: (757) 398-6287

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JUL - 9 2004

James H. I. Weakley
President
Lake Carriers Association
Suite 915
614 West Superior Ave
Cleveland, OH 44113-1383

Dear Jim:

Thank you for your letter requesting an additional Coast Guard icebreaking tug (WTGB) be permanently assigned to the Great Lakes region. I understand and empathize with your valid concerns regarding the availability of appropriate icebreaking cutters to efficiently enable transits of Great Lakes shipping.

My staff is currently researching the feasibility of such a move. In addition to considering the icebreaking capabilities and homeport locations of the new 225-foot buoytenders (WLBs), we must also take into account our ever-increasing role in Homeland Security as well as our Search and Rescue, Aids to Navigation, Living Marine Resource Protection and Fisheries Regulation mission requirements in the Great Lakes region and along the northern East Coast. These issues will be thoroughly addressed during an icebreaking operations program manager meeting, hosted by my Waterways Management staff, in late July.

As always, we will continue to support the Great Lakes shipping industry to the best of our ability. USCGC MORRO BAY (WTGB 106) or another WTGB will be considered for a temporary assignment to the Great Lakes if needed next winter. We also look forward to the new Great Lakes Icebreaker, USCGC MACKINAW (WLBB 30) joining the fleet.

If you have additional questions or concerns, please do not hesitate to contact CDR John Little, of my Waterways Management staff, at (757) 398-6673.

Sincerely,

James D. Hull
Vice Admiral, U.S. Coast Guard
Commander, Atlantic Area

Copy: Commander, Ninth Coast Guard District
Commander, First Coast Guard District

©

COMMANDER, ATLANTIC AREA
UNITED STATES COAST GUARD
431 CRAWFORD STREET
PORTSMOUTH, VIRGINIA 23704-5004

October 3, 2005

Dear Mayor Carlson:

Thank you for your letter highlighting the close relationship between the Coast Guard and the great city of Charlevoix.

ACACIA has a long and tremendous history on the Great Lakes. In part, the longevity of all cutters in ACACIA's class drove the decision to recapitalize the buoy tender fleet. The new buoy tenders are more economical to operate and maintain in relation to the greater capabilities they possess, and this requires fewer hulls to support the same workload. While specific cutter homeport decisions are rendered in Washington, I work closely with the appropriate USCG District Commander to ensure the Commandant is fully aware of all issues and background information pertinent to that decision.

As we move towards a future of fewer, yet more capable USCG assets, decisions about where and how to employ them assume greater criticality. I appreciate your willingness to participate in this process, and I look forward to working with you in the future.

Sincerely,

V. S. CREA
Vice Admiral, U. S. Coast Guard

Mayor Norman L. Carlson, Jr.
City of Charlevoix
210 State Street
Charlevoix, Michigan 49720

U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street, S.W.
Washington, DC 20593-0001
Staff Symbol: G-OCU-2
Phone: (202) 267-0333
Fax: (202) 267-4415

5440
G-12530

OCT 12 2005

Norman L. Carlson, Jr.
Mayor, City of Charlevoix
210 State Street
Charlevoix, MI 49720

Dear Mayor Carlson:

On behalf of Admiral Collins, I would like to thank you for taking the time to send us your detailed letter of August 30, 2005 urging the Coast Guard to continue to homeport a cutter in Charlevoix. Please accept our gratitude to the City of Charlevoix for its unwavering support of the Coast Guard and specifically the Coast Guard Cutter ACACIA, which has been proud to call Charlevoix home for many years.

As you are aware, the ACACIA, commissioned in 1944, is the last of the 180ft buoy tenders in service and will be decommissioned in the summer of 2006. These World War II era cutters are being replaced by new and more capable 225ft buoy tenders, which include CGC ALDER in Duluth and CGC HOLLYHOCK in Port Huron. Additionally, the new Great Lakes Icebreaker, CGC MACKINAW, to be homeported in Cheboygan, will be equipped with buoy tending capability which will increase its operational flexibility.

The improved capabilities of the 225ft cutters, in conjunction with the MACKINAW and the 140ft Icebreaking Tugs, will allow the Coast Guard to meet its operational responsibilities to the American public on the Great Lakes with a more capable and efficient fleet. Rest assured that we will continue to provide the same level of professional service that the citizens and mariners of the Great Lakes region have come to expect from the Coast Guard.

You mentioned in your letter the desire for CGC MORRO BAY, homeported in Connecticut, to be relocated to Charlevoix. MORRO BAY is currently fully employed serving both New England and New York State during winter icebreaking seasons. At this time, we have no plans to relocate MORRO BAY to the Great Lakes. However, if future mission requirements make additional cutters on the Great Lakes necessary, Charlevoix will most certainly be considered as a potential homeport. Thank you for your staunch support of the Coast Guard, CGC ACACIA and Coast Guard members in your community.

Sincerely,

James X. Monaghan

J. X. MONAGHAN
Chief, Office of Cutter Forces
U.S. Coast Guard
By direction

RECEIVED
OCT 17 2005
CITY OF CHARLEVOIX

(E)

U.S. Department of Homeland Security
United States Coast Guard

Commander
Ninth Coast Guard District

1240 East Ninth Street
Cleveland, OH 44199-2060
Staff Symbol: d
Phone: (216)902-6001
Fax: (216)902-6018

3128
56-05
OCT 19 2005

The Honorable Norman Carlson. Jr.
Mayor of Charlevoix
210 State Street
Charlevoix, MI 49720

Dear Mayor Carlson:

I am writing in response to your letter of August 30, 2005, requesting consideration of Charlevoix as the future homeport of CGC MORRO BAY. At this time, no decision has been made about the possible reassignment of the MORRO BAY or another cutter to the Great Lakes. Because of operational demands in other areas of the country, the relocation of an additional asset to the Lakes remains uncertain for the immediate future.

If MORRO BAY or another cutter is assigned to the Great Lakes, the Coast Guard will conduct a study to determine the best location for the cutter's homeport. Charlevoix will be included in the study.

I appreciate your community's commitment to CGC ACACIA over the years and for your continuing interest in welcoming the Coast Guard. Please contact Captain Mike Hudson of my staff at (216) 902-6064 if you have further questions.

Sincerely,

R. J. PAPP, JR.
Rear Admiral, U. S. Coast Guard
Commander,
Ninth Coast Guard District

Copy: CGC ACACIA (WLB-406)

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OCT 24 2005
CITY OF CHARLEVOIX

Lake Carriers' Association®

The Greatest Ships on the Great Lakes

JAMES H. I. WEAKLEY, PRESIDENT
216-861-0590 • weakley@lcaships.com

November 4, 2005

Admiral Thomas H. Collins
Commandant (G)
United States Coast Guard
2100 Second Street, S.W.
Washington, DC 20593

Dear Admiral Collins:

Lake Carriers' Association represents 12 U.S.-Flag Great Lakes fleets which have a combined total of 55 vessels with a per-trip carrying capacity of more than 1.9 million tons. Major cargos include iron ore and fluxstone for the steel industry; coal for power generation; and limestone and cement for the construction industry. LCA's members have the capacity to haul more than 120 million tons of dry-bulk cargo on an annual basis.

In April 2004, we wrote Vice Admiral James D. Hull, Atlantic Area Commander, and formally requested an additional 140-foot icebreaking tug (WTGB) be assigned to the Great Lakes. The response I received assured me the matter would be carefully considered and evaluated. We recently received a copy of a letter addressed to the Mayor of Charlevoix, Michigan, from the Coast Guard's Office of Cutter Forces. The letter stated the requested 140-foot WTGB, CGC MORRO BAY, "is currently fully employed serving both New England and New York State during winter icebreaking seasons. At this time, we have no plans to relocate MORRO BAY to the Great Lakes. However, if future mission requirements make additional cutters on the Great Lakes necessary, Charlevoix would be considered as a potential homeport." The letter further discussed the current mix of cutters on the Great Lakes, contrasted the efficiencies of the 225s with the 180s and concluded that in conjunction with the ability of the new MACKINAW, "will allow the Coast Guard to meet its operational responsibilities to the American public on the Great Lakes with a more capable and efficient fleet."

