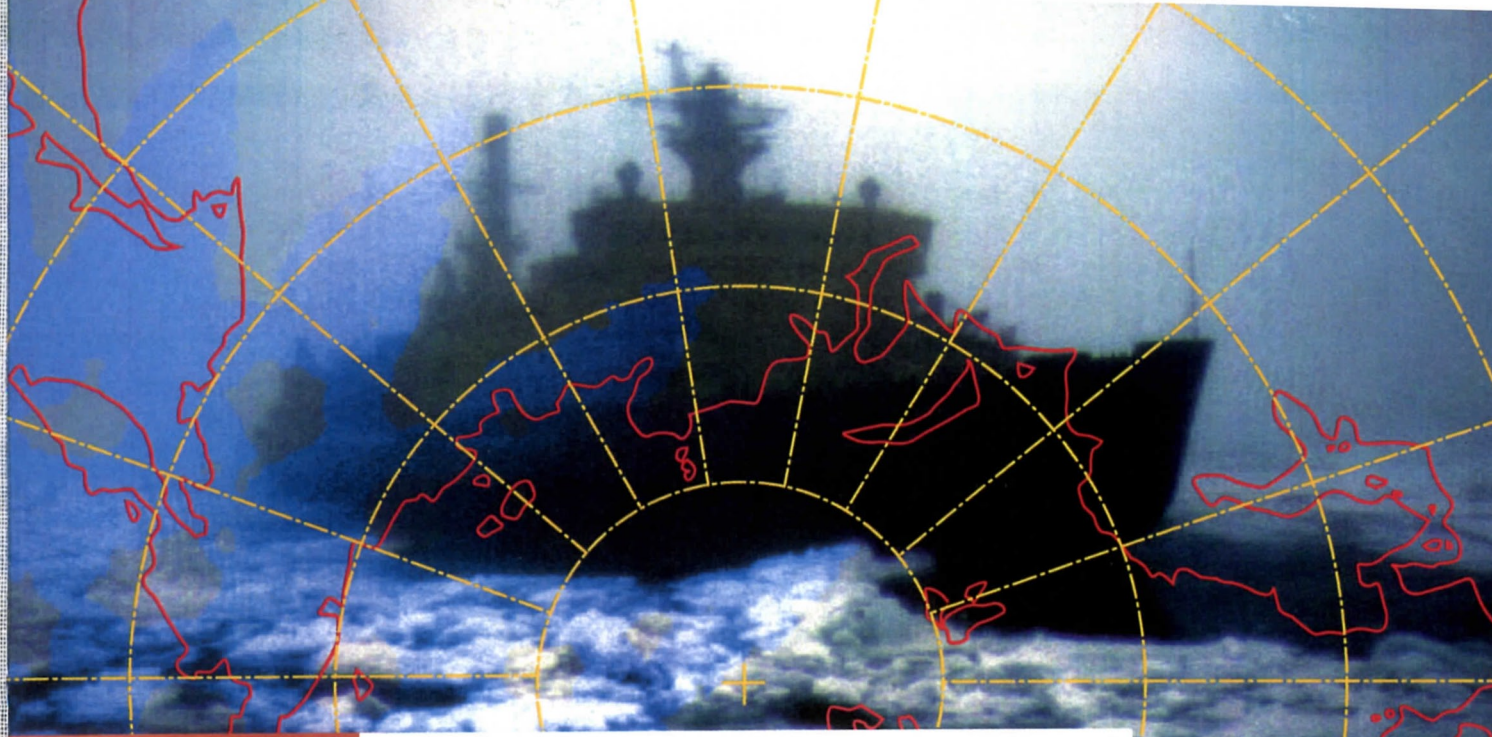
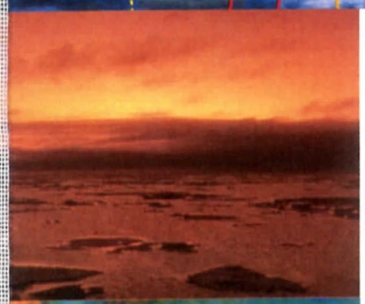




INSROP WORKING PAPER
NO. 122 - 1998, I.1.3

Navigational Safety Management System of the NSR.

