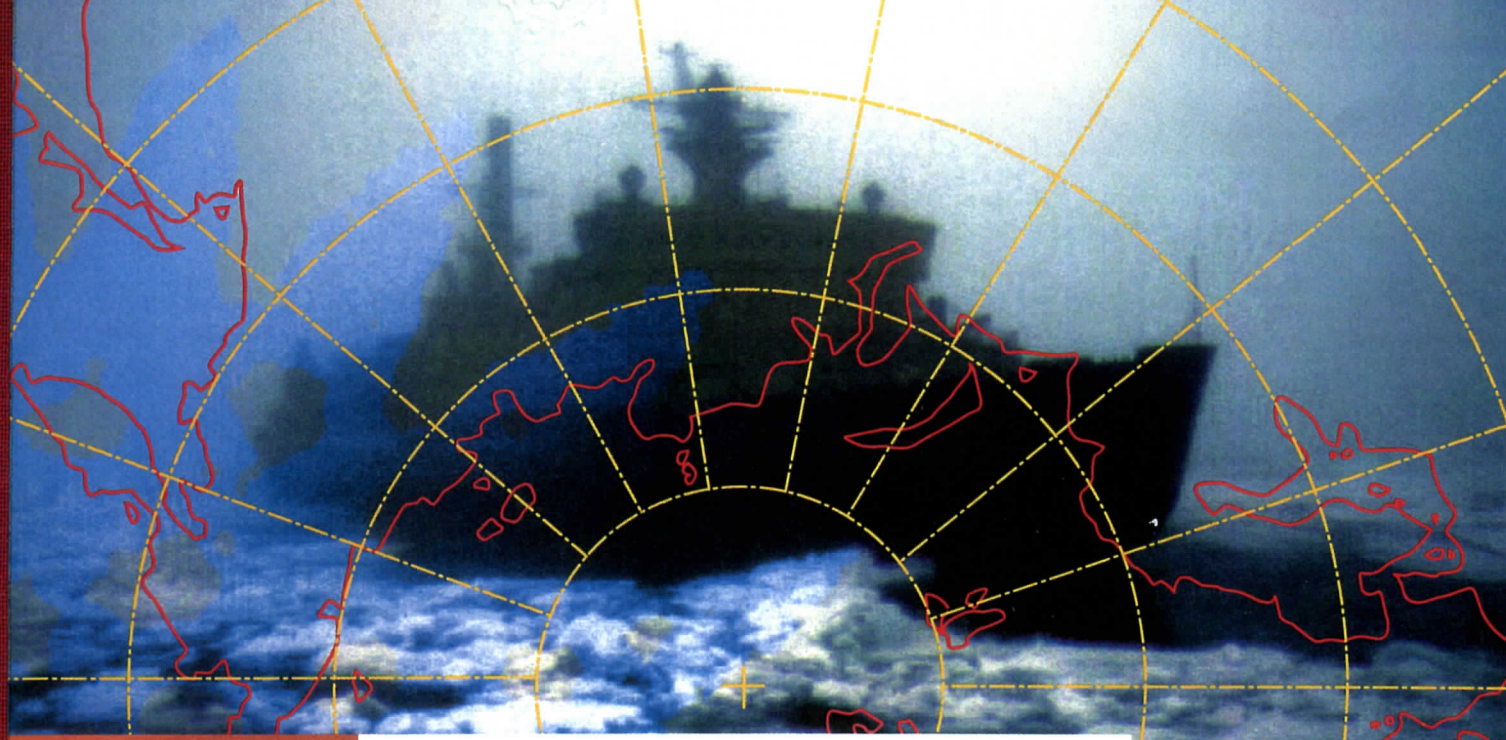

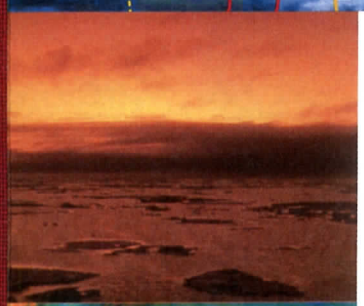

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Using the INSROP Phase 1 Data in a Transport Evaluation Process

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INSROP International Northern Sea Route Programme

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Supervisor:	Anders Backlund, Kværner Masa-Yards Technology
Title:	**Using the INSROP Phase 1 Data in a Transport Evaluation Process**
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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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1. Background

During Phase 1 of the INSROP, a great number of reports has been produced covering a wide range of topics in the field of natural conditions, environmental questions, international trade and laws and politics.

As in any large project lasting for many years, it is valuable to compare the achieved results with the project goals in order to be able to take necessary corrective actions. A suitable way to control how well the work done fulfils the target of the program is to take the standpoint of a possible user of the project data.

In order to evaluate how well the INSROP Phase 1 data fulfil the project goals, Kvaerner Masa-Yards Technology (KMY) and Edgar Gold of the Oceans Institute in Canada have studied the results of the different reports. KMY has considered the role of one user, a Western ship owner interested in new business opportunities, while Edgar Gold has covered the interests of an insurer supposed to insure the Western shipping company's vessel.

2. Objectives

The hypothetical Western owner is interested in the new business opportunities that the opening of the Northern Sea Route for Western ship owners can bring. He is especially interested in the possibilities to compete on the market of the Murmansk Shipping company, a company that has been operating for a long time on the route and has seemed to be successful in the trade.

The objective of this study is to evaluate the data provided by the INSROP reports in view of the owner's needs. He has realised that probably the most potential trade would be the trade of nickel concentrates and other possible similar cargo from the harbour of Dudinka. One reason for the trade selection is also that he supposes that most data can be found on this trade, limiting the risk to some extent.

NOTE! Only INSROP Working Papers (IWP) published before 15.9.96 and discussion papers available before the same date have been considered in this study. The authors are aware of the large number of reports which will still be published within INSROP Phase 1 and that they may include data listed as not available. It has, however, been considered important to prepare the report before the final decisions of the structure of the INSROP Phase 2 will be done.

3. Decision basis for the owner

To be able to evaluate the business potentials, the owner has to do a number of calculations and estimations.

The owner's questions are related to the following main groups:

- actual transportation task
- required investments and costs for them
- cost on chartering an existing vessel
- operating costs
- operating risks
- legal requirements and restrictions
- income / competition

3.1 Transportation task

Cargo
The cargo is known to be nickel concentrates from the mines in the Norilsk area.

Market / Route to market
To be able to evaluate the trade, data on the market of the cargo is needed. How much of the trade is within Russia and how much is taken to a western market?

The cargo is to be transported from the harbour of Dudinka at the Jenisei river to Rotterdam on the European continent.

Vessels
The owner is interested in two alternative solutions: chartering an existing vessel or building a new vessel to suit the trade. The owner knows that sister vessels exist to the vessels that have been used in the trade. Are they available? Can any other existing vessels be used?

3.2 Investments

Operating philosophy
To be able to do the final decision, two different operating philosophies must be considered: operating with the assistance of icebreakers or independently. Both options will have to be considered in all further questions to give the optimum result.

Requirements for vessels to be used
It is necessary to know the conditions in which the vessel will operate to evaluate the requirements to be put to the vessel. Information required is for instance: required ice class, performance requirements (performance in both ice and open water), requirements set by the port facilities and route.

Vessel size
The vessel size selection is based on a comparison of the profitability of different vessel sizes. Vessel sizes to be compared will be based on physical restrictions and general experience. The actual comparison will not be described further in this report as the data requirement does not depend on the size of vessels.

Number of vessels required
The owner should be able to evaluate the number of vessels required to fulfil the task. This requires knowledge of the expected transit time of the vessels to be used as well as loading times in the ports on the route. The final result is a function of vessel size.

Price of newbuilding
If a newbuilding is needed, the size of the investment must be determined. This requires an even more detailed knowledge of the operating conditions, port facilities and legal requirements.

Available vessels fulfilling the requirements
The existing vessels fulfilling the requirements should be known.

Charter rate of an existing vessel
In case an existing vessel is used, the charter rate of a vessel fulfilling the requirements must be known.

