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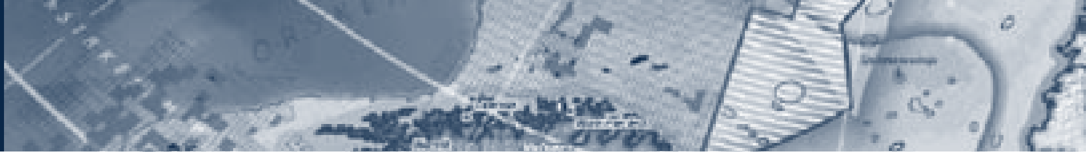

FOCUS NORTH **8-2007**

Developments in Arctic Shipping

Produced by the research company Ocean Futures, Oslo for the Norwegian Atlantic Committee

Increased access in a warming Arctic

The sea ice in the Arctic Ocean is undergoing dramatic change. Due to global warming, the average temperature in the Arctic has risen by about twice as much as in the rest of the world during the last decades. As the Arctic warms, the ice melts. The ice edge is retreating northwards, the ice is becoming thinner and weaker, the occurrence of perennial ice along Russian coastal areas is diminishing, and deep-draft ice ridges are disappearing.

The ice cover is expected to shrink further in the years to come. Some climate models predict the Arctic could be ice-free during the summer in the course of this century.

These changes open up new possibilities for resource exploration, development and marine transport. This applies particularly in the Russian Arctic, where the shallow continental shelf north of Siberia can more easily be explored than in the past. The ice which remains is easier to surmount.

Sailing conditions from Western Siberia to the Barents Sea are becoming steadily better. As the ice diminishes, ships will be able to sail in deeper waters farther from the coast, allowing the use of larger, deeper-draft vessels.

The situation is different in North America. The melting of seasonal ice has enabled harder, perennial ice to infiltrate the Canadian archipelago. This continues to restrict the types of ships that can be used in this region.

Today, usage of the Northwest and Northeast Passages as a transit route between the Atlantic and the Pacific is insignificant. The possibility of using them increases as the sea ice retreats. However, extreme variation in ice conditions along the routes from year to year presents a difficult challenge for marine transport planning and risk assessment.

At the current rate of melting, the central Arctic Ocean may be opened to transit shipping earlier than the Northwest Passage. The most powerful icebreakers are able to sail through the central Arctic in the summer and have made more than 50 voyages to the North Pole since 1977. Russia's nuclear icebreakers operate independently in the central Arctic during the summer season, while diesel icebreakers typically operate in tandem.

There is little experience in the Central Arctic during other seasons. Only one voyage has been successfully completed—by the nuclear icebreaker *Sibir*, which reached the North Pole on 25 May 1987. Further study is necessary to evaluate the future for ship operations in the central Arctic.

Destination Arctic

Although global climate change may open up new shipping routes via the Arctic in the coming decades, the marine industry today does not tend to view the Arctic as a route between southerly destinations. Rather, the marine industry is focused on the Arctic as a destination.

The most dynamic developments with consequences for shipping are based in the region rather than outside it. The Arctic is becoming a key region for economic growth, especially in Norway, Canada and Russia.

Canada

Marine shipping in the Canadian Arctic is growing steadily. Population growth is increasing the demand for deliveries of goods and materials. Northern communities have the highest rate of population growth in Canada and one of the highest in the world: 16 percent per decade.

The mining sector is a major user of marine transport in the Canadian North. Mining activity remains strong and is expected to grow. The Raglan nickel mine in Northern Quebec went into full production in 1997 and the Voisey Bay nickel mine in Labrador in 2005. Base metal mines are

