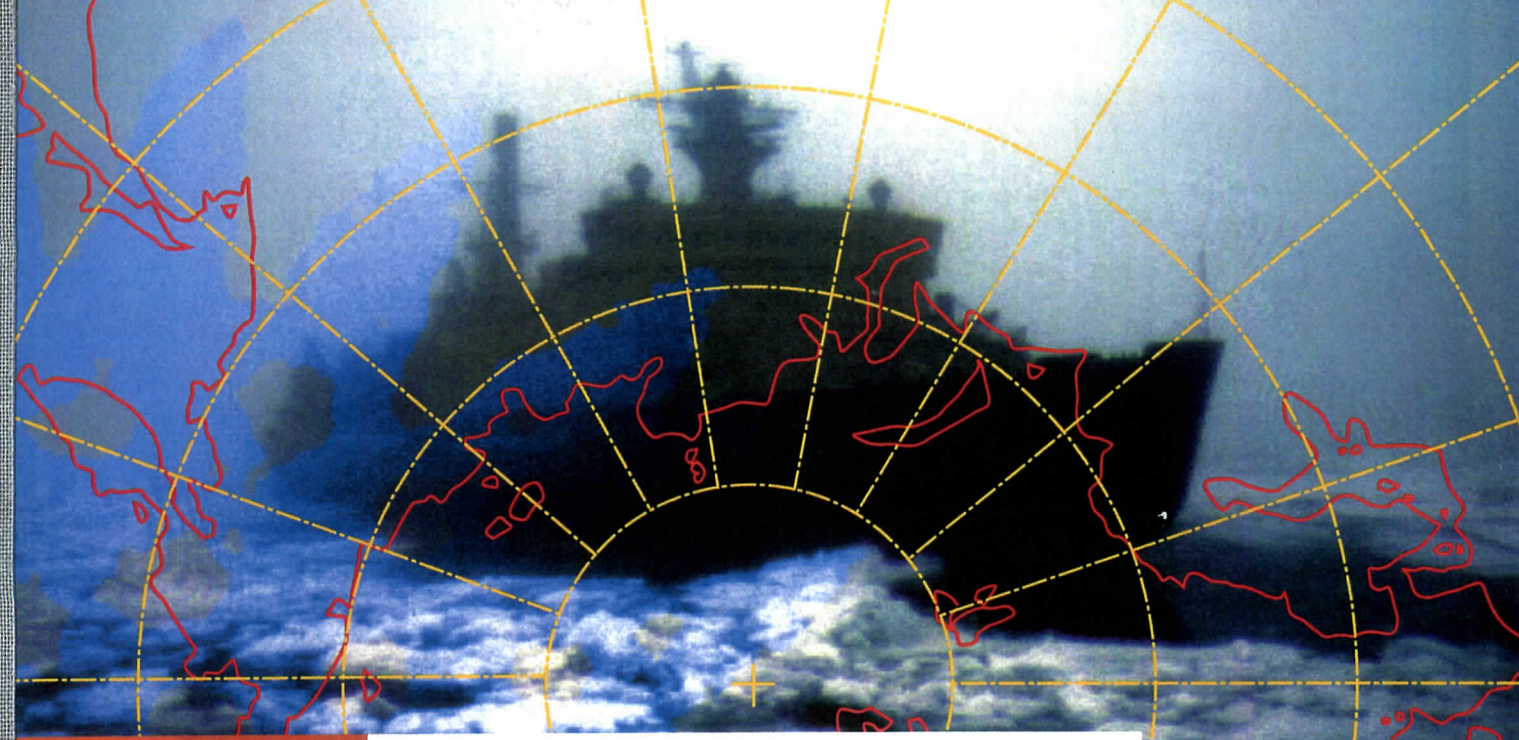

INSROP WORKING PAPER
NO. 96 - 1998, IV.1.1

Current Use of the Northern Sea Route

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and Anatoly N. Yakovlev

INSROP International Northern Sea Route Programme

Central Marine Research & Design Institute, Russia

The Fridtjof Nansen Institute, Norway

Ship and Ocean Foundation, Japan

International Northern Sea Route Programme (INSROP)

Central Marine Research & Design Institute, Russia | The Fridtjof Nansen Institute, Norway | Ship & Ocean Foundation, Japan

INSROP WORKING PAPER NO. 96-1998

Sub-programme IV:	Political, Legal and Strategic Factors
Project IV.1.1:	Historical and Current Use of the Northern Sea Route
Supervisor:	Jens Petter Nielsen, University of Tromsø, NORWAY
Title:	**Current Use of the Northern Sea Route**
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Date:	30 January 1998
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FOREWORD - INSROP WORKING PAPER

INSROP is a five-year multidisciplinary and multilateral research programme, the main phase of which commenced in June 1993. The three principal cooperating partners are **Central Marine Research & Design Institute (CNIIMF)**, St. Petersburg, Russia; **Ship and Ocean Foundation (SOF)**, Tokyo, Japan; and **Fridtjof Nansen Institute (FNI)**, Lysaker, Norway. The INSROP Secretariat is shared between CNIIMF and FNI and is located at FNI.

INSROP is split into four main projects: 1) Natural Conditions and Ice Navigation; 2) Environmental Factors; 3) Trade and Commercial Shipping Aspects of the NSR; and 4) Political, Legal and Strategic Factors. The aim of INSROP is to build up a knowledge base adequate to provide a foundation for long-term planning and decision-making by state agencies as well as private companies etc., for purposes of promoting rational decisionmaking concerning the use of the Northern Sea Route for transit and regional development.

INSROP is a direct result of the normalization of the international situation and the Murmansk initiatives of the former Soviet Union in 1987, when the readiness of the USSR to open the NSR for international shipping was officially declared. The Murmansk Initiatives enabled the continuation, expansion and intensification of traditional collaboration between the states in the Arctic, including safety and efficiency of shipping. Russia, being the successor state to the USSR, supports the Murmansk Initiatives. The initiatives stimulated contact and cooperation between CNIIMF and FNI in 1988 and resulted in a pilot study of the NSR in 1991. In 1992 SOF entered INSROP as a third partner on an equal basis with CNIIMF and FNI.

The complete series of publications may be obtained from the Fridtjof Nansen Institute.

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CONTENTS

Abbreviations:

AARI	- Arctic and Antarctic Research Institute
AMTS	- Arctic Marine Transportation System
ASC	- Arctic Shipping Company
CNIIMF	- Central Marine Research and Design Institute
FESCO	- Far East Shipping Company
ISP	- Integrated iron-and-steel plant
LNG	- Liquefied Natural Gas
LPG	- Liquefied Petroleum Gas
MOH	- Marine Operations Headquarters
MSC	- Murmansk Shipping Company
MTS	- Marine Transportation System
NSC	- Northern Shipping Company
NSR	- Northern Sea Route
NSRA	- Northern Sea Route Administration
RF	- Russian Federation
PSC	- Prymorsk Shipping Company
SCDN	- State Committee of the Russian Federation for development of the North
SSC	- Sakhalin Shipping Company
UL	- Ice class of ice-strengthened cargo vessels under the Russian " Register of Shipping", Russia, 1995
ULA	- Highest ice class of ice-strengthened arctic-going cargo vessels under the Russian " Register of Shipping", Russia, 1995

INTRODUCTION

Considered in this paper are the problems of using the NSR in the period 1991-1995, and outlook for development of the Arctic Marine Transportation System.

The results of studies conducted by Academician A. Granberg within the INSROP project III.01.1 "The Significance of the NSR for Regional Development in the Arctic Area of Russia " (Working Paper N 19-1995) have been taken into account in this work.

The main purpose of the work is to generalize the results of the marine transport operations for servicing those northern regions which gravitate towards the NSR, and to assess the up-to-date state of transition to market system.

The changes of political, social and economic situations in the Russian Federation for the last five years have determined changes in both production sphere and organization of economic transportation including Russian northernmost regions, the Arctic zone and the Far East.

