PROBLEMS OF THE NORTHERN SEA ROUTE DEVELOPMENT

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Driving forces and development problems of cargo flows along the Northern Sea Route[1]

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Abstract. The author analyzed the trends and prospects of the Northern Sea Route. The main problem is that this rather complex system is influenced by many factors, often contradictory and poorly predictable. Thus, the increase in demand for energy and resources determines the overall need for the development of the Arctic shelf. However, the possible cooling and worsening of the ice conditions may adjust to the possibility of transporting of the resources to the Asia-Pacific market, for instance. In this regard, along with the methods of factor and economic analysis the expert approach was used for the study. Its main result is a package of proposals aimed at supporting the Arctic marine cargo flow.

Keywords: *Arctic, marine freight traffic, economy, resources, shelf, factors, icebreakers, climate, program*

Introduction

The main objective of the study is to analyze the trends and to assess the prospects of development of sea lanes of the Russian sector of the Arctic. Scientific novelty and relevance are determined by the undertaken factor analysis and the model of scenarios. The functioning of Arctic communications and their fundamental element — the Northern Sea Route is a subject for research made by Yevdokimov G., Kozmenco S., Mikhailichenko V., A. Pilyasov and some other Russian authors, but recently no attempts to integrate the assessments had been made. Serious foreign research in this area could hardly be distinguished.

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Aanalysis of the traffic flow along the Northern Sea Route

At the end of the XX century in the country's economy showed a radical change associated with its transition from a management target criterion to the criterion of economic efficiency. This shift affected the Arctic marine transport dramatically: its peak was in 1987 (around 6.5 million tonnes), in 1999 it decreased to 1.6 million tonnes (4 times less), while in the east part it decreased in 40 times (to 30 thousand tons). In recent years there has been a gradual increase in freight traffic, including transit, but it clearly does not meet the geo-economic challenges and opportunities in the Russian Arctic.

In the Barents Sea, due to the development of Varandey field in 2010, there was 7,5 million tons of oil transfered. The sharp decline (to 3.9 million) occurred in 2011 due to reduced production in the Ugzno-Hilchuyusskoe field. However, this sector did not enter the waters of the Northern Sea Route, but it is a basic element of all traffic. Until 2010, freight traffic via the NSR did not exceed 2 million tons, over 80% of them were in the Kara Sea due to the activity of JSC “Norilsk Nickel” and export of oil and gas condensate from the Gulf of Ob.

Volume of transportation along the Northern Sea Route in 2011 was 3,1 million tonnes according to the NSR administration, including the export of 806 thousand tons — 26% of all traffic; delivery of 1471 tonnes — 47.2%, taking into account the international traffic on the Northern Sea Route; transit of 834 tons — 26.8% of traffic [1]. in the areas adjacent to the NSR, the flow of cargoes in 2011 was mostly done via the ice covered areas (in accordance with Article 234 of the UN Convention on the Law of the Sea with respect to the waters of special regulatory conditions) in the Pechora Sea (south-east of the Barents Sea) — 3,9 million tons and the northern part of the Bering Sea — 415 thousand tons. In the Arctic the total flow of cargoes, taking into account the transportation within the borders of the NSR (3 111 thousand tons) and the adjacent regions (4 315 thousand tons), was nearly 7.5 mln. tons. It should be noted that the transit along the Northern Sea Route is not transportation between foreign ports. In 2011, there was no such type of transportation at all and in 2012 — just one. The main traffic flows run between the port of Murmansk and the ports of Southeast Asia, 14 time the carriage of good had been done by the vessels with a deadweight of over 20 thousand tons, 10 — with a deadweight of more than 70 tons: Murmansk — Chinese ports: 492.7 thousand tons; Murmansk — ports of South Korea: 231 thousand tons. Murmansk — Bangkok (Thailand): 90.3 thousands tons.

