COMMERCIAL SHIPPING ON THE NORTHERN SEA ROUTE

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Introduction

Over the past eight decades the ice-infested sea route along the Russian Arctic coast has been steadily developed. Massive resources, including nuclear-powered icebreakers, have now enabled regular navigation. The western portion is kept open all year and there are through voyages between the Atlantic and the Pacific for three or four months annually. The sea route is part of an overall transportation system. Development has concentrated on transporting Siberian raw materials and delivering goods from other parts of the country to coastal ports and the great Siberian river arteries. It is the rivers which in fact carry the bulk of cargoes to the northern coast, although navigation is also seasonal. The use of the Arctic Ocean as a short-cut between Europe and Asia/North America has until now been limited. Recent political and economic changes in Russia have altered official attitudes about international use of the sea route; the authorities are currently encouraging foreign interest in shipping across the top of Eurasia.

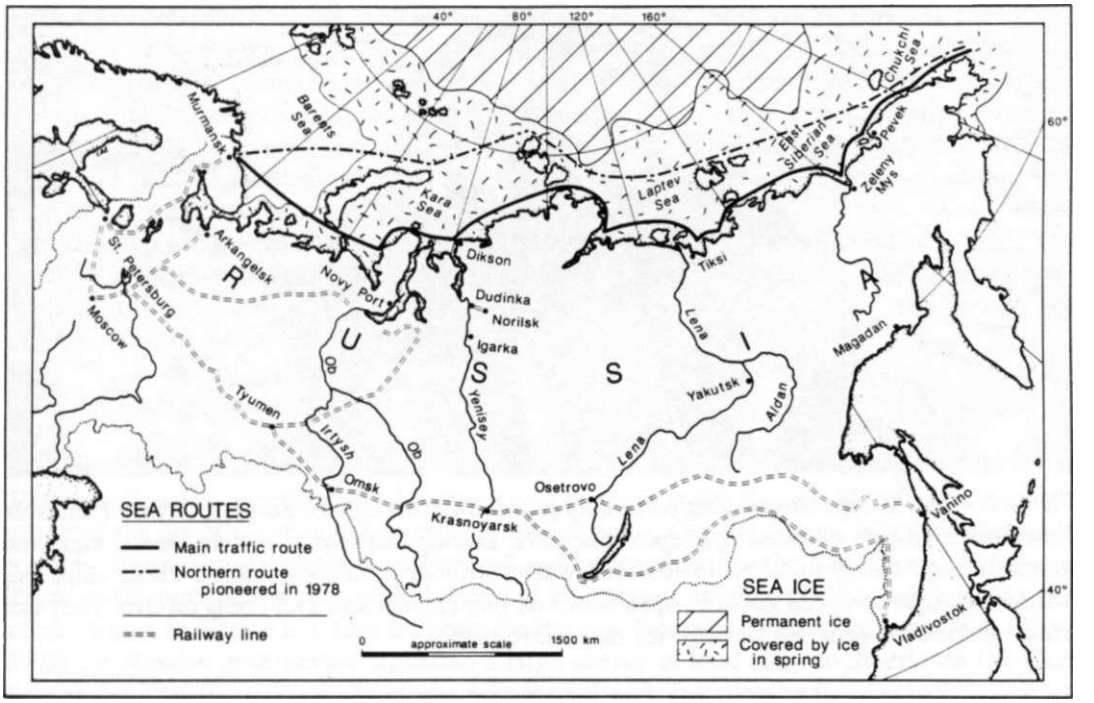

Figure 1: The Northern Sea Route.

Source: Drawn by Christine Earl, Carleton University.

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In legal and geographic terms there is an important distinction between the Northeast Passage and what the Russians term the Northern Sea Route. The Northeast Passage is the route linking the Atlantic and Pacific via the various seas to the north of Russia. From a legal perspective it is governed by international law, treaties, and coastal state legislation consistent with international law.[1] By contrast, the Northern Sea Route, shown in figure 1, has until now been an internal Russian trade and shipping route, stretching from the straits linking the Barents and Kara Seas in the west to the Bering Strait in the east. For practical purposes navigation of the Northeast Passage is accomplished using the Northern Sea Route.

This article will examine commercial shipping on the route by examining four topics: obstacles to navigation; the development of shipping; the way in which the river and coastal systems complement each other; and interest in promoting the route as a competitor to the traditional links via Suez and Panama between the Atlantic and the Pacific.