The State lost control over the united and well-balanced marine transportation system (MTS) of Russia. The priority in activities of some shipping companies, created on the basis of the State shipping companies, is oriented towards the solution of current financial and economic problems, with prospects and development of the marine transport capacity being put off.

Economic crisis in the Russian Arctic, first of all, resulted from sharp reduction of State investments into marine fleet and port equipment, technical reconstruction of the main enterprises, geological and exploration works, etc. In all zone gravitated towards the NSR, the production of key industries dropped and industrial investments almost ceased. Liquidation of State material-technical supply and disorganization of economic-transportation links negatively influenced the regularity of the cargo supply from other regions. The majority of industrial enterprises , transport and ice-breaker fleets are faced with a difficult financial situation due to the price liberalization.

Crisis phenomena became intensified due to a number of other reasons directly related to the activity of shipping companies. First of all, in the process of transition to the private ownership, the marine transport became broken down, and turned into a number of disintegrated organizations and enterprises having no mutual obligations.
In the second place, the commercial orientation of stock shipping companies , as a rule, is not directed towards cabotage, and this fact makes its organization and realization rather difficult. Disintegration of the marine transportation system into small companies obviously does not contribute to the efficiency of this sector of the national economy.

The unification of the State and private interests is an essence of the concept of the Russian transport development. The goal can be achieved only under comparable

economic conditions for the cargo supply to the northernmost regions and the Far East of Russia and for foreign trade.

Taking into consideration economic, political, international, ecological and social aspects of the Arctic, the President of the Russian Federation charged the Government to formulate by 1 January 1998 [1] :

- principles of united State policy relating to the Arctic as a special region with long-term and vital national interests of Russia, affecting many aspects of life of the country;

- requirements to the development of energetic base for reliable support of social and economic development of Arctic regions, including increasing use of non-traditional and traditional power sources;

- tasks of the development of the technological transportation system of the NSR;

to determine:

- measures to be taken to develop and improve international cooperation in the region of the NSR taking into consideration the increased interest to its use for realization of the transit cargo transportation between European and Asian ports, as well as measures to protect the Arctic sea environment against pollution from ships, with especially susceptible nature of the far north regions being taken into account.

1. CURRENT STATE OF CARGO TRANSPORTATION AND SHIPPING ORGANIZATION ALONG THE NSR

The crisis phenomena in Russia with regard to the NSR, manifested themselves for the last five years in: reduction of the transportation volume; delays in delivery of cargo in ports of departure, and, accordingly, delayed sailing of vessels from the ports; delays in paying freight charges; increase of charges for using aids to navigation (hydrometeorological support, aviation, communication). Favorable ice conditions in traditional navigation seasons of 1991-1995 (except of the Vilkitskiy Strait) made it possible to extend periods of vessel operations along the Route, and to ensure the safety of navigation. The reduction of transportation volume on the NSR, made it possible, as a rule, to use only ice classified vessels to carry cargoes to Arctic points. Favorable ice conditions contributed to more extensive operations of river class vessels along sea ways of the NSR. River vessels completely provided the cargo supply from the Lena river to the Yana and Indigirka rivers. In 1992 navigation for the first time, 4 river vessels exported the timber from the port of Tiksi to Japan.

Ice conditions along the sea ways usually allow river ships to navigate, more or less safely, along the route from the Olenek river to the Indigirka river, and less safely to the Kolyma river. Other routes in the Laptev and East-Siberian seas are practically inaccessible for reliable operations of river vessels due to ice conditions. Ramified river net of the European North, Siberia and the far east (most of the rivers flow from south to north) with tributaries is the important addition to natural connection system - the NSR.

1.1. Basic Directions of Cargo Transportation along the NSR

No serious changes occurred in distribution of traffic along the NSR between sea shipping companies, excluding the decline of transportation volume during the past few years (tables 1,2). Murmansk Shipping Company remain the leader of Arctic transportation ; its vessels operate year-round on the route to Dudinka , provide a larger part of supply in the main directions, carry out cargo transportation to the Western region and provide all needed traffic in transit as well (Fig 1.).

The main line of Northern Shipping Company is timber export from Igarka ; the Company partly services the Dudinka direction in traditional autumn-winter period providing container line Arkhangelsk-Dudinka. Vessels of the NSC deliver commodities in small shipments to the points of south-western part of the Kara and Laptev seas.

Fleet of the FESCO provides the majority of dry cargo transportation in the Eastern region. First of all, this is a direct supply from the east, including that from the ports of Prymorje, Magadan, Beringovskiy (coal), living support commodities to the points of Chukotka, timber export from the port of Tiksi to Japan, container movement from the ports of the Eastern region to Prymorje and from Magadan.

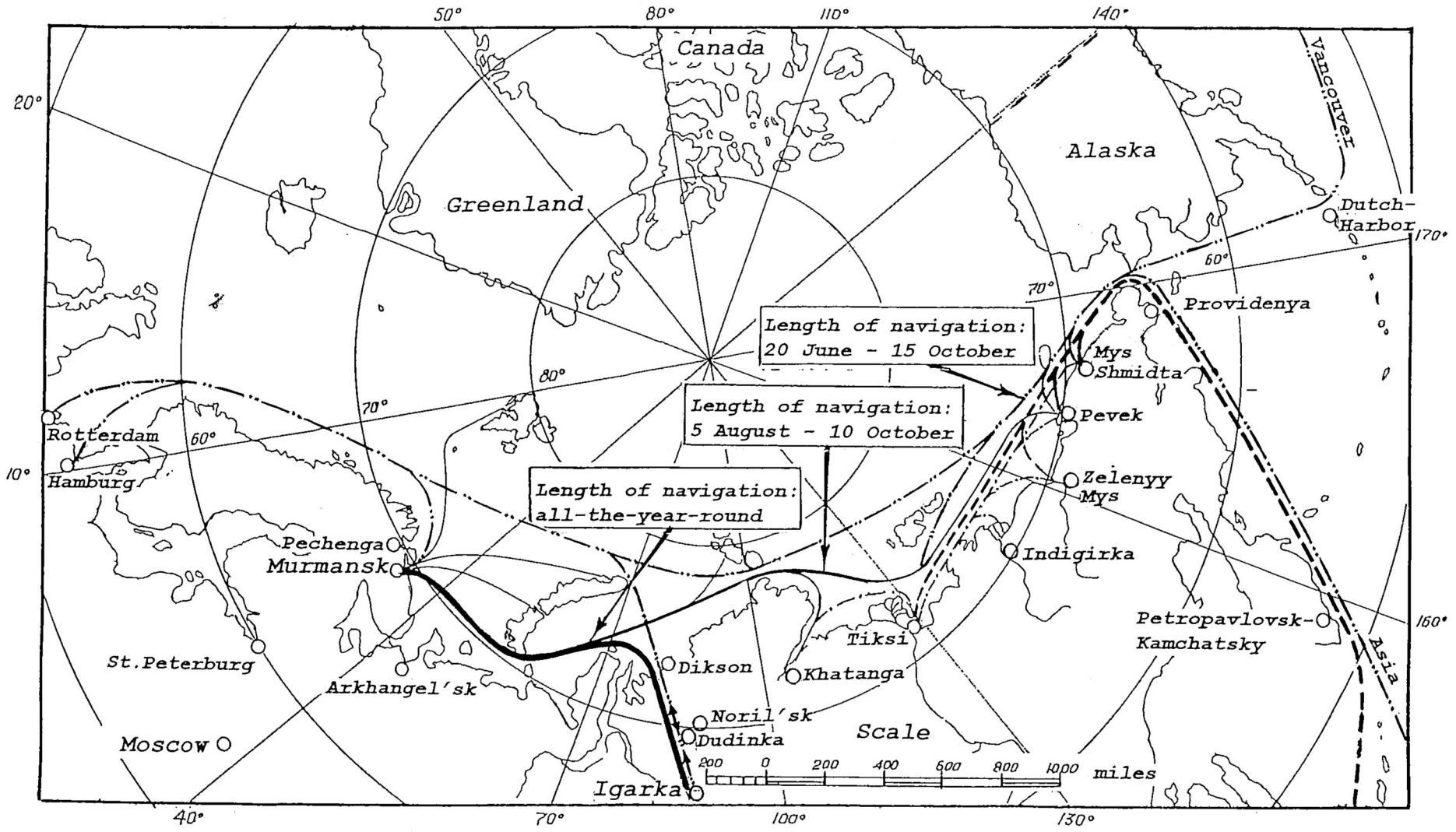

Fig 1. *Main directions of cargo transportation along the Norhern Sea Route*

Delivery of cabotage cargo from West

Delivery of cabotage cargo from East

Intra-Arctic transportation of cabotage cargo

Transit,export and import transportation of cargo

SSC takes part in the transportation of regime cargo to the Eastern region through the port of Vanino, but the vessels mainly operate in the far eastern basin.