In 2012, traffic grew to almost 4 million tons, including the transit: from 0.8 to 1.2 mln. tons; the trend of the traffic is growth. In 2011 we had only 34 transit flights with 834 thousand tons of goods, the next year it was more than 1.27 million tons and 46 flights. Basic goods were

sent from the port of Murmansk to the Asia-Pacific market with the following characteristics: 1) China: imports of gas condensate — 181 thousand tons; imports of iron ore — 262 thousand tons; export of general cargos — 30 tons 2) South Korea: imports of gas condensate — 303 thousand tons; export of aviation fuel — 198 thousand tons 3) Singapore: fuel oil import — 45 thousand tons [1]. In 2012, due to changes in the situation on the European and, especially, on the Northern-American markets it has been carried out the first (in the full sense of the word) transit voyage from the port of Hammerfest (Norway) to Hangzhou (China) port. It was made by the only gas carrier in the world of ice-class "Ribera Del Duero Knutsen" with a tonnage of 173.4 thousand m^3. However, in 2012, the highest level of so-called second transit along the Northern Sea Route was reached. In 2012, as it has already been mentioned, we had flights (1,270 thous. tons), in 2013 — only 33 flights (1,160 thous. tons) and in 2014 — 24 flights (240 thous. tonnes)[2]. It should be noted that they were significantly higher in the waters of the North Sea Route — in 2012, about 4 million tons, including the export of oil from the Gulf of Ob — 1.5 million tons, to ensure the functioning of the Norilsk industrial area (to ensure the Kola MMK with the fineshteik) — about 0.6 million tonnes, plus the export of wood and short sea shipping. Only the icebreaker "Krasin" (Far Eastern shipping company) provided the assistance in the eastern sector of the NSR for 37 ships which brought 125 thousand tones of cargoes, and took away about 105 thousand tons, including the garbage collected during the cleaning program in the Arctic. Wood is widely exported to many countries and the geography of export is constantly expanding. The main importing countries are Belgium, Germany, Great Britain, Hungary, the Netherlands, France and other EU countries. Deliveries are carried out to Turkey, Iran and some Asia-Pacific countries. Although the total amount of cargoes is not more than 500 thous. tons and it is not comparable, of course, to hydrocarbons, but woo transportation along the NSR amounts to hundreds thousands of tons.

Separately we consider the transport in the Barents Sea, related to the Arctic water areas, but not within the NSR area. Thus, the company "Lukoil" built offshore ice-resistant loading terminal (IRLT) with a capacity up to 12 mln. tons per year. Marine terminal is for shipment of oil produced in the Timan-Pechora province, and it is located in the village of Varandey in the Nenets Autonomous District. The oil is transported from Varandey oil in small shuttle tankers to the port of Murmansk to raid collector "Belokamenka" for further export. IRLT was put into operation in 2008. The terminal is operating all the year round, in winter they use icebreaking vessels. Established Arctic marine oil transportation system has no analogues in the world, in addition to the

[2] Severnyj morskoj put v 2014 godu. URL: http://www.arctic_info.ru/tag/severayj_morskoj_put (Accessed: 10 February 2015).

Varandey oil terminal, it includes inter-field pipeline with the length of 158 km, the shore tank farm with capacity of 325 thousand m^3, pump station, energy-supply of the objects, and supplying fleet of three shuttle tankers with a deadweight of 70 thousand tons, an icebreaker, tug and raid transshipment complex with a capacity of 250 thousand tons, as well as a village for workers. The shipment of oil from the terminal started in 2008 and in 2009 reached a peak of 7.7 million tons. After that, production volumes began to decline and in 2012 they amounted to 3.9 mln. tons, in 2013 — 2.9 million tons. In 2014, the level shipment was about 3 million tons. Shipment was carried out by shuttle tankers to the Kola Bay and then the oil was sent to European customers[3].

In 2005, we began to implement the project for Prirazlomnaya in the Pechora Sea. The "Sevmash" company (Severodvinsk) reconstructed the first offshore ice-resistant platform in the country (OIRP). Its installation had been repeatedly postponed and was completed only in 2014. The maximum production of the project is 9-10 mln. tons during the next three years. The transport system had been ensured and transportation of oil has been listed in the previous section.

The main Russian maritime transport company in the Arctic is "Sovremenniy komerchesky flot". Today, a third of the fleet of the company has the ice class — it is the largest, youngest and technically advanced tanker fleet in the world. It is not surprising that the company has already developed a long-term cooperation with the leading oil and gas companies such as Gazprom and its units, Exxon Mobil, Vitol, Glencore and etc[4]. Currently, "Sovkomflot" is the leading company providing transit navigation along the Northern Sea Route — the perspective offshore route that shortens the route from Europe to the Asia-Pacific region. Thus, in the period from 2010 to 2013, the ships of the company made seven voyages between ports of the European continent and South-East Asia and transported 360 thousand tons of hydrocarbons and 67 thousand tonnes of iron ore concentrate.

