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The Concept of the shared Multi-Users Transportation System in the Northern Sea Route Area

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ABSTRACT

Today the aquatory along the Northern Sea Route (NSR), as well as the whole Arctic zone of Russian Federation, witnesses the growth of various activities: merchant shipping, industrial fishing, geological explorations and carbohydrates production on the polar shelf. The government policy articulates the support of the further development of the Arctic region. Consequently, one can observe a remarkable intensification of transportation supporting the everyday activities of industrial enterprises, private and state companies and their departments, directly involved in works in Arctic and socially important for the local population. In the same time, this activity generates the growing demand for the transport and supporting infrastructure's development. The specific conditions of Polar Regions make it economically unwise to create any redundant facilities. In the same time, the current studies revealed that there are separate shipping parties of supply cargo (including those bound for open roadsteads) consisting of homogenous issues in many numbers, but relatively small by individual size. Simultaneously, many shippers (belonging to different administrative bodies) send similar cargo quite independently, thus providing the fleet overcapacity. All these factors drive to conclusions that a more rational usage of the infrastructural objects and transportation vehicles by the federal executive authorities and commercial companies in Russian Arctic would minimize the total budget expenses allocated for materials and supplies transportation.

KEY WORDS: Shared multi-users transportation system; Northern Sea Route; Arctic.

HISTORY AND CURRENT STATE

In the era of the administrative economy, the central authorities solved all the questions of utilization of the NSR. For this purpose in 1932 the Main Directorate of the NSR ("GlavSevMorPut"), – a governmental organization for national economic development and provision of navigation along the NSR, was created. Until 1946 it belonged to the Council of People Commissars of USSR, from 1946 until 1953 – to the Council of Ministers of USSR. The procedure of tonnage allocation for the supply transportation under the "Northern (expedition) delivery" program assumed the submission of administrative requests through the State Planning Committee of the Council of Ministers of USSR ("GosPlan"). GosPlan was a governmental body responsible both for overall national planning of the country's economy and the control of these plans' implementation. In addition, the Council on problems of the North and Arctic at the Government of USSR, and the State Committee on the affairs of the North existed to deal with the implementation of the state policy in Arctic.

Today the inherited organization is the Federal Governmental State enterprise "The Administration of the NSR". It was created by the Resolution of the Government of Russian Federation by March, 15th of 2013 № 358-p that was based on item 3 of Article 5.1 of the Federal Low by April, 30th 1999 № 81-FZ «Code of Maritime shipping of Russian, responsible solely for the organization of navigation in the water areas of the NSR». As the main goals of this organization, «the provision of safety of navigation and environmental protection in the water areas of the NSR. (Scope of activities, 2015)» were declared (The principles...,2008; The Strategy..., 2013; Resolution of the Government..., 2014; The scope of responsibility..., 2015).

The academic researches of the Russian Artic area are numerous. Still, the bibliographic study shows that by now those researches are fragmentary and inner inconsistent (Gorodetskiy, A.E., Ivanov, V.V., Filin, B.N., 2014; Izotov, O.A., 2005; Konovalov, A.M., 2013). In the studies (Izotov, O.A., 2005; Tolstych, D.A., 2009), most closely related to the offered hypothesis, the idea of formation of a general shared transportation systems was firstly introduced. Still, the development of a solid methodological foundation for rational organization, management and control of the multi-users shared transportation system in Russian Arctic region remains an actual scientific problem. The solution of this problem would minimize the total costs of supply material transportation, including the expeditional supply and delivery of material resources.

GOALS, METHODOLOGY AND STAGING

The preliminary stage of the concept's development revealed three main components of the maritime transportation in Arctic:

transit (including the cross-trading);

import-export, mainly connected with the world trade;

short-sea (inner maritime economy), defined by domestic needs, including social ones.

Accordingly, the following methodology was adopted:

First stage: in every sector of the transportation defined above, the identification of the key participants involved in planning and transportation, as well as other relevant national economic activities in Arctic; their specific demands and features perception, an arbitrary clusterization of these participants.

The cluster of “external” participants includes those operating beyond the boundaries of the system’s control and permitting only reactive and/or proactive response.