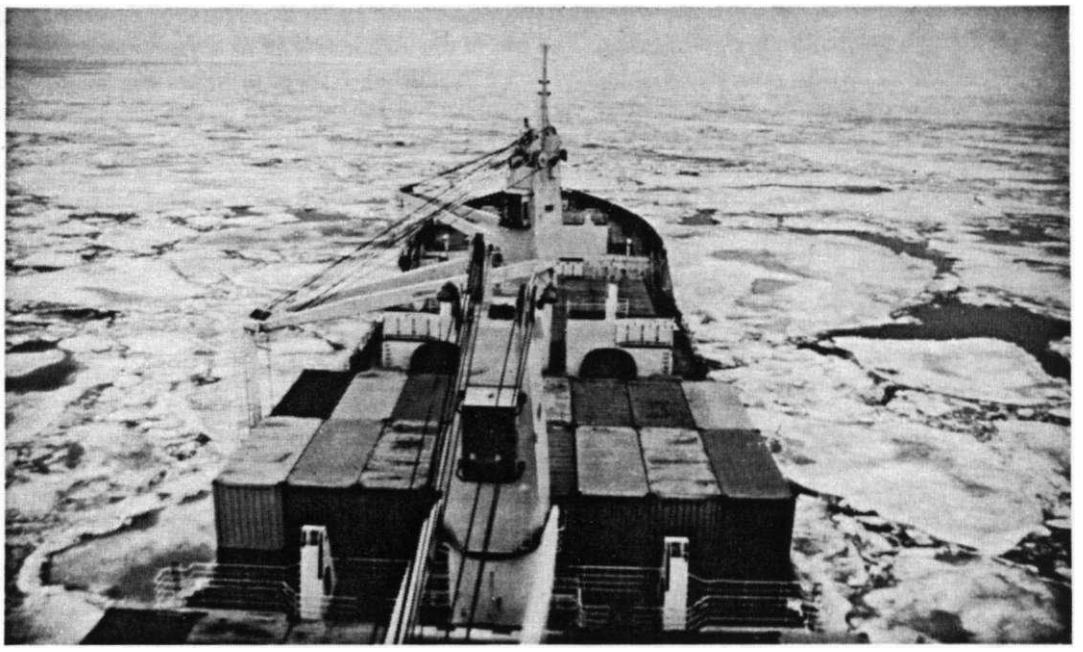

Figure 2: SA-15 type icebreaking cargo ship proceeding through ice north of Taymir Peninsula (northernmost part of Eurasia), September 1991. During this voyage the ship made eight-ten knots through ninety to 100% ice-covered waters without icebreaker escort. These ships can achieve thirteen-fourteen knots in open water on one engine, and 17.5 knots on two. They can make continuous progress through ice one metre thick.

Source: Courtesy of N. Kjerstad.

Obstacles to Navigation

Sea ice and water depths are the two main impediments to navigation. While the entire route is affected by ice for much of the year, in the summer there is melting due to the combined effects of milder temperatures and the influx of warmer water. The North Cape current, an extension of the Gulf Stream, affects water temperatures as far east as the Kara Sea, and the great Siberian rivers discharge large volumes of warmer water into coastal seas. Between late

June and mid-November parts of the route are ice-free, and conditions improve progressively between June and September. The whole system is open for a period in the summer, but all sections are not necessarily open simultaneously. Dates of break-up and freezing can vary widely and local winds are the principal influence on ice conditions in a given area. Sustained northerly winds can bring heavy ice from the polar pack onto the route.[2]

Captain Lawson Brigham (USCG) has observed that ice off Siberia is a mixture of fast (attached to the shore) first-year, and much denser multi-year, ice from the polar pack. Regional clusters, or massifs, occur off the coast every summer. These influence how easily traffic can move along the sea route.[3] With the current icebreaker fleet, regular through passages are possible between July and October, and have been made in November. For more than a decade, the western portion has been kept open year-round as far as the Yenisey River.

While the continental shelf off the Russian Arctic coast is relatively shallow, minimum depth in most straits exceeds twenty metres. Yet the two parallel straits between the Laptev and East Siberian Seas are both shallow and exclude passage by ships with conventional hulls larger than 20,000 deadweight tons (dwt), as well as by the largest, nuclear-powered icebreakers which draw eleven metres. Still, a cargo ship escorted by an icebreaker passed north of Novosibirskiye Ostrova in early June 1978, showing that the straits can be avoided in suitable ice conditions.[4]

It is at the eastern end that ice conditions are most restrictive to year-round navigation. In the East Siberian Sea the shallow continental shelf and weak ocean currents favour the formation of vast expanses of fast ice up to 250-500 kilometres off the coast. This area experiences the least summer melt of the Russian Arctic seas. Further east, in the Chukchi Sea, currents and prevailing winds compact drift ice against the coast in winter, creating extensive pressure ridges. In summer, onshore winds normally abate and navigable leads develop.[5] Ice conditions improve markedly as summer progresses. By September there is a good chance that most of the route can be sailed in open water.

Skies are generally overcast in the Arctic, and the summer is the cloudiest season. The precipitation season (July to September) coincides with the period when ice conditions are most favourable for navigation (July through October). The peak period for fog is June to September, with a maximum in August.[6]

Commercial Navigation in the Northeast Passage

The commercial potential of an Arctic sea route to and from Siberia was first promoted in the 1860s by a Russian entrepreneur who owned gold mines near the Yenisey. His efforts eventually attracted the attention of an enterprising British mariner, Captain Joseph Wiggins, who made a series of pioneering voyages from England **and** the continent to the Yenisey and Ob' rivers. There were sporadic ventures until **the** turn of the century which brought machinery, tea and other cargoes to Siberia in return for grain for Europe. During the Russo-Japanese War (1904-1905) the Russian government organized **a** large convoy of food ships to Siberia via the Kara Sea, as the Trans-Siberian Railway was fully loaded with war supplies.[7]

The next spurt of activity was between 1911 and 1916. By now the population of western Siberia was sufficiently large to provide **a** viable market and to generate exports. The government had become interested in improving navigation and was developing services, such as the Trans-Siberian Railway, which were available to move products imported by water within southern Siberia. A British-Norwegian company organized **a** series of trading voyages. An energetic young Norwegian, Jonas Lied, was **a** driving force. As well as importing machinery and other goods the syndicate started exporting Siberian butter, timber, flax, hemp, hides and bristles. Lied and others were eager to develop Siberian exports and they obtained timber rights

and constructed a modern sawmill on the Yenisey as first steps toward establishing a pulp mill. They also acquired fleets of river steamers, built a port at the mouth of the Yenisey to create an integrated ocean-river system, and established radio stations along the coast.[8]