In August 2010, a large-capacity Aframax size and Arc5 (ICE-1A Super) ice class tanker "Baltica" passed along the route Murmansk (Russia) — Ningbo (Cina). The tanker with a deadweight of 117 thousand tons was the largest ship ever worked in the Arctic region and it proved the possibility of large-scale ship-navigational operations along the Northern Sea Route. The duration of flight was 22 days, 8.4 days the tanker had been moving along the Northern Sea Route. Time saving, in comparison with the path through the Suez Canal, was 18 days. In 2011, an even larger Suezmax size and ice class Ags4 (1se-1A) tanker "Vladimir Tikhonov" with a deadweight of 163 tons passed through the route: to the north of the New Siberian Islands, breaking throught the ice for more

[3] Varandejskij terminal. URL: http://www.arctic_info.ru/ProjectsPage/varandeiskji-project (Accessed: 21 February 2015).
[4] Arktika pokoryaetsya umelym // Port-news: portovyj servis. Otchet 2014. S. 22—25.

than 2 thousand miles along the Northern Sea Route for 7 days. The duration of the flight along the route Murmansk (Russia) — Maptaphut (Thailand) was 28 days. Saved time — 8 days. So, a new deep-water route applicable to navigation of vessels with a deep draft has been approved. Thus, the relevance of the commercial shipping along the Northern Sea Route has been approved as well [5]. In November 2013 the tanker of the ice class Ice-2 (1C) "Viktor Bakaev" passed along the Northern Sea Route to the West during the period of intensive ice formation. The possibility of a large tanker navigation of a lower ice class was proved by using the tactical ice navigation: improved interaction with icebreakers escort and the correct choice of route.

In 2013—2014 Russian "Sovkomflot" built four gas tankers of Arc6 class for the project "Sakhalin SPG", and in the future (2016) — for the "Yamal SPG". At the same time, the company "NOVATEK" plans to place an order for the construction of 10 gas carriers at the Japanese and South Korean shipyards, the company intends to use them for the transportation of liquefied natural gas from the Yamal Peninsula.

In accordance with the Strategy of development of the Russian Arctic and national security until 2020, one of the most important tasks is improvement of transport infrastructure in the Arctic continental shelf development areas in order to diversify the main supply routes of Russian hydrocarbons to the world markets. It may be noted that the turnover of goods along the northern routes is taken as one of the main characteristics of social and economic development of the Russian Arctic.

Factor analysis of the cargo flow along the Northern Sea Route shows that the action of various forces is rather contradictory. Especially in terms of forecasts, both the near and long-term perspective. Thus, climate change, as the experts say, and warming may cause "icebreaker free shipping" in the Kara Sea for the Arc7 class vessels with ice passability up to 1.5 m. by 2020. Some conflicting forecasts exist as well. Some experts predict cooling in the next 5 years, which was typical for the end of the last century, when in the Kara Sea icebreaker assistance was needed from December to May. Accordingly, in the eastern sector of the NSR the thickness of the ice cover could range from 2 to 3 meters, and the ice class requirements for icebreakers could be changed [2].

Experts note that Arctic navigation of recent years have shown that climatic conditions make the passage of cargo ships along the Northern Sea Route to the various ports of Southeast Asia 7—22 days shorter, compared to the use of the Suez Channel, and it is an important pre-economic assets. The fee for icebreaking vessels along the NSR and a new flexible fare could be equated to payments for the passage via the channel. Increased insurance when sailing on the Northern Sea Route in view of risk of ice damage can be compared with in elevated insurance at

[5] Ibid.

Aden strait passage (meeting with the pirates). Additional expenses while passing the NSR are the cost of ice pilot, but it is not very high, about 10 thousand USD per flight. On this basis, we can assume that the time-saving voyage is equivalent to a reduction of the shipowner's cost of 250—900 thousand USD per flight, depending on the volume and type of goods [1, 3, 4].

The "failure" in the transport system of the Northern Sea Route in the 1990s was caused by the transfer of the national economic system from the principle of state expediency to the principle of economic efficiency. Accordingly, the state support of the NSR was sharply reduced. And the development of the transport system is on the principles of efficiency requires a large-scale increase in freight traffic.