The cluster of “internal participants” includes the players whose behavior to a certain extent is the subject of regulation, control and planning. For these participants, deeply and widely involved in the sea transportation and auxiliary economic activity, a preliminary analysis is needed, the analysis of their needs and demands for transport infrastructure (including ports) and technologies. The goal here is to assess the possibility of joint exploitation and competition, both economic and technological.

The core hypothesis of this stage is that the transport operations based on the same or similar technology could be performed complexly, for the interests of several participants, thus resulting in the economy of scale. The methodology implies that these complex analyses should take into account not only pure transport and national economic criteria, but also technological features and geographic location criteria.

Accordingly, maritime shipping routes break into following categories:

- transportation of import/export multi-issues cargo between the general public ports;

- import of bulk cargoes from Northern ports and port points;

- regular supply deliveries for the Northern ports, port point and hydrotechnical structures;

- expeditional supply deliveries to the port points and unequipped shores;

- construction material supply for port points;

- construction material and supply deliveries to unequipped shores and facilities;

- expedition, including ecological monitoring and cleaning;

- transit transportation;

- passenger transportation;

- passenger cruises.

This approach would enable to percept a general outlook of the shared transportation systems for many users. In addition to pure transportation, it also could be extended over some other maritime economic activities in Arctic.

This analysis will result in formulating criteria for matching every Arctic port and port point to one of the technologic development stage (under the classification of UNCTAD). Based on this classification, certain recommendations could be derived, taking into account types and quantities of technological equipment in ports, demands for required territories, buildings, constructions, facilities and water areas of ports and port points.

It is expected that in some cases there will be a necessity to shift from conventional sea port to modern cargo handling complexes, among other features including logistic infrastructure for consolidation and distribution of multi-issue supply and transit shipment.

Second stage – the potential aggregated joint transportation systems are identified, among them large unified inter-department sub-systems for transportation of multi-item cargo and supplies are selected, those which used for transportation aimed for development of the infrastructure and expeditional delivery.

Third stage – complex mathematical models (optimizational, imitational) of separated different transportation sub-systems' operations providing their rational planning and exploitation.

Fourth stage – the complex integrated simulation model for the sub-systems joint operations enabling to perform an adequate and accurate prognoses of general and particial parameters of single interacting systems aiming both for rational regional development of separate components and coordination of the component's functions within the external system environment. Different scenarios of development are to be studied.

ANALYSES AND SOLUTIONS

In Russian Federation there is a group of systematically performing transportations demanding for out-of-port handling of ships. This group consists of expeditional (navigational, or so called "Northern") delivery. This regular navigational delivery is a complex of annual governmental measures aimed for supply of the Russian Northern territories with vitally important goods, mainly food and fuel, in anticipation of the winter season.

The phenomenon of the Northern delivery can be explained by the following reasons:

- the absence on the Russian Northern territories the own production base for the majority of manufactured goods and food staffs;

- the remoteness by thousand kilometer from main industrial areas, which makes very difficult and expensive for persons and companies their own transportation of goods;

- the total absence of the transport infrastructure, with only rudiment elements for air and inner waterways modes.

A more generic reason is in extreme natural and climatic conditions in Russian Northern areas, which occupy over two third part of the Russia's territory. Under these conditions, the only solution is the centralization of the purchase, transportation and distribution of the goods from Southern areas of the country. This responsibility both in the USSR and in Russian Federation bears the state, sponsoring the task from the federal budget and performing it via regional and local authorities. This activity assumes out-of-port handling of ships, which makes containerization quite difficult task. The opportunities offered by existing out-of-port handling technologies are shown in Figure. 1. Accordingly, an important problem today is the development of the pool of out-of-port container handling equipment, like rough terrain container handlers (RTCH) etc.