With the coming of Communist rule development of the sea route was taken over by a government committee, "Komseverput," with a mandate to develop the Northern Sea Route and to transport goods between European Russia and the mouths of the Ob', Yenisey, Lena, and Kolyma. During the 1920s, the development pattern established by the British-Norwegian company a decade earlier continued. Komseverput shipped timber (which soon became the most important export) and grain to Europe, importing machinery and other goods. There was little domestic trade. Aids to navigation in the western Arctic were improved, ice reconnaissance by aircraft initiated (early efforts included flights by German zeppelins from the Kola Peninsula), and icebreakers used to assist Kara Sea convoys.[9]

Ten years later the emphasis changed to domestic trade, although timber exports continued. In the 1930s the focus on economic self-sufficiency through ambitious five-year plans resulted in a sustained drive to develop the Arctic's potential. A powerful new organization, Glavsevmorput (Chief Administration of the Northern Sea Route), was created in 1932. It had "money, skill, and enthusiasm,"[10] as well as responsibility for all aspects of northern development, including the sea route. It was headed by Otto Yul'yevich Schmidt, a dynamic mathematician and scientist, and a hands-on administrator who participated in annual icebreaking voyages. Jonas Lied, who met him, wrote that "he was a striking personality, a man of six foot three, with a long black beard and a perpetually intense expression on his countenance. It cannot be denied that he had vision, but he was always sure of himself as a great man."[11]

Longer voyages were achieved. Freight was first shipped from European Russia to the mouth of the Lena in 1933, and from Vladivostok to the mouth of the Kolyma in northeastern Siberia in 1935. Navigation aids and coastal radio services were extended. The first ice-strengthened freighters were acquired at the end of the 1930s.[12] A pioneering through passage without mishap was achieved in 1934. Icebreakers escorted the first through voyages by freighters in 1935 and by warships (two destroyers) the next year. The two main cargoes were timber from the Yenisey (mostly in British and Norwegian bottoms) and supplies from other parts of the USSR. In the late summer of 1937 a number of ships were caught in ice brought onto the coast from the central Arctic by strong winds. Twenty-six vessels, including icebreakers, spent the winter in the ice, and one sank. This was the era of the purges and punishment for economic failure. In the fall-out from the mass overwintering, Glavsevmorput was overhauled and its scope reduced to operating the Northern Sea Route. Otto Schmidt was dismissed in 1939 but escaped death, eventually becoming editor of the *Great Soviet Encyclopedia?*

During the war lend-lease vessels, including liberty ships handed over to the Russians, made 120 voyages with cargoes from the American west coast via the Bering Strait to northern ports. Information is scarce about these extraordinary voyages by relatively thin-skinned ships, the largest to use the sea route up to that time.[14]

From the early 1950s there were four decades of systematic and steady application of resources to the improvement of ocean and river transport. Navigation aids were further extended and modernized, ice-strengthened freighters acquired in large numbers, extensive research and surveys conducted, and synoptic services improved. The building of a large fleet of powerful icebreakers was a dramatic component of an integrated development plan. Both cargo carried and the length of the navigation season expanded steadily (see table 1). While the former roughly doubled in each decade between 1950 and 1970, the expansion of the season was perhaps even more impressive, rising from less than four months in 1950 to year-round in the west by 1980.

Table 1
Volume **of** Cargo and Length **of** Voyages on the Northern Sea Route, **1935-1987**

Year	Cargo in Thousands **of** Tons	Length **of** Season
1935	246	93 days
1940	289	93 days
1950	503	122 days
1960	1013	128 days
1970	2400	140-150 days
1980	4951	year round for western section
1987	6579	year round for western section

Source: Derived from figures presented at the Conference of Nordic Navigation Institute, Tromsø, Norway, March, 1992.

Dr. Terence Armstrong of the Scott Polar Institute, who has followed developments for more than forty years, has described the five main elements in annual freighting operations as: (i) two-way traffic between Kara Sea ports and Murmansk; (ii) from Vladivostok and Murmansk to the northeast coast; (iii) from both Murmansk and Vladivostok to the mouth of the Lena; (iv) annual re-supply of military, scientific, and commercial stations on the Arctic coast and offshore islands; and (v) through voyages from the Atlantic to the Pacific. The first passages of the season and winter voyages across the Kara Sea are made in convoys with icebreaker escorts. Cargo ships are towed by icebreakers when the lead cut by the icebreaker fills in rapidly. For through voyages icebreakers are used to assist in congested areas.[15]

The Kara Sea. In recent years there have been three traffic streams: shipments between Murmansk and Dudinka, timber exports from Igarka on the Yenisey, and support of the west Siberian oil and gas industries.[16] There has been virtually year-round navigation for more than a decade between Murmansk and Dudinka, 200 kilometres up the Yenisey at the end of the only railway to the major mining centre of Norilsk. Return voyages from Dudinka haul nickel ore brought by rail from Norilsk for smelters near Murmansk. Freighters also go 675 kilometres up the Yenisey to Igarka, for about five months in the summer to load timber for export. This is a significant trade, accounting for fourteen percent of all lumber exports in recent years.[17]