3.3 Operating costs

Fuel costs
The actual fuel consumption must be determined on the basis of machinery fuel consumption rate, power used along the route, time used at certain power levels. Possible use of assisting icebreakers also influences on the fuel consumption and thus fuel costs.

Manning costs + regulations
Existing manning requirements of the port country must be known

Port fees
The fees for harbour assistance, loading and other possible costs caused by visiting the port must be known.

Other infrastructural fees
Vessels visiting a port must pay different fees stipulated by the government. Such fees are piloting fees, icebreaker assistance fees, fairway fees, etc. All such fees must be known in an extent that makes it possible to evaluate the effect of different designs on these fees.

Insurance costs
Hull and machinery, P&I, and cargo insurance fees are important when evaluating the economic risks in a new area.

3.4 Income / competition

The basic interest of the owner is naturally the potential of making profits from the operation. The owner should have knowledge of the different cargoes available and the possible competitive transportation solutions. He should also have knowledge of the cargo base, i.e. how real the transportation need is and how long it will last.

A factor highly influencing on the income possibilities is the competitive situation. Are there many competitors acting already on the route? Is it expected that when the trade increases, new highly competitive owners will come on the market? What is the expected supply/demand relationship?

As the traffic in many areas can be seasonal, the owner should be able to evaluate the alternative use of the fleet and how he can improve the suitability of his fleet for an alternative use.

3.5 Operating risks

Accidents
Accidents are avoided as far as possible in all operations. Still they happen. Data on the possible accidents and statistical accident rates for this route would be valuable when preparing preventive actions and estimating the additional costs caused by these accidents. Data on available SAR and salvage services should be presented. Data on available repair facilities are also essential.

Ice damage
Damage to the vessel or parts of it caused by ice is an obvious risk when operating along the NSR. Operating statistics from the route could present

valuable information about the risk for such damages and the costs for repairing them.

Icebreaker availability

In case of increased traffic, it is expected that icebreaker assistance will not be readily available. Experience of the Baltic shows that even in a situation with a large number of icebreakers, a certain degree of downtime is expected because of icebreaker unavailability. What is the position of the single owner in a situation of lack of icebreaker assistance?

Downtime

Downtime due to difficult weather conditions and port congestion is expected in any trade. Data on the risks in this specific trade are required.

3.6 Legal requirements and restrictions

Before starting an operation in a new area, the owner should know the rules and regulations governing. These laws may stipulate requirements for use of national services, they may regulate the position of vessels of different nationality, etc. All such legal framework should be known.

4. Marine insurance coverage factors

4.1 Types of Marine Insurance

In the operation of cargo vessels, there are four principal required types of marine insurance coverage:

- Hull and Machinery Insurance (H&M)
- Cargo Insurance
- Protection and Indemnity Insurance (P&I)
- Oil Pollution Coverage (for loaded tankers)

Fuller details of these insurance types are already covered in IWP 1, Marine Insurance for the Northern Sea Route. This section will simply provide an overview of this information, but with an emphasis on data requirement and the risk assessment decision process. It should be noted that there are also several other types of insurance coverage, such as war and strike risk, etc., which are not of consideration for the NSR at this stage even though they would present interesting considerations. However, the IMO has concluded an international convention relating to liabilities arising out from the ocean transportation of hazardous and noxious substances. When this treaty enters into effect, it will require a new area of insurance coverage that may affect the NSR.

4.1.1 Hull and Machinery Insurance (H&M)

H&M insurance provides the necessary coverage against loss or damage to the hull, machinery and attached equipment of the vessel. However, at present, H&M policies do not cover navigation in ice-infested waters and require special arrangements with the insurer and commensurate clausing of the policy. Although "double-hulled" vessels have been operating in Arctic waters for a long period, this type of construction is now also increasingly being utilised for open water navigation. It is considered that such vessels are less likely to cause marine pollution in case of collision or grounding. It is too early to assess if insurance premiums are positively affected by this type of construction. In some cases, a double hull may, in fact, involve higher repair and maintenance costs and, thus, higher insurance premiums.

H&M insurance provides coverage for total and partial loss up to a stated value. In cases of total loss the insured receives the insured value fully. In cases of partial loss coverage for required repairs is related to the insured value. Coverage is only paid when the repairs are completed. Repairs may be required to be carried out in accordance with the wishes of the insurer.

H&M insurance also provides coverage for a "constructive total loss" (CTL), which may be very relevant on the NSR due to long distances and lack of salvage, towage and repair facilities. A CTL occurs when there is not a total loss but where the damage

would require repairs that are close to or above the insured value. (Under Norwegian law 80% of the insured value.) In such cases the insured is paid the insured value and the vessel can then be treated as a total loss. However, the insured may still have the obligation to remove the damaged vessel or wreck. This would be covered under the vessels' P&I policy discussed below.

H&M insurance also provides coverage for collision liability towards another vessel. Under English law this coverage, under the "running down clause" provides up to 75% of liability towards the other vessel. The Norwegian policy provides coverage for up to 100% of liability. This is important coverage on the NSR, where vessels operating in close proximity with icebreakers and in convoy with other vessels may be prone to more frequent physical contact.

The H&M insurance premium is based on the risk exposure of the vessel. There is no specific scientific basis of determining such risks. However, the insurer's decision to accept the risk and charge a specific premium is more likely based on actuarial experience with that type of risk and with the owners proposing the coverage. In terms of the NSR there is as yet relatively little actuarial knowledge of the risks involved. On the other hand, a number of London insurers have underwritten risks for the Russian market for some years and, as a result, there is some experience in the insurance market. Nevertheless, there is still a significant lack of reliable statistical data and it can be expected that initial premiums will be conservative until a better data base is provided. Such data should include:

- vessel type, size and class
- vessel seaworthiness and record
- experience and competence of master, officers and crew
- availability of an "ice navigator" or expert on board
- planned navigational route
- time of the year for the voyage(s)
- equipment on board
- regulatory requirements along the route
- available services along the planned route

More specifically the required data should provide information on:

- the different conditions affecting navigation along the NSR
- classification societies' "ice class" requirements and definitions
- seasonal ice class considerations
- operational difficulties in specific or expected ice conditions
- navigational infrastructure along the route, including navigational aids, communications etc.
- ice information availability for alternative routes
- identification of specific risks to the vessel
- salvage, towage, repair, docking and related facilities along the route.

As already indicated, insurers would be particularly interested in data on the accident/loss record of the proposed insured or, if that were not available, for other, similar operators on the route. Obviously, if nuclear-powered icebreakers are to be utilised, there may be special, legal and other considerations involved in the risk coverage.

4.1.2 Cargo Insurance

Cargo insurance covering risk of loss or damage to the various types of goods carried on board vessels is usually underwritten more widely than H&M and P&I insurance. However, it is based on the same principles as H&M insurance. Cargo insurance covers loss and damage to all types of cargo, including liquid and dry bulk cargoes and general cargoes, whether carried in containers or on a "break-bulk" basis. On the NSR cargo damage claims may especially arise out of "freezing" and "sweating" damage - as recently elaborated in an IDP entitled Freezing Damage to Northern Sea Route Cargo: Liability and Insurance Conditions.

As in H&M insurance, the CTL principles are also available for cargo insurance. This is especially relevant for the NSR where, in the case of an interrupted voyage, the costs of forwarding goods to their planned or final destination may, in fact, exceed their insured value. In such cases, the insurer may actually pay the insured value.

Specific factors to be taken into consideration when assessing cargo insurance risks are:

- type, value and quantity of cargo
- characteristics of the carrying vessel
- contemplated route of the vessel
- characteristics of the cargo, i.e. packaging, containers, bulk liquid or dry bulk, value, danger or hazard, etc.
- experience of the type of cargo to be insured, including loss record etc.

Once again, there is relatively little actuarial experience of insurers for cargoes on the NSR. However, in many cases, the cargo policy may not specify the route to be taken as it is assumed that carriage will be between points A and B by the most direct, safe route. Nevertheless, it can be expected that most cargo insurers will require disclosure if the NSR is to be used, especially in cases of high-value cargoes.

