

TESTIMONY OF
DR. LAWSON W. BRIGHAM
INTERNATIONAL ARCTIC RESEARCH CENTER
UNIVERSITY OF ALASKA FAIRBANKS
AND
CENTER FOR ARCTIC STUDY & POLICY
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Introduction

Good morning Mr. Chairman and distinguished members of the Subcommittee. I am honored to testify today regarding the roles of the United States in Arctic maritime transportation and the marine infrastructure requirements for the U.S. maritime Arctic. My name is Lawson Brigham and I am a researcher at the International Arctic Research Center of the University of Alaska Fairbanks and a Fellow at the Coast Guard Academy's Center for Arctic Study & Policy. I received my PhD in Polar Oceanography from the University of Cambridge in the United Kingdom. During my U.S. Coast Guard career I served as commanding officer of icebreakers on the Great Lakes and in Antarctic & Arctic waters. I have also served as Chair of the Arctic Council's Arctic Marine Shipping Assessment from 2004-09 and have recently been a member of the Council on Foreign Relations Independent Task Force which released its report titled *Arctic Imperatives: Reinforcing U.S. Strategy on America's Fourth Coast* in March 2017. My comments today are personal perspectives based on my polar operational experiences and participation in U.S. and international Arctic affairs.

No discussion of Arctic marine transportation can be made without a review of the Arctic Council's *Arctic Marine Shipping Assessment (AMSA) 2009 Report*. The United States was a lead country in this effort with Canada and Finland; more than 200 experts from the eight Arctic states, the Arctic indigenous people, and other key stakeholders (such as the global shipping

industry) contributed to AMSA. The Report contained 96 findings under key themes including: marine geography; Arctic sea ice changes; the history of Arctic marine transportation; law of the sea and governance of the maritime Arctic; the AMSA traffic database; scenarios of future marine uses; indigenous peoples issues and the human dimension; environmental considerations and impacts; and Arctic marine infrastructure requirements and gaps. The AMSA effort can be understood from three perspectives

- As a *baseline assessment* of Arctic marine activity using the AMSA (2004-05) database as an historic snapshot of Arctic marine use.
- As a *strategic guide* for use by a host of Arctic and non-Arctic actors and stakeholders.
- As a policy document of the Arctic Council since the recommendations of the AMSA 2009 Report were negotiated and consensus for their approval was reached by the Ministers of the eight Arctic states.

The 17 recommendations of AMSA, approved by the Arctic state ministers in April 2009, included three, inter-related themes: ***Enhancing Arctic Marine Safety; Protecting Arctic People and the Environment***; and, ***Building the Arctic Marine Infrastructure***. The recommendations in these themes are fundamental to responding to increased marine use and to future investments required for enhanced marine safety, environmental protection and effective facilitation of marine operations. All continue to require close international cooperation. The huge deficit in Arctic marine infrastructure significantly requires careful long-term planning and large investments from a host of public and private sources. New public-private partnerships will require development and political support.

The Drivers of Arctic Marine Transportation

One of the major tasks of the AMSA team was to determine the many uncertainties and key driving forces that might shape the future of Arctic navigation out to years 2020 & 2050. AMSA used a scenarios (plausible futures) approach that identified 120 factors or driving forces that could be influential. The most highly influential factors included: global oil prices; the importance of a stable legal regime for the Arctic Ocean; new Arctic resource discoveries; world trade patterns and radical changes in global trade dynamics; a major Arctic shipping disaster; limited windows of Arctic marine operations (seasonal impacts on shipping economics); Arctic maritime enforcement; escalation of Arctic maritime disputes; the marine insurance industry; rapid climate change and changes that are more disruptive sooner than anticipated; disputes between indigenous marine uses and commercial navigation; more active, non-Arctic maritime nations such as China, Japan and Korea becoming involved in Arctic Ocean navigation; and, global (International Maritime Organization) agreements on Arctic ship construction, marine safety and maritime pollution rules & regulations.