It could be ensured ***by transportation of hydrocarbons***. Currently, they make up more than half of all traffic along the NSR, and taking into account the Barents Sea (not included in the waters of the NSR, but it is the Arctic sea) it is up to 70%. However, the world's energy demand is reduced, but hydrocarbon prices have different volatility. According to the US Department of Energy Information (EIA), the global oil production, including gas condensate, grew by 15.7% in 1996—2005. Over the past 9 years (2005—2014), despite high oil prices and investments, the production grew up by only 5.3% [6].

The situation with the hydrocarbons could be considered with the use of liquefied natural gas. Traditionally, natural gas is considered an energy raw materials and local consumption was provided exclusively on pipes-enforcement until 1990. The breakthrough came in the early 1990s, when they technology of mass production and delivery of liquefied natural gas (LNG) was invented. Production of liquefied natural gas in 1995 was less than 10 million tons. In 2012, LNG trade had amounted to 236,3 million tonnes [5]. Commercial liquefied natural gas (LNG) had been increasingly taking the global market. Goldman Sachs Experts accounted that in 2015 the global LNG trade volume exceeded $ 120 billion, passed ore and had become the second after oil. [6]

The Russian Federation is currently producing approximately 12% of global oil and 18% of natural gas. According to leading experts in the near future, Russia's oil production will begin to decline, even taking into account the entry into active phase of development of Arctic fields in the Nenets Autonomous District and the Pechora Sea. Russia's share in the global LNG market today is less than 5%, the target task for the next 20 years is to reach 12% of the total market volume[7]. If at the end of 2012 the share of our country global gas production amounted to 17.6%, in the global LNG trade — only 4,5% [5]. It is known that Gazprom has postponed the Shtokman project and the

[6] Manukov S. Pyat syurprizov dlya energeticheskogo rynka. 3 yanvarya 2016. URL: http://expert.ru/2016/01/3/pyat-syurprizov-kotoryie-mogut-zhdat-energeticheskij-ryinok/?ny (accessed: 05 January 2016).
[7] SPG 2015. URL: http://www.creonenergy.ru/consulting/detailConf.php?ID=115315 (Accessed: 05 January 2016)

construction of LNG plants on Yamal (Kharasaveyskoye deposit). But there was an innovation project “Yamal SPG” by OJSC “NOVATEK”, the largest independent and second on volumes of natural gas producer in Russia. The project is planned to develop the Ugzno-Tambeyskoye condensate field on the Yamal Peninsula and build a LNG plant. Under construction is Sabetta port in the Gulf of Ob on the Yamal Peninsula.

Arctic sea transportation of oil are going to be done in the western sector of NSR in the foreseeable future (Barents and Kara Seas) and unlikely will not exceed 40 million tons. More attractive in terms of growth and the state of relations with the Asia-Pacific market, and even in terms of warming variant means (optimistic variant) that the eastern sector of NSR will be available for shipping without icebreakers during 5—6 months. Asia-Pacific LNG market is poorly accessible due to high transport costs and general economic risks of the delivery from Western Siberia and from the Barents Sea. Pacific market is far away, and icebreaker support in the Arctic transport system is necessary almost all year round. North American market is Russia's most preferred because at European market we are actively strengthen “pipe” communication. However, the CAP will be at least “insensitive” to exports in connection with own resources until 2030. In addition, the closest neighbor and ally of the US is Canada and it has oil reserves that are three times superior the reserves of Russia. Heavy oil, mostly asphalt, but technological progress rapidly improves the development of such deposits. Finally, we must not forget the traditional “no confidence” in the Russian production, a specially strong in times of crisis and cooling of relations.

Selected strategic issues for Arctic freight traffic is ***the state of the icebreaker fleet***. It consists of (federal ownership) six atomic and five diesel-electric icebreakers. However, by 2022, the period of active development of the Arctic shelf, only half of them will remain. The newest nuclear powered icebreaker “50 Years of Victory” had been building for almost 20 years in conditions of constant shortage of funds, we can understand the seriousness of the problem. It should be borne in mind that the cost of an icebreaker can reach 1 billion US dollars, and the linear icebreaker — 1—2 billion US dollars. Currently, the Transport Strategy of the Russian Federation for the period till 2030 envisages the construction of three universal atom icebreakers of LA-60YA class able to operate on the ice of 2.8 meters thick, and in the shallow waters of the mouth of the Yenisei, the Ob Bay and other coastal areas of the Arctic seas. They will replace icebreakers type “Arctic” and “Taimyr” in ice pilotage. Obviously, this is not enough for all year-round exports in the Arctic zone of the Russian Federation, if its volumes will be millions and tens of millions of tons. Advertised transit scheme are now calculated for the summer period (July-September) and are unsuitable for mass-production of LNG requiring the 100% availability of the NSR [7].