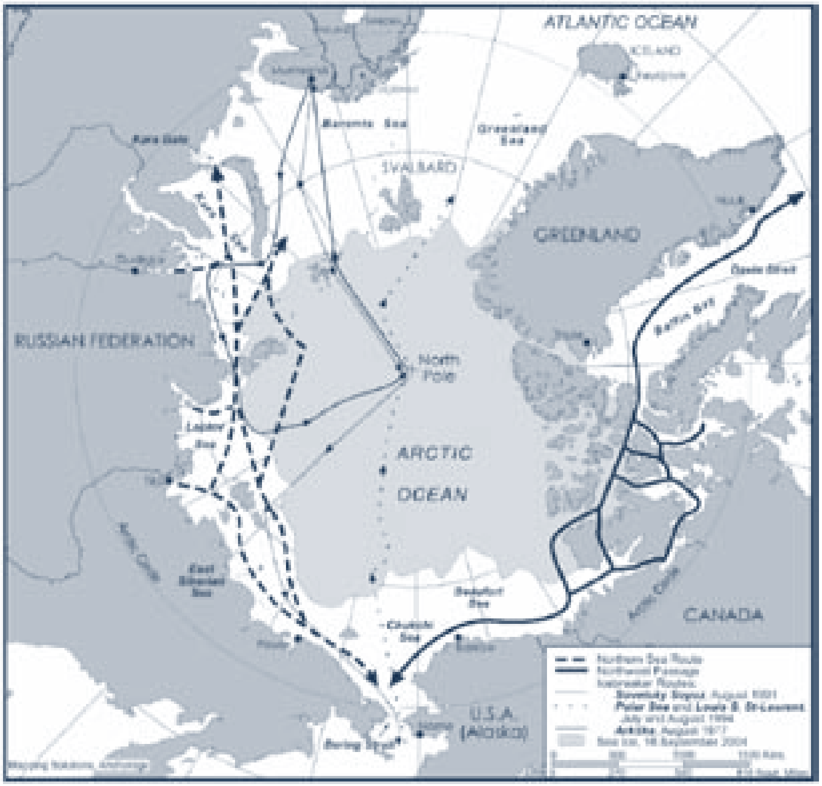

Figure 1 – Arctic shipping routes Source: US Arctic Research Commission

also under development in the Coronation Gulf region, and several new gold and diamond mines are scheduled to open.

Canada is also developing its oil and gas resources in the Mackenzie Delta. Plans are in place to build a gas pipeline to the delta within the next decade. Once completed, oil and gas activity in the Beaufort Sea will increase.

Canada is building up its marine transport capacity to be the primary means for supplying its communities and resource development activities in the North. Trucking cargo across the tundra via winter roads is prohibitively expensive, and its seasonal nature is inadequate to meet the year-round movement of goods required.

Marine transport in the Canadian North is now a stable, independent commercial sector. In 1997, the government sold its interest in Canarctic Shipping, a state-owned consortium. The new company, FedNav, is now entirely privately owned.

Fednav is expanding its Arctic fleet by building newer, larger and more powerful icebreaking cargo ships. It is currently completing a 32,000 ton icebreaking cargo ship to service the Voisey Bay mine. These developments underscore that marine shipping in the North can be commercially viable and profitable without public subsidy.

Russia

The Russian economy has grown at a rate of 6.5 percent per year since 1999. Growth has generally been greater in the Arctic regions than in the rest of the country, largely due to increased oil production, which has risen 10 percent per year. Thus a driving force behind Russia's economic development is its resource base in the North.

Petroleum's dominating importance in the Russian economy gives grounds to expect that great efforts will be made to increase production in the years to come. If Russia is to meet its production goals, however, it is crucial that it increase its export capacity from the North.

In 2003, all of Russia's gas exports and 88 percent of its oil exports went to European customers. A considerable portion came from the Russian North, transported either southwards via pipeline or westwards via the Northern Sea Route and the Northern Maritime Corridor, which stretches from the Barents Sea to the European continent.

Marine transport of oil from northwest Russia increased dramatically from 2002 due to increased production farther to the east. Crude oil, bunker oil and refined products are sent by train from Western Siberia to the White Sea. From there, oil is shipped on small, ice-strengthened tankers to Murmansk, where it is transferred to large tankers for export to the European market.

The transport capacity was originally about 5.4 million tons—about one tanker per week from Murmansk. This is expected to triple or quadruple over a short period of time.

According to a recent UN report, oil production on the Russian shelf will be so large that oil transport in the Barents Sea will increase by a factor of six by 2020, or 32 million tons per year. Other analyses give higher figures, from 36 to 130 million tons per year.