The diversity of these factors and uncertainties highlight the **complexity** and **global connections** that can influence the future of Arctic Ocean marine operations and shipping. For example, global price stability was determined to be a major factor and during the conduct of AMSA (2004-09) oil prices fluctuated from a high of US\$147 per barrel to a low of US\$55 per barrel (today's price is approximately US\$65-66). This was deemed to be a huge factor for future onshore and offshore hydrocarbon development, and directly impacting the levels of offshore marine support and Arctic marine transportation systems. In the AMSA scenarios process, three criteria were used to select the two most influential factors for the scenarios matrix and the future of Arctic marine navigation: the degree of plausibility; relevance to Arctic and maritime affairs; and, being at the right threshold of the many factors considered. Two most influential factors stood out under this evaluation: **resources and trade** (the level of demand for Arctic natural resources and trade); and, **governance** (the degree of relative stability of rules and standards for marine use both within the Arctic and internationally). These two primary factors were used to develop a set of four plausible futures for Arctic navigation. It is important to note that a changing climate and Arctic sea ice retreat provide for greater marine access and potentially longer seasons of navigation throughout the Arctic Ocean. **However, the economic factors of Arctic natural resource development, connections to global markets, and global commodities prices are considered the primary drivers of future Arctic marine operations and shipping.**

This is the situation we view today in the development of Arctic natural resources in the Russian North and the investments in their national Arctic waterway, the Northern Sea Route, to facilitate the marine transportation of these valuable resources to global markets. A similar situation exists in Norway with its strategic focus on offshore development in Arctic Norway and the requirements for marine systems to support these complex, Arctic operations. For the United States the potential for offshore exploration and development of the Alaskan maritime Arctic (in the Beaufort and Chukchi seas), and the requirements for safe, effective marine transportation systems, are driven primarily by the economics of Arctic natural resource development. Maritime governance must also be considered highly important for all these regional Arctic developments in the form of a stable, operating system of legal and regulatory measures that are reinforced by broad international cooperation.

Lack of Arctic Marine Infrastructure

One of the greatest concerns and significant risks identified by the Arctic states in the AMSA report is the **general lack of marine infrastructure in the Arctic**, except for the coasts of Iceland, northern Norway and northwest Russia. Missing or lacking infrastructure in most Arctic areas include: hydrographic data and marine charts; complete and adequate coverage of marine communications; environmental monitoring (for weather, sea ice, and icebergs); search and rescue capability; environmental response; aids to navigation, and more. For much of the Arctic, the lack of deepwater ports, places of refuge, salvage and towing services, and port reception facilities – all normally available to the global maritime industry – is of very serious concern to the Arctic states and the global community. This huge deficit in marine infrastructure makes it

very difficult to evaluate the full risks associated with Arctic marine operations and shipping, and exposes new Arctic marine projects to an incomplete or non-existent safety net.

The AMSA report concludes that the vastness and harshness of the Arctic environment make the conduct of marine emergency response more difficult throughout the region. The Arctic Ocean's hydrographic database for charting is not adequate in most areas to support future levels of Arctic marine operations (for commercial shipping, offshore development, tourism, fishing and research). In addition, the monitoring network of meteorological and oceanographic observations critical to safe and efficient navigation is extremely sparse and not adequate to support increases in Arctic marine transportation. Importantly, the marine infrastructure that is missing in the Arctic Ocean for the commercial world is likewise generally absent for naval and military operations. The lack of ice information, marine charts, communications, and emergency response is no less critical to the safe and effective operation of security forces as it is to commercial Arctic marine operators. This situation places importance on having civil and military organizations in the Arctic working together on infrastructure issues and developing mechanisms for emergency response well in advance of a maritime incident or crisis situation.

A Council on Foreign Relations (CFR) Independent Task Force (2016-17) assessed the challenges and opportunities for the United States in the Arctic region in the face of changing conditions. Two of the six major goals in the final report noted two critical infrastructure needs: "funding up to six icebreakers operated by the U.S. Coast Guard and having at least three operational in the polar regions at any one time," and, "improving telecommunications, energy, and other infrastructure in Alaska to support a sustained security presence and economic diversification." The report discussed several key needs: mapping and weather prediction requirements; a U.S. Arctic deepwater port; developing a trans-Arctic search and rescue communications network; and, creating a series of safe harbors and search and rescue stations along the coast. Notable information to the Task Force from NOAA's Hydrographic Services Review Panel is that only 4.7% of the U.S. maritime Arctic is charted to modern international standards (although there are U.S. nautical charts available for the entire region).