I must respectfully disagree with the U.S. Coast Guard's conclusion and again request the U.S. Coast Guard station an additional 140-foot-long icebreaking tug, the MORRO BAY or another, on the Great Lakes. We are deeply concerned about the Coast Guard's ability to perform its icebreaking mission on the Great Lakes now and in the future. As you are aware, none of the WTGBs were funded for mid-life rehabilitation and overhaul. The increased operational demand and reduction in maintenance of these aging vessels have resulted in more frequent and severe breakdowns.

Continued . . ./

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The last 180 buoy tender in the Coast Guard, the ACACIA, will be decommissioned in Charlevoix, Michigan, next summer and will not be replaced. While the new MACKINAW will soon be in service, it is yet to be proven in actual ice operations or demonstrate its ability to work buoys. I am optimistic about the new MACKINAW; however, the U.S. Coast Guard's Great Lakes fleet will be down one hull when the ACCACIA is decommissioned. This vessel needs to be replaced with an additional WLB or WTGB. While the 225s and the new MACKINAW may be more efficient, with respect to the buoy tending mission, they cannot be in two places at once, nor can they perform two missions at once. On the Great Lakes, there is a tension between the icebreaking mission and the buoy tending mission. When the conditions are ready to set buoys in the southern Great Lakes, the icebreaking mission remains in full swing in the northern reaches of the Lakes. I must also question whether the efficiencies of the new hulls are offset by the inefficiencies of the barges used in conjunction with the WTGBs to work buoys. The Great Lakes is the only place in the Coast Guard to use this tug-barge combination and two of our WTGBs must deal with this additional burden. Unless an additional 140-foot-long icebreaker is assigned to the Great Lakes, the movement of cargos vital to our nation's defense capabilities and economic well-being may be compromised.

Shipping during the "ice season" is critical to the fleet's ability to meet the needs of commerce. For example, in 2004, LCA's members moved more than 111 million tons of dry-bulk cargo. The table below illustrates how much of that cargo moved during periods of ice cover:

Month 2004	**U.S.-Flag Carriage** *(net tons)*	**Percent of 2004 Float**
January	4,438,130	4.0
February	275,048	0.2
March	3,304,986	3.0
April 1-15	4,731,104	4.2
December 16-31	4,328,549	3.9
Total	**17,077,817**	**15.3**

With the exception of February (the Locks at Sault Ste. Marie, Michigan, are closed from January 15 until March 25th causing the lack of movement in February), the monthly totals are significant in themselves, but the aggregate total – 17.1 million tons – is an enormous contribution to the U.S. economy. Those tons represent the raw materials that keep our nation's steel mills working in winter and the fossil fuels that feed the region's power plants. The Canadian-Flag fleet on the Great Lakes also moves a significant amount of cargo during the ice season and receives U. S. Coast Guard icebreaking assistance.

It would be impossible for the U.S.-Flag Great Lakes fleet to move an additional 17.1 million tons of cargo during the spring, summer, and fall. There is very little reserve carrying capacity that could be activated. This year, only one mid-sized self-unloader (annual carrying capacity of 1.5 million tons) did not sail. Therefore, it is imperative that cargo move on the Great Lakes as long as possible each year.[1]

Further exacerbating the problem this year is the fact that the Canadian Coast Guard recently decommissioned one icebreaker CCGS SIMCOE (with no planned replacement), and will idle another after January 11, 2006. As a result, Canada will contribute only one icebreaker for much of this winter. This means U.S. Coast Guard icebreaking assets will have even more work to do than normal. It is currently forecast that coal will be shipped from Ohio's Lake Erie ports of Ashtabula and Conneaut throughout the winter. If natural gas prices continue to rise, there could be even more demand for coal during the ice season. The salt trade out of Goderich, Ontario, is projected to continue uninterrupted this winter, with most of that cargo destined for communities along Lake Michigan. As you are aware, the U.S. Coast Guard and Canadian Coast Guard are in the process of renewing an icebreaking MOU. I am concerned about the ratio of shared resources. While the demand on U.S. icebreaking resources has increased to support the Canadian-Flag fleet's effort to supply coal to Canadian power plants, the MOU has allowed the Canadian Coast Guard to reduce the number of vessels involved with the mission. I fully support the cooperation and sharing of resources between the two countries; however, I do not believe the U.S. Coast Guard can meet its commitment to the Canadian Government and the American Public without the addition of another 140-foot icebreaker on the Great Lakes.

Our concerns about the Coast Guard's ability to break ice on the Great Lakes in the short- and long-term in no way reflect on the skill and dedication of the crews on the ice-capable assets. We know from years of experience that these men and women are among the Service's finest. The issue is simply that there are more than 100 U.S. deep-draft ports on the Great Lakes and six connecting waterways that must handle cargo during the ice season. The current compliment of U.S. Coast Guard icebreaking assets will strain to meet the needs of this commerce. Deployment of an additional 140-foot-long icebreaker to the Great Lakes will help ensure America's industrial heartland has the raw materials it needs to keep our nation safe and strong.

In April 2004, a representative of U.S. Coast Guard's Activities New York informed me that they use six icebreaking cutters to break ice in the 150 miles of river and harbor from December 15 to March 15 (I assume they are counting the three 140-foot WTGBs and three 65-foot-icebreaking harbor tugs WYTLs). This may be true; however, the Great Lakes Region uses five icebreaking cutters (all 140-foot WTGBs) to cover more than 1,500 miles of international border (in addition to all of Lake Michigan) and our ice season is a month longer – from December 15 to April 15. Although we have access to the two 225-foot buoy tenders (New York Harbor and Long Island Sound also have access to buoy tenders for icebreaking), I would like to point out that these vessels were designed as ocean-going buoy tenders. As an afterthought, the two assigned to the Great Lakes received some structural reinforcement to allow them to work buoys in the ice. The ALDER and HOLLYHOCK may have some ability to facilitate the movement of commerce and break ice; however they have not faired well during ice operations. They lack maneuverability, the ability to effectively use astern propulsion in ice, and have yet to be a proven icebreaking asset. The 225s can be used to maintain an established track in favorable ice conditions, but are ineffective at direct vessel assists, establishing new track, or handling windrows of ice.

[1] *Lake Carriers' Association's members only move dry-bulk cargo, but the movement of liquid-bulk cargos, such as heating oil and gasoline, is in fact year-round on the Great Lakes.*

Another justification for the additional vessel in the Great Lakes is Border Security and Homeland Security. We are supportive of Charlevoix's offer to serve as the homeport for the replacement vessel, and we feel very strongly it should be located in Northern Michigan. This would allow the vessel to support icebreaking in the Straits of Mackinac and patrol the International Border with Canada. The New York area has seen three new 87-foot Costal Patrol Boats and none have been assigned to the Great Lakes. I understand those vessels may not be appropriate for the Great Lakes due to our winters, which further justifies the transfer of the MORRO BAY to Northern Michigan.

When we discussed this issue in Cleveland, you suggested I make the business case for the vessel transfer. Therefore, I am requesting, under the Freedom of Information Act, the numbers and categories of mission hours attributed to all WTYLs and WTGBs commissioned in the United States Coast Guard. I would also like the number of mission hours dedicated to icebreaking, by vessel, for the First, Ninth, and Fifth Coast Guard Districts.

Please let me know if you need additional information on the importance of shipping on the Great Lakes during the ice season. It will be provided without delay. I look forward to working with you to ensure our nation's manufacturers and the Americans and Canadians living in the Great Lakes Region are not left out in the cold.

Sincerely,

James H. I. Weakley

James H. I. Weakley
President

JHIW:lca
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cc: Vice Admiral Vivian S. Crea – Commander, Atlantic Area
Rear Admiral Robert J. Papp, Jr. – Commander, Ninth Coast Guard District
The Honorable Norman Carlson, Jr. – Mayor of Charlevoix
Members – LCA Board of Directors
Members – LCA Navigation Committee
Members – LCA Captains Committee

U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street, S.W.
Washington, DC 20593-0001
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Phone: (202) 267-1528
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Lake Carriers Association
Attn: Mr. James H. I. Weakley
Suite 915
614 West Superior Avenue
Cleveland, OH 44113-1383

Dear Mr. Weakley:

This is in response to your letter of November 4, 2005, regarding stationing an additional ice breaking cutter on the Great Lakes.