PSC, since its establishment in 1971, provide the transportation of oil products in bulk to the ports of the Eastern regions from the hub ports of Vladivostok, Nakhodka and Arkhangelsk. "Partizansk" type tankers deliver oil products from heavy tankers to the bar of the Kolyma river and in the port of Schmidt Mys.

Table 1. Dynamics of the main cargo traffic along the NSR (%) [2]

Main cargo traffic	1991	1992	1993	1994	1995
1.Direct west-to-east transportation	100	82	65	48	50
2. Direct coastal shipping from the east	100	78	60	21	24
3. Internal arctic coastal shipping	100	99	56	11	6
4. Coastal shipping from the Arctic	100	88	53	49	53
5. Foreign trade (total)	100	61	70	85	88
6. Transit transportation	100	115	118	80	57
Total along the NSR	100	81	63	48	50

Note: Total cargo transportation volume along the NSR in 1995 exceeded total cargo transportation volume in the foreign Arctic at least two fold.

Table 2. Ratio of the main cargo transit in 1991 to 1995

Main Cargo traffic	Ratio 1991:1995
1. Direct west-to-east transportation	2,0
2. Direct coastal shipping from the east	4,2
3. Internal arctic coastal shipping	17,0
4. Coastal shipping from the Arctic region	1,9
5. Foreign trade (total)	1,1
6. Transit transportation	1,7
Total along the NSR	2,0

The Arctic Shipping Company is a State-owned company and its main objective is to carry cargoes along the routes of internal arctic coastal navigation:

- cargo delivery from Tiksi to the Khatanga Gulf and points of the Laptev sea, coal delivery from the port of Zeleny Mys (the Kolyma river) to the port of Pevek. ASC provide transit cargo transportation from Pevek to Zeleny Mys.

Shallow-draft fleet of ASC takes cargoes from large deep-draft vessels in the Khatanga Gulf, in the region of Tiksi and of the bar of the Kolyma river, and moves them to the destination where the depth is about 4-5 m at the most.

Data of tables 1 and 2 show that volumes of the main coastal cargo traffic along the NSR decreased by a factor of two from the west and 4 times from the east from 1991 to 1995.This fact can be attributed to the following two causes: sharp reduction of economic activity in Arctic regions and disruption of economic links in the Russian North. Besides, definite stabilization of coastal shipping along the NSR has been observed for the last two years.

Total volume of foreign trade continuously remains small. At the same time the import of cargoes to Dudinka and points of Chukotka shows a slight growth.

NSR transit traffic volume came to its minimum in 1993, however, then the further decrease occurred due to low efficiency of NSR transit as compared to the alternative (south sea) version.

1.2. Structure of the Arctic Marine Transportation System

The system of AMTS consists of :

- transport fleet;
- liner and harbor ice-breaker;
- sea ports and other objects of shore structure;
-aids to and means for (navigational-hydrographic, hydrometeorological, aviation, communication);
- emergency and rescue service, bases of the supply and fleet maintenance service on the route;
- departments, which control sea operations in the Arctic, service AMTS in one way or another, and are situated either directly in the Arctic or beyond the region . (Marine Operations Headquarters, NSRA, ice-breaker fleet services of the MSC and FESCO).

The general system of sea operations on the NSR, besides the above sea shipping companies, incorporates the objects of a number of industries which provide cargo transportation by their own fleet and transshipment of cargo in ports or unequipped points, carry out geological, exploration, scientific and other works in the seas of the Russian Arctic. The competence of bodies managing sea operations includes: ensuring safety of navigation along the NSR; regulating traffic along the NSR; organizing and supervising ice-breaker and pilot support, air reconnaissance; taking measures to prevent pollution of sea and northern coast of Russia from vessels.

All ships navigating the NSR, are under direct operative control of the Marine Operations Headquarters with regard to: option of the route, compliance with the NSR navigation rules, support to the safety of navigation, environmental protection, ice-breaker escorts and observance of laws and regulations which are in

force in the Russian Federation and applied to the Arctic region.

Fees for the cargo transportation along the NSR are established according to direct agreements between ship- and cargo-owners and on the basis of Price-List 11-01 of the State Price Committee (tariffs for sea vessels engaged in coastal shipping) with account for the index regularly set by the Government of the Russian Federation. Despite sliding-scale indexation, the values of the tariff rate lag behind the growth in expenses needed to maintain vessels and other objects engaged in the coastal shipping, which makes the coastal shipping non-profitable.

Ice-breaker service costs, determined by the rates of Price-List 11-01, are paid by cargo-owners simultaneously with freight and other service payments in ports of departure. The relationship between a port and a transport vessel is regulated by actual international, state, ministerial or local laws, rules or other acts (The Code of Trade Navigation, daily rates, port rules, etc.). The relations between cargo-owners and ship-owners are also determined by appropriate laws, rules and terms of the carriage contract.

Internal economic relations within the NSR system, due to its natural monopoly, are not based on a mechanism of market competition, and are an object of the State regulation which imposes on the State the functions of coordination of interests and of a guarantor of normal operation of this transportation system. On the other hand, both AMTS's departments and the regions adjacent to the NSR, are subjects of the market economy, they act at the markets of consumed resources, labor and, to a certain extent, capital, being affected by increasing of prices and other manifestations of the market situation.

Forms of economic cooperation between transport fleet owners and clients are in principle in conformity with a structure of their working relations. State tariff regulation of coastal transportation along NSR is excused by monopoly status of carriers, however a way of the regulation - that is centralized indexation- seems to be not flexible enough to enable one to correct tariffs under conditions of inflation and growth of resources and labor costs. With the present level of tariffs, the NSR coastal shipping is less effective than foreign trade, so the shipping companies concerned, cover all losses incurred through the cargo supply to the far north regions by taking advantage of the foreign trade.

Economic cooperation between ice-breaker owners and transport vessel owners does not correspond to a character of their working relations. Although ice-breakers technologically destined to act in concert with vessels, ice-breaker support fees are to be paid by cargo-owners. The rates of the ice-breaker support to the NSR and in ports are centrally established and indexed, but their level does not cover expenses on exploitation and depreciation. The Decision of the Russia Federation Government of 19 July 1994 No 718 " Measures to Improve NSR Management" was addressed to the Ministry of Finance with a view to ensure annually federal budget allocations for the relevant state support in accordance with appropriate agreements, allotted as a compensation of expenses (not covered by operating revenue) for maintenance and operation of ice-breakers and other vessels subject to remain State-owned vessels.

Arctic shipping efficiency and fulfillment of tasks set for the marine transport under conditions of navigation in vast ice-covered water areas of the NSR where high level of variations of ice cover with time and space is a usual thing, require centralization

of management and rigid undivided authority. Performance of transportation tasks in the Arctic basin is connected with a necessity to subordinate various interests of the parties which take part in transportation process, to the united goal. At the same time the market can not ensure the self-regulation both in preparing for and carrying out the navigation along the NSR.