4.1.3 Protection and Indemnity Insurance (P&I)

P&I insurance provides the shipowner with "protection" against "third party" risks and provides those damaged with "indemnity" coverage for claims. In day-to-day vessel operation it is the most important insurance as it provides coverage for some 30 *P&I risks* up to a potential unlimited ceiling with the exception of oil pollution. P&I coverage is arranged through a small number of mutual P&I "Clubs", principally based in the U.K., Norway, Japan, Sweden and the U.S. In general, P&I insurance

covers all risks not covered under the other types of marine insurance. Included are cargo liability, wreck removal, legal fines and costs, death and personal injury, collision with fixed and floating objects, etc.

P&I insurance is taken out by ship owners and charterers, who are members of the P&I club. The claims record as well as the expected risk are taken into account in setting annual premium "calls" as well as subsequent calls if there are many and/or large claims. Once again, also the characteristics of vessel and planned voyage and trade will be considered. In this connection the NSR will present a relative unknown factor to P&I Clubs and it is expected that initial P&I premiums will be on the conservative side until some reliable claims information can be developed. For example, continuous operation in very cold conditions may affect the occupational health and safety of crew members and thus could lead to increased claims and expensive medical evacuation. Also, the possibility of Russian legal action and fines for regulatory offences in an uncertain legal system may result in higher costs. Damage to cargo due to freezing and sweating may be another factor to be taken into consideration.

P&I clubs will be especially interested in the actual ship operation and management, demonstrated skill of master, officers and crews, maintenance of the vessel, communications system available and other operational factors. Although some P&I clubs have experience of Russian operations, many have not. As a result, some owners and charterers may have difficulty in obtaining adequate coverage, at least at the beginning of the trade. In general, it can be predicted that P&I claims on the NSR may well be higher than those experienced elsewhere. In particular, wreck removal, pollution salvage and towage, cargo, and crew claims will be of special concern. Accordingly, the information base required for P&I insurance will be similar to that needed for the other types of marine insurance. However, special emphasis will be on the actual operational information of the NSR voyage.

4.1.4 Oil Pollution Coverage

Tankers carrying persistent oils and operating anywhere today are also subject to special liability insurance coverage for marine pollution. P&I clubs provide first-level coverage under the IMO's Civil Liability Convention (CLC). This coverage provides compensation for pollution damage arising out from an oil spill. As with other P&I coverage, pollution insurance is also based on similar criteria in terms of loss record, voyage type, etc. It can be expected that NSR insurance in this area will be carefully considered as there are few records of NSR tanker voyages and there will be a fear that possible environmental and other damage claims will be especially high in the NSR region.

The second level of oil pollution coverage is provided under the IMO's International Oil Pollution Fund Convention (FUND), which is funded through oil industry contribution and administered by the International Oil Pollution Claims Fund (IOPCF). FUND coverage commences when the CLC coverage is insufficient or not available. Although it may be conjecture to assess how the NSR would be accepted by

the IOPCF it is likely that the major contributing states would wish to carefully assess unknown pollution risks in the NSR region.

Both the vulnerability of the Arctic environment and the difficulties in combatting operations increase the need for special considerations when determining the insurance coverage levels and overall risks.

5. Investments

5.1 Requirements for vessels to be used

5.1.1 Importance

To be able to start an evaluation of the transportation task, one of the main starting topics is the question of requirements for the vessels set by the environment, different authorities and practical arrangements. Without a good knowledge in these topics, it is very unsure, almost impossible, to start a business operation.

5.1.2 INSROP discussion on requirements for the NSR vessels

The requirements for vessels operating along the NSR, when it comes to necessary ice class, have been discussed in three reports, IWP14, IWP 17 and IWP32.

IWP 17, Operational Aspects, discusses the requirements in general terms, with references to other publications. No direct data on the requirements for vessels operating along the NSR can be found in this report. IWP 14 discusses briefly the requirements for vessels and states in general terms that the NSR administration normally would require a minimum ice class of UL or L1 or equivalent. Lower class vessels may be permitted during summer. In another section it is said that the NSR regulations normally demand ice class L1 or equivalent.

IWP 32, Evaluation of the Northern Sea Route Using the Ice Regime Shipping Control System, lists the ice class that would be required in different parts of the NSR in different months of the year, using the Canadian Arctic Shipping Pollution Prevention Regulations. For year-round operation to Dikson (represented by the Western Section in the report) would require CAC 4 ice class. Operating during the open water season only would in some cases be possible with Type E vessels. This is, however, just a study of what the Canadian Rules would require.

Physical restrictions set up by the environment along the route have also to be known. In IWP 17 some characteristics about the Arctic ports have been listed. There it is stated that the Dikson port can be entered at a maximum draft of 11 m. The Dudinka port is also discussed but no such data is given. IWP 44 discusses the ports along Ob/Irtysh and Yenisey. The draught at key in Dudinka is said to be 11.5 m. IWP 19 confirms this data in addition to which it reports that the maximum water depths on the route from the Yenisey Bay are 10.4 - 10.6 m. On the basis of this, we may assume that a draft of 11 m is the limit when operating to Dikson and a vessel draught of about 9.5 m is maximum at the key in Dudinka..

Data on the straits along the NSR are presented in IWP 2 "Routing, Communication and IT-Customising". This report states that the straits west of Dikson have the following draft limitations: the Kara Gate 21m, the Yugorski Strait 12 m and the Matochkin Strait 13 m. If we consider the Dikson limitation, 11 m, these straits do not put any additional limitations.

The route along the Yensei River from Dikson to Dudinka is not described in any report. It would be of interest to know if there are any limitations for extensive traffic along the route. Does the river allow vessels to meet at any point of the river or are there problems expected in case of a larger traffic density?

Some more specific requirements set up by the NSR administration are described in IWP 2. Such requirements are for 30 day fuel, 60 day food supply and distilling plant for water.

5.2 Available vessels fulfilling the requirements

5.2.1 Importance

In any new transportation task, there are two possible alternatives to be compared: the use of an existing vessel or the construction of a new vessel. When starting a totally new operation from which you have very little experience, it is tempting to use an existing vessel, limiting the capital risk. When the legal and other requirements are known, it is still not clear which vessels fulfil these requirements. Especially along the NSR where most requirements are set according to Russian specifications, it is important to be able to translate these requirements to Western standards, so that the characteristics of a vessel can be compared to the requirements set up.

5.2.2 Description of existing vessels for NSR operation in INSROP

As a part of IWP 26 and 42 a database has been built up on existing ice strengthened Russian cargo vessels and icebreakers. This database can also be found as a part of the GIS-material.

The INSROP Project III.05.2 has published a discussion paper called "The World Ice-Classified Fleet. A feasibility study of the Northern Sea Route as an alternative to the International Shipping market". This report includes an extensive list of the ice class vessels over the world.

To be able to use these listings and the earlier list of vessel requirements, one needs to establish the correspondence between the Canadian ice classes and the ice classes of other classification societies. The Discussion Paper produced by project III.07.1. "The NSR tariff Structure of Fees" includes an appendix a table describing the approximate correspondence. The problem is, that this table is based on the class notations in

1990. The notations used in the report dealing with the requirements uses the latest version of the Canadian Rules. IWP 2 includes tables of approximate ice class equivalencies. The author makes a note that a certain degree of personal judgement has been included in the ice class equivalency determination. It would be of great help to know what these personal judgements have been, so that this evaluation could be done for a specific vessel.

On the basis of the ice class requirements stated above, it can be assumed that the SA-15 type vessel with the ULA ice class notation, is suitable for operation along the NSR. No report really states its suitability for year-round operation, but general knowledge of the history allows us to make this conclusion. The physical restrictions (water depth in Dudinka 11.5 m) do not limit the use of the vessel with its Arctic draught of 9.0 m.

5.3 Number of vessels

5.3.1 Importance

As the capital costs play a major role in an Arctic transportation system it is in the interest of the owner to optimise the combination of vessel size and number of vessels. The number of vessels will be calculated on the basis of cargo volume, cargo capacity of vessels and transit time estimate for the vessel. The transit time estimate will include both time at sea and time in port. It is one of the main topics of a feasibility estimation to find the optimum size of vessel and corresponding number of vessels.