The spring break-up is dramatic. High water levels and ice can cause damage and flooding in river ports. Even Dudinka, the sea route's busiest port, is flooded and evacuated for two weeks at the end of May. In recent years ice breakwaters have reduced damage to harbour installations and ships.[18] In the early postwar years foreign ships were still important in the Yenisey timber trade. Russian vessels took over in the mid-1950s and a Greek ship in 1962 was reportedly the last foreign timber carrier to call at Igarka.[19]

Shipments for the west Siberian oil and gas industries have also involved year-round navigation, with cargoes discharged directly onto the ice on the west side of the Yamal peninsula in winter and in the Ob' estuary in the summer. The requirement to supply

equipment for the oil and gas fields was one of the spurs to winter navigation, but now that development of the fields has declined these shipments have tapered off.[20]

The Northeast Coast. Deep-sea ships reach Pevek, the Kolyma, and Mys Schmidta between late June (there have been experimental calls as early as May) and October. Freight brought down the Lena for coastal points is also trans-shipped in Pevek. Both ocean and river deliveries are important in supplying the Northeast, with around sixty percent of freight for the Igarka and Kolyma rivers coming directly by sea and the rest down the Lena. Pevek is busy during the navigation season. Three large vessels can be handled simultaneously and there are generally between ten and twenty in the roadstead awaiting berths.[21]

The Lena Mouth. Cargoes are transferred between ocean-going and river freighters in Tiksi. Supplies for the eastern Arctic brought down the Lena in river vessels are trans-shipped here or in Pevek for onward shipment. Timber began to be shipped directly to Japan from Tiksi in 1984. By 1991 these exports were virtually the same (700,000 tons) as from Igarka, the traditional wood port on the Yenisey.[22]

Through Voyages. While there have been occasional passages between European and Far Eastern Russian ports via the north, it is the Trans-Siberian Railway, rather than the seasonal Northern Sea Route, which has remained the major artery for such through traffic. In recent years it has carried five times as much European freight to Japan as the sea route. The sea route has largely supplied the Arctic coast and hauled out Siberian ore and timber. But in the last two decades it has also been used by Russian freighters trading to Japan, China, and the west coast of Canada, as well as for through voyages between Europe and Asia. These voyages have all been made by Russian vessels; indeed, only two foreign surface ships have made through passages in this century—the German commerce raider *Komet* in 1940 and the French polar supply vessel *L'Astrolabe* in 1991. The latter venture had several sponsors: a French shipping company and scientific association, and a Japanese media firm. An excursion was undertaken to a former G U L A G camp when the ship called at Igarka - a reminder of the past and an illustration of recent sweeping political changes.[23]

In the past ten years voyages between the northern coast and Japan and Canada have demonstrated how modern ice-strengthened vessels and contemporary ice forecasting have extended the navigation season. It was in 1984 that one of the versatile Finnish-built SA-15 type icebreaking freighters made the first of several shipments of pipes from Japan to the Ob' estuary via the northern route. Ships plying the sea route have been visiting Vancouver since 1979. Indeed, in 1986 three made homeward passages with grain after the end of the normal navigation season. The last cleared Vancouver on 12 November, and with minimum assistance reached Arkhangelsk on 2 December. Grain shipments from Vancouver to Arctic ports continue. At the time of writing the latest such sailing was by the *Ivan Bogin,* which cleared Vancouver on 27 August 1992 for Murmansk.[24]

The first offer to open the Northern Sea Route to international shipping was made early in 1967, when it was argued that it could save thirteen days between Hamburg and Yokohama as opposed to the conventional link via Suez. Soviet cargo carriers made three demonstration voyages from north European ports and Japan. Unforeseen events then intervened. The Suez Canal was closed later in 1967 by war and the invitation for international shipping on the sea route was quietly withdrawn. The Soviets apparently did not wish to offend friendly Arab governments by offering an alternative to the Suez Canal. The Canal was to remain blocked for eight years and international shipping adjusted smoothly to using the Cape route.[25]

Twenty years later, the USSR was shifting its economic enterprises to a self-financing system. In 1989 shipments between western Europe and Japan were made in a new generation

of 20,000-dwt freighters, one on charter to a German firm. The following year space was offered to foreign shippers in eight SA-15s trading between Europe and Japan via the Arctic. In 1991 there were fifteen such voyages with 210,000 tons of cargo.[26]

The Northern Sea Route was again declared open to foreign shipping in 1991. Interestingly, the initial regulations, published as a notice to mariners, were issued by the Ministry of Defence. They specified compulsory pilotage and icebreaker service, and charts and sailing directions were made available. In a procedure similar to that established by the Canadian Arctic Waters Pollution Prevention Act, ships have to meet standards prescribed by the state and permits are issued. Igarka was opened to foreign ships.[27] Further regulations and schedules of fees were to be issued in 1992.