The points provided in your letter clearly illustrate the importance of domestic ice breaking. The United States Coast Guard shares your concerns in ensuring the important commerce of the Great Lakes region continues unimpaired throughout the winter months. America's Heartland must be provided the raw materials needed to ensure our economy stays strong regardless of inclement weather and difficult ice conditions.

The planned decommissioning of ACACIA in 2006 and the recent decision by the Canadian Coast Guard to deactivate CCGS SIMCOE for the upcoming winter should not have a significant impact on ice breaking operations by both the United States Coast Guard and our Canadian ice breaking partners. ACACIA has only averaged 16 hours of ice breaking per year over the last 6 years and CCGS SIMCOE has had little involvement with any of the three ice breaking operations that take place on the Great Lakes annually. With the new MACKINAW coming into service and the enhanced ice breaking capabilities of our 225' WLBs, the Coast Guard is confident that it can meet the ice breaking demands of the Great Lakes with the assets in place. As with other missions, the Coast Guard will continue to monitor the mission performance of its Great Lake ice breaking assets to ensure they are meeting mission requirements.

The Coast Guard looks forward to working together with the Lake Carriers Association to ensure our nations maritime commerce flows unimpaired throughout the upcoming and future ice seasons. The information you requested under the Freedom of Information Act concerning the mission hours for WYTLs and WTGBs, and ice breaking hours by District are enclosed. Please feel free to contact me if you have further questions.

Sincerely,

TERRY M. CROSS
Vice Admiral, U.S. Coast Guard
Acting Commandant

Enclosure

Mission Hours for WTGBs and WYTLs
Past ten years

WTGBs

CGC MORRO BAY	1996	1997	1998	1999*	2000*	2001*	2002	2003$	2004	2005	Total
Drug Interdiction	0	0	0				0	0	0	0	0
Migrant Interdiction	0	0	0				0	0	0	0	0
Other LE	20	0	0				0	0	0	0	20
Ports, Waterways, Coastal Security	0	0	0				130	895.6	1059	1065	3149.6
Defense Readiness	0	0	0				0	0	0	0	0
Search and Rescue	73	1	0				0	46.4	46.5	2	168.9
Marine Safety	0	0	36				0	0	98.5	82.5	217
Aids to Navigation	20	166	153				0	0	36.5	0.5	376
Ice Operations	167	120	71				0	781	282.5	143.8	1565.3
Marine Environmental Protection	0	0	0				0	0	0	0	0
Living Marine Resources	50	0	0				0	0	184.5	317	551.5
Support (Training, Public Affairs, Etc)	599	735	495				215.5	82	96.8	131.7	2355
Total	929	1022	755	0	0	0	345.5	1805	1804.3	1742.5	8403.3

CGC PENOBSCOT BAY	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	54	0	0	0	0	0	0	0	0	0	54
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	0	0	12	46	0	47.2	0	0	0	0	105.2
Ports, Waterways, Coastal Security	82	0	38	61	77	21.1	1136.2	1160.2	1414.4	1205.4	5195.3
Defense Readiness	0	0	0	0	0	0	0	0	0	0	0
Search and Rescue	0	28	78	15	2	3.9	0	0	0	12.6	139.5
Marine Safety	0	0	56	0	0	0	0	0	23.7	13.7	93.4
Aids to Navigation	41	438	266	301	419	499.7	30.2	0	0	0	1994.9
Ice Operations	297	167	99	214	247	344.5	15.1	285	286.3	134.3	2089.2
Marine Environmental Protection	9	0	0	0	0	0	0	0	0	0	9
Living Marine Resources	529	286	126	336	31	0	0	0	0	0	1308
Support (Training, Public Affairs, Etc)	667	198	199	80	125	153.3	127.3	70	6.7	111.3	1737.6
Total	1679	1117	874	1053	901	1069.7	1308.8	1515.2	1731.1	1477.3	12726.1

(*) Cutter decommissioned

($) Ice breaking hours includes deployment to D9 (620 Hrs)

Includes hours while deployed to D1

Mission Hours for WTGBs and WYTLs
Past ten years

CGC STURGEON BAY	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	0	0	0	0	0	0	0	0	0
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	0	0	72	4	0	0	0	0	0	0	76
Ports, Waterways, Coastal Security	185	11	0	44	60	385	953.3	1203.3	1275	1389.7	5506.3
Defense Readiness	0	0	0	0	0	0	0	0	0	0	0
Search and Rescue	22	16	14	36	0	6	0	2	0	0	96
Marine Safety	30	0	24	63	0	0	0	0	49.1	12.2	178.3
Aids to Navigation	26	111	17	229	139	359.5	15.8	50.3	0	0	947.6
Ice Operations	319	128	65	149	293	321.2	33.3	286	371.1	146.1	2111.7
Marine Environmental Protection	8	0	0	84	36	0	0	0	0	0	128
Living Marine Resources	454	203	94	302	12	3.5	0	0	0	0	1068.5
Support (Training, Public Affairs, Etc)	329	208	331	327	230	337.4	177.4	82.9	120.7	115.9	2259.3
Total	1373	677	617	1238	770	1412.6	1179.8	1624.5	1815.9	1663.9	12371.7

CGC THUNDER BAY	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	6	0	0	0	0	0	0	0	0	0	6
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	0	0	0	41	110	0	0	0	9.4	0	160.4
Ports, Waterways, Coastal Security	0	0	0	0	51	149.9	592.4	832	735.7	708.8	3069.8
Defense Readiness	0	0	0	0	0	38.1	0	0	0	0	38.1
Search and Rescue	30	2	17	0	0	2	4.3	0	0	7	62.3
Marine Safety	0	0	0	0	0	51.4	161.4	0	0	0	212.8
Aids to Navigation	13	5	0	0	30	324.5	203	0	0	0	575.5
Ice Operations	246	169	240	53	113	162.9	65.4	273	273	246.4	1841.7
Marine Environmental Protection	0	0	0	0	0	0	0	0	0	0	0
Living Marine Resources	73	234	548	797	458	281.6	7	5	158.5	169.5	2731.6
Support (Training, Public Affairs, Etc)	743	678	79	133	108	191.7	308.6	127	131	280.4	2779.7
Total	1111	1088	884	1024	870	1202.1	1342.1	1237	1307.6	1412.1	11477.9

(*) Cutter decommissioned ($) Ice breaking hours includes deployment to D9 (620 Hrs) # Includes hours while deployed to D1

Mission Hours for WTGBs and WYTLs
Past ten years

CGC BISCAYNE BAY	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	36	11	34	0	0	0	0	0	0	81
Migrant Interdiction	0	0	11	0	0	0	0	0	0	0	11
Other LE	0	0	0	0	0	0	0	0	0	0	0
Ports, Waterways, Coastal Security	0	0	33	0	0	103	54.7	0	53.7	125.1	369.5
Defense Readiness	0	0	0	0	59	32	0	59.5	0	0	150.5
Search and Rescue	2	0	4	12	9	29.5	21.2	21.6	0	61.4	160.7
Marine Safety	0	0	11	0	3	0	0	71.3	77.3	7.8	170.4
Aids to Navigation	12	35	24	81	47	57.3	19.7	49.7	204.5	9.8	540
Ice Operations	1162	465	98	487	329	814.7	303.2	631.4	569	537.8	5397.1
Marine Environmental Protection	0	18	0	0	7	0	0	0	0	0	25
Living Marine Resources	0	0	15	49	124	0	21	0	0	0	209
Support (Training, Public Affairs, Etc)	225	228	287	272	248	238.1	387.8	197.7	383.6	256.1	2723.3
Total	1401	782	494	935	826	1274.6	807.6	1031.2	1288.1	998	9837.5