In addition to oil, liquefied natural gas (LNG) will be exported from the region. The Shtokman field is expected to have a capacity of 14 million tons of LNG per year, which would generate more than 200 shiploads annually. This export will occur from ice-free harbours on the Kola Peninsula. However, because Shtokman and other fields in the Barents Sea are located in areas with seasonal ice, developing the fields will require icebreakers and ice-strengthened ships.

Svalbard

Maritime traffic in Svalbard's waters is increasing. The principal cargo is coal from the Norwegian and Russian mines. Norwegian coal production rose ten-fold over the last decade: from 290,000 tons in 1994 to 2.9 million tons in 2004, while Russian exports fell from 485,000 tons to 132,000 tons over the same period.

Fishing vessels from several countries operate around Svalbard, and it is a popular cruise ship destination in the summer season. In 2004, 200 fishing vessels were registered in the Svalbard fishery protection zone, and 32 large cruise ships with 13,000 passengers visited the archipelago.

Demand for ice class ships

A key indicator of the Arctic's attractiveness for shipping is growth in the fleet of ice-strengthened ships. In 1992, only three percent of the world tanker fleet had some form of ice classification. This is projected to increase to 10 percent, or 18 million tons by 2008.

Rapid expansion in Russia's oil exports and the phasing out of older, single-hull tankers has led to an increased demand for tankers that can operate in ice-infested waters. The greatest demand is for ships that can operate in the most difficult ice.

This has led to a rapid growth in orders for tankers of the highest ice class. Orders now total 11.6 million tons—nearly three times the current fleet by tonnage (see Table 1). In 2004, $4.5 billion was invested in ice-class vessels, mostly those with the highest amount of ice strengthening (Lloyds Class 1A or higher).

Table 1 – Ice-class tankers
in operation and on order worldwide
Deadweight tonnage (dwt) in million tons

	Current fleet		On order	
	No.	dwt	No.	dwt
Class 1A / higher	262	4.2 m	165	11.6 m
Class 1B / lower	735	19.3 m	69	3.9 m
Total ice class fleet	997	23.5 m	234	15.5 m
Total tanker fleet	5825	344.0 m	1295	90.9 m

At present, only a quarter of the current ice class fleet is high ice class, and most of these are less than 20,000 tons. New orders are for large ships. Nearly three-quarters of those on order will be high ice class with an average size of 53,000 tons.

Overall, the ice class tanker fleet is expected to grow by 33 percent in 2006. According to Det Norske Veritas (DNV), a third of all DNV-classed tankers currently on order are ice-strengthened.

Ownership patterns are also changing. New orders show broader international interest. Some ship owners are speculating that Russian oil exports will continue to grow and increase the demand for ships. Others want the increased flexibility ice-strengthening offers, even though they have no current plans to trade in ice-covered regions. Greater diversity in ownership indicates greater awareness of the economic opportunities in the Arctic and confidence that the region will continue to grow for some time.

Shipping safety rules

National authorities and ship classification societies regulate the design and construction of ice-strengthened ships. Experience showed these rules were inadequate to ensure safe, environmentally responsible operations in the polar regions. Different, contradictory rules were confusing to the industry and could be used to restrict competition and prevent equal access. Expectations for substantial growth in Arctic shipping prompted efforts to improve international polar ship standards.

IMO "Polar Code"

The International Maritime Organization (IMO) began a process in 1993 to harmonize rules for polar ships. In 2002, the IMO published a set of Guidelines for Ships Operating in Arctic Ice-Covered Waters, also known as the Polar Code.

The IMO Guidelines outline a system of classes for ships that operate in the Arctic. They designate different levels of capability for operating in ice-infested waters.

The Guidelines provide non-mandatory recommendations for reducing the risks imposed on ships operating in the Arctic. These include construction and equipment recommendations, plus guidelines for operations, damage control and environmental protection. They also address the training and certification of ship operators.