Scale of Shipping Effort in Recent Years

Exploitation of the Northern Sea Route has until now largely involved coastal services. The route acts as a northern east-west tier in an overall transport system for Siberia. The southern tier is the Trans-Siberian Railway, and north-south links are provided seasonally by the rivers, rail in western Siberia, some roads, and air transport. Both operations and organisation have changed over the years. The once-powerful Glavsevmorput, under whose auspices commercial navigation beyond the Kara Sea was launched in the 1930s, was gradually dismantled. By 1992 operations were being run by semi-independent shipping companies and agencies under the Ministry of the Merchant Fleet. There is an Administration of the Northern Sea Route in the ministry, but this is a regulatory rather than an operating agency.[28]

Cargo ships and icebreakers are operated by the Murmansk and Far East Shipping Companies (FESCO), which are becoming more autonomous as Russia moves toward a market economy. Fourteen of the eighteen major icebreakers, including all the nuclears and their infrastructure, are under the Murmansk Shipping Company. The route is divided between the two companies. There are two "Operations Headquarters," at Dikson for the western portion under the Murmansk Shipping Company, and at Pevek under FESCO for the eastern segment. These headquarters manage shipping operations, pilotage, safety, and search and rescue, as well as issue ice and weather forecasts and handle pollution problems.[29]

Navigation aids, radio stations, "hydrometeorological services" (weather and ice forecasting) and fifteen polar hydrographie vessels are the responsibility of a separate agency in the Ministry of the Merchant Fleet. There is a hyperbolic navigation system and some 2500 navigation aids, radio and light beacons in the Arctic. Considerable experience has been gained in ice forecasting, both for voyage planning and to advise ships about optimum ice routes. An undisclosed number of early warning military radar stations and other defence installations are scattered along the route. Their numbers alone complicate their supply and support by sea, along with that of radio stations and other installations.[30]

Cargo peaked in 1987 at 6.6 million tons and has since declined as the centrally-planned and controlled economy has unravelled. It was *55* million tons in 1990 and 4.9 million in 1991, when there were more than nine hundred voyages by some two hundred ships.[31] Almost half the traffic is between Murmansk and Norilsk, via Dudinka. Overall outward shipments of raw materials (primarily nickel ore from Norilsk, shipped via Dudinka, and timber) are almost balanced by inbound trade from other parts of the country.[32] As a matter of comparison, annual shipments by water in the Canadian Arctic totalled about 360,000 tonnes and traffic on the St. Lawrence Seaway reached thirty-six million tonnes in 1991.[33]

There are 254 cargo ships operating in the Russian Arctic, 141 of which are ice-class.[34] Longer operating seasons were made possible some fifteen years ago by the simultaneous

introduction of more capable freighters and more powerful icebreakers. Larger cargo ships, better able to operate in ice, were introduced in batches. The main groups were twenty SA-15 type 20,000-dwt versatile combination ro-ro, container, and bulk cargo carriers, and twenty-seven 20,000-dwt bulk carriers, heavily used in the year-round ore trade from Dudinka.[33]

The SA-15s, with 21,000 shaft horsepower (shp), have been described as "quasi-icebreakers" and are capable of forcing their way through ice one metre thick.[36] Another innovation was the use of lighter-carrying freighters ("LASH," or "lighter aboard ship vessels"). The lighters can enter shallow waters and eliminate the need for large harbour facilities. An icebreaking LASH carrier traded to the eastern Arctic starting in 1987, and a 40,000-shp, nuclear-powered, ice-strengthened LASH ship, *Sevmorput,* was introduced in 1989. By 1990 thirty percent of the cargoes delivered to Tiksi and Mys Schmidta were carried in LASH ships. However, there have apparently been difficulties in loading and unloading lighters on open and exposed roadsteads and it is reported that *Sevmorput* has not been cost-effective.[37]

Figure 3: SA-15 type icebreaking ship *Kola* in Pevek roadstead, September 1991. These versatile double-hull ships can handle ro-ro, container and bulk cargoes. (Ro-ro stern ramp visible on starboard quarter above stern towing notch for taking other ships in tow in ice.) They have an icebreaker bow, thirty-six millimetre icebelt plating, and an air bubble system below the light-load line.

Source: Courtesy of N. Kjerstad.

The Russians introduced 3000-ton "river-sea" freighters and tankers for inland and short-sea voyages at the start of the 1970s. These relatively shallow-draught ships have been used increasingly between northern coastal ports and points deep in the interior, as well as to bring cargoes from far inside European Russia and central Asia. Unlike in the Beaufort Sea and the Mackenzie River system, tugs towing large barges have not been used extensively in open waters, and the operation of pusher tugs has been limited.

Figure 4: Riverine infrastructure: Lonsk (Yakutia) on the Lena River, 1989. The vessels alongside on the right are similar to the versatile "river-sea" type introduced some twenty years ago. They have traded all over Russia and have voyaged to the UK and the Mediterranean.

Source: Courtesy of Dr. R. North.

Figure 5: North-south arteries connect the Northern Sea Route with the interior: tug and barges on the Lena, 1989. Note the containers on the first barge.

Source: Courtesy of Dr. R. North.

Figure 6: Nuclear-powered icebreaker *Vaygach* on the Northern Sea Route, September 1991. This is one of two 44,000-shp vessels built in Helsinki and fitted with nuclear reactors in Leningrad. Termed "shallow draught" icebreakers, they draw 8.1 metres, which makes them suited for working in river estuaries.

Source: Courtesy of N. Kjerstad.