2. STATE OF NSR MATERIAL AND TECHNICAL BASE

A very fast rate of renovation of the Arctic fleet aiming at transport support of the economic development of the northernmost regions of Russia, enabled the country to create the core of the AMTS in 1960-1985, including liner ice-breakers of high capacity, ice classified vessels of UL and ULA class, sea ports and other means of Arctic shipping support.

Since 1985, economic state of the country has not favoured the growth of Arctic transportation. The reduction of centralized capital investments could not be compensated by own investments of shipping companies, although they received the right to leave depreciation funds at their own disposal, but this fact does not ensure the collection of necessary finance for own reproduction.

The programs, related to the development of material technical base of the AMTS and its maintenance at a proper level, have been slowly realized for the last five years so that the situation does not allow to compensate the aging of technical aids and its reduction due to writing off over-age equipment or handing over a part of vessels to foreign shipping companies operating in the off-shore zones.

The Decree of the President of the Russian Federation " Measures to Renewal the Russian Merchant Marine" of 3 December 1992, No 1513, Governmental Decisions of 20 July 1993, No688 " Authorization of the Provisions of the Russian Merchant Marine Renewal Fund" and of 9 October 1993 No 996 " The First Measures to be Taken to Renew the Russian Merchant Marine" determined financial sources for the fleet construction. The sources were: federal budget, own funds of transport enterprises, resources of newly established fund and of domestic and foreign investors.

Besides, the document clarified that the construction and maintenance of the ice-breaker fleet and the construction of strengthened ice classified vessels and passenger vessels for servicing the population of the far north, were to be budgeted by the Federal Government.

As of 1 January 1997, the development of the Fund and the implementation of the fleet construction Program were suspended for a long time due to insufficient financing.

The composition of the fleet for the Arctic region with due regard for the possibility of using reefer vessels and tankers of ice class of foreign companies, enabled the management to provide transportation along the NSR in usual and prolonged Arctic navigation periods.

The near-term outlook that envisages the stabilization and growth of demand in transport support, transport fleet tonnage, may happen to be not sufficient for the NSR.

2.1. Transport Fleet

At present the vessels of 5 shipping stock companies operate in the Arctic region: Murmansk, Northern, Far Eastern, Prymorsk shipping companies and the State

Arctic shipping company (table 3.).

Table 3. Composition of shipping fleet (ice-strengthened vessels) as of 1.01.1996 [2]

Ship type	Specialization	Cargo capacity, tons	Ice class	Number of ships-Company
"Norilsk"	Conventional	12200	ULA	5 - MSC 6 - FESCO
"Ivan Papanin"	Conventional	6200	ULA	1 - MSC
"Vitus Bering"	Conventional	6200	ULA	5- FESCO
"Dmitriy Donskoy"	Bulk carrier	15850	UL	18 - MSC
"Michail Strekalovskiy"	Bulk carrier	15850	UL	2- FESCO
"Sevmorput" (nuclear)	Lighter carrier	22200	UL	1 - MSC
"Kapitan Sakharov"	Container ship	3800	UL	1 - NSC 3 - FESCO
"Sestroretsk"	Container ship	3800	UL	3 - FESCO
Various types	Timber carrier	2100-6500	UL	39 - NSC 8 - FESCO
"Samotlor"	Tanker	15000	UL	12-FESCO
"Partizansk"	Tanker	5300	UL	1 - NSC 9 - PSC
		Total	ULA UL	17 97

Vessels of the Baltic and Sakhalin shipping companies have finished to operate in the Arctic since 1994 due to lack of cargo-traffic from Baltic countries and a small number of ice- going vessels.

The major transportation volume along the NSR is moved by transport vessel of UL and ULA classes. These vessels carry also full transit cargo of foreign shippers. Average age of ULA vessels is 9,3 years, and of UL vessels - 12,2 years, which makes it possible to operate them after 2000. Ice going capability of ULA vessels is 1,0 m, and of UL vessels is 0,5 m.

The Arctic Shipping Company owns small tonnage conventional vessels of L-1 and L-3 classes (15 vessels) of 3800-4670 t. carrying capacity each, and a 3000 t. bulk carrier of L-3 class and a 3900 t. tanker of L-3 class.

The Arctic fleet is not used to the full; transportation volumes are unequally distributed between sea shipping companies. The major part falls on the MSC and

NSC, and only 30-45% of other companies' fleet is involved in transportation along the NSR.

In the Arctic western region, a shortage of tankers occurred after Latvia had left the Soviet Union, was compensated for account of foreign and joint shipping companies. There is also a shortage of reefer vessels and supply vessels.

The organization of marine operations in the eastern sector of the Arctic provides for the use of "Samotlor" type tankers (for oil products supply) and "Partizansk" type tankers (for transshipment of oil products from heavy tankers to shore stores in the ports of Schmidta Mys, Ryveem, Zeleny Mys on the Kolyma river).

To provide a stable Arctic transportation irrespective of its further development, it is necessary to build new vessels specified in the Program of the Renewal of Russian Merchant Marine [4].

The activity of the Merchant Marine Service of the Russian Ministry of Transport in 1991-1996 was to ensure stable functioning of the Marine Transport, the safety of navigation and improvement of servicing the population and economy of Russia. Among the first significant problems to be solved were: coordination of operations of various modes of transport aiming at sound functioning of transport system engaged in supplying the far north regions and some specially specified north regions; the development of normative legal documents including the Merchant Shipping Code, port and transport laws, normative documents concerning commercial operations; tariff policy including the development of ice fee rates (per ton) for Arctic shipping.

2.2. Ice-breaker Fleet

Liner ice-breakers (NN 1-15, table 4.) are federal property. According to the Decision of the Russian Federation Government [5], the liner ice-breakers are rented by stock shipping companies. At the same time the State compensates those expenses on the exploitation and maintenance of ice-breakers which are not covered by the revenue.

At present the nuclear ice-breaker "50 Years of the Victory" is being constructed at the Baltic yard. It is close to "Arktika" type ice-breakers, but has better hull shape and the improved main engine, units and devices. The ice-breaker will carry passengers' accommodations and may be utilized for tourist trips and scientific expeditions. The commission is envisaged in 1999.

Technical state of the majority of ice-breakers is satisfactory. At present nuclear ice-breakers "Russia" and "Siberia" are laid up for repairs. Those ice-breakers which are engaged in operations, cover Arctic shipping demand for quantity and reliability. Voyage reports for the last 4 years show a rather high average speed of the escort: in western region within traditional shipping season - 7,3 - 9,6 kn, in winter - 6,0-8,0 kn; in eastern region 4,9-7,5 kn. Nuclear ice-breakers are normally used in unfavorable ice conditions in the eastern region, or for escorting vessels eastward to the ports of Chukotka.

In 2000 the nuclear ice-breakers "Arktika" and "Siberia" and diesel ice-breaker "Ermak" are destined to be written off on account of the over-age , the ice-breakers

remaining in service by then will have to ensure the Arctic shipping at least within the present-day volume of cargo traffic.

Table 4. Composition of ice-breaker fleet [2]

Name	Power, ths h.p.	Ice going capability	Year of construction	Operator
Nuclear				
1."Arktika"	75,0	2,3	1974	
2. "Siberia"	75,0	2,3	1976	
3. "Russia"	75,0	2,3	1985	
4. "Soviet Union"	75,0	2,3	1989	MSC
5. "Yamal"	75,0	2,3	1992	
6. "Taymyr"	48,3	1,8	1989	
7. "Vaygach"	48,3	1,8	1990	
Diesel				
8. "Ermak"	41,4	1,6	1974	FESCO
9. " Admiral Makarov"	41,4	1,6	1975	FESCO
10. "Krasin"	41,4	1,6	1974	FESCO
11. "Kapitan Sorokin"	24,8	2,25*	1974	MSC
12. "Kapitan Nikolaev"	24,8	2,0*	1978	MSC
13. "Kapitan Dranitsyn"	24,8	1,4	1980	MSC
14. "Kapitan Khlebnikov"	24,8	1,4	1981	FESCO
15. "Vladivostok"	26,0	1,4	1969	FESCO
16. "Mudjug"	10,0	1,4*	1982	NSC
17. "Magadan"	10,0	0,95	1983	FESCO
18. "Dikson"	10,0	0,95	1983	NSC
19. "Ivan Moskvitin"	5,4	0,6	1971	FESCO
20. "Kapitan Kosolapov"	4,1	0,7	1976	NSC

Note: * ice going capability have been increased up to these figures after the reconstruction of the relevant ice-breakers.
The Program of the renewal of Russian Merchant Marine provides for the construction of liner and port ice-breakers. Their real readiness for operations may be expected after 2000.