5.3.2 Parameters affecting the speed of a vessel in ice

When calculating the vessel speed in ice conditions, a number of parameters from both the vessels and the ice conditions must be known:

The vessel
- propulsion power
- propeller characteristics
- hull form characteristics (stem form, parallel midbody, etc.)

The ice conditions
- level ice thickness
- level ice strength
- ice concentration
- ridge frequency
- ridge dimensions
- ridge strength characteristics
- multi year ice frequency
- ice cover extent

The use of assisting icebreakers greatly influences the speed of the vessel with certain characteristics. When evaluating the speed of an icebreaker-cargo vessel combination, also the performance of the icebreaker must be known. In many cases the vessel will be a part of the convoy of many vessels. The speed of such a convoy depends on the capabilities of the vessels included, especially the vessel with the poorest performance. Availability of icebreakers also greatly affects the total time consumed on the trip (e.g. how long is the waiting time for a convoy to be built up and an icebreaker to be available).

The vessel data bank in the GIS includes some data on vessel characteristics (hull form, etc.). It is not, however, discussed in any report how these values should be used in estimating the vessel performance.

The discussion paper for INSROP Project I.1.10 of June 1996 includes calculations of transit speed of a SA-15 type vessel in different sections of the NSR. The calculation is based on published ice condition data and a division of the NSR into seven segments. The subdivisioning does not fully fit into a case of traffic along the Yenisey River but gives some starting ideas of speed along the route.

These data are more extensive than those listed in point 6.3.2 where only some maximum data are required.

5.3.3 NSR ice condition reporting in INSROP

An absolute majority of the ice condition data has been registered in the INSROP GIS. This database incorporates the ice conditions for the whole NSR registered in the AARI ice charts for the period 1967-90. Data are presented both as single year ice charts and multi-year statistics. Data have been registered for a great number of points covering a network of co-ordinates.

The GIS includes data on the following characteristics:

- level ice thickness (first year ice and old ice)
- ice coverage (first year ice and old ice)
- fast ice existence

The data are presented for each month on the basis of 10-day ice charts. As each month consists of several ice charts, probabilities are presented also on a single year basis.

The multi-year statistics include ice coverage probability numbers (10, 40 and 70%) as well as maximum, minimum average and medium values.

The level ice thickness statistics present the probability of the level ice thickness to be in certain ranges (70-120, 120-200, above 200) in addition to the above mentioned specified numbers.

The fast ice statistics present the probability of fast ice existence in every listed point.

It can be concluded that the number of data on the characteristics included is quite extensive. A coverage of 23 years and a time interval of 10 days between charts can be regarded covering.

The data banks however lack information on one critical characteristic: ridges. To estimate the transit velocity, power requirement and hull strengthening without including ridges cannot be regarded as meaningful. It is well known that some of the seas along the NSR are heavily ridged and that the ridges have a major influence on all subjects listed above.

A more general discussion and description of the NSR ice conditions is included in the discussion Paper for project I.1.19 "Ice Environment and Ship Hull Loading along the NSR". This paper concentrates on the methodology of ice condition characterisation, especially in the case of ice damage probability calculations. Suggestions for distributions of different ice condition parameters are presented. Ice condition data from the NSR are presented, but with the same problem as in the INSROP GIS: lack of ridge data.

In IWP 22 there are some notes on the ridges in the Pechora and western Kara Seas. This paper presents values on the ridge spacing and ridge sizes, but it does not give any numbers on the ridge strength characteristics.
It can also be noted that data on level ice strength characteristics are missing

Another topic not covered in the GIS is compressive ice. It is well known that this phenomenon exists and that it has a major influence on both the traffic and the strengthening of vessels. It would therefore be essential to have data on at least areas of greater risk for compressive ice as such data has been presented in other projects. Perhaps the results of a separate project on compressive ice can be included in the future.

A separate subject is the reliability of the data derived from the ice charts. It would be useful to have results of actual measurements included in the data base as a supplement to the data derived by air borne reconnaissance.

5.3.4 Convoy speed discussion in INSROP

Another topic not covered is the convoy speed. IWP 14 describes the convoy techniques and discusses the topic of "Safe speed" in general terms, but does not include any figures on actual expected speeds. At the Northern Sea Route Expert Meeting 1992 (a supposed preface to INSROP) Tor Wergeland presented a paper ("Commercial Shipping Perspectives") including figures for SA-15 type vessel speeds. These numbers were however for the total NSR, why it is difficult to do assumptions for the route to Dikson/Dudinka.

5.3.5 Time in port

IWP 44 describes the facilities in Dudinka. The harbour is well equipped with cranes (more than fifty 32 ton cranes). The port can accommodate five vessels simultaneously which does not seem to be a very large number remembering the fifty cranes. This fact can be compared with the data presented in IWP 17, where it is said that the harbour can accommodate up to ten vessels simultaneously.

There are ample storage areas but according to the report they are not covered. A double track railway also serves the harbour.

Some other ports are discussed in IWP 54 in a description of the rivers Dvina, Onega, Mesen and Pechora. Some data on the cargo capacity are given for the largest ports.

No report discusses the expected loading times in the NSR ports, even if such times with certain reliability can be calculated when the lifting capacity for the specific port is known and general figures on port efficiency are available for different ports in the world.

The available data on ships, ice conditions and the route in general as well as published information on ship performance were used to evaluate different route alternatives to the Yenisey river. The evaluation also included ship speed calculation. Figure 5.1 shows the different route alternatives.

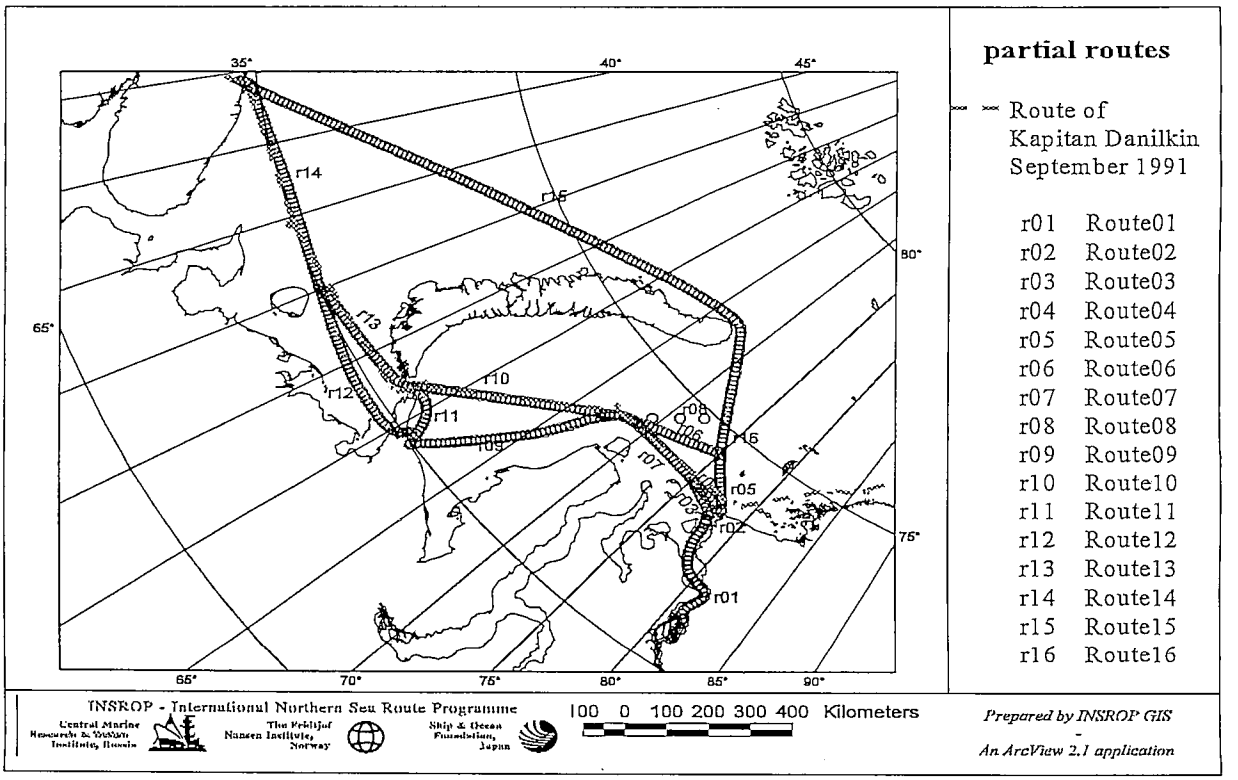

Figure 5.1 Different route alternatives between Murmansk and the Yenisey river, determined by the use of INSROP GIS

Table 5.1 shows the one-way transit times on the above mentioned route when using the SA-15 type vessel.