Within the CFR report section reserved for additional member views, I was joined by three task force members in stating that "the lack of infrastructure in the U.S. maritime Arctic is a *serious national gap* with human, security, economic and environmental implications for the 21st century. Many elements of infrastructure mentioned in the CFR report require sustained, long-term investment: hydrography and charting; a viable Arctic port; polar icebreaking capability; advanced communications; a robust environmental observing system; strengthened monitoring and surveillance; search and rescue capacity; environmental response capacity; aids to navigation; marine salvage; and more. All are necessary to respond to increasing Arctic marine use, facilitate marine navigation, and provide for a robust marine safety and environmental protection framework not only in the U.S. Arctic, but throughout the circumpolar world." It is clear a major marine infrastructure gap remains throughout the U.S. maritime Arctic.

Recent Progress and United States Arctic Leadership Roles

During the past decade the United States has played leadership roles at the International Maritime Organization (IMO), the Arctic Council and among the Arctic states in negotiating a number of key instruments related to Arctic marine use and transportation. The U.S. under the leadership of the Coast Guard at the IMO in London worked with the Arctic states and other major maritime nations to develop a new IMO code for ships operating in the polar regions. The result is an international, mandatory set of marine safety and environmental protection rules and regulations for ships sailing in Arctic and Antarctic waters (known as the Polar Code). Four key and binding Arctic agreements have also been developed with strong leadership from the State Department:

- Arctic Search and Rescue Agreement (2011) (among the Arctic states)
- Arctic Oil Spill Preparedness and Response Agreement (2013) (among the Arctic states)
- Agreement on Enhancing International Arctic Science Cooperation (2017) (among the Arctic states)
- Agreement on Unregulated Fishing in the Central Arctic Ocean (December 2017) (Canada, Iceland, Norway, Russia, USA, China Japan, South Korea and the European Union).

Each of these agreements will require robust implementation and, in some cases as with the IMO Polar Code, effective enforcement. Importantly, continued international cooperation will be required not only among the eight Arctic states, but also among all maritime states and the global maritime industry.

Near-term U.S. Arctic Marine Infrastructure Needs and Summary

The role of the United States in future Arctic marine transportation can only be improved by sustained investments in a range of marine infrastructure in Alaska. Priority investments and near-term actions from my perspective include:

- ***Hydrography and Charting*** ~ increased funding to NOAA's National Ocean Service to increase hydrography and charting in America's Arctic frontier (highest priority).
- ***Implementation and Enforcement of the IMO Polar Code*** ~ support and additional funding to the Coast Guard for all requirements related to the application of the IMO Polar Code in U.S. Arctic waters.

- ***U.S. Arctic Port at Nome*** ~ funding for dredging and outer breakwater construction to allow for the mooring and support of large ships in all seasons. This development will provide for a port presence (and support) of major U.S. vessels within the U.S. maritime Arctic (for example, Coast Guard icebreakers, naval combatants, government survey & research ships, and commercial vessels). Such an investment will make Nome a more effective, regional hub port to other smaller harbors and to future offshore development in U.S. Arctic waters.
- ***Icebreaking Capacity*** ~ funding to DHS and the Coast Guard has been appropriated to begin addressing the critical needs to replace and enhance the U.S. polar icebreaker fleet. Sustained funding in near-term budgets must be a priority to meet a recognized national requirement for U.S. polar icebreaker capacity.
- ***Arctic Waters Monitoring and Surveillance of Marine Traffic*** ~ funding support for continued development of effective military and civilian (such as the Marine Exchange of Alaska) systems for enhanced monitoring & surveillance, or 'domain awareness,' of marine operations and shipping in U.S. Arctic waters.
- ***Search & Rescue and Environmental Response*** ~ support to the Coast Guard and other federal agencies to fully implement and meet U.S. responsibilities under the Arctic SAR Agreement and the Arctic Oil Spill Preparedness & Response Agreement.
- ***Seward Marine Center and Polar Research Ship Sikuliaq*** ~ continued federal support to the University of Alaska Fairbanks for the Seward Marine Center (under the College of Fisheries and Ocean Sciences) and the research ship *Sikuliaq* which operates extensively in U.S. Arctic waters and beyond into the Arctic Ocean.
- ***Communications and Aids to Navigation*** ~ increased funding for enhanced military and civilian communications systems and advanced aids to navigation (physical and virtual) in the U.S. maritime Arctic.

Thank you Mr Chairman for the opportunity to testify before you today. I am happy to answer any questions you may have. I would also be very pleased to provide additional information to the Subcommittee members and staff at any time.