It is the sustained development of the icebreaker fleet which above all has facilitated the steady growth of Arctic navigation over the past thirty years. The first major post-war improvements were five 22,000-shp diesel-electric icebreakers built in Finland between 1959 and 1969. At the same time the first nuclear-powered icebreaker, *Lenin* (44,000 shp) entered service in 1960. In the 1970s, five more powerful vessels joined the fleet-two 75,000-shp nuclear-powered and three 36,000-shp diesel-electric ships. Four shallow-draught 22,000-shp icebreakers were also introduced to work in rivers and their estuaries. One of these, *Kapitan Khlebnikov,* carried passengers through the Canadian Arctic in 1992.[39]*

Three dramatic events immediately demonstrated the much improved capabilities of the new additions. First, there was a voyage to the North Pole by one of the 75,000-shp ships, *Artika,* in August 1977. The second was a passage along the "high-latitude route" north of the Arctic islands in May-June 1978 by her sister icebreaker, *Sibir,* and a freighter. Finally, there was the opening of year-round navigation to Dudinka from Murmansk in the same year.[39]

In the 1980s, two improved 75,000-shp and two 44,000-shp shallow-draught icebreakers, all nuclear-powered, were introduced. An additional 75,000-shp vessel, *Yamaz,* was delivered late in 1992 and a sistership will enter service in 1993. There are therefore seven nuclear-powered icebreakers in service, with one more being built. *Lenin* was retired from service in 1989 after operating, with undisclosed interruptions, for twenty-nine years. It has been estimated that the service life of the 75,000-shp icebreakers will be twenty-five years; they will thus be due for replacement at the turn of the century.[40] It has also been suggested that the entire sea route could be kept open year-round with a 150,000-shp super icebreaker. However, Alexander

Arikaincn, a leading Russian researcher, has also pointed out that in future less expensive solutions may be found to Arctic transport problems.[41] Some of the oldest diesel-electric icebreakers will be retired over the next five years. In any case the size of icebreaker fleets that will be supported in a market economy is uncertain. Icebreakers are now earning foreign currencies in the summer as polar cruise ships and there have been suggestions that some tonnage is surplus even to winter requirements.

The Role of Siberian Rivers in Moving Freight to and from the Arctic Coast

The great Siberian rivers move supplies to the Arctic coast from railway ports in the south and transport goods brought by sea into the interior. The total freight carried on the Ob'-Irtysh, Yenisey, and Lena systems (much of it between river ports) is roughly eleven times that transported on the sea route. In recent years rivers have carried sixty-five percent of waterborne freight in Siberia, and ninety-two percent of freight delivered beyond the Arctic circle.[42]

Figure 7: Rail-river interface: Osetrovo on the Lena, 2700 kilometres from the sea. The Lena functions as part of an integrated system of which the Northern Sea Route is in the northern tier.

Source: Courtesy of Dr. R. North.

The length of the river navigation season depends on ice conditions and water levels. In order to extend the season, shallow-draught icebreakers have increasingly been used near river mouths over the last twenty years. The Ob' and Yenisey mouths are ice-free for roughly 120 days, while in the east the period is between seventy-six and ninety-three days. In the south at the railway ports (a full 2700 kilometres from the coast in the case of the Lena) the mean ice-free season is between 160 and 180 days. The first convoys leave the south as the ice breakup starts. The actual navigable period, however, depends on water depths. In some years there are apparently difficulties even on the Lena due to low water. Some tributaries of all the major rivers are deep enough for traffic only during the spring run-off, and their navigable seasons can be as short as ten to thirty days. In such cases good organization is needed to assemble convoys to deliver their annual shipments as soon as these rivers open.[43]

Sea Routes from Rotterdam to the Far East or the west coast of North America

.....— via the Northern Sea Route
— via Panama or Suez

Figure 8: Sea Routes from Rotterdam to the Far East or the West Coast of North America.

Source: Drawn by Christine EarL Carleton University.

Figure 9: Moving raw materials by water: timber raft on the Lena near Yakutsk in 1989. Note the width of the river in this location, some 1400 kilometres from the sea. Timber floated down the Lena is loaded for Japan at Tiksi near the river mouth.

Source: Courtesy of Dr. R. North.

Potential Development of the Sea Route for Through Traffic Between the Atlantic and the Pacific

The actual route used depends on ice conditions. The distance between the straits linking the Barents and Kara Seas (at the western end of the sea route) and the Bering Sea in the east is 2200 nautical miles (n.m.) along the "high-latitude" route north of the island groups, and 2900 n.m. along the coast. Ports in northern Europe and the north Pacific are closer via this route than by the Suez Canal (see figure 8). Indeed, the distance between Rotterdam and Yokohama is thirty-five percent shorter by the sea route (thirty-six percent for Hamburg) than via Suez. Figure 8 also shows that distances from Rotterdam or Hamburg to southern California are roughly the same by both the sea route and the Panama Canal. Vancouver and Seattle are closer via the Russian Arctic.[44]

In the wake of political changes, there is a new willingness to discuss the feasibility of expanding through traffic. Given the expensive infrastructure in place, such as icebreakers, navigation aids, and specialized ice-strengthened ships, development of the sea route for international trade is obviously in Russia's commercial interest. Yet it is obvious that many factors will determine whether it can attract increased transit trade. They include not only shorter distances between Europe, North America, and Asia in comparison with other routes, which could translate into cost savings, but also the length of the shipping season and reliability

of service; incremental costs for insurance, pilotage and icebreaking; whether vessels are suitable for the goods requiring shipment; and the development of alternate routes. In the longer term, new ship designs and improved techniques for ice navigation could become important. So too could the question of whether foreign ships will be allowed.