Month	Transit time	Round trips/month
1	93.4	1.8
2	158.6	1.2
3	279.0	0.9
4	303.6	0.9
5	313.9	0.9
6	135.5	1.4
7	71.9	2.0
8	70.6	2.0
9	70.6	1.9
10	71.9	2.0
11	76.1	1.9
12	82.7	1.9

Table 5.1. Transit times in different months on the route Murmansk - Dudinka

5.4 Price of vessel

5.4.1 Importance

Recent studies on the costs of Arctic transportation have shown that the capital costs of the vessels play a very major role in the feasibility. Up to 60% of the costs can be related to the financing of the vessel construction. Reasons for the high vessel price are above all the high power and heavy strengthening requirements. Other factors influencing the price level are the low number of manufacturers capable of constructing these vessels and the limited knowledge base (compared to open water vessels) about the prevailing environmental conditions.

5.4.2 Parameters affecting the price of an icebreaking vessel

As mentioned above, the construction costs of an icebreaking cargo vessel are mostly influenced by the power requirement and the hull strengthening requirement. For other types of vessels, different other characteristics may influence the costs, however usually to a more limited extent.

A definition of the power requirement requires a broad knowledge of the environmental conditions in the operating area of the vessel. A knowledge of only the maximum conditions easily leads to an over-dimensioned solution, making the vessel unnecessarily expensive. As for open water vessel where statistical data on different features (such as wind and wave data) are available for performance requirement

definition, a knowledge of the variability of the different ice features is essential for an economically feasible solution.

The most important characteristics that should be known are:

First year ice:

- Level ice thickness
- Strength of level ice
- Ridge frequency
- Ridge size
- Ridge strength characteristics
- Compressive ice strength and occurrence frequency

Multi-year ice:

- Concentration

The discussion above has been dealing with the construction costs of ice breaking vessels. One should however remember that there is a difference between the construction cost and vessel price. As this is a more purely economical question, not too specific for the vessel intended for Arctic operation, this matter will not be discussed in detail.

A certain remark may perhaps still be justified. Especially when making comparisons with standard open water vessels, it may be misleading to compare relative differences in construction costs and apply them on the market prices, even if such comparisons are quite common (e.g. if the construction costs of an ice capable vessel is X% more than for a standard open-water vessel, this does not necessarily mean that the market price of the ice capable vessel would be X percentage higher than the market price of the open water vessel). The number of manufacturers of Arctic vessels is limited and they are mostly situated in countries with higher cost level. Other factors influencing the vessel price are the fact that the Arctic vessels are one-off products in comparison to the open water vessels built in long series as well as the higher quality required when manufacturing the Arctic vessels.

5.4.3 INSROP discussion on prices of vessels for NSR operation

General vessel price indications have been given in two reports (IWP 22 and 48) regarding LNG and LPG vessels. A more general discussion on the effect of season length and environmental conditions on the price of a vessel has not been presented.

6. Operating costs

6.1 Fuel costs

6.1.1 Importance

Cost of fuel is the main operating cost component of a vessel. In standard open water operations a fixed daily consumption rate is often used. In an Arctic system this approach cannot be used as the power level will vary depending on the ice conditions, and the time spent at a certain power level will depend on the extent of different conditions.

6.1.2 Data availability

The fuel oil consumption (per time unit) is the function of the engine power level and the specific fuel oil consumption rate of the engine. The total consumption can then be calculated when it is known for how long the different power levels (ice/open water) will be used.

On the basis of the speed determination described in chapter 5.3, a consumption estimation can be done. Data to be used are power level, time spent at each power level and specific fuel oil consumption rate (SFOC). Additional data required which are not specified in 5.3. include only the SFOC which depends on the type of machinery. In this case a knowledge of the specifically Arctic machinery is essential.

The availability of data required for vessel speed calculation has been described earlier. The question of specific machineries for Arctic vessels has not been discussed in any report. IWP 22 and 48 include examples of fuel consumption rates but they do not describe the assumptions behind theses figures. The GIS data bank on Arctic vessels includes a field for fuel consumption, but it does not present any number in this field.

6.2 Manning costs + regulations

6.2.1 Importance

One of the key questions when selecting a vessel to be used and when deciding the total operating system to be used is the question of manning. Different organisations set up rules that govern the nationality and level of manning onboard a vessel

operating in a certain area. As the manning costs are a significant part of the vessel's operating costs it is important to know the existing laws and regulations.

6.2.2 Discussion on manning topics in INSROP

The question of manning regulations for vessels operating along the NSR has been discussed to some extent in IWP 17. The NSR regulations are there described and it is noted that the Master must be experienced in operating the vessel in ice.
Costs related to the manning of vessels along the NSR have not been discussed in any published IWP. The only reports considering this question are IWP 22 and 48. These reports give the cost of manning for some specific vessels according to Western standards. The GIS data bank includes data on crew size in listed vessels.
An interesting detail in this discussion is the availability of experienced masters. If the traffic increases, there might occur a shortage of capable ship masters and at least it could be expected that the crew costs can be increased. Special training, including both ice simulators and existing vessels would be needed.

6.3 Port fees

6.3.1 Importance

Port fees and other infrastrucural fees play some role in areas with high competition between alternative ports. In an area like the NSR with few competitive alternatives, they are of less importance. It must, however, be pointed out that also these fees must be predictable. For this purpose also port fees should be commonly known.

6.3.2 Discussion on port fees in INSROP

Port fees have been discussed in only one IWP, number 54. Other papers mentioning the topic are IWP 22 and 48 where all possible cost components have been included. Both these reports discuss cases where the NSR port is represented by an LNG/LPG loading structure, not a port. Because of this, no port fees are assumed at the NSR end. IWP 1 refers to a publication "Port Dues and Charges for Commercial Soviet Seaports". However, no figures are presented.

IWP 54 discusses the transportation of timber in North West Russia. It states that the total port fees in Narjan-Mar are 0.523 USD/m^3 of which the canal fee is 57%. No other ports or cargoes have been discussed.

It is nevertheless expected that some kind of port fees will be charged from foreign vessels in all harbours. As data are available for only timber in Narjan-Mar, one can only assume general world market level. A clarification of this subject would be most recommendable for a future project.

6.4 Other infrastructural fees

6.4.1 Importance

For most of the other infrastructural fees, the same can be said as for the port fees: the level will probably not affect the total economy of the system, but predictability will be required. As in any operation, a certain degree of justification for fees to be charged is expected.

6.4.2 Discussion on other infrastructural fees in INSROP

The NSR fee is referenced in many occasions with the usual statement that it is too high. In the discussion paper to Project III.07.1 the authors discuss in a somewhat difficult way the general price setting principles. The present price setting is discussed as well as possible new fee principles. As the present fee is based on full displacement, ice class only with a separation for summer/winter and whole NSR/part, a possible fee structure based on assistance distance and cargo type is discussed. The present fee structure is however described incompletely. It is difficult to know what the difference is between "Escorting" and "Special escorting". In addition there are no definitions for what the "full displacement" means. In many cases (including INSROP reports) this is supposed to mean the displacement of the vessel. In fact experience has shown that full displacement means the measure length*breadth*draught, which is a considerably much larger figure than the displacement and thus are also the prescribed fees much higher.

Costs for pilotage are also given. The fee for one pilot is 210 USD/day including commission. In addition to this must all expenses related to the delivery of the pilot to the vessel (including travel expenses 80 USD) be paid by the owner.

Inspection required to get NSR certificate costs 75 USD/hour for each surveyor.