CGC BRISTOL BAY	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	0	0	0	0	0	0	0	132.5	132.5
Migrant Interdiction	0	0	0	0	0	0	0	0	0	3	3
Other LE	0	0	0	0	0	0	0	0	31.1	26.7	57.8
Ports, Waterways, Coastal Security	5	3	0	0	0	0	0	0	10.8	41.6	60.4
Defense Readiness	0	0	0	0	0	0	0	12.7	69.6	12.1	94.4
Search and Rescue	3	13	0	0	0	4	1.6	0	0	14.5	36.1
Marine Safety	0	0	0	0	0	0	0	86.5	0	0	86.5
Aids to Navigation	478	608	568	567	510	409.2	402	368.9	428.4	257.4	4596.9
Ice Operations	453	199	6	301	219	533.8	7	346.7	365.4	345.5	2776.4
Marine Environmental Protection	0	0	0	0	0	0	0	0	0	0	0
Living Marine Resources	0	0	0	0	3	0	0	0	0	0	3
Support (Training, Public Affairs, Etc)	294	284	99	134	366	351.8	322	148.3	168.4	418.3	2585.8
Total	1233	1107	673	1002	1098	1298.8	732.6	963.1	1073.7	1251.6	10432.8

(*) Cutter decommissioned ($) Ice breaking hours includes deployment to D9 (620 Hrs) # Includes hours while deployed to D1

Mission Hours for WTGBs and WYTLs
Past ten years

CGC KATMAI BAY	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	0	0	0	0	0	0	84.1	0	84.1
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	0	0	26	109	27	0	42.3	0	0	0	204.3
Ports, Waterways, Coastal Security	0	0	0	0	0	0	0	0	0	0	0
Defense Readiness	0	0	0	0	0	43	82.2	0	0	7.6	132.8
Search and Rescue	6	1	0	119	0	6.7	53.3	197.7	10.3	60	454
Marine Safety	0	0	0	1	0	0	0	0	0	0	1
Aids to Navigation	5	11	10	131	96	19.3	14	52.4	31.3	0	370
Ice Operations	1428	647	251	552	282	561.7	270.9	756.3	627	566.8	5942.7
Marine Environmental Protection	0	0	0	18	0	0	0	0	0	0	18
Living Marine Resources	0	0	59	0	0	0	0	0	0	0	59
Support (Training, Public Affairs, Etc)	289	442	458	344	383	312	133.2	200.4	410.3	399.4	3371.3
Total	1728	1101	804	1274	788	942.7	595.9	1206.8	1163	1033.8	10637.2

CGC MOBILE BAY	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	0	0	0	0	0	0	0	0	0
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	0	0	0	0	0	0	0	0	151.9	0	151.9
Ports, Waterways, Coastal Security	0	0	0	0	0	0	0	0	64.5	126.9	191.4
Defense Readiness	0	0	0	0	0	7.8	6.6	0	3.9	2.1	20.4
Search and Rescue	7	23	5	53	36	0	12.6	0	0.2	1.7	138.5
Marine Safety	0	0	0	0	0	0	0	0	0	0	0
Aids to Navigation	559	345	811	642	450	361.5	350.7	431.1	380.5	464.3	4795.1
Ice Operations	1240	488	0	341	12	549	271.6	655.4	449.9	252.6	4259.5
Marine Environmental Protection	0	0	0	0	0	0	0	0	0	0	0
Living Marine Resources	0	0	0	0	0	0	0	0	0	0	0
Support (Training, Public Affairs, Etc)	262	285	665	275	362	335.8	59.9	241.6	123.9	185.4	2795.6
Total	2068	1141	1481	1311	860	1254.1	701.4	1328.1	1174.8	1033	12352.4

(*) Cutter decommissioned

($) Ice breaking hours includes deployment to D9 (620 Hrs)

Includes hours while deployed to D1

Mission Hours for WTGBs and WYTLs
Past ten years

CGC NEAH BAY	1996	1997	1998	1999	2000	2001	2002	2003#	2004	2005	Total
Drug Interdiction	0	0	0	83	0	13	0	0	0	0	96
Migrant Interdiction	0	0	0	0	0	0	12	0	0	4.2	16.2
Other LE	0	0	323	140	0	0	115.4	120	90.4	0	788.8
Ports, Waterways, Coastal Security	174	0	0	0	0	19	0	604.3	42.3	132.6	972.2
Defense Readiness	0	0	0	0	5	0	0	0	0	0	5
Search and Rescue	8	7	0	6	2	0	0	5.7	27.2	0	55.9
Marine Safety	0	0	46	0	12	6	5	0	9.9	0	78.9
Aids to Navigation	217	9	0	1	13	0	35	0	0	0	275
Ice Operations	1116	663	0	561	206	776	208	725.6	524.6	493	5273.2
Marine Environmental Protection	0	0	0	6	0	0	0	0	0	0	6
Living Marine Resources	0	0	2	101	68	31	0	14.3	0	115.3	331.6
Support (Training, Public Affairs, Etc)	147	444	523	336	461	171	372.9	247.4	199.8	90.4	2992.5
Total	1662	1123	894	1234	767	1016	748.3	1717.3	894.2	835.5	10891.3

(*) Cutter decommissioned ($) Ice breaking hours includes deployment to D9 (620 Hrs) # Includes hours while deployed to D1

Mission Hours for WTGBs and WYTLs
Past ten years

WYTLs

CGC BOLLARD	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	49	0	0	0	0	0	0	0	0	0	49
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	95	0	0	0	0	20.6	133.1	0	0	0	248.7
Ports, Waterways, Coastal Security	0	61	31	0	72	118.5	187.8	403.1	89.2	0	962.6
Defense Readiness	0	0	13	23	0	0	0	0	0	0	36
Search and Rescue	5	0	0	7	8	3.1	19.6	0	0	0	42.7
Marine Safety	0	14	0	56	0	0	0	0	0	0	70
Aids to Navigation	398	437	277	397	304	235.4	348.1	183.2	296.1	402.3	3278.1
Ice Operations	103	30	0	29	104	179.7	0	480.4	208.7	140.3	1275.1
Marine Environmental Protection	0	0	0	0	0	0	0	0	0	0	0
Living Marine Resources	0	0	0	1	0	0	0	0	0	0	1
Support (Training, Public Affairs, Etc)	142	242	201	236	149	125.5	12.1	68.3	52.3	96.9	1325.1
Total	792	784	478	749	637	682.8	700.7	1135	646.3	639.5	7288.3

CGC BRIDLE	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	0	0	0	0	0	0	0	0	0
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	0	0	0	0	0	20	136.4	0	0	0	156.4
Ports, Waterways, Coastal Security	11	0	0	61	196	42.3	87.9	161.6	212.3	4.6	776.7
Defense Readiness	0	0	0	0	0	0	0	25.7	15.3	111.8	152.8
Search and Rescue	1	51	8	0	0	0	0	5.3	1.5	11.5	78.3
Marine Safety	146	68	44	0	0	0	0	10.7	0	0	268.7
Aids to Navigation	300	58	366	190	110	24	212.8	144.1	63.2	302.9	1771
Ice Operations	103	29	159	86	81	170.4	50.6	308.5	186.7	171.5	1345.7
Marine Environmental Protection	0	78	0	0	0	0	0	0	0	0	78
Living Marine Resources	0	0	0	0	3	0	0	0	0	0	3
Support (Training, Public Affairs, Etc)	190	239	170	354	213	110.6	58.5	101	25.4	42.5	1504
Total	751	523	747	691	603	367.3	546.2	756.9	504.4	644.8	6134.6

(*) Cutter decommissioned ($) Ice breaking hours includes deployment to D9 (620 Hrs) # Includes hours while deployed to D1

Mission Hours for WTGBs and WYTLs
Past ten years

CGC HAWSER	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	29	23	0	0	0	0	0	0	0	52
Migrant Interdiction	5	20	0	0	0	0	0	0	0	0	25
Other LE	134	8	52	3	0	0	0	619.6	0	0	816.6
Ports, Waterways, Coastal Security	186	149	140	173	347	448	700.6	138.8	468	420.6	3171
Defense Readiness	0	0	0	0	17	16.9	0	2.5	0	7	43.4
Search and Rescue	3	16	194	16	6	10.5	8.8	7	4.9	3.3	269.5
Marine Safety	109	102	148	156	37	151.9	0	0	25.6	0	729.5
Aids to Navigation	46	64	172	121	91	89.5	28.3	0	11.6	75.9	699.3
Ice Operations	99	107	127	138	187	209.7	125.4	236.9	168.8	56.6	1455.4
Marine Environmental Protection	0	3	0	0	0	23.1	0	0	0	0	26.1
Living Marine Resources	1	23	29	48	100	22	2.1	0	0	0	225.1
Support (Training, Public Affairs, Etc)	181	296	177	183	144	128.1	48	79.2	27.8	77.9	1342
Total	764	817	1062	838	929	1099.7	913.2	1084	706.7	641.3	8854.9