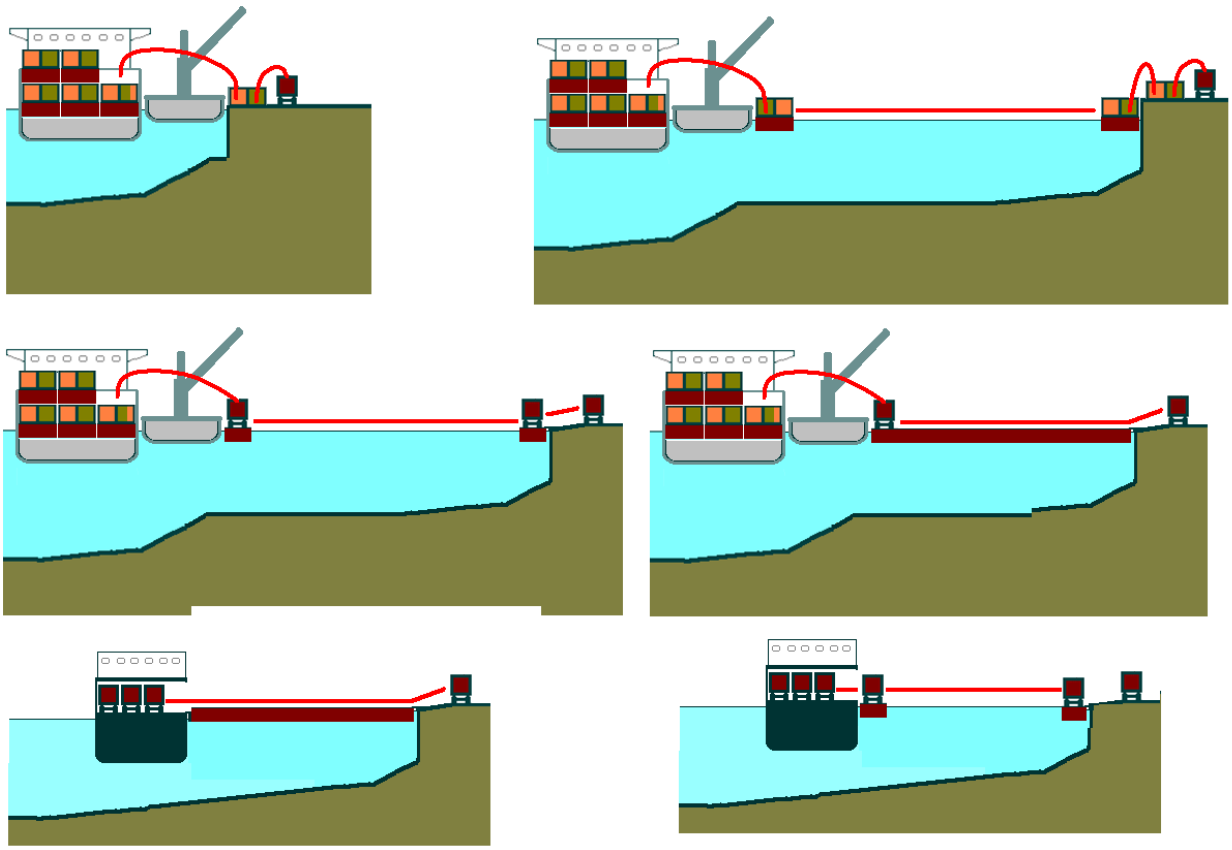

Figure 1. General variants for out-of-port container handling

While the range of the specialized handling equipment for “civilian” transportation is relatively stable and well-studied, the out-of-port container handling equipment need a lot of researches and studies to find the boundaries of applications for existing types and possibly developing of new prototypes, t.t. like on Figure. 2.