All the necessary inspections (immigration, duty, NSR certificate) are today performed in Murmansk. This means that an extra harbour visit, costing both money and time (about two days), is required.

6.5 Insurance Premiums

6.5.1 Importance

Although marine insurance costs do not represent a major factor in terms of NSR expenditures, they will still be an important factor in terms of assessing the feasibility of the necessary commercial investment. In most cases, the total marine insurance

premium will vary between 1 and 8% of vessel value. In some cases it can be even higher. However, once again, there is as yet relatively little information on this. IWP 46 reports that marine insurance costs under Canada's Arctic Pilot Project would be the largest single cost component of the operation, i.e. up to 24%. However, this projection was never actually tested in practice. In any case, as already suggested above, the marine insurance market would treat any new operation very conservatively and initial costs would be commensurately high. As also indicated above, the many unknown factors relating to operational liabilities will present P&I clubs with particularly difficult decisions. Accordingly, a strong INSROP data base, which assists underwriters in coming to the necessary decisions, is essential. It is certainly as important as the commercial data base without which the NSR cannot become a reality at all.

6.5.2 INSROP Assessments of Marine Insurance Premiums

The topic of marine insurance risks for the NSR is being researched under INSROP Sub-Project IV.3.3 which at this stage has produced IWP 1 and IWP 46 and an IDP on cargo insurance. This research has so far concentrated upon an examination of the various types of marine insurance, the insurance system itself and includes some of the knowledge acquired by insurance markets in London, New York, Oslo and Tokyo. In addition, some comparisons are drawn from the Arctic Pilot Project in Canada which examined Arctic risk assessment thoroughly, but without any operational testing. Although the Arctic Pilot Project provides some assistance, it cannot be compared in terms of navigation in those parts of the NSR where multi-year ice is not experienced. That should have an effect on insurance costs.

Another research paper, IWP 48 provides some insights of possible NSR marine insurance costs from a shipowner's perspective, but provides little reliable backup for the points put forward. IWP 1 and IWP 46 attempt to provide a number of recommendations on the action necessary to strengthen interest in the marine insurance area amongst the other researchers in INSROP. In addition, INSROP Sub-Project IV.3.3 has also attempted in raising interest in the major insurance markets by "de-mystifying" the NSR in the hope that an active marine insurance market with realistic premiums can be developed. This work is still proceeding.

At the same time, researchers in INSROP Sub-Project IV.3.3 have tried to obtain actual marine insurance quotes on two hypothetical vessels, based on the data presently available. Contacts have been taken to hull and P&I underwriters in Canada, Norway, Russia, Japan, UK and US. Of these, only the Russian underwriters were capable of giving a quotation. It is, however, not well known how reliable and dependable the quotations will be. The Norwegian market is looking at the NSR since 1993 and has set out a guideline for the risk. This guideline can be found in attachment 1.

It can thus be concluded that, at this stage, a shipowner wishing to invest in the NSR has little actual marine insurance to rely on. The insurers are only slightly better off as they can at least assess some aspects of the traditional Russian market at this stage in

order to.decide on needed premiums. However, even such assessment is considered far from reliable especially in terms of recent Russian political and commercial developments. It remains, therefore, to be seen if INSROP can provide the real data base required. At this stage it appears that the first phase of INSROP will not be able to achieve this.

7. Income / competition

7.1 Importance

The ultimate objective of any commercial operation is to create profits. This also applies to maritime operations along the NSR. A possibility to profit making must exist to attract any kind of operations along the NSR. Because of this, data on the income possibilities and the expected competition is essential.

7.2 INSROP discussion on income level of NSR operations and competition on the route

One of the main topics of subprogram III "Trade and Commercial Shipping" is to investigate the commercial potential for shipping operations using the NSR. A number of studies have been performed to create an understanding of the possible trades that could use the NSR, as a transit route utilising either the whole distance or parts of it. Two reports have dealt with the problem of the total route, five reports have discussed the oil and gas potentials in the western part of the NSR and four reports have discussed the regions along the NSR and along the rivers floating to the NSR area. Of the fourteen reports published within subprogram III, eleven have dealt with the potential of different cargo to be transported through the NSR.

Most of the reports do not, however, indicate the possible income level. Most of the reports are studies into the available cargo, while few discuss the actual costs related to the transportation and the potential of success. Two reports (IWP 22 and 48) include comparisons of present rates and possible NSR rates. IWP 44 calculates the transportation costs from the rivers Ob and Yenisey, but does not conclude anything about the competitive situation. In addition, the report includes some errors (calculation errors and NSR fee estimation errors) which makes it even more difficult to draw the right conclusions.

No report discusses the competitive situation on the NSR. What are the actual possibilities of a Western owner to compete with Russian shipping companies with extensive experience on the route? Is it really expected that a free competition will take place? There are some indications that a protective legislation is planned. It would be of greatest interest to hear the view of both Western and Russian specialists on this matter.

8. Operating risks

8.1 Accidents

Statistical data
IWP 17 discusses data from earlier sailings. Data from some sailings during early and late sailings is given in a table, including route data, area of severest ice conditions and waiting time due to heavy ice conditions. The same report states that the most severe section of the route is the one from Cape Chelyushkin to the port of Tiksi. In another section of the report the history of navigation in the Russian Arctic is described. Among others, the passage of the French vessel L´Astrolabe in 1992 is described. The average speed is said to have been 11 knots. In 1991 more than 200 Russian vessels made a total of about 900 trips in the Arctic.

SAR
When operating a vessel in any area of the world, it is the responsibility of the owner and the master of the vessel to take care of the emergency readiness onboard the vessel. As a part of this, it is important to secure that the standard SAR-services are available.

The COSPAS-SARSAT system for sending rescue requests has been discussed in IWP 17. It is noted that the system works well in the Arctic, eventually even better than at more southern latitudes. A picture (9-4) of the satellite system coverage indicates however that there are shortcomings in some areas of the NSR. It is somewhat difficult to read the picture, but it can be concluded that 2-3 satellites cover the route to Dudinka.

There are however no data on actual SAR-services. As the reviewer states, it would be of great importance to know where SAR services can be found and what the level of services for these stations is.

Oil spills
Oil pollution and related topics are discussed in WP 63, WP 64, WP 65 and WP 76. The discussions are related to oil pollution combatting plans and shore reception facilities. Short listings are included concerning the available oil combat equipment as also lists on the responsible parties (WP 76).

A table has also been prepared showing factors influencing the oil spill risk level (WP 65).

WP 63 discusses the regulations controlling different kinds of pollution caused by ships. Different rules are described, but very little is said about special implications on vessels inteded for operation along the NSR.

Even though four reports discuss the oil spill and combat questions, very little is said about the special requirements caused by the environmental conditions. It would be of great use to discuss the risk level and combat cost level along the NSR in comparison with standard open water conditions. This would be of interest when determining the insurance levels.

8.2 Ice damage

IWP 14 discusses the damage statistics of operation along the NSR. It is stated that during the period 1954-90 a total of 800 damages were reported on the NSR. The ice conditions in which the damages have occurred are described in general terms. It is concluded that many ice damages are caused by icebreakers in close-tow towing relatively old vessels not designed for this type of operations. Relatively many old ships of L1 class have been involved in the damages. The eastern part has, due to its more difficult ice conditions, a larger part of the damages. On the route to Dudinka, most of the damages (46 %) occur between Belyi Island and Dikson. The majority of the damages are located in the bow section.

A third chapter of the same report describes the ice accidents. Some historic accidents are described (Chelyushkin, Kasachstan). In a table, numbers are given for the percentage of sailing vessels with ice damages on the western and eastern part of the NSR. It can be noted that in heavy ice conditions on the western part 7.5 - 8.0 % of the vessels have ice damages. In light ice conditions the respective figures are 1.0 - 1.5 %. It is also noted that the relatively largest amount of accidents can be found in August - September during the easiest ice conditions.

IWP 35 also discusses the ship damages. Some data are the same as in IWP 17 but also some new data are presented. It is stated that 82.5 % of all ship damages were caused to the hull. The rest was caused to propellers, shafts, steering gear.