CGC LINE	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	69	0	0	42	79	0	0	0	0	0	190
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	33	49	0	0	37	0	77.5	0	0	0	196.5
Ports, Waterways, Coastal Security	176	62	140	98	211	214.9	681.3	764.5	334.3	420.6	3102.6
Defense Readiness	0	0	91	24	6	58	53.4	0	0	7	239.4
Search and Rescue	31	8	187	1	62	5.2	0.7	1.8	0	0	296.7
Marine Safety	0	0	50	14	0	71.6	0	0	34.2	8	177.8
Aids to Navigation	35	39	100	95	110	235.1	34.8	36.1	34.6	13.4	733
Ice Operations	138	103	44	154	214	112.4	14.3	157.6	120	44.8	1102.1
Marine Environmental Protection	0	0	4	17	0	0	0	0	0	0	21
Living Marine Resources	0	0	0	7	86	0	0	0	0	0	93
Support (Training, Public Affairs, Etc)	165	433	249	243	239	228.1	38.1	11	106	28.7	1740.9
Total	647	694	865	695	1044	925.3	900.1	971	629.1	522.5	7893

(*) Cutter decommissioned ($) Ice breaking hours includes deployment to D9 (620 Hrs) # Includes hours while deployed to D1

Mission Hours for WTGBs and WYTLs
Past ten years

CGC PENDANT	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	0	0	0	0	0	0	0	0	0
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	0	0	0	0	0	137.2	0	0	0	0	137.2
Ports, Waterways, Coastal Security	35	42	44	227	16	13	107.8	118.8	184	134.8	922.4
Defense Readiness	0	0	0	0	0	56.5	0	0	0	0	56.5
Search and Rescue	1	0	0	57	0	0	0	0	2.5	0	60.5
Marine Safety	0	0	28	0	0	0	0	0	0	0	28
Aids to Navigation	319	289	292	432	390	423.8	445.6	363.6	141.2	112.5	3208.7
Ice Operations	57	9	0	0	133	46	0	182.1	198.1	102.6	727.8
Marine Environmental Protection	4	0	0	0	0	0	0	0	0	0	4
Living Marine Resources	0	0	8	15	0	0	0	0	0	0	23
Support (Training, Public Affairs, Etc)	242	261	408	310	404	73.7	151.6	146.8	207	275.8	2479.9
Total	658	601	780	1041	943	750.2	705	811.3	732.8	625.7	7648

CGC SHACKLE	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	0	0	45	0	0	0	0	0	45
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	0	0	0	0	0	0	0	0	0	0	0
Ports, Waterways, Coastal Security	3	8	0	10	123	168.7	238.6	327.1	115.1	18.2	1011.7
Defense Readiness	40	161	0	0	0	0	0	0	0	0	201
Search and Rescue	0	23	0	0	8	0	0	0.5	0.3	3.5	35.3
Marine Safety	0	0	8	0	0	0	0	0	0	0	8
Aids to Navigation	306	231	143	275	182	109.8	165.8	81.6	106.1	156.4	1756.7
Ice Operations	70	0	4	10	159	203	7.2	151.6	74.9	151.7	831.4
Marine Environmental Protection	0	23	78	0	3	13	0	0	0	0	117
Living Marine Resources	0	0	0	0	0	0	0	0	0	0	0
Support (Training, Public Affairs, Etc)	198	251	373	133	191	176.6	83.9	62.5	86.9	120.1	1676
Total	617	697	606	428	711	671.1	495.5	623.3	383.3	449.9	5682.1

(*) Cutter decommissioned ($) Ice breaking hours includes deployment to D9 (620 Hrs) # Includes hours while deployed to D1

Mission Hours for WTGBs and WYTLs
Past ten years

CGC TACKLE	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	0	0	0	0	0	0	0	27.5	27.5
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	0	0	0	10	0	0	25.5	0	165	0	200.5
Ports, Waterways, Coastal Security	0	0	15	0	74	52.1	380.7	331.2	197.8	71.8	1122.6
Defense Readiness	0	0	0	0	0	48.5	12.7	0	0	0	61.2
Search and Rescue	0	2	5	18	15	0	0	0	0	4	44
Marine Safety	0	13	4	0	0	0	0	0	0	0	17
Aids to Navigation	138	104	154	215	184	162.1	285.3	60.8	86.5	108.9	1498.6
Ice Operations	246	100	80	14	200	253.2	52	229.4	122.3	219.2	1516.1
Marine Environmental Protection	0	0	0	0	0	0	0	0	0	0	0
Living Marine Resources	0	20	15	30	0	0	0	0	0	0	65
Support (Training, Public Affairs, Etc)	122	149	128	234	206	64.4	24.6	36	55.8	153.5	1173.3
Total	506	388	401	521	679	580.3	780.8	657.4	627.4	584.9	5725.8

CGC WIRE	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	0	0	0	0	0	0	0	0	0
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	62	55	62	0	0	37.6	10.3	0	0	0	226.9
Ports, Waterways, Coastal Security	158	130	55	38	69	92.6	651.7	905.6	426.4	409.7	2936
Defense Readiness	0	0	0	0	0	0	11.5	0	0	1.4	12.9
Search and Rescue	3	5	13	30	0	0	0	7	15.7	0.6	74.3
Marine Safety	6	0	158	247	18	0	16.8	0	4.5	0	450.3
Aids to Navigation	12	148	270	70	18	72.4	14.8	1.5	8.4	3.6	618.7
Ice Operations	80	70	7	66	167	84.1	199.8	234	158.1	58.7	1124.7
Marine Environmental Protection	20	134	2	26	0	9.3	0	0	0	0	191.3
Living Marine Resources	0	0	0	0	0	0	0	0	0	0	0
Support (Training, Public Affairs, Etc)	373	269	214	101	190	63	127.4	80.5	74.9	194.7	1687.5
Total	714	811	664	578	462	359	1032.3	1228.6	688	668.7	7322.6

(*) Cutter decommissioned ($) Ice breaking hours includes deployment to D9 (620 Hrs) # Includes hours while deployed to D1

Mission Hours for WTGBs and WYTLs
Past ten years

CGC CAPSTAN	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	19	0	0	0	0	0	0	0	19
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	127	65	0	0	0	77	32.5	0	140.8	0	442.3
Ports, Waterways, Coastal Security	210	39	2	0	36	182	354.6	529.4	470.6	121.8	1945.4
Defense Readiness	0	0	0	0	38	0	5.8	0	0	0	43.8
Search and Rescue	1	7	11	3	38	12.6	0	3.2	8.8	1.9	86.5
Marine Safety	146	190	178	387	100	54.9	97	0	0	359.3	1512.2
Aids to Navigation	79	58	18	7	10	0	0	6.8	0.5	0	179.3
Ice Operations	41	29	0	0	66	79.5	0	107.3	103	96.3	522.1
Marine Environmental Protection	0	78	0	0	66	0	0	0	0	193.4	337.4
Living Marine Resources	0	0	0	0	0	0	0	0	0	0	0
Support (Training, Public Affairs, Etc)	112	317	138	313	374	314.1	181.3	158.7	86.6	77.5	2072.2
Total	716	783	366	710	728	720.1	671.2	805.4	810.3	850.2	7160.2