Another problem is connected with the ice assistance and the width of the channel. Icebreakers of the “Arctic” type make an ice channel of 33—34 meters, while the width of the “Panamax” class tanker reaches 40 m (deadweight up to 80 thousand tons), “Snesmax” — 50 m. (deadweight up to 200 thousand tons). By the way, this same class include modern LNG carriers, tonnage of which reaches 170 thousand tons. Already mentioned icebreakers LC-60YA class will create a channel width of 37—38 meters, so the question is about the new icebreakers type LK-110YA able to overcome the ice up to 3.5 meters thick and assist the «Panamax» class ships in any ice conditions (channel 43—44 m). Theoretical and experimental studies allowed to offer new innovative technical means (RF patent) for routing wide channels (50 and more) in the ice. Such channels could be used by almost all large vessels,in all conditions, including ice compression. Creating traditional icebreake of 50 m wide leads to a significant increase in resistance of the ice and therefore larger power consumption. Therefore, when creating a new one, the most important task is to reduce ice resistance [7].

This task was accomplished by creating a new icebreaker as multiply structure on a single platform. The proposed icebreaker has three or four bodies, relatively small ones, so the total area of the ship is considerably less than the width of the channel created by the icebreaker. The proposed construction individual parts of the body do not overlap. This arrangement allows to create favorable conditions for breaking the ice. Each of the airborne corps operates on the “cleavage” in the channel, made by the head of the icebreaker. As it has been shown in research, assisting the large vessels in the channel can reduce the ice resistance by up to 40% compared to the previous version of the icebreakers’ construction. Thus, due to the special onboard accommodation buildings managed to achieve a further reduction of the ice resistance and therefore energyl costs for laying a broad channel. The proposed technical solution passed comprehensive testing in the laboratories of the Krylovsky state scientific center. The research focused on the indicators of the ice propulsion and control of new icebreakers and its ice resistance. Currently preliminary design of a new icebreaker is almost ready. [7]

The shelf development, especially in view of possible climate changes, can lead to quite optimistic scenario. It may be noted that the transportation in the eastern part of the NSR and transit won’t achieve considerable size in the next 10 years. With regard to 2025 and a more distant perspective, there may be a positive trend, especially if expert opinion on the warming and changing the ice conditions in the Arctic will be true. The optimistic scenario means warming the ice cover in the Arctic and the ice could become smaller and thinner. Navigation would be improved not only along the sea routes, but also along the coastal zone and the main rivers strengthening the ca-

pacity for the development of water transport, trade and tourism. The Northern Sea Route may become one of the major freight routes on the globe, and the reduction of the ice cover could be conducive to the development of oil and gas offshore. However, experts warn about new risks. Under the influence of combined factors such as rising sea level, melting of permafrost, and strengthen impact of the waves as a result of increase in the area covered by water, could increase the erosion of coastlines in the Arctic. All this creates a very dangerous impact on the entire infrastructure, especially ports [2].

Expert survey on the problems of NSR

Taking into account all these circumstances, quite conflicting results we get from the expert survey, which was conducted in the course of the scientific-practical conference "Economic research in the North: From the Past to the Future", held at the Institute of Economic Problems (2011). We offered conference participants the questionnaire devoted to the state policy in the North. The survey was filled by the 34 participants, including 9 doctors of sciences, 18 candidates of sciences and 7 specialists without a degree. The most representative part came from research organizations (17 pers.), ten specialists were working in higher education, 4 — in the bodies of regional and municipal authoritiesl and 3 — in production plants.

A large group of questions was devoted to the perspectives of the Arctic shelf and the NSR development, which were important for the forecasts. In general, the possibility of gas production at the offshore fields in the Arctic was estimated quite positive: over 70% of respondents in 2011 believed that on the shelf there will be produced from 100 to 200 billion m^3 of natural gas by 2025. Development of the fields of the unique Kara Sea was most likely to start in 2025 or beyond (68% of respondents), the earlier periods noted 32% of the participants. With regard to the construction of a liquefied natural gas (LNG) plant on the Kola Peninsula, the firm confidence was expressed by 59% of the experts, but the timing (2020 or 2025) and possible power (more than 25 or more than 35 million tons) were different. 40% of respondents believed that it was possible to build an LNG plant on the Yamal Peninsula (Kharasavey settlement), and more than 50% did not give any answer. 55% preferred the export to the Asia-Pacific region (APR), and 40% — to North America.