2.3. Sea Ports

At present the port of Murmansk, Arkhangelsk, Igarka and Providenija are open for foreign vessels. The Russian Federation Government gives an annual permission for foreign vessels to call in Arctic ports (including Dikson, Tiksi, Pevek, Dudinka, etc.).

The Decision of the Russian Federation Government [5], concerning the improvement of transport service for the northernmost regions, was sent to the Russian Ministry of Economy , Ministry of Finance, State Committee of Property and executive bodies of the Sakha Republic (Yakutia), the Nenets, Taymyr and Chukcha autonomous okrugs (districts) for the purpose of considering a possibility of transfer of ownership of sea ports along the NSR to the above subjects of the Russian Federation and of servicing the needs of the regions listed in the order.

Early in 1995, the Russian Ministry of Transport together with appropriate federal and regional executive bodies defined the list of ports on the NSR to be transferred to the entities of the Russian Federation, but executive bodies in the regions had not accepted ports under their authority up to the beginning of 1997, and the ports of Khatanga and Pevek remained under the jurisdiction of the federal government.

Since 1990 practically all Arctic ports have suffered the reduction in the volume of cargo handling operations, non-fulfillment of measures for the modernization of technical facilities, non-improvement of technical facilities and technology of intermodal cargo handling operations. Pier structures of the majority of Arctic ports require capital repair and reconstruction as well as dredging works to make berthing of modern vessels possible.

Arctic ports are faced with considerable additional difficulties due to historically established practice: the ports supply adjacent settlements and enterprises with heat, water and electric power not receiving usually any compensation from consumers.

Harbor and local fleets lag behind the up-to-day demand for quantity and structure. Due to the above, the sea ports in the Arctic are the most weak link in the AMTS.

The largest Arctic port with the developed port structure is Dudinka. The port of Dudinka, owned by the RSC "Norilsk Nickel", has operated year round since 1978 (except spring high-flood). The port reconstruction carried out in the 80s enables the port to handle sea vessels of up to 10 m. draft [2].

After being partly reconstructed, the port of Zeleny Mys increased its possibility as a transshipment base, nevertheless the major part of cargo traffic formerly delivered to this region, became handled through the port of Pevek because a year-round road was built from this port, whereas the "winter" road from the port «Zeleny Mys» operates only from November till May.

The technology of on-the-roadstead cargo handling operations are maintained in the ports of Schmidt Mys and Ryveem owned by the Russian Corporation "Almazzoloto" and the administration of Chukcha autonomous okrug (district). The construction of ice piers erected in the winter, was practiced during a number of years at Schmidt Mys and Ryveem, however these piers were destroyed annually during shipping season under the influence of positive temperature and storms, and the piles driven into the bottom, when the piers had been constructed, became real dangers to navigation.

The port of Igarka is situated on the east bank of the Enisey river 664 km upstream from its estuary and belongs to the Igarka woodworking integrated plant. Capital repair of piers was carried out in 1980-1987. Technological scheme includes the roadstead or pier loading of packaged timber delivered from Lesosibirsk by river barges, onto sea vessels. Approach depths (from seaside) to the port are limited by

Lipatnikov Perekat (65 km downstream from Igarka), where the minimum depth may come to 6,8-7,2 m.

The main carrier of timber cargoes from Igarka is NSC which has specially built high cost fleet of ice strengthened vessels. The vessels of NSC carried 245,1 thous. tons in 1995, against 750 thous. tons of cargoes which had been carried annually up to 1989, that is, within the period of more than 10 years. Further development of the woodworking integrated plant in Krasnoyarskiy Kray (region) and timber export from Igarka respectively, will depend upon investments. The Igarka direction is always distinguished by its high productive capability and profitability.

Maximum period of navigation up to Igarka, after the ice-breakers of "Kapitan Sorokin" type were put into operations, becomes 150 - 165 days.

2.4. Technical and Economic Results of the AMTS's Activity

The changes in social and economic situation being formed during the process of transfer to the market economy in all branches of industry, resulted in considerable modifications in methods of management of production and criteria of estimation applied to the results.

Production efficiency depends upon the quality of products and labor hours which determine a competitive capacity of the producer at the market. These factors are used when analyzing results of the AMTS's activity (including transport and ice-breaker fleets, ports). The main criterion of estimation of the results of the transportation process is assumed to be the efficiency with due regard for the quality (safety of cargoes, reliability of delivering, environmental protection etc.).

Arctic operations of 1991-1995 were carried out in a year-round regime in the western area of the NSR. Arctic operations in the eastern area (beyond the Vilkitskiy Strait) were conducted during the main two seasons: a traditional (summer) season - June-October and a longer one - May-November. The main directions as in previous years, remained the same: Dudinka, Igarka, principal ways of transportation from the west and east, transit and supply operations.

River, research and special purpose vessels were in operation on the route side by side with transport vessels, hydrographic vessels and liner ice-breakers.

Dynamics of the performance characteristics of the dry cargo fleet for 1991-1995 are presented in table 5.

The capacity of the dry cargo fleet on the NSR in 1995 was equal to 72,2 ton-mile/tonnage-day (average figure for 1985-1995 is 64,3) which resulted from good ice conditions in the traditional navigation period and high operational speed, respectively.

The efficiency of the tanker fleet was 50 % higher than that of the dry cargo fleet; the intensity of the cargo handling operations are 1,5-2 times as high as the period before, although their level has a trend towards a certain reduction in the recent years.

Table 5. Dynamics of performance characteristics of the dry cargo fleet [2]

Factor	Dimension	1991	1992	1993	1994	1995
Average distance covered by a vessel	Miles	2350	2320	2700	2600	2340
Average operational speed	Knots	11,0	10,5	10,5	10,4	10,7
Productive capacity of 1 ton of vessel's carrying capacity	Ton -mile/ Tonnage-day	64,4	60,6	64,6	64,7	72,2
Gross intensity of handling	Ton/Day	824	784	701	893	1223

The characteristics of the transit transportation show sufficiently high performance: 1991 - 142,9; 1992 - 117,7; 1993 - 107,4; 1995 - 101,5; 1995 - 126,5 ton-mile/tonnage-day. A trend towards the reduction is mainly caused by decrease of vessel handling rate in ports.

The production and financial results of AMTS's operations depend considerably upon occasional factors, including abnormal natural conditions which, regretfully, could not be predicted by science.

It should be noted that a share of Dudinka cargo traffics in the total Arctic transportation increased from 44,6% up to 61% for the period of 1987-1995. High and stable speed of the MSC vessels both in summer and winter in the Dudinka direction, intensity of the cargo handling, provide favorable conditions for enhancing the overall performance of enterprises of ISP "Norilsk Nickel".

In assessing characteristics of fleet operations of sea shipping companies involved in Arctic transportation, one can assert that AMTS's efficiency decreases when the transportation volume falls. All general national processes are reflected in the work and efficiency of the transportation system.

Besides, it should be noted that reserves of transport vessels operating the Arctic, are huge, and if necessary, these reserves capable to ensure the growth of transportation up to 4 mill. tons.