CGC CHOCK	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	2	0	0	0	2.2	0	0	0	0	4.2
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	114	209	21	91	0	150.4	118.8	70.5	429.7	0	1204.4
Ports, Waterways, Coastal Security	141	107	163	65	160	13	34.3	605	94.4	61.5	1444.2
Defense Readiness	0	0	0	14	0	8	0	0	0	42	64
Search and Rescue	8	6	2	25	0	30.8	4.4	11.9	28.6	0.8	117.5
Marine Safety	0	5	85	164	66	86.8	0	0	0	177.3	584.1
Aids to Navigation	14	6	33	10	0	0.7	22.4	84.6	6.3	74.9	251.9
Ice Operations	114	57	0	0	74	42.1	0	59.1	136.2	4.2	486.6
Marine Environmental Protection	0	0	0	0	12	0	1.7	0	0	48.3	62
Living Marine Resources	0	259	215	201	177	72	7.7	0	12.5	155.7	1099.9
Support (Training, Public Affairs, Etc)	57	170	120	193	83	364.3	442.4	61.4	51.4	214.8	1757.3
Total	448	821	639	763	572	770.3	631.7	892.5	759.1	779.5	7076.1

(*) Cutter decommissioned ($) Ice breaking hours includes deployment to D9 (620 Hrs) # Includes hours while deployed to D1

Mission Hours for WTGBs and WYTLs
Past ten years

CGC CLEAT	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Drug Interdiction	0	0	0	0	0	0	0	0	0	151.1	151.1
Migrant Interdiction	0	0	0	0	0	0	0	0	0	0	0
Other LE	119	121	169	90	0	184.3	186.7	109.9	242.7	0	1222.6
Ports, Waterways, Coastal Security	193	10	86	48	119	0	369.8	409.7	227.4	144.3	1607.2
Defense Readiness	0	0	0	0	0	181	0	0	0	0	181
Search and Rescue	16	10	0	11	9	33	43.5	43.6	0	0	166.1
Marine Safety	76	148	163	299	183	0	0	6.6	0	53.6	929.2
Aids to Navigation	134	43	0	0	5	19.1	0	0	0	3.1	204.2
Ice Operations	60	55	0	8	75	21.2	0	121.7	109.3	46.3	496.5
Marine Environmental Protection	9	10	10	0	0	142.2	0	1	0	134.7	306.9
Living Marine Resources	0	0	0	0	1	0	0	0	0	103.9	104.9
Support (Training, Public Affairs, Etc)	166	291	162	282	315	203.6	93.6	28.2	169.6	156	1867
Total	773	688	590	738	707	784.4	693.6	720.7	749	793	7236.7

(*) Cutter decommissioned ($) Ice breaking hours includes deployment to D9 (620 Hrs) # Includes hours while deployed to D1

Ice Breaking hours
Last 10 years by Class and District

	WTGB	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	AVG
D9	CGC BISCAYNE BAY	1162	465	98	487	329	814.7	303.2	631.4	569	537.8	5397.1	539.71
D9	CGC BRISTOL BAY	453	199	6	301	219	533.8	7	376.7	365.4	345.5	2806.4	280.64
D9	CGC KATMAI BAY	1428	647	251	552	282	561.7	270.9	756.3	627.4	566.8	5943.1	594.31
D9	CGC MOBILE BAY	1240	488	71	341	12	549	271.6	655.4	449.9	252.6	4330.5	433.05
D9	CGC NEAH BAY	1116	663	0	561	206	776	208	725.6	524.6	493	5273.2	527.32
D1	CGC PENOBSCOT BAY	297	167	99	214	247	344.5	15.1	285	286.3	134.3	2089.2	208.92
D1	CGC STURGEON BAY	319	128	65	149	293	321.2	33.3	286	371.1	146.1	2111.7	211.17
D1	CGC THUNDER BAY	246	169	240	53	113	162.9	65.4	273	273	246.4	1841.7	184.17
D1	CGC MORRO BAY	167	120	71	Decom	Decom	Decom	Decom	171	282.5	143.8	955.3	159.22
D9	CGC MORRO BAY								620				

	WYTLs	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	AVG
D1	CGC BOLLARD	103	30	0	29	104	179.7	0	480.4	208.7	140.3	1275.1	127.51
D1	CGG BRIDLE	167	77	159	86	81	170.4	50.6	308.5	186.7	171.5	1457.7	145.77
D1	CGC HAWSER	99	107	127	138	187	209.7	125.4	236.9	168.8	56.6	1455.4	145.54
D1	CGC LINE	138	103	44	154	214	112.4	14.3	157.6	120	44.8	1102.1	110.21
D1	CGC PENDANT	57	9	0	0	133	46	0	182.1	198.1	102.6	727.8	72.78
D1	CGC SHACKLE	70	0	4	10	159	203	7.2	151.6	74.9	151.7	526	52.6
D1	CGC TACKLE	246	100	80	141	200	253.2	52	229.4	122.3	219.2	1643.1	164.31
D1	CGC WIRE	80	70	7	66	167	84.1	199.8	234	158.1	58.7	1124.7	112.47
D5	CGC CAPSTAN	41	29	0	0	66	79.5	0	107.3	103	96.3	522.1	52.21
D5	CGC CHOCK	114	57	0	0	74	42.1	0	59.1	136.2	4.2	486.6	48.66
D5	CGC CLEAT	60	55	0	0	75	21.2	0	121.7	109.3	46.3	488.5	48.85

	WLB (225/180)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	AVG
D9	CGC ALDER										151.8	151.8	151.80
D9	CGC HOLLYHOCK									526	470.7	996.7	498.35
D5	CGC ELM			0	0	0	0	0	0	126.2	0	126.2	15.78
D1	CGC JUNIPER		0	0	0	34	0	0	0	28.7	0	62.7	6.97
D1	CGC WILLOW		0	0	0	0	0	0	64.7	65.1	0	129.8	14.42
D9	CGC ACACIA	143	15	0	42	0	54.3	0	32.4	0	10.3	297	29.70
D9	CGC BRAMBLE	298	5	0	160	0	3	0	67.7	0		533.7	59.30
D9	CGC SUNDEW	328	191	19	37	62	196.2	33.5	304	105		1275.7	141.74
D5	CGC GENTIAN	110	0									110	55.00
D1	CGC BITTERSWEET	0	7									7	3.50

	WAGB	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	AVG
D9	CGC MACKINAW	1747	977	20	425	533	954	281.5	1300.7	1017.4	537.3	7792.9	779.29

(H)

Lake Michigan USCG Vessel Asset Comparison

Portion of East Coast-Coast Guard Assets	Lake Michigan-Coast Guard Assets
(Portland, ME to Homestead, FL - South of Miami)	*(Coasts of MI, IN, IL, and WI)*
1,640 Miles of Coastline	**1,640 Miles of Coastline**

AIRCRAFT TYPES

East Coast Coast-Guard Assets		Lake Michigan-Coast Guard Assets	
HC 130			
HU-25			
HH-60		HH-60	
HH-65			
MH-68			
TOTAL	5	TOTAL	1

AIR STATIONS

East Coast-Coast Guard Assets		Lake Michigan-Coast Guard Assets	
Jacksonville, FL		Traverse City, MI	
Miami, FL			
Atlantic City, NJ			
Elizabeth City, NC			
Cape Cod, MA			
TOTAL	5	TOTAL	1