The survey raised a question about the possibility of transportation along the NSR by the 2020. Rather, we asked for the most sophisticated NSR sector (from Vilkitsky Strait to the Bering Strait), where in 2011 the total volume of cargos amounted to only 1,0 million tons. The answers showed that the total cargo traffic in 2020: for 60% of the experts would not exceed 3 million tonnes and for 30% of experts — 3 to 10 million tons. The volume of transit traffic in Western and

Eastern sectors were evaluated as 1 million tons (by 85% of experts). It should be mentioned that as a transit we examined all transportation of goods to foreign ports.

Thus, a sufficiently high volatility of factors did not allow us to identify certain statistical correlations and forced to take some extreme expert scenarios. So, in *the worst case scenario*, we get the following:

a) in the next five years cooling begins and ice condition worsen to the levels of 1980s—1990s;

b) the world market is not experiencing a high demand in oil, demand is growing insignificantly, but the prices are not conducive to large-scale development of the Arctic shelf;

c) as a result of the project "Yamal LNG" was completed at the first stage (16,5 million tons); Novoportovskoye deposit is being developed by the minimum variant; Stockmann project is not working (no output);

d) transit traffic grow slightly (no more than 2—3 times with respect to 2014); home traffic (including cabotage)and the "northern delivery" are slowly growing;

e) the development of the nuclear fleet is limited to the construction of three icebreakers of LK-60YA type by 2025 and then 2—3 same vessels by 2030, so the NSR has 4—5 icebreakers along the route at the same time.

Accordingly, in the *optimistic scenario* the climate and ice conditions are extremely favorable, the global markets are growing, and a rapid development of the shelf begins. "Yamal LNG" in 2025 will reach the capacity of 30 million tons. Correspondingly, icebreaker fleet and the whole structure of the NSR develops. Obviously, these two versions have a number of variant in between and, consequently, the same does the NSR dynamics. We do not consider it necessary, given the stochastic nature of the dependencies, to carry out some "average" calculations and have "realistic" scenario — although it can really be obtained by "averaging". However, specific changes and any surprises are possible, so it is more practical to make changes to the options.

The significance of the study is an attempt to justify the impact of the separate macroeconomic processes, the situation in the global markets in particular, on the development of the Arctic Sea routes. From the methodological point of view, a certain novelty factor may be a compound of approaches and expertise, providing an organic analysis and forecasting. Regarding the application of the results, they should include the construction of scenarios and considerations on the development of the Northern Sea Route.

Conclusion

In conclusion, the provision of positive dynamics of cargo flows along the Northern Sea Route and the protection of national interests in the Arctic waters should be ensured by a set of measures:

1) Assessment of climate change and a system of maps for different ice conditions in the Arctic for the long-term perspective.
2) Development of integrated traffic forecast scenario for the Northern Sea Route for the period up to 2030, depending on changing conditions in major world energy markets.
3) Creating a favorable regime for international shipping, including the use of the port special economic zones; the establishment of the sea transit corridor "Europe – Asia".
4) The adoption of the federal target program "Development of transport system in the water area of the North Sea Route", which should include the following:
   a) rehabilitation of meteorological and hydrographic support (control) throughout the NSR route;
   b) improvement of the Arctic communications, especially in current ports (Khatanga, Dixon, Tiksi, Pevek, etc.) and the newly established (Indiga, Sabetta, Harasovey) in accordance with the prospective increase in freight traffic and transit;
   c) the maintenance of the icebreaker fleet (including new construction) at the level of optional for transportation and assistance in changing ice conditions;
   d) creation of attractive conditions for carriers along the Northern Sea Route (tariff regulation, insurance, security system, etc.).
5) Normative legal support of the "economy" of the sea communication, including the adoption of a system law "On ensuring the national priorities in the waters of the Northern Sea Route".

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CALL OF THE HIGH LATITUDES

Fridtjof Nansen: "The greatest value is the ability to wait". We'll be alivc if we can...

Salted splashes of the sea / foto A.P.Oboimov, 2014 Arctic Expedition 2014 on the yacht "Apostol Andrey "