Liner ice-breakers, in spite of their high cost and constructional complexity, still remain auxiliary aids in polar shipping, and produce no separate transport product. At the same time, efficient and safe vessels' movement in ice is impossible without ice-breakers, and their role is an important part in achieving objectives of transportation process. Nevertheless, direct criteria allowing us to find a quantitative estimation of ice-breaker's role in each operation, have not been yet

developed.

At the same time, the escorting velocities in various ice situations in combination with transport fleet performance in zone of ice-breaker support enable us to estimate the efficiency level.

Results of ice-breaker operation analysis are the basic data for the formation of its prospects., further organization of both Arctic shipping and ice-breaker support of vessels sailing to ice covered ports of Russia in the winter.

The main task of liner ice-breakers is to escort vessels through ice by means of leading and tugging methods. Therefore, relative significance of time spent in escorting vessels, in relation to overall time of operation, is one of the features of their overall performance. The ice-breaker escort includes the following operations: the escort as such, hull seeking, canal setting, ice breaking, stepping vessels in caravan, etc.

Over-all ice-breaker time is divided into the main two groups: underway time and stay time.

Scheme of vessel movement organization for NSR and ice-breaker support in summer, is mainly related to directions of seasonal transportation. It means that the initial stage of navigation has close relation to vessels escorted to the Arctic points, and the final stage relates to vessels leaving the NSR, so the vessel traffic is not balanced in terms of time. Over-all time of ice-breaker support includes also a time spent by the ice-breakers to provide a basic stay for a vessel engaged in cargo handling operations if ice conditions present any danger to the vessel.

Apart from escort and approaches to vessels, according to the accepted method, ice-breaker passages to the Arctic and to the bases are also pointed out. All other operations, having no immediate relation to the escort of vessels, are broken down into a residual group accounting for several fractions of a percent.

Expenses of the liner ice-breaker time in the Arctic in 1994-1995 are presented in table 7, and those in the western and eastern regions of the Arctic for 1991-1995 are shown in table 8.

Table data shows that overall time expenses on nuclear liner ice-breakers in longer period of navigation
(winter, spring, fall - 1080 ice-breaker-days) considerably exceed the time expenses in the summer (795 ice-breaker-days).

It is clear from the table that overall time expenses on liner ice-breakers for escorting vessels in 1991-1995 are decreasing which is consistently explained by the fall of cargo traffic on the NSR and by favorable ice conditions in recent years.

On the whole, the existing ice-breaking fleet, under conditions of the reduction of transportation volume after 1990, covers the requirements to shipping along the NSR. After 2000, only 10 liner ice-breakers will be in operation, and so the construction of new vessels .will be a problem to be solved.

Table 7. Total time expenses of liner ice-breakers for escorting vessels along the NSR in 1994-1995 (ice-breaker - day)

Ice-breakers which were escorting vessels	Longer period(months)			Summer 6-10	Total
	Winter 1-2	Spring 3-5	Fall 11-12		
Nuclear: "Rossija", "Soviet Union", "Yamal", "Taymyr", "Vaygach"	264	490	326	795	1875
Diesel "Ermak", Admiral Makarov", "Murmansk"	-	-	52	490	542
Total	264	490	378	1285	2417

Table 8. Total time expenses of liner ice-breakers for escorting vessels in the western and eastern regions in 1994-1995 (ice-breaker - day)

Region	1991	1992	1993	1994	1995
Western Region,	2092	1700	1487	1120	755
including longer period	1200	1057	885	600	463
Eastern Region	801	790	285	304	238
Total	2893	2490	1772	1424	993

Ice-breaker operations in terms of shipping company and over-all activities, have negative financial result since 1995; this fact may partly be explained by imperfection of the existing tariffs for the transportation and ice-breaker support in the Arctic.

Generally, it might be concluded that Arctic shipping is getting suitable to new social and economic conditions in the Russian Federation.

As for natural conditions which are an important factor affecting the navigation in Arctic basin, the results of scientists ("Climatic regime of the Arctic by the border of XX and XXI centuries" volume, Rosgidromet, AARI, 1991) are worth quoting: Analysis of the collected material shows that for modern and historical periods, climatic and ice conditions in the Arctic have not suffered basic changes, although sometimes their fluctuations seem to be rather impressive. One of the reason for such stability of natural conditions in this region of our planet is a stability of sea Arctic ice against changes of external climate forming factors which is provided by the presence of unsalted water on ocean surface. Taking into consideration that there is no evidence of a possibility that any essential changes in the state of the water will take place in the near future, one may draw a conclusion that, as to the ice conditions, the present situation has a large probability of lasting at least till the year 2005. Thus, with due regard to careful conclusions of the scientists, one may infer that ice cover on the NSR will remain stable, and demand for ice-breakers and ice-breaking vessels will not subside in the foreseeable future.

3. DEVELOPMENT OF THE NSR

Generally, the North will certainly keep on its role as the main raw and power base of the Russian economy. The NSR will remain the main national transport route in the Arctic which ensures vital needs of its population and functioning economic complexes of northern regions.

In order to confirm the NSR development prospects, it seems necessary to consider legislative acts and programs of Russia regarding this problem for post-soviet period. The results of the analysis will allow us to formulate aims, tasks and measures in relation to the basic directions of development of shipping along the NSR.

3.1. Development of the NSR in Legislative Acts and Programs of Russia

- "Program of Renewal of the Russian Merchant Marine for 1993-2000 "[4] provides for renewal of the Arctic fleet with nuclear ice-breaker "50 years of the Victory" (75.000 h.p.), 5 diesel ice-breakers (33.000 h.p.), UL class vessels (tankers, reefers, conventional and passenger vessels, etc.) - 76 vessels totally.

  Investments from the Fund of fleet renewal (10%) and federal budget (90%) are estimated at RBL 10,9 mlrd and USD 1,083 mlrd , respectively.

  However, due to the absence of financial means, the construction of ice-breakers and vessels have been postponed. According to the Program, USD 36 mill. will be invested in the development of Arctic ports.

- The draft of "State Program of Economic and Social Development of the Russian North" [6] was developed and presented to the Government of the Russian Federation in 1994. The Program was not accepted. A section of the Program "Transport complex" included the forecast of investments in the NSR (table.6).

  When comparing the investments in the NSR on Programs [4 and 6] , it is clear that total investments in the Program [6] are considerably decreased. But even under these conditions, the Russian Federation Government find no funds to invest in the Program [6].

- The Decision of the Russian Federation Government of June 19, 1994, No 718 " Measures to Improve the NSR Management" [5] defined an order of leasing nuclear and diesel ice-breakers to stock shipping companies, as well as an order of passing the Arctic ports into the ownership of federal subjects. The main directions of the NSR development as a part of the program of social and economic reformation of the Far North regions were planned to be prepared in 1994-1995.

Table 6. Forecast of investments in the NSR for period till 2000 (billion rubles/million doll.)

Objects	1995-2000
Transport Fleet	1796,5/100,6
Liner ice-breakers	1064,1/ 93,0
Sea ports	186,5/ -
Port ice-breakers	255,2/ 0.3
hydrographic objects	285,9/100,0
Nuclear - powered fleet base	253,4/125;0
Total	3841,6/418,9

- The Federal Law " Bases of the State Regulation of the Social Economic Development of the North of the Russian Federation", 1996, [7] defines a principle of the state regulation - - advanced development of infrastructure , first of all , communication and transport, including the NSR. According to this Law, the amount of finance allotted for supplying the north with cargoes (goods) presents a separate line in the Federal budget.

- The Federal Program "Economic and Social Development of Small Indigenous Peoples of the North up to 2000" [8] defines measures to be taken for development of transport and communication in traditional areas of inhabitation of small indigenous peoples of the Far North. In particular, it is planned to develop water transport (put into operations 20 steamships and cutters). For these purposes, 366 mlrd. rubles are to be invested in 1997.