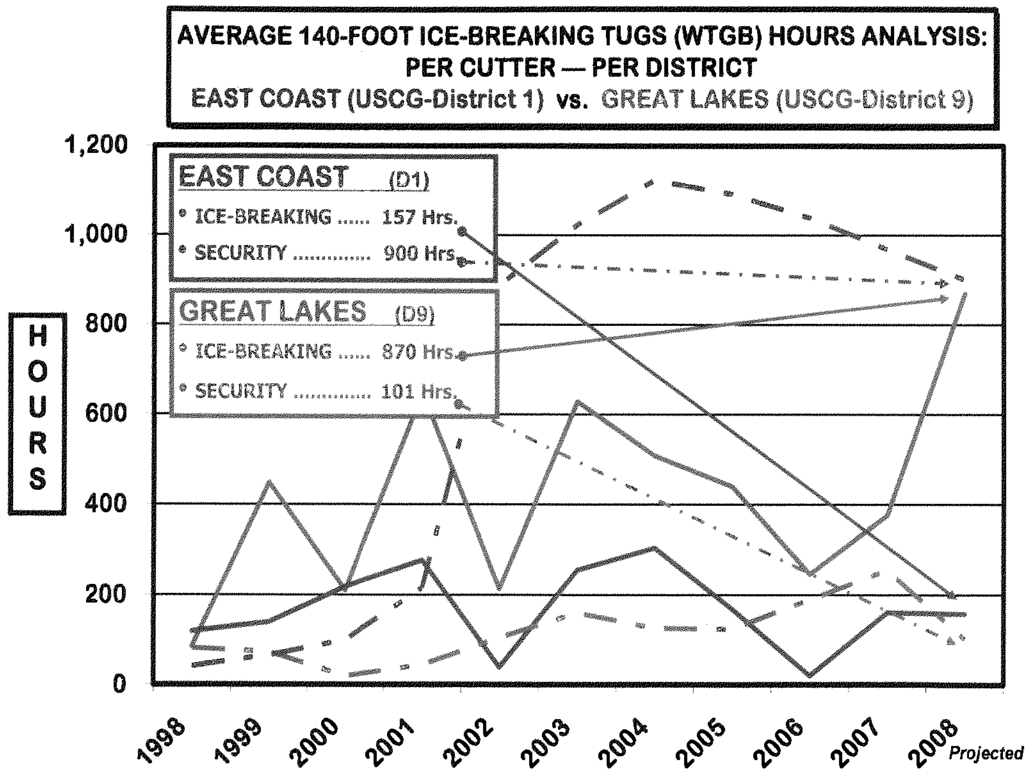
COAST GUARD VESSELS 65 FEET AND GREATER IN LENGTH

East Coast-Coast Guard Assets		Lake Michigan-Coast Guard Assets	
Size of Vessel	Number	Size of Vessel	Number
418	1		0
378	2		0
270	11		0
225	3		0
210	7		0
175	8		0
160	2		0
140	4	140	1
123	0		0
110	16		0
100	1		0
75	3		0
87	21		0
65	11		0
TOTAL	90	TOTAL	1

Notes:

Source of information: www.uscg.mil/datasheet

USCG Assets located North of Portland, ME and South of Homestead, FL were not counted in above numbers


AVERAGE 140-FOOT ICE-BREAKING TUGS (WTGB) HOURS ANALYSIS:
PER CUTTER — PER DISTRICT
EAST COAST (USCG-District 1) vs. GREAT LAKES (USCG-District 9)
EAST COAST (D1)
ICE-BREAKING ...... 157 Hrs.
SECURITY .... 900 Hrs.
GREAT LAKES (D9)
ICE-BREAKING ...... 870 Hrs.
SECURITY .... 101 Hrs.
HOURS
1,200
1,000
800
600
400
200
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Projected

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ACCOMPANYING POWERPOINT PRESENTATION SUBMITTED WITH:

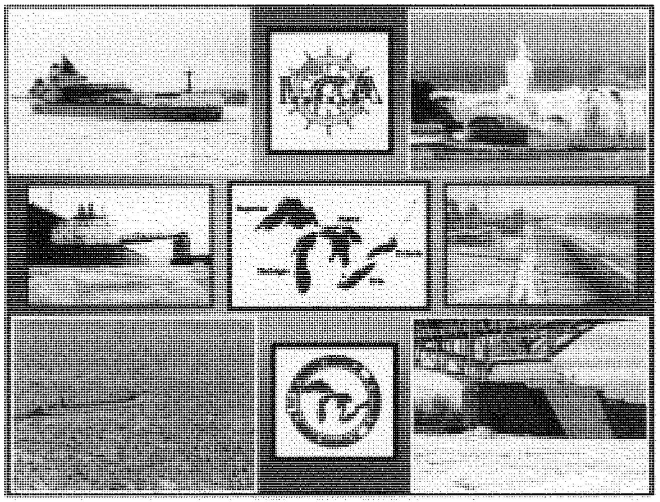
STATEMENT BY
JAMES H.I. WEAKLEY

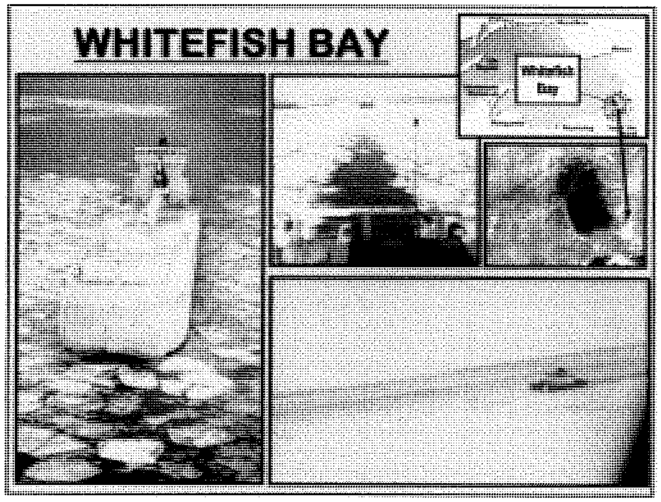
President-Lake Carriers' Association
Vice President-Great Lakes Maritime Task Force

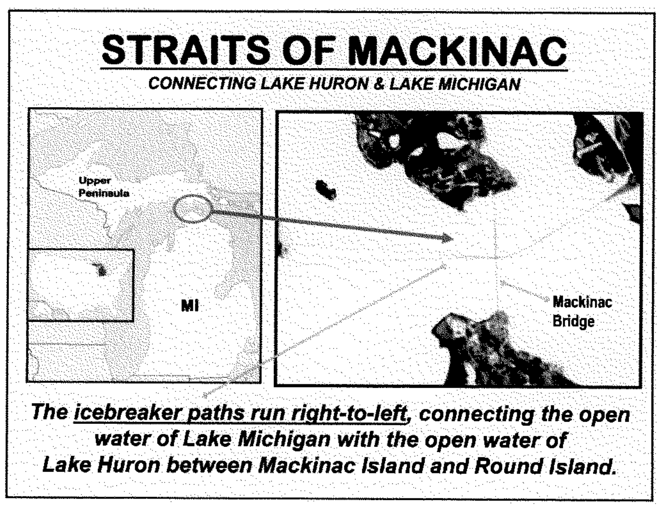
Suite 915 • 614 West Superior Avenue • Cleveland, Ohio 44113
Phone: 216-861-0590 • Cell: 216-406-3003 • E-Mail: weakley@lcaships.com

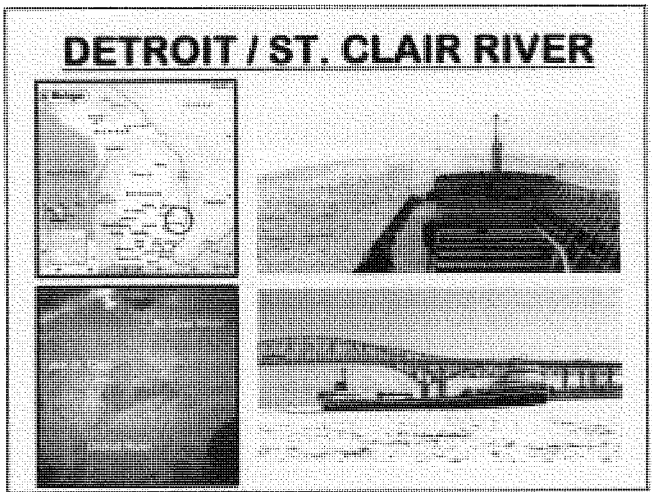
Before the Subcommittee on
Coast Guard and Maritime Transportation
United States House of Representatives

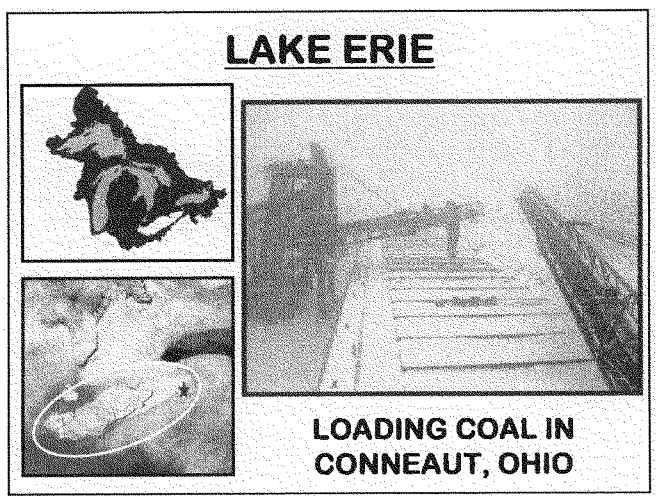
COAST GUARD ICEBREAKERS
Rayburn House Office Building – Room 2167
July 16, 2008 – 2:00 p.m.

