



11-12 October 2012, Riga

**Riga Technical University
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Dedicated to the 150th Anniversary and
The 1st Congress of World Engineers and
Riga Polytechnical Institute / RTU Alumni

DIGEST

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Analysis of Northern Sea Route Role in Merchant Shipping

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Keywords – Ice melting, transoceanic voyages, financial benefits, advantages, disadvantages, shippers, ship-owners, seafarers, cargo flow, Baltic seafarer competitiveness.

I. INTRODUCTION

Article analyzes possibility to use *Northern Sea Route* as a viable means to shorten long transoceanic voyages in the Northern Hemisphere due to ice melting, its advantages, disadvantages and accessibility.

II. ADVANTAGES IN NSR USE

With every year the Northern Polar waters are becoming more accessible to shipping due to the reduction of Arctic ice. Polar waters' availability, as well as polar global resources (gas, oil, and iron ore) stimulates a significant growth of shipping cargoes, including transoceanic. Shipping in the Arctic Ocean trade takes two main shipping routes - the Northwest Passage along the Canadian coast and the Northern Sea Route (*NSR*) (*Северно морской путь*) along the Russian coast. *NSR* that stretches from Murmansk to Bering Strait can reduce distance between European and Chinese Northern ports by 10 – 30%. The most beneficiaries are European ports, E Asia ports North of Hong Kong and North America ports N from Portland. These regions include 10 of the biggest world ports.

From all vessels' costs – capital costs (~40% of all costs), voyage costs (~35%), and operating costs (~25%) – the most significant savings due to shorter distance and subsequently fuel reduction can be made on voyage costs. Vessel's operating costs have been reduced every day by sailing along *NSR* rather than through the Suez Canal.

Savings can also be made on Suez Canal fees. A significant advantage of *NSR* is the absence of the pirates which currently plague major shipping routes.

Plans by the Russian Federation are: to improve *NSR* infrastructure and increase national export include the building of four new ice breakers and a 12 hydrographic ships, the improvement of the transmission performance of *NAVAREA XX* and *XXI* regions, the establishment of a *GLONASS/GPS* shore station, and a *NSR* chart bank establishment [1].

III. DISADVANTAGES IN NSR USE

The main disincentive for more *NSR* transoceanic voyages is the small number of powerful ice breakers and their current use as passenger vessels for tourism to the Arctic. The variable ice breaker fee, which ranges from 3 to 73 USD per ton, is the major costs in transiting the *NSR*.

Other unfavorable factors for the development of the route are the large investments required for the operation of permanent vessels in *NSR*, the current inaccessibility of the *NSR* to non – Russian federation companies.

NSR infrastructure – low capacity *NSR* ports, unreliable navigational charts, poor rescue options, long demurrages and bureaucratic obstacles – needs to be developed.

IV. NSR FREIGHT AND EXPORT FREIGHT CHARACTERISTICS

From year 2000 there has been a growth in freight transportation in *NSR*. In period between years 2005 – 2007

cargo traffic has exceeded 2 million tons. In year 2011 freight volume was around 15 million tons, in year 2020 – it is estimated that even 65-70 million tons will be carried in the *NSR*. Nowadays traffic mainly constitutes vessels plying from Varandey terminal, opened in 2005, Dudinka port and the White Sea ports to Europe.

The annual commercial potential of *NSR* in period 2015 – 2020 [2] will consist of:

- 25 – 30 million tons of crude oil export from the Kara Sea Timans - Pechory area, as well as from the Oba and Jenisey oil fields direction to the Europe;
- 15 – 20 million tons of liquefied gas exports from the Harasavey Terminal - completed in 2013 – in the Yamal peninsula;
- 1 – 3 million tons of gas condensate exports from the Oba and Jenisey fields;
- 1 – 2 million tons of fertilizer export;
- 1 – 2 million tons of timber cargo exports.

V. BALTIC STATES (LATVIAN, LITHUANIAN, ESTONIAN) SEAFARERS' COMPETITIVENESS FOR WORKING IN NSR

Baltic seafarers' competitiveness for working in *NSR* is currently assessed to be average. Baltic seafarers' strengths are Russian and English language skills, as well as the similarities of mentality and culture. Baltic seafarers' relatively short contracts – an average of 3 – 4 months – represent no special advantage over other nation's seafarers. Co – operation with the Russian Federation ship company *Sovkomflot*, which mainly plies in *NSR*, may be considered as one of the key opportunities for the Baltic States seafarers.

Latvian Republic's 3 maritime training centres *Interorient*, *LAPA* and *NOVIKONTAS*, as well as numerous Russian Federation maritime training centers have created a training course *Ice navigation/Ship's handling in Ice covered waters* which faces significant increase of the demand [1]. There is also great demand for officers with ice condition experience.

VI. CONCLUSIONS

The European Union, China, Japan, S Korea, Canada and the U.S., which would be the greatest beneficiaries, should support the Russian Federation in *NSR* development including the construction of ice breakers, *NAVAREA* district infrastructure creation, enhancement of navigational charts, etc. – in order to effectively use *NSR* in international supply chains.

In order to nominate Baltic sailors as a significant source of officers in Arctic waters, training of seafarers must be carried out. To be competitive, Baltic seafarers have to be a step ahead and courses or lectures in *Ice navigation/Ship's handling in Ice covered waters* must be included the Baltic Marine education programs. It is preferable to use the Norwegian ship classification society *DNV* standard for preparing ice officers.

VII. REFERENCES

- [1] Stelpa I. Development prospects of Northern Sea Route. Diploma work. - Riga, Latvia: Latvian Maritime Academy, 2010. - 69 p.
- [2] Chernov V. 30.08.2010. We are northward bound. <http://www.rzd-partner.com/press/2010/08/30/357629.html>