IACS Unified Requirements for Polar Ships

In parallel with IMO efforts, the International Association of Classification Societies (IACS) has

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developed a set of unified technical construction standards for the hull and machinery of ships sailing in polar waters. Their purpose is to ensure ships of different polar classes can withstand the effects of ice and temperature while sailing in conditions appropriate for their class.

By unifying structural standards based on different experience and design philosophies, the Unified Requirements constitute a state-of-the-art set of construction standards for polar ships. The structural requirements are under final review and are about to be released; the machinery requirements are still under development.

IACS rules strongly influence national shipping regulation. For example, Canada is incorporating the IACS Unified Requirements for Polar Ships in its national regulations. Given the projected increase in Arctic marine transport, the IMO and IACS efforts constitute an important element to ensure transport develops safely and with due regard for protecting the Arctic environment.

Technological developments

Ship designers have made important advances in ship design that improve performance, efficiency and economics.

Traditional icebreaking technology relies on a sloping bow form, low-friction hull coatings, and air bubbling or heeling systems. The latest technology is based on bow propellers and steerable thrusters that can reduce ice resistance by 40 to 50 percent, meaning lower operational costs and shorter sailing times.

Aker Finnyards has developed a unique vessel concept called the Double Acting Ship (DAS). The ship's bow is optimized for open water conditions, while its stern is designed for icebreaking. When breaking ice, the ship is steered stern-first with a steerable electric-drive thruster, called an Azipod.

Aker Finnyards built a 106,000 ton DAS and fitted it with a 16 megawatt Azipod. During Arctic sailing trials, the ship broke through ice ridges 15 meters thick without difficulty. The design achieved power savings up to 50 percent. High operational efficiency was essential to the concept's economic viability, as the Azipod costs about 40 percent more than traditional propulsion systems.

Aker Finnyards has built a 14,500 ton container ship for Norilsk Nickel using the DAS design. The ship will operate year-round in the western region of the Northern Sea Route with minimal or no icebreaker assistance. If it performs well in Arctic conditions, it could significantly influence the future development of Arctic shipping.

Challenges to Arctic shipping

Despite the positive trends already mentioned, there are several key challenges for the expansion and development of Arctic shipping.

In Russia, difficulties in modernizing the Northern Sea Route prevent its development as a viable alternative to other shipping routes (such as the Panama and Suez Canals) and threaten the viability of resource development in Russia. To increase oil and gas production, especially in Western Siberia, Russia must maintain reliable, year-round marine transport to develop the production infrastructure and export products to market.

Dwindling icebreaker fleet

The greatest need is for icebreakers. Russia currently has 14 icebreakers. The fleet is ageing, as no new icebreakers have been brought into service since 1993. A new nuclear-powered icebreaker has been on the construction ways for years; latest predictions indicate it will be finished in 2008.

Icebreaking cargo ships could circumvent the problems posed by a dwindling icebreaker fleet. However, this will increase the cost of ships, as an icebreaking cargo vessel can cost three times as much as a normal vessel. An ice-strengthened vessel is typically only 30 to 50 percent more.

The extra cost must be offset by efficient operations. One way is to employ them exclusively to shuttle cargo through ice-infested waters to a transfer terminal, where the cargo is shifted to larger, more cost-effective open-ocean vessels. Russia is using this operating model to export oil from northwest Russia. The same model could be applied to other operations and locations.

Marine insurance

Insurance is another cost factor, as the risks associated with ice navigation will no doubt affect premium cost and policy conditions.

Analysts have concluded that the marine insurance industry is willing to underwrite navigational and related risks in ice-covered areas of the Arctic, but there is still too little international experience to determine how expensive that coverage is likely to be. In particular, more information is needed on environmental risks, Russian services to shipping, and Russian legislative development.

Summarized from "Developments in Arctic Shipping" (11/2005), available (in Norwegian) at ocean-futures.com

Maps with full colour version are available at www.dnak.org

Hegland trykkeri a.s

About FOCUS NORTH

This series of short fact sheets will cover current issues on developments in The High North. The first 10 issues are written by experts from Ocean Futures, www.ocean-futures.com The series can also be downloaded from the web, www.dnak.org

Editor: Marit Rye Ramberg
ISSN: 1502-6361