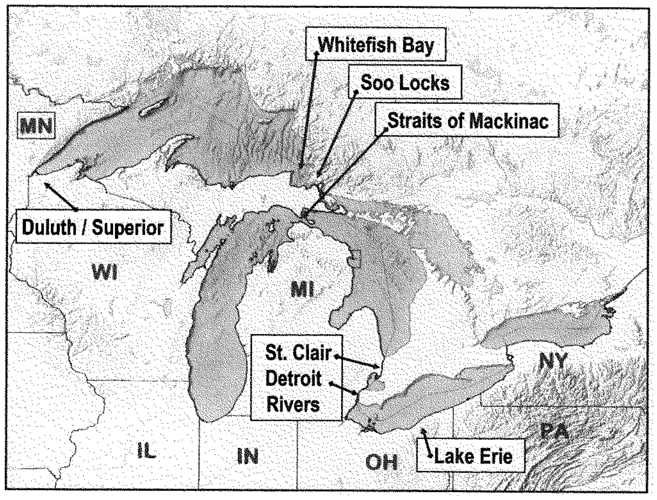


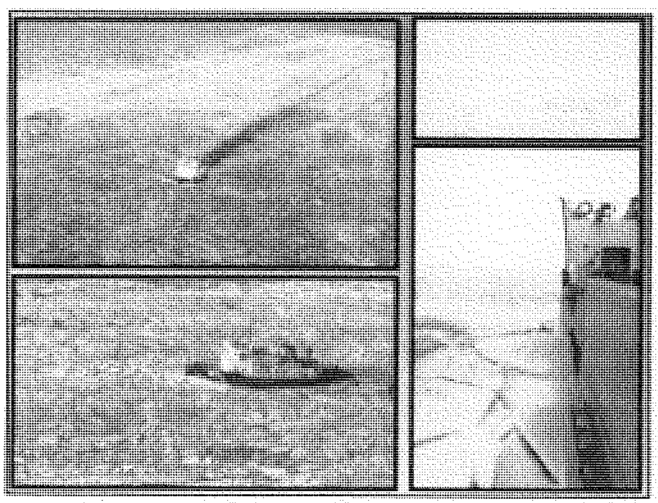

WHITEFISH BAY


STRAITS OF MACKINAC
CONNECTING LAKE HURON & LAKE MICHIGAN
Upper Peninsula
MI
Mackinac Bridge
The icebreaker paths run right-to-left, connecting the open water of Lake Michigan with the open water of Lake Huron between Mackinac Island and Round Island.

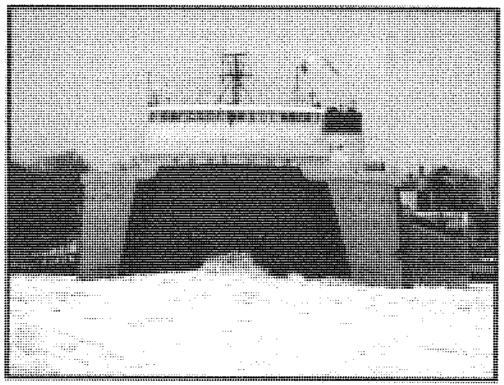

DETROIT / ST. CLAIR RIVER


LAKE ERIE
LOADING COAL IN
CONNEAUT, OHIO


Whitefish Bay
Soo Locks
Straits of Mackinac
MN
Duluth / Superior
WI
MI
St. Clair
Detroit
Rivers
NY
PA
IL
IN
OH
Lake Erie

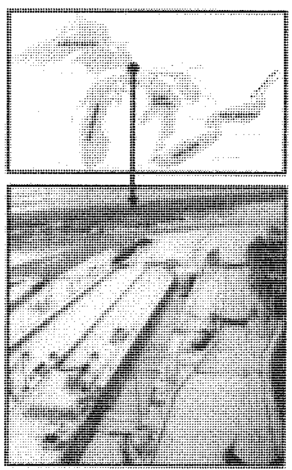


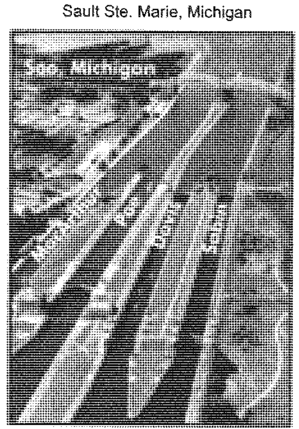
WATERWAYS NEED TO BE VIABLE CONDUITS FOR COMMERCE



SOO LOCKS

Sault Ste. Marie, Michigan



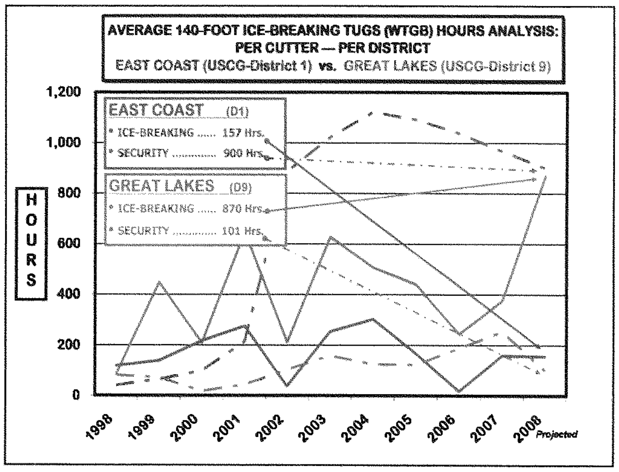


LACK OF ADEQUATE ICEBREAKING COSTS
$1.3 MILLION IN DAMAGES

LAKE MICHIGAN USCG VESSEL ASSET COMPARISON

COAST GUARD VESSELS
65 FEET AND GREATER IN LENGTH

East Coast-Coast Guard Assets		Lake Michigan-Coast Guard Assets	
Size of Vessel	Number	Size of Vessel	Number
418	1		0
378	2		0
270	11		0
225	3		0
210	7		0
175	8		0
160	2		0
140	4	140	1
123	0		0
110	16		0
100	1		0
75	3		0
87	21		0
65	11		0
TOTAL	90	TOTAL	1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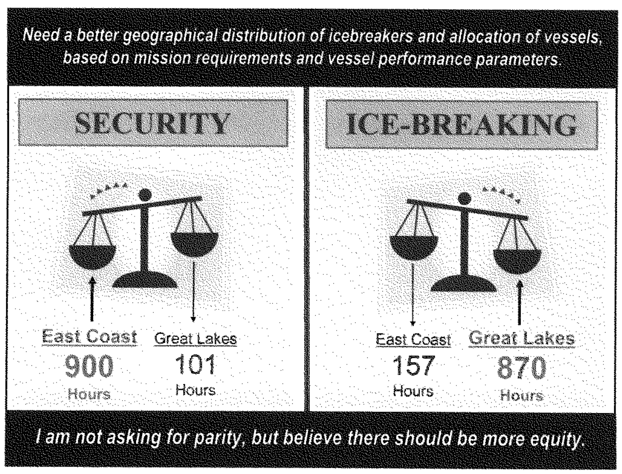
Need a better geographical distribution of icebreakers and allocation of vessels, based on mission requirements and vessel performance parameters.
SECURITY
East Coast
900
Hours
Great Lakes
101
Hours
ICE-BREAKING
East Coast
157
Hours
Great Lakes
870
Hours
I am not asking for parity, but believe there should be more equity.

7