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# Nuclear Icebreakers Clear the Way for Arctic Oil

By Alexander Panin

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The atomic icebreaker Yamal assisting in the dismantling of a Russian North Pole research station in 2009.

While the voyage of the steamship Chelyuskin was one of the first attempts to sail the length of the Northern Sea Route in 1933, French catamaran Babouchka's trip in 2013 was probably the most reckless.

The Chelyuskin was a conventional ship, as opposed to the Babouchka, a peculiar hybrid catamaran, capable of sailing in the water and rolling over the ice, powered only by the wind and human stamina.

Despite their different origins, both ships had the same fate — they were gripped by ice and had to be rescued. The only difference, besides an 80-year time lapse, was that the Chelyuskin's crew spent months on the ice and was eventually evacuated by air, while the French sailors were saved within days by the Russian icebreaker Admiral Makarov.

The importance of icebreakers' work leading ships to safety through the freezing waters of the Northern Sea Route rises even more as, despite the dangers, the exploration work on hydrocarbons in Russia's northern coastal shelf gathers pace.

In April, state-owned Gazprom shipped the first 70,000 tons of oil from the Prirazlomnaya oil field in the Pechora Sea.

And within the next three years there are plans to start shipping liquefied natural gas from the Yamal Peninsula under an international project called Yamal LNG.

Ice is a major threat to vessels shipping out hydrocarbons or those bringing in supplies. It is also a barrier to commercial transit navigation from China to Europe.

## The Frozen Seaway

The Northern Sea Route stretches from the Kara Sea to the South Siberian Sea, and links with the Bering Strait between Asia and North America. When connected with the ice-free waters to the south, it becomes the shortest seaway between European ports and China.

Because of harsh conditions, navigation in these waters is possible for only half of the year. And even then ships may not be safe without an icebreaker escort. To make year-round navigation possible, more ice-class ships are needed as conditions do not seem to be improving drastically.

Despite talk of global warming, the polar ice seems to be showing signs of coming back in strength. European satellite Cryosat surveys of the Arctic Rim revealed that over last year the ice-covered area grew by 50 percent from 2012. The satellite, launched in 2010 to study the Arctic ice, had since then been reporting receding ice coverage in the region. Just a few years ago scientists predicted all of the Arctic ice would melt before the end of 2013. Now they are postponing their forecasts for another decade.

Ice is a hazard for shipping not only on the Northern Sea Route, but in the neighboring Baltic Sea waters, which are considered milder in terms of ice coverage.

Two years ago the nuclear-powered icebreaker Vaigach set a record rescuing 250 ships from the ice in the Baltic over a period of 1 1/2 months.

## Built For A Purpose

Ships have to be specially designed and equipped to sail through ice. A conventional icebreaker uses the energy from its engines to slide over the ice and crush it with its own weight.

An icebreaker has to combine three characteristics to be successful and survive in inhospitable waters. First, a reinforced body prevents the ship from being gripped and crushed by ice from the sides. Second, a specially designed hull lets it roll over thick ice. And third, it needs a hugely powerful engine to keep it going in even the worst of conditions.

"Today, the most powerful thrust is achieved only with the use of nuclear energy," said Vyacheslav Ruksha, the head of Atomflot, a subsidiary of state-owned nuclear energy

corporation Rosatom that manages nuclear icebreakers.

Russia, with the biggest icebreaker fleet in the world, has an advantage no other country possesses. It has more than 30 icebreakers of different classes, six of which run on nuclear power and are strong enough to move through ice more than 2 meters thick — which they have to navigate when escorting ships in the Kara Sea.

Another advantage of nuclear power is that these ships have a very high level of autonomy. In the Arctic, where there may be no ports for hundreds of nautical miles around and no means to refuel, this is crucial.

"Even the most advanced diesel-powered icebreakers consume 350 to 400 tons of fuel a day," Ruksha said. "If you want such a ship to sail autonomously for two months, for instance, you can calculate how much fuel would first have to be stored somewhere and then blown as exhaust into the sea."