While shorter voyages could mean direct cost reductions, these would have to be set against the expenses of Arctic navigation—extra costs for ice-strengthened vessels, insurance and maintenance, and icebreaking and pilotage. The International Northern Sea Route Project, which involves research institutions in Norway, Russia, and several other countries, has done preliminary cost comparisons for an SA-15 20,000-dwt cargo ship using the sea route as opposed to Suez and Panama. Higher capital costs for ice-strengthened vessels, as well as icebreaking fees and insurance costs, were weighed against the costs of longer voyages by alternate routes. It was found that passages between Rotterdam (and European ports further north) and Japan, as well as between Rotterdam and Prince Rupert, would be commercially "marginally interesting" between July and October. The advantage of voyages to Vancouver and Seattle would be marginal. Other American west coast ports and the main Chinese ports, including Hong Kong, would be more profitably reached by alternate routes. For the rest of the year, overall passage speeds on the sea route were found to be too slow, even given the advantage of shorter distances. In order to be competitive year-round larger vessels capable of higher transit speeds would be needed.

Passage speed and the length of the navigation season were pinpointed as the two key factors in determining whether voyages would be profitable.[45] There are many variables behind these factors. The lengths of actual routes can vary, depending on ice conditions as the navigation season advances, these can deviate by as much as 2100-3400 n.m. The Arctic and Antarctic Research Institute of St. Petersburg, using data collected over twenty years, determined that there is a seventy-eighty percent probability that an SA-15 can navigate the sea route without icebreaker assistance in September. Indeed, the probability of ships of the two highest ice classifications making through passages without icebreakers for two-three months is sixty-seventy percent.[46]*

Current Interest in an International Route

A new political willingness in Russia to consider foreign involvement was signalled by the then-General Secretary, M. Gorbachev, in a speech at Murmansk in October 1987.[47] President Yeltsin confirmed Russian interest in international cooperation on the sea route late in 1991.[48] In the fall of 1988, the Russians had approached the Frijtof Nansen Institute in Norway about cooperating in research on possible international use of the northern route. Eventually, a collaborative pilot project looked at several factors which have a bearing on development-environmental, commercial, political, and legal. A detailed five-year study, estimated to cost US $11 million and to involve institutions and organisations in Russia, Norway, the UK, the US, and Japan, was proposed and funding is being sought.[49]

The advantages of an Arctic shipping route are also being promoted by groups in Alaska and Tacoma, and by Captain V. Mikhailichenko of the Murmansk Shipping Company who has become a tireless and frequently-quoted spokesman. In 1990, the Governor of Alaska convened a conference of Arctic states which established the "Northern Forum" to provide for regular meetings of regional leaders. It has publicized a futuristic "Arctic Great Circle Trade Route"—the shortest passage directly across the Arctic Ocean, rather than along the Siberian coast—to further reduce distances between Europe and the north Pacific. In November 1991 a permanent "Northern Forum" secretariat was established in Anchorage, with promotion of the

sea route between Alaska and Northern Europe to market Alaskan products as a priority goal.[50] It is hoped to organize test shipments during the 1993 navigation season. The port of Prince Rupert is apparently interested in the success of this venture.[51]

There is intense interest in developing offshore oil resources in the Barents Sea, and in particular in its southeastern section, known as the Pechora Sea. The Russians do not have ice-breaking tankers like *M.V. Arctic* and ships based on this design could prove an attractive alternative to transporting oil out by pipeline.[52] There could also be opportunities to sell the technology of the ice navigation radars fitted in the *Arctic* and other Canadian ice surveillance systems for use on the sea route.

Two other developments could point the way to the future. The sea route was used in shipping prefabricated buildings from the Northwest Territories to Yakutia in August 1992. They went from Vancouver to Tiksi in an ice-strengthened Russian freighter, and then up the Lena in a small vessel.[53] Could this be the precursor to further shipments between Pacific ports and northeastern Siberia? Finally, London underwriters are discussing the insurance premiums that would be appropriate for ships navigating the sea route.[54]

The Future

Annual cargo traffic between northern Europe and the Far East is currently about thirty **million** tonnes. Just over one million is carried on the Trans-Siberian Railway, and 216,000 on the Northern Sea Route. Optimistic forecasts predict that the volume of world trade will double over the next two decades. Visionaries are thinking of increasing the use of the Arctic route between Europe and Asia and capturing new traffic between Europe and North America. They are also looking at the potential offered by new ship designs (possibly submersibles) and improved icebreaker technology. Another long-term consideration is how global warming will affect ice conditions.[55]

Several factors will influence commercial viability. These include the availability of suitable ships, icebreakers, and other infrastructure, and trends on competing routes. A substantial fleet of powerful Russian icebreakers and ice-capable cargo ships and a pool of experienced polar mariners already exist. The level of domestic and foreign resources to be applied to Arctic navigation in the emerging Russian market economy remains to be seen.

Economies of scale have driven development trends in world shipping over the past fifty years. Projections to the end of the century are for further rationalization in container handling. There will be an emphasis on reducing costs in ports through new loading techniques and it is predicted that dry bulk cargoes will increasingly be shipped in larger vessels.[56] How these trends will influence the economic future of the northern route will depend on the niche which could be captured in projected traffic flows to and from Europe.