All in all, it can be concluded that scattered data abut damages to vessels caused by ice exist. A more analytical approach and description discussing the damages caused to vessels of higher ice class in different ice conditions would be valuable. The actual damages should also be compared with theoretical estimates and class regulations. More detailed descriptions of both the ice conditions and the actual damages would make it possible to apply these data on other vessels.

8.3 Icebreaker availability

As the number of icebreakers is limited, it is expected that a vessel will have to wait for an icebreaker to arrive. This is normal in Baltic conditions and is probable in the NSR at least at higher traffic volumes.

Availability of icebreakers (and thus expected downtime when waiting for icebreaker assistance) has not been discussed as a separate topic. The icebreaker fleet is described in IWP 19 but no discussion on the actual availability and assumed icebreaker waiting time has been included. Studies usually assume that icebreakers are available all times and that no extra time has to be included.

It is however expected that such downtime will occur. Experience from operations in the Baltic and published articles on NSR operation indicates that a certain downtime is expected. How long this downtime will be is to a large extent a question of traffic volume, icebreaker characteristics, ice conditions, characteristics of assisted vessels and assistance distances. If a large amount of traffic through the whole NSR is developed and no additional icebreakers are used, a remarkable downtime must be expected. A more detailed description of the convoy operation during the same times of larger traffic volumes would be enlightening.

8.4 Downtime

Downtime can basically be divided into three groups: downtime when sailing due to environmental conditions, downtime because of icebreaker unavailability and downtime in port operations. Downtime due to icebreaker unavailability has been discussed in chapter 8.3.

8.4.1 Downtime when sailing

In the design of any vessel, the maximum conditions to be met are specified. In the absolute majority of cases it is known that conditions in excess of the specified may occur but so seldom, that it would not be economically feasible to include them. When these conditions occur, the vessel will either have to stay in port or stop at sea to wait for more favourable conditions.

To be able to evaluate the risk for such downtime which in ice for instance includes heavy ice compression, a good knowledge of the prevailing environmental conditions is required. The presentation of the environmental conditions has been discussed in chapter 5.1.

8.4.2 Downtime in port operations

Another topic, quite tightly related to the loading time, not dealt with is the time each vessel is expected to be forced to wait for berth due to port congestion. This is a question very familiar to owners trading to other Russian ports, who also know that the waiting times can be considerable. This topic should be reported in INSROP.

It is also expected that other reasons for downtime (such as inspection by the NSR administration) will occur. It is important to know all possible downtime one should be prepared for.

8.5 Laws and regulations governing the operation of vessels along the route.

8.5.1 Importance

When making the decision to start operations in a foreign area not so far familiar, it is of utmost importance to know the legal framework in the area. Every investment decision will have a limit of maximum risk and a risk-factor included in the required rate of return. As these numbers are tied to the total investment size, they belong to the group of highest importance to the project success.
Technical requirements have been discussed in chapter 6.1. This chapter will focus on the legal requirements for general business operations along the NSR.

8.5.2 Discussion in INSROP on laws and regulations for operation along the NSR

Legal questions are a part of INSROP Subprogram IV. This subprogram also handles social and political topics.

Only two reports within this subprogram discuss legal matters. IWP 20 discusses the Port State Jurisdiction in the European Union, with special emphasis on the classes of legal persons affected. A later report is said to discuss the World Trade Organisation General Agreement on Trade in Services and the EU competition law in relation to equal participation rights in NSR transportation.

As described above, the report deals with a matter not special for NSR vessels but applicable to vessels trading on any route, as long as they dock in a EU or EEA harbour. This report is as such informative but not unique and does not shed any light on the special requirements when sailing along the NSR.

IWP 37 discusses the legal status of the Russian baselines in the Arctic. As a part of this discussion it also to some extent considers the question of internal water.

The topics dealt with in IWP 37 are of indirect interest to an owner operating along the NSR as they are the baseline for innocent passages along the Arctic Russian coastline. The report does not, however, deal directly with the innocent passages, even if some indications of this matter are given. It is as such a starting point but the results are difficult to put into practise in normal operations.

What is totally lacking in INSROP is discussion of the legal frames governing maritime operations in Russian waters. One can of course assume that only international regulations apply, but as long as this is not declared to be the fact, a level of uncertainty still exists.

IWP 17 (subprogram I) deals with the regulations dealing with the safety of life and the environment. The report lists the international conventions ratified in Russia. The history of Soviet legislation is described including the contradictories of different rules. According to the report Soviet rules are still valid in Russia as long as new rules are prepared.

The history of the NSR regulations is described, as well as a general description of the present regulations. The ports open for foreign vessels are listed. It is somewhat difficult to understand this list, as it first declares 9 Arctic ports to be open for calls by foreign vessels since 1991 and later declares the only port open for foreign vessels is Igarka and that efforts are being made for opening 4 more ports.

The weakest point in the regulations is said to be the part on routine communications between vessel and the Marine Operations Headquarters or the NSR Administration.

9. Conclusions and recommendations

When taking the viewpoint of a Western owner in search for new business opportunities, one can conclude that the overall assistance from INSROP reports is rather weak. Some specific topics have been discussed in multiple reports (mostly the history of the NSR and INSROP) while other type of information is lacking totally.

In the estimation of the size of the required investment, a good number of information about the technical requirements for the vessel is presented. Most of this information relates to the rules and restrictions set up by different institutions. It remains unclear for the non-expert reader, how much these different requirements affect the price of the vessel. Very little is also said about the possible new solutions in vessel design and how they would relate pricewise.

The GIS set up to include the information produced within INSROP is one of the most promising results of the project so far. The gathering of information on the prevailing environmental conditions has got a good start, even though some very important information is still missing. To make it simple, one could conclude that the level ice information included is of very little information as long as no information on ridges and compressive ice exists.

The different other costs have been touched upon quite easily. Some discussion is included on the special NSR fees, but it remains difficult to put these presentations into practice in projects of different form than those presented.

Some reports have covered the operational questions very carefully, giving a view of the practical navigational questions. On the practical side, one would however look for more data on actual performed sailings to assist the insurance work and different types of general evaluations.

Some data have been presented on the harbours along the NSR. This is a type of very basic data and it should be possible to easily collect data in a very informative manner.

The recommendations for actions to promote the insurance activities on the NSR have been presented in IWP 1. The list of recommendations includes both practical actions to be taken by legal authorities and actions that could be taken by INSROP.

When summarising how well different topics have been covered in the INSROP Working papers, one can conclude that a small number of topics has been well covered in any IWP. Some topics have been slightly covered in a large number of reports. The question is which is to be preferred: to have a good coverage of a limited number of topics or to have a light coverage of a large number of topics. One would probably combine the two options, while the most favourable alternative would be to have the most critical questions well covered and the less critical questions discussed more briefly.

When it comes to the forthcoming work within INSROP, the following recommendations can be done on the basis of the study performed:

1. Information on ridges and compressive ice must be included in the GIS. The data must be presented in a user friendly system so that the data can be used in ship design and vessel speed calculations.

2. Statistical data on the operations along the NSR must be presented more detailed. These data should support the different risk estimation procedures of future operators.

3. Actual case-studies on the business opportunities of NSR traffic must be performed to show the feasibility of increased NSR use. Studies should include actual cargo costs at delivery point.

4. Basic data on the condition of the infrastructure along the NSR which could describe the possibilities of safe operations, should be collected. Examples of data would be harbour characteristics, rescue systems, etc.

5. The potentials of new technology to increase the earning capabilities should be studied.

Review of INSROP Discussion Paper
Using the INSROP Phase 1 in a transport evaluation process

By Anders Backlund, Jari Kivelä and Edgar Gold

After Phase 1 of the INSROP (1993-1995) the following Study was carried out in order to evaluate to which degree the various participating projects have managed to fulfill the programme objective. The Study was carried out by Anders Backlund and Jari Kivelä of Kvaerner Masa-Yards technology of Helsinki together with Edgar Gold of the Oceans Institute of Canada, Halifax NS.