Russia's newest nuclear icebreaker — the 50 Let Pobedy, or 50 Years of Victory — is currently the biggest and most powerful in the world. Almost 160 meters long and 30 meters wide, its two nuclear-powered engines are capable of jointly producing 55 megawatts of power — enough to cover the electricity needs of a small city. The only existing icebreaker of a similar class in the world is the U.S. diesel-electric and gas-powered Polar Star, built in 1976.

### New Generation of Ice Warriors

However, while Russia's fleet is impressive, it is aging. Most of its most powerful ships were built during the Soviet era and they are now more than 20 years old, and many of the oldest have had their service lives extended. If not for new shipbuilding projects, the "50 Let Pobedy," built in 2007, would be the only Russian nuclear icebreaker by 2021.

Knowing this, Atomflot has in recent years launched a multi-billion dollar program to build new — and even more powerful — icebreakers.

In November 2013, United Shipbuilding Company, or USC, a state-owned ship building giant, began work on what is to become the biggest and most powerful icebreaker in the world. Called Project 22220 and named Arctica, it will be as tall as an 18-story apartment building and 173 meters long. With its nuclear engines giving out 60 megawatts of power, it will be able to tackle ice up to three meters thick. The ship is scheduled to sail in 2017.

Atomflot plans to order two more ships of this class, but has not yet agreed on a price with the USC. The estimated cost of building three nuclear powered icebreakers is about $3 billion, Ruksha said.

In 2011, USC also started building a smaller diesel-electric icebreaker, slated for completion in 2015.

Finland has also been actively purchasing icebreakers.

At the beginning of this year, a joint venture between USC and Arctech Helsinki Shipyard, a Finnish affiliate of South Korean heavy equipment holding company STX, won a tender to build an icebreaker for Finnish Transport Agency. The vessel, capable of passing through ice

up to 1.6 meters thick, is planned to be delivered by the end of 2016.

Canada, the U.S., Germany and Norway also have plans to build new icebreakers but no concrete dates for starting construction.

China also has an icebreaker building program. One of its new ships, the White Dragon, was recently deployed on ice patrol in the Antarctic.

### Icy Water Logistics

The Northern Sea Route cuts about half the distance off the conventional route from Asian ports to Europe through the Suez Canal.

One of the countries most interested in the seaway is China, which has seen its import and export volumes boom in recent decades.

Last summer, Russian icebreakers led the first Chinese commercial ship through the Northern Sea Route on its way to the Dutch port of Rotterdam. It made its destination even faster than planned, and almost two weeks earlier than it would have if it had gone via the traditional route through the Suez Canal.

According to the American Bureau of Shipping, 71 ships sailed through the Northern Sea Route in 2013, 54 percent more than in 2012.

But even though the transit potential of the seaway is growing, it will still be nowhere near the volumes that go through the Suez Canal, shipping experts said.

The Suez handled about 900 million tons of cargo in 2013, and only 5 million to 10 million tons of transit shipping volumes are expected to come to the northern route in the coming years.

“Cargo volumes do not originate close enough to the route,” said Henrik Falck, chairman of the board of Norwegian Tschudi Shipping Company.

Most trans-continental container routes pass between the ports of China, Australia, North and South America, he said, which is too far south of the Northern Sea Route.

Instead, cargo for the Northern route should originate in the north — in Europe and in Russia itself, he said. And the existing potential of this region means icebreakers will not remain idle in the dockyard.

Atomflot’s Ruksha agreed. The Arctic-class vessels were originally built to pave way for caravans shipping supplies for Norilsk Nickel and to export its products, as the mining giant has no other means of transportation, he said.

“Now our task is to help Yamal LNG vessels go safe through the ice-covered waters,” he said, adding that when fully developed the project will increase annual cargo volumes in the Northern Sea Route by over 17 million tons.

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