The obvious obstacles to greater commercial use of the sea route in the immediate future remain seasonality and the requirement for specialized ships. The navigation season in the east is only four (in good years, five) months. Over time new ship designs and further improvements in navigation systems and synoptic services could alter the commercial equation.

During this century commercial use of the Northeast Passage has become well established. Thus far shipping has consisted largely of domestic traffic along the northern coast. The development of a viable navigation route by the Russians has been achieved through a lengthy and sustained effort. Will this now lead to regular international use of the Northern Sea Route for both transits and trade with Siberia and north European Russia? This question could become one of the most interesting in world-wide trade at the turn of the century and beyond.

NOTES

* Jan Drent is a retired Commodore living in Victoria. He has a particular interest in developments in Russia. He acknowledges with thanks the photographs supplied by Dr. R North and Mr. N. Kjeistad. Dr. North, of the University of British Columbia, has long studied and observed the Siberian transportation system. Mr. Kjeistad, of the More and Ramsdal College of Marine Studies in Ålesund, Norway, has made voyages in Russian ships in the Kara Sea. In 1991 he made a voyage in an SA-15 from Europe to the Far East via the sea route and evaluated coverage by GPS. Additional thanks go to Christine Earl of Carleton University for the maps.

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12. Armstrong, *The Northern Sea Route,* 32-33, 75.

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14. Armstrong, *The Northern Sea Route,* 49.

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26. *Polar Record,* XXVI (1990), 128; *Polar Record,* XXVII (1991), 137; Granberg, "The Northern Sea Route," 8.

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28. A. Arikaincn, "Management of the Northern Sea Route: Stages and Problems of Development," in Brigham (éd.), *The Soviet Maritime Arctic,* 141; *Polar Record,* XXVII (1991), 137.

29. Arikainen, "Management," 147; *NSR Pilot Project Summaries,* 6.

30. Arikainen, "Management," 143; *Soviet Shipping,* No. 2 (1989), 36; W. Ostreng, The Northern Sea Route: A New Era in Soviet Policy?" *Ocean Development and International Law,* XXII (1991), 281; *Northern News,* No. 9 (September 1991), 2; A Kazimorov, "Nefteproduktov vartikiskie punkti," *MorskoyFlot,* No. 9 (1990), 6.

31. In 1990 252 vessels made 886 transits. *Lloyd's List,* 20 November 1992.

32. Granberg, The Northern Sea Route," 8.

33. Figures for the Arctic are from Captain D. Johns of the Canadian Coastguard. Annual shipments by freighters into the eastern Canadian Arctic amount to roughly 110,000 tonnes, and 200,000 tonnes of raw materials are exported by sea. Some 50,000 tonnes are shipped into the western Arctic in barges from down the Mackenzie River. Tonnage on the St. Lawrence is taken from *Globe and Mail,* 30 March 1992.

34. Granberg, The Northern Sea Route," 8.

35. *Polar Record,* XXII (1984), 175.

36. Ostreng, The Northern Sea Route," 265.

37. *Polar Record,* XXVI (1990), 127; *Soviet Shipping,* No. 3 (1991), 12.

38. Brigham, "Soviet Arctic Marine Transportation," 127.

39. A. Arikainen, "Arctic Shipping: Strategy of Development," *Soviet Shipping,* No. 4 (1987), 21.

40. Matyushenko, The Northern Sea Route," 58; V. Demianchenko, *et al.,* "Nuclear-Powered Icebreakers of the Murmansk Shipping Company," *Soviet Shipping,* No. 2 (1991), 22.

41. Demianchenko, *et al.,* "Nuclear-Powered Icebreakers," 23; Arikainen, "Arctic Shipping," 23.

42. Armstrong reported total freight carried in 1987 on the Ob'-Irtysh as thirty million tons, on the Yenisey as twenty-seven million tons *(Polar Record,* XXIV [1988], 129-130), and on the Lena in 1983 as thirteen million tons *(ibid.,* XXII [1984], 176). The total is thus roughly seventy million tons, compared to six million for the sea route. See also North, "Siberian Rivers," 177.

43. North, "Siberian Rivers," 180.

44. By comparison, the length of the St. Lawrence Seaway is roughly 1560 n.m.; Rotterdam-Yokohama is 6940 n.m. by the sea route and 10,713 n.m. via Suez; Hamburg-Yokohama is 6920 n.m. by the NSR and 11,073 via Suez.

45. T. Wergeland, The Northern Sea Route-Rosy Prospects for Commercial Shipping?" *International Challenges,* XII, No. 1 (1992), 43; "Pilot Project II: Commercial Shipping and the NSR" *NSR Pilot Project Summaries,* 8-10.

46. A. Buzuev, "Natural Factors and their Influence on Sailing on the Northern Sea Route," *International Challenges,* XH, No. 1 (1992), 84.

47. Brigham (ed.), *The Soviet Maritime Arctic,* 309.

48. Granberg, The Northern Sea Route," 10.

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51. Letter from David Orr, Northern Sea Route Project Manager, Alaska, 9 March 1992.

52. *Financial Post,* 23 March 1992; Discussion with Mr. A. Snied of CanArctic, 31 March 1992.

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56. J. Eyre, The Containerships of 1999," *Maritime Policy and Management,* XVI, No. 2 (1989), 133-145; A. Ariel, "Delphi Forecast of the Dry Bulk Shipping Industry in the Year 2000," *ibid.,* XVI, No. 4 (1989), 317.