The Concept of the 1997 Federal Program " The World Ocean" [1], section 9 " Development and Use of the Arctic" provides for formulation of tasks aimed at development of the NSR technological transportation system and at determination of measures to develop and improve international cooperation in the region of the NSR. At the same time, an increased interest from foreign countries in using the NSR , mainly for transit cargo transportation between European and Asian ports, is considered herein after.

The above legislative acts and programs concern only a part of NSR's problems. These documents define conceptually the prospects of the NSR development.

At present, a Draft of the Federal Program "Northern Sea Route" [10] is being discussed in Russian scientific organizations.

3.2. Aims and Tasks of the Development of the NSR

The Arctic regions with the population accounting for 1% of the total population of the country, give 11 % of Russian national income. Arctic export share (22% of Russian one) will increase, mainly at the expense of extraction of the basic

hydrocarbons. The Russian Arctic concentrates more than half of the infrastructure of sea and river communications of the country. The core of these links is the NSR.

As the Russian North economy becomes more stable and developed, the existing coastal transportation will increase, NSR transit and export/import transportation will develop. New sea cargo traffics in the western part of the NSR will be oil, natural gas, petroleum gas, condensate .

The goals of the NSR development can be expressed in the following words: the reliable, up dated and qualitative provision of transport services in the Arctic on the basis of stable development of the national Arctic sea transport in the interests of Russia, with due regard for growing Russian and foreign needs in this field .

The use of the NSR must be a Russian monopoly and be under State control and make a profit for the State as it is with operation of the Panama, Kiel and Suez canals.

Reliable delivery of cargo is a matter of top priority for the NSR, where force-major cases have a higher probability due to ice conditions. From this point of view, any expenses were considered to be justified. Nowadays, market economy requires that investments have to be economically substantiated.

The fact of cargo delivery in due time plays the growing role on the market. On its basis, highly effective production systems which operate on the basis of the minimized storage reserves, will be formed. The due time delivery will be the main requirement to the developed technological transportation systems of hydrocarbon exports from the fields of the Arctic coast and shelf of the Barents and Kara seas.

Quality of the cargo delivery has to be provided by all technological operations related to delivery of cargoes (increase in the share of packaged and processed industrial raw cargoes), transportation by sea and allied modes of transport and the final delivery to clients.

NSR development tasks will be the following [11]:

- development of technical and material base of the NSR to such extent which would ensure the rapid development of Arctic new fields and seaborne oil and gas exports, reliable internal and external transport links in any time of the year, Russian State priority and interests of RF subject in the Arctic for long-term prospects;

- implementation of new principles of the State and market regulation of commercial and legal conditions for Russian and international shipping along the NSR: tariff system of fees for use and services; State insurance of cargo and vessel including guaranteeing safety and planned time of passing through the NSR;

- creation of the safety management system for navigation in the Arctic which ensures minimum risk of vessel casualties in ice, safety of human life at sea and the marine environment protection.

The NSR development tasks will be fulfilled by stages which are determined in the decree of the President of the Russian Federation [1]. At the first stage (1997-2002) a task is to stop the uncontrolled process of fall and stabilization of the main parameters for current technologies of NSR Arctic transportation. At the next stage

(2003-2007), a potential is to be created for the NSR in financial, legal, political, ecological, scientific spheres. At the following stage (since 2008), according to the strategy of the internal development of Russia and its position in the international arena and in the Arctic as well as according to the prospective needs of the country, a new technological structure of the NSR will be formed, including new transport technologies for NSR transit and hydrocarbon exports from coastal fields and those of shelf of the Barents and Kara seas.

3.3. Basic Directions of NSR Development

The basic directions of NSR development have been elaborated by the Central Marine Research and Design Institute [11] and presented for incorporation into the federal program " The World Ocean" [1].

Direction 1. Transport support for the development of productive forces and economic relations of the Far North zone.

Measures:

- creation of data base on the development of production forces of the North and potential cargo traffic affected by the NSR;

- development of schemes of the transport support of the economy and activity of the Far North population;

- marketing transport services for transit and regional export/import cargo carriages along the NSR, and comparison of their efficiency to the alternatives: the South Sea Route, trans-Siberian railway, river, sea and pipe modes of transport;

- coordination of interrelations between the sea and allied modes of transport for the development of intermodal transportation;

- development of international transit cargo transportation along the NSR;

- development of Arctic sea tourism.

Direction 2. Enhancement of the role of the NSR in the development of natural resources of the Far North zone.

Measures:

- elaboration of technological transportation systems of LNG/LPG exports from fields of the coast and shelf of the Barents and Kara seas;

- elaboration of technological transportation systems of oil exports from the Timan-Pechora, Priob, Enisey and other fields;

- elaboration of a technological transportation system of mining metallurgic product exports;

- development of a technological transportation system of technical supply to regions of oil and gas fields being developed;

- development of a technological transportation system of timber and other product exports.

Direction 3. Development of material and technical base of the NSR.

Measures:

- elaboration of the development concept of NSR material and technical base with regard to various types of property;

- determination of the demand and sources of investments in the development of dry cargo, liquid cargo and ice-breaker specialized fleets up to 2008;

- development of the existing and creation of new ports and transshipment terminals, including shelf ones; determination of investments sources.

Direction 4. Improvement of the NSR navigation management system.

Measures:

- preparation of a legislative normative basis of state regulation and commercial legal conditions for navigation of Russian and foreign vessels along the NSR;

- development of NSR management principles through vertical and horizontal channels;

- substantiation of the creation of regional transportation and industrial-transportation enterprises of various types of property;

- proposals to change juridical status of marine spaces bordering the northern coast of Russia, taking into consideration national interests and provisions of the 1982 UN Convention of the Law of sea;

Direction 5. Improvement of the price setting and transport policy for the development of Arctic shipping.

Measures:

- elaboration of principles of state regulation of price-setting and tariff policy under the market conditions;

- improvements with respect to charges and fees for services provided by the marine transport and ice-breaker fleet for regional and transit transportation.

Direction 6. Navigation safety and communication.

Measures:

- elaboration of the concept of NSR navigation management;

- technical economical feasibility study of the creation of Arctic ice reconnaissance and communication system to ensure operative management of navigation and safety of navigation with regard to cooperation of various departments' users;

- scientific monitoring of introduction of satellite navigational differential sub-system in the Arctic, with experimental tests being carried out;

- elaboration of draft system of operative monitoring of vessel position in Arctic region taking into consideration the requirements of the safety of navigation and international shipping.

On the whole, within the middle-term prospects, the NSR will develop as a national transport way for the benefit of Russian economy. International shipping development may promote additional investments and so facilitate the solution of internal problems.

Realization of projects on hydrocarbon exports from fields of the Barents and Kara seas, transit general/containerized cargoes and export/import transportation along the NSR for needs of Arctic subjects of the Russian Federation enables the country to gain USD 8-10 mlrd per year as an additional income for the Russian budget.

CONCLUSIONS

1. On the way to the market economy, Russia takes measures **to maintain the NSR as the united national route in the Arctic.** The State executes trade-off functions with regard to interests and financial support of State, stock and private enterprises concerned with the cargo supply to the North. The State will play the leading role in forming regional markets of commodities and transport services.

2. The structure of the AMTS has not changed. It includes transport vessels, ice-breakers, ports, aids to navigation and navigational aids (navigational-hydrographic and hydrometeorological equipment, aviation and communication) and navigation management bodies (NSRA, MOH, ice-breaker fleet services, MSC, FESCO).

Transport vessels are owned by stock shipping companies.

Liner ice-breakers are under federal ownership. Liner ice-breakers are rented to stock shipping companies by the Dicision of the Russian Federation Government [5]. Therefore, the State reimburses the expenses on ice-breaker maintenance not covered by the income.

Ports are transferred in ownership of the Arctic Federal Subjects [5].

3. Cargo transportation volume along the NSR decreased by a factor of two in 1991-1994. This resulted from the fall in domestic economic activity and from disturbance of the balance of economic ties in northern regions. The reduction of the cargo transportation volume along the NSR came to a pause and stabilized at 1994 level. However, this volume is twice as much as the total cargo transportation volume in the foreign Arctic.