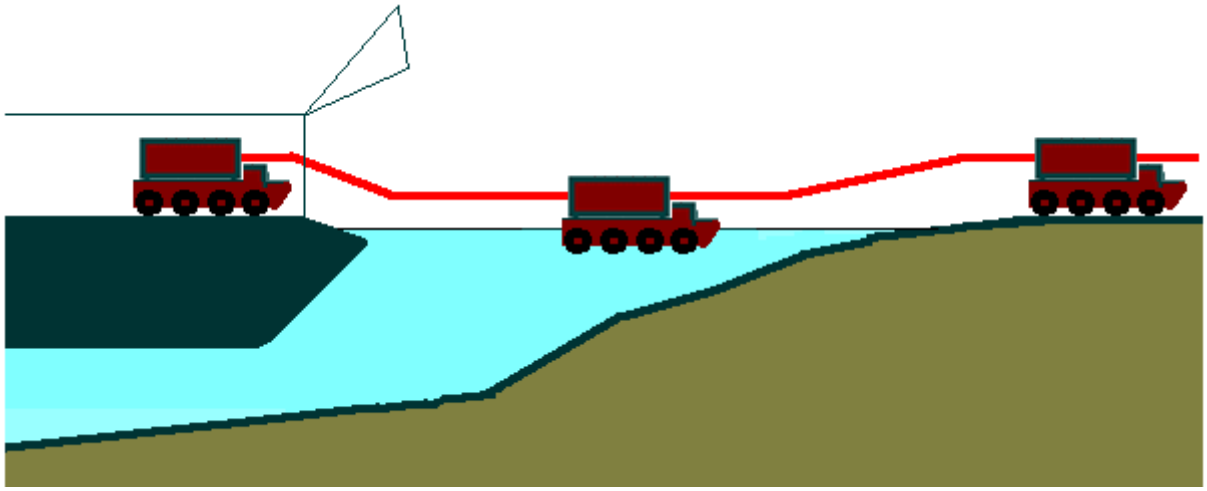

Figure 2. Example of amphibian technology for container handling

For the container handling in out-of-port conditions there might be finger-pierce floating berths arranged formed out of lighters or pontoons, with the last one equipped with a ramp. Another variant is to deliver ashore by a lighter a container handling equipment specimen, e.g.

RTCH, for further handling of containers shuttled between ship and shore by lighters. There might be a lot of combinations of similar schema.

In the same time, all the advantages of above mentioned variants could be integrated into an unified transportation/handling solution base on the lighters-abroad-ship system (LASH). These systems already proved their flexibility and efficiency, being intensively used in many countries. In Russian Federation (in contrast with the former USSR) these systems do not exist. The only exemption is quite unique super-powerful LASH system built around nuclear-powered ice-breaking LASH vessel “Sevmorput” (or «Northern Sea Route” in Russian).

The ship was built in 1988 and totally rehabilitated in 2016. Originally, the ship was designated to deliver goods on lighters and in containers for distant areas of the Russian Arctic. The ship can navigate through the ice up to 1 m thick, she carries 74 dedicated lighters or 1336 TEUs (Figure. 3).

Figure 3. Nuclear powered ice-breaker LASH ship “Sevmorput”

The existence of this LASH vessel with these unique features provides a scaled logistical advantage both for defense transportation system and all Arctic cargo flows support.

For the full realization of this potential advantage, it is required to develop a lighter set very well-balanced functionally. Its functional profile should be defined by taking into account the interests of all participants involved in transportation activity in Arctic region.

At this stage the authors propose the following content of the functional components of the system:

- nuclear-powered ice-breaking LASH vessel, equipped with auxiliary lifting cranes;

- specialized LASH standard modules: pontoon-berths, hold-types, platforms, ramps (Figure. 4);

- self-propelled barges with ramps;

- rough terrain container handlers.

Figure. 4–5 give examples of cargo handling based upon this system.