The main objective of INSROP was to determine factors of importance to decisions as to commercial utilization of the North Sea Route (NSR), the sea lanes from Europe to the Pacific along the Russian Arctic. The first phase of the programme resulted in 113 Working Papers provided by 170 researchers from nine countries, where the outcome of sub-programmes into geographical, environmental, commercial and political subjects were to be integrated into a book project, a Geographical Information System (GIS) data base and a simulation project in Phase 2.

Through a case-study, using the NSR in a hypothetical commercial project, the Study set out to evaluate the information provided by the INSROP reports (published before 15.9.96) from the point of view of a Western shipping company. By using the available reports in such a context, the Survey proposed to identify laps or atrophies in the programme and thus convey vital experience as to the future direction of the Programme.

The Survey identified a specific cargo, nickel concentrate from the mines in the Norilsk area, to be exported over the port of Dudinka on the Jenisei River and carried by ice-fitted vessels to Rotterdam.

This hypothetical project was broken down into five basic topics which together would form the basis for decision by a shipowner. Each of the topics were treated and discussed against the information provided by the respective project reports, thus forming a practical criticism of the contents.

These five basic topics have been discussed in detail:

- Investment in vessels, technical requirements, number of vessels and total costs involved.
- Operating costs, such as fuel, manning, port fees, other infrastructural fees and insurance.
- Income, freight revenue, competition.
- Operating risks, accidents, ice problems, icebreaker assistance, potential downtime and regulations governing ship operation along the route.

Particular attention has been paid to the marine insurance coverage factors, reviewed by Edgar Gold.

Ship operation in ice-infested waters is so far not generally dealt with by the marine insurance societies. Hull & Machinery Insurance require special arrangements with the insurer for navigation under extreme conditions. Similarly, the Northern Sea Route presents a relatively unknown factor to the P&I Clubs, and it is expected that premiums may initially be on the conservative side until relevant experience has been gained. The report emphasizes that the vulnerability of the Arctic environment and the harsh operating conditions increase the need for special considerations when determining insurance coverage levels and overall risks.

The Survey points out two basic factors for commercial use of the NSR:

The first is whether such a trade will be open to general competition from Western operators. Information as to port tariffs, NSR fees and other infrastructural costs would be essential, but has not been dealt with in the present reports. In addition, a shipowner would need more information on downtime from port congestion, waiting for convoys, icebreaker availability etc.

The second concern the legal framework for maritime operations in Russian waters. This matter has so far been totally lacking in INSROP.

In its conclusion, when taking the point of view of a Western shipowner, the Survey finds that the overall assistance to be derived from the INSROP reports is rather weak.

A small number of topics have been well covered by projects, whereas a larger number have been more lightly covered in several reports. In setting down recommendations for forthcoming work within INSROP, the Survey emphasizes five specific points:

- Information on ice ridges and compressive ice must be included in the GIS. The data must be presented in a user-friendly system to be used in ship design and vessel speed calculations.
- Statistical data about operations along the NSR should be presented in more detail. Such information should support the different risk estimate procedures.
- Actual case-studies on the business opportunities of NSR traffic must be performed to show the feasibility of increased use. Studies should include actual cargo costs at delivery point.
- Basic data about the condition of the infrastructure along the NSR should be collected, describing the parameters for operation, port operation, emergency systems etc.
- The potential of new technology to increase the earning capabilitities should be studied.

This reviewer would also have liked to see a discussion of the supply and demand factors in this particular trade. For example the volume and regularity of nickel concentrate available over the port of Norilsk, the world market price level, demand in Western Europe with desired consignment sizes and frequency. The crucial issue in such projects - albeit hypothetical - is what transport costs a comparatively low-cost raw material can afford.

This is the third basic factor of importance to the future of the Northern Sea Route as an international shipping lane.

Dag Bakka Jr

Kvaerner Masa-Yards

16.1.1998

Anne Berteig
INSROP Programme Secretary
The Fridtjof Nansen Institute

Please find attached the report for the INSROP Discussion Paper III.07.5 *Using INSROP Phase 1 data in a transport evaluation process* by A. Backlund et. al. The report is delivered in paper and in a 3½" computer diskette, which contains the report text and all graphs in file REP_EVAL.DOC, which is a Word 6.0 format file. The report is basically in the same form as the preliminary report, only some languague corrections have been made to the preliminary report.

Comments from the reviewer were not incorporated into the report, because the review did not actually disagree with the evaluation, but mainly dealt with the contents of the evaluation report. In the last paragraph of the review there was, however, the following wish for the report contents.

> *This reviewer would also have liked to see a discussion of the supply and demand factors in this particular trade. For example the volume and regularity of nickel concentrate available over the port of Norilsk, the world market price level, demand in Western Europe with desired consignment sizes and frequency. The crucial issue in such projects — albeit hypothetical — is what transport costs a comparatively low -cost raw material can afford.*
>
> *This is the third basic factor of importance to the future of the Northern Sea Route as an international shipping lane.*

The purpose of the evaluation report was to find out, how well the work done in INSROP phase 1 would fulfill the project goals. We fully agree that the items mentioned by the reviewer would be of great interest of any western ship owner and thus they should be considered in the future work of INSROP.

A summary of the contents of the report will be delivered to You by E-mail.

Sincerely

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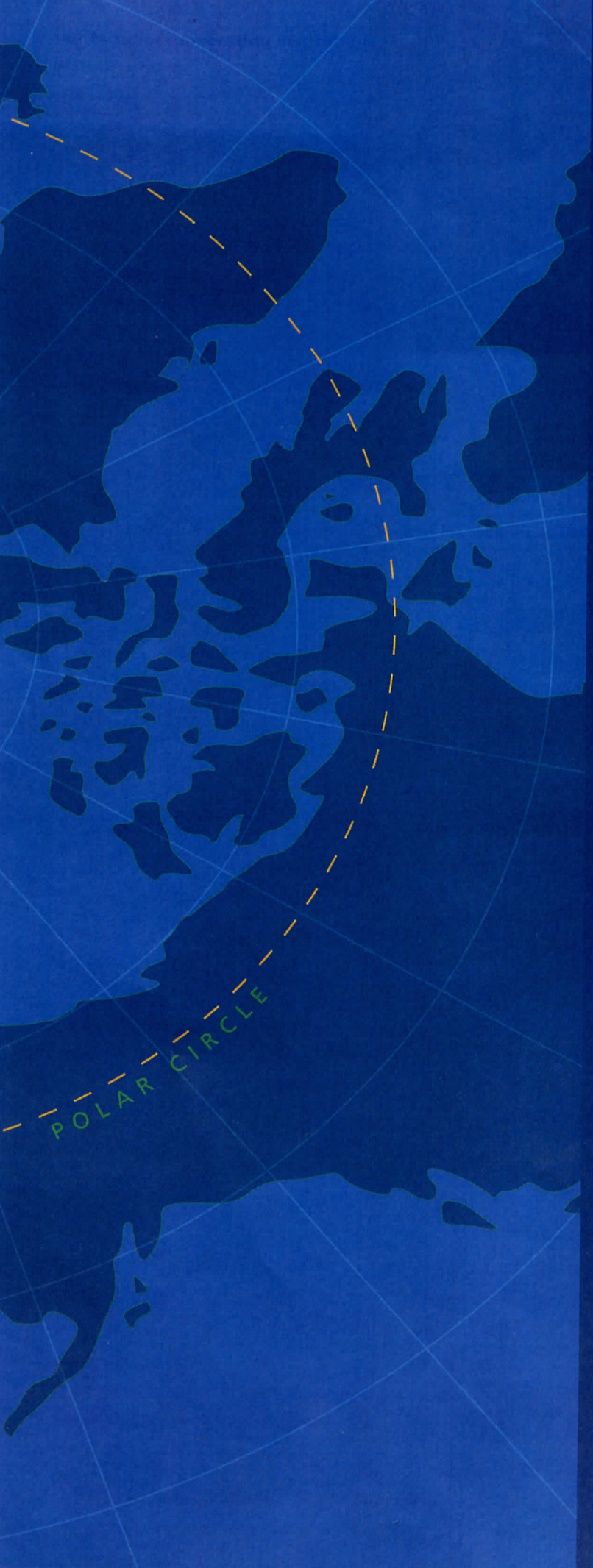

The three main cooperating institutions of INSROP

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.