4. The directions of cargo traffic remain identical: cabotage cargo supply from the west (24%), from the east (11%), internal Arctic cabotage (0,5%), Arctic cabotage export (32%), Arctic foreign export (25%), import (2%), transit cargo transportation (5%).

All cargo transportation, including transit, is carried out by Russian vessels. Five shipping companies take part in Arctic transportation: MSC (25 vessels), NSC (75 vessels), FESCO (45 vessels), PSC (26 vessels), ASC (19 vessels).

Ice classified vessels (17 - ULA and 97 - UL) cover the great bulk of cargo transportation. However, there is a shortage of tankers, reefer vessels and supply vessels.

Up to 10 foreign tankers (Latvian and Finnish) are rented for oil product supply of the points of the Russian Arctic. Foreign tankers are placed under authority of the Russian-Finnish company "Arctic Shipping Service" (Murmansk). Arctic ports (Dikson, Tiksi, Pevek, Dudinka, etc.) are annually opened for foreign vessels by the of the Russian Federation Government [12].

5. Scheme of ice-breaker position on the NSR as previously, is determined by directions of cargo traffic, terms of navigation and specific ice conditions.

MSC's ice-breakers (10 vessels) navigate year round in the western sector - on line Murmansk-Dudinka (ISR "Norilsk") and escort vessels on all the route for longer period (May-November), as well as for traditional period (June-October) in regions of heavy ice conditions (The Vilkitskiy and Long Straits) .Since 1990 nuclear ice-breakers have annually made voyages on the NSR with foreign tourists aboard, including voyages to the North Pole, and brought in foreign revenue.

Diesel liner ice-breakers of FESCO (5 vessels) ensure traditional navigation terms in the eastern part of the NSR. However, under hard ice conditions in area of the Long Strait, diesel ice-breakers can not always overcome the ice cover, and in this case nuclear ice-breakers will come to help them.

6. On the whole, up dated potential of ice-breaker and transport fleet in the Arctic is able to ensure, up to 2002, stabilization and then recovery of the volume of cargo traffic along the NSR to the level of 1986.

Reserves of Russian transport vessels and ice-breakers of the strengthened ice class could ensure the increase in the cargo transportation volume between the ports of Europe, North America and Asia up to 300-350 thous. t. [13].

7. The Northern Sea Route opened since July 1, 1991 for international shipping, has not been used by foreign commercial vessels. This fact depends on three factors: 1) foreign cargo- and ship-owners have no relevant information of opportunities of the NSR as a safe and the shortest way against the traditional "south" way; 2) ice classified vessels (ULA, UL) are generally not available in foreign countries; 3) limits of the shipping season on the NSR.

8. The further development of the NSR is envisaged to be within the terms and scales which will ensure fast development of new Arctic oil and gas fields and seaborne oil and gas exports, reliable internal and foreign trade links year round, as well as the state priority of Russia in the Arctic and interests of Arctic federal entities for long-term prospects.

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31 Oct., '97

Dear Dr. Ragner,

I have now read the draft of the INSROP Discussion Paper *Current uses of the Northern Sea Route* by Ivanov, Ushakov and Yakovlev. It represents an important contribution and in my view is now ready to be published, apart from the the clear need for some serious polishing of the English. To some extent current information on operations on the NSR is even more difficult to obtain now than it was during the most secretive period of the Soviet Union -- hence the great importance of this work.

Yours sincerely,

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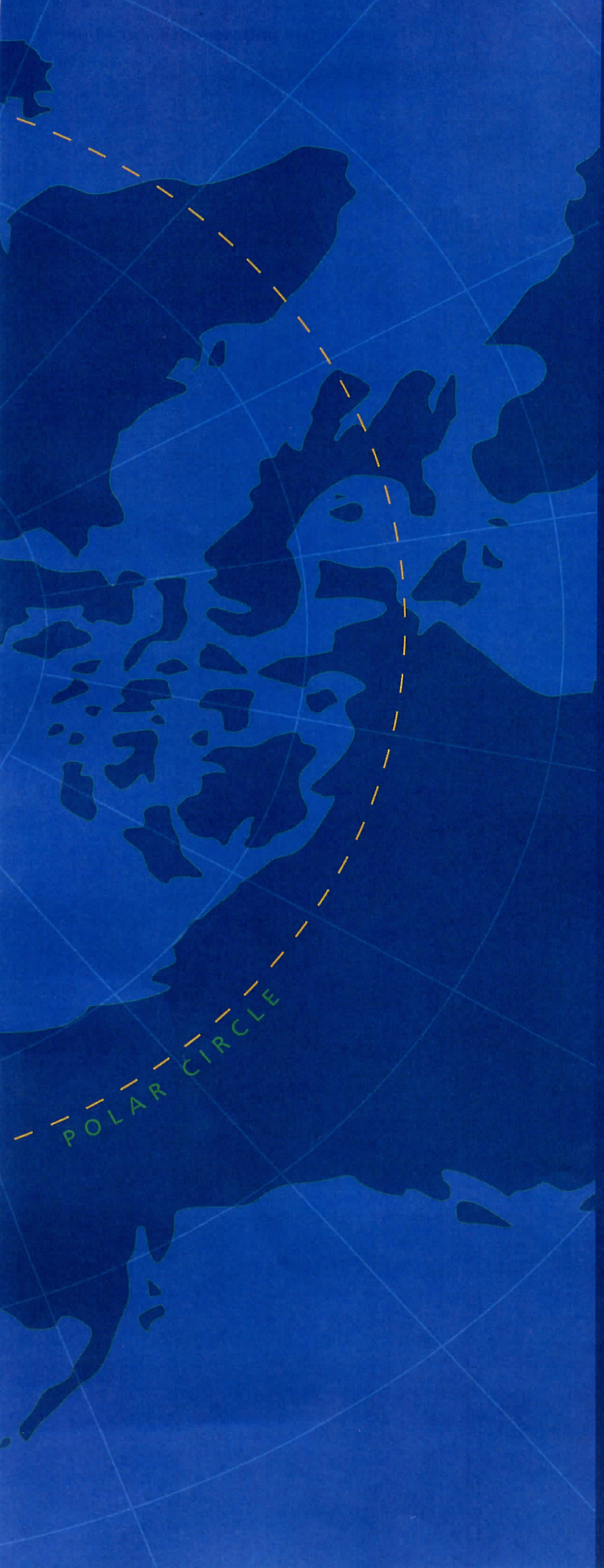

The three main cooperating institutions of INSROP

Ship & Ocean Foundation (SOF), Tokyo, Japan.

SOF was established in 1975 as a non-profit organization to advance modernization and rationalization of Japan's shipbuilding and related industries, and to give assistance to non-profit organizations associated with these industries. SOF is provided with operation funds by the Sasakawa Foundation, the world's largest foundation operated with revenue from motorboat racing. An integral part of SOF, the Tsukuba Institute, carries out experimental research into ocean environment protection and ocean development.

Central Marine Research & Design Institute (CNIIMF), St. Petersburg, Russia.

CNIIMF was founded in 1929. The institute's research focus is applied and technological with four main goals: the improvment of merchant fleet efficiency; shipping safety; technical development of the merchant fleet; and design support for future fleet development. CNIIMF was a Russian state institution up to 1993, when it was converted into a stock-holding company.

The Fridtjof Nansen Institute (FNI), Lysaker, Norway.

FNI was founded in 1958 and is based at Polhøgda, the home of Fridtjof Nansen, famous Norwegian polar explorer, scientist, humanist and statesman. The institute spesializes in applied social science research, with special focus on international resource and environmental management. In addition to INSROP, the research is organized in six integrated programmes. Typical of FNI research is a multi-disciplinary approach, entailing extensive cooperation with other research institutions both at home and abroad. The INSROP Secretariat is located at FNI.