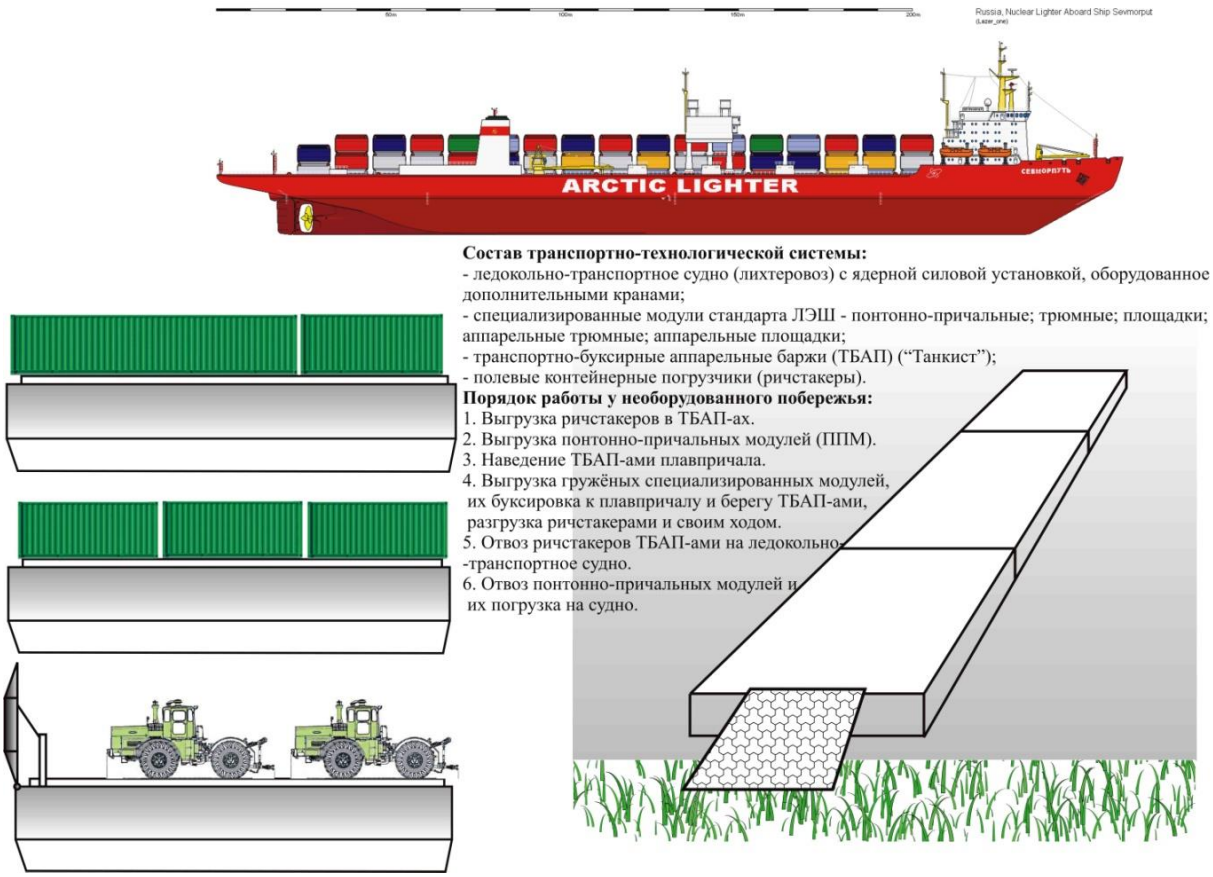

Figure 4. Components of the LASH system

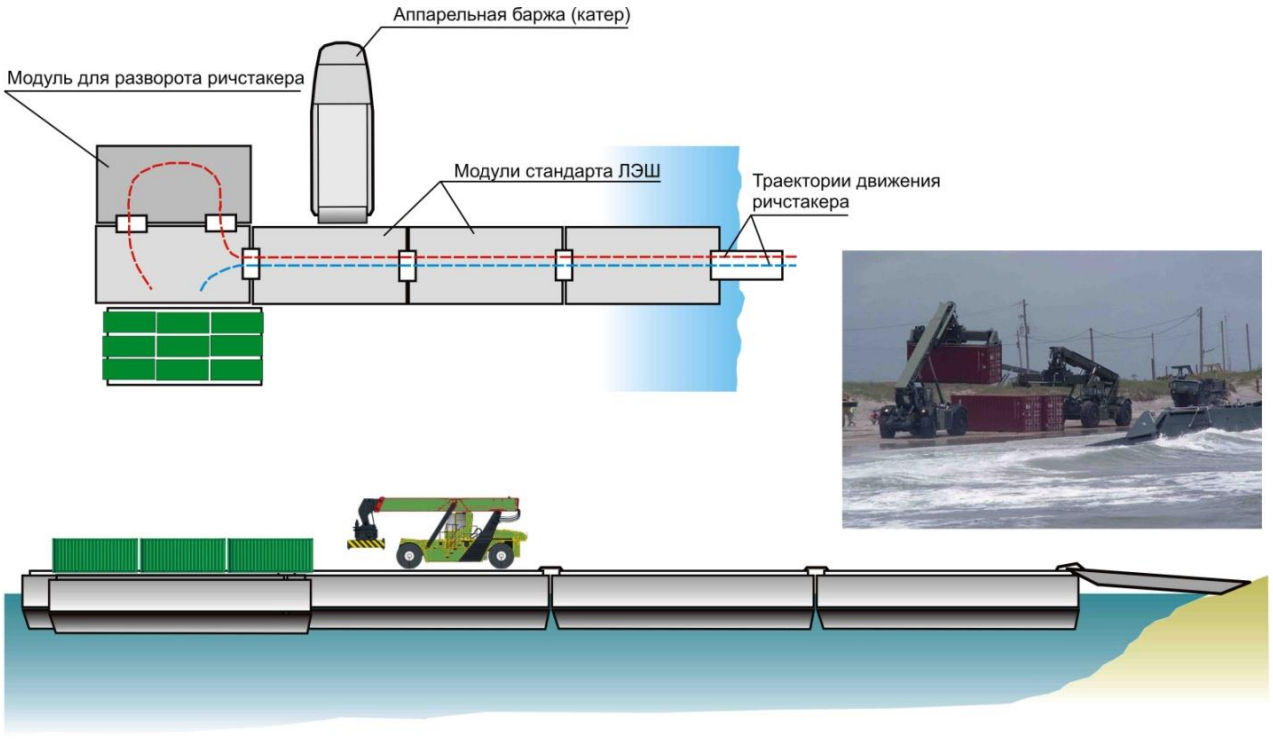

Figure 5. System operations at out-of-port container handling

CONCLUSIONS

The proposed methodology provides the results of investigations which help to optimize the industrial activities of separate transportation and national economic bodies, i.e. directly providing the improvements in efficiency of different departmental and administrative industrial systems – users of sea areas and infrastructure of Arctic.

In respect of the Federal Executive government bodies, who are the key stakeholders of transportation and economic activities in the sea areas of Arctic , the expected result could be the creation of the governmental unified integrated management system, providing the joint exploitation of transportation vehicles and infrastructural objects, minimizing the total budget investment planning and execution.

The proposed hypothesis and methodology assume also investigations of legislative and regulation base with the aim of creation of unified information management system for transportation and national economic activities, bases upon the positive experience of similar Federal Executive bodies of state power in 2000th.

REFERENCES

Gorodetskiy, A.E., Ivanov, V.V., & Filin, B.N., 2014. Legislative and methodological problems of strategic planning of development of the Russian Federation Arctic zone. *Ecology and economy*, 4(16), pp.4–13.

Izotov, O.A., 2005. *Optimization of the process of exploitation of the objects of maritime and river transport in the context of joint utilization systems.* PhD. St. Petersburg: Admiral Makarov State Maritime Academy.

Konovalov, A.M., 2013. The system of state strategic planning of the Russian Federation Arctic zone. *Science and transport. Maritime и river transportation*, 1(5), pp.57–63.

Resolution of the Government of Russian Federation by 21/04/2014 № 366 "On approval of the State program of Russian Federation "Social - economic development of Russian Federation Arctic zone".

The principles of Russian Federation state policy in Arctic for the period until 2020 and further future. Approved by the President of Russian Federation 18/09/2008 Act №1969.

The scope of responsibility and functions of the Administration of the Northern Sea Routs. Official website of the Federal governmental state organization "the Administration of the Northern Sea Routs". (Updated 12 April 2015) Available at: http://asmp.morflot.ru/ru/celi_funktsii/

The Strategy of Russian Federation Arctic zone development and provision of national security for the period until 2020. Approved by the President of Russian Federation 18/02/2013.

Tolstych, D.A., 2009. Regional industrial-logistic terminals as the element of formation of the integrated transport infrastructure. PhD. St. Petersburg: Admiral Makarov State Maritime Academy.