Part 1: ISM Code Implementation in the Russian Arctic.
Part 2: Satellite Communication used for Safety Management of NSR Navigation.

By Vladimir Vasilyev, Eugene Yakshevich, Alexander Baskin and A. Shigabutdinov

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. 122-1998

Sub-programme I: Natural Conditions and Ice Navigation

Project I.1.3: Navigational Safety Management System of the NSR

Supervisors: Vladimir Vasilyev and Eugene Yakshevich, CNIIMF

Title: **Navigational Safety Management System of the NSR.**
Part 1: ISM Code Implementation in the Russian Arctic.
Part 2: Satellite Communication used for Safety Management of NSR Navigation.

Authors: **Alexander Baskin and Vladimir Vasilyev (Part 1)**
Eugene Yakshevich and A. Shigabutdinov (Part 2)

Address: Central Marine Research and Design Institute (CNIIMF)
Kavalergardskaya Street 6
193 015 St.Petersburg,
RUSSIAN FEDERATION

Date: 15 December 1998

Reviewed by: Professor Edgar Gold, Oceans Institute of Canada, Halifax, Nova Scotia, Canada.

What is an INSROP Working Paper and how to handle it:

This publication forms part of a Working Paper series from the **International Northern Sea Route Programme - INSROP**. This Working Paper has been evaluated by a reviewer and can be circulated for comments both within and outside the INSROP team, as well as be published in parallel by the researching institution. A Working Paper will in some cases be the final documentation of a technical part of a project, and it can also sometimes be published as part of a more comprehensive INSROP Report. For any comments, please contact the authors of this Working Paper.

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.

SPONSORS OF INSROP

- Nippon Foundation/Ship & Ocean Foundation, Japan
- The government of the Russian Federation
- The Norwegian Research Council
- The Norwegian Ministry of Foreign Affairs
- The Norwegian Ministry of Industry and Energy
- The Norwegian Ministry of the Environment
- The Central and Eastern Europe programme
- State Industry and Regional Development Fund, Norway
- Phillips Petroleum Company, Norway
- Kværner a.s.
- Norwegian Federation of Shipowners
- Norsk Hydro
- Fridtjof Nansen Institute

PROFESSIONAL ORGANISATIONS PERMANENTLY ATTACHED TO INSROP

- Ship & Ocean Foundation, Japan
- Central Marine Research & Design Institute, Russia
- Fridtjof Nansen Institute, Norway
- National Institute of Polar Research, Japan
- Ship Research Institute, Japan
- Murmansk Shipping Company, Russia
- Northern Sea Route Administration, Russia
- Arctic & Antarctic Research Institute, Russia
- Norwegian Polar Research Institute
- SINTEF (Foundation for Scientific and Industrial Research - Civil and Environmental Engineering), Norway.

PROGRAMME COORDINATORS

- **Yuri Ivanov, CNIIMF**
Kavalergardskaya Str.6
St. Petersburg 193015, Russia
Tel: 7 812 271 5633
Fax: 7 812 274 3864
E-mail: cniimf@neva.spb.ru

- **Willy Østreng, FNI**
P.O. Box 326
N-1324 Lysaker, Norway
Tel: 47 67 11 19 00
Fax: 47 67 11 19 10
E-mail: sentralbord@fni.no

- **Hiroyasu Kawai, SOF**
Senpaku Shinko Building
15-16 Toranomon 1-chome
Minato-ku, Tokyo 105-0001, Japan
Tel: 81 3 3502 2371
Fax: 81 3 3502 2033
E-mail: sofkawa@blue.ocn.ne.jp

GENERAL

This report consists of two parts.

Legal and organization aspects of the International Safety Management Code (ISM) concerning the Russian Arctic are described in the first part.

Safety navigation technical provision questions are generalized in the second part. The most attention has been concentrated on the satellite communication usage.

TABLE OF CONTENTS

PART 1: ISM CODE INPLEMENTATION IN THE RUSSIAN ARCTIC

1.1. Introduction

Since the "Safety of navigation" concept has not yet been formulated in any international and national documents, we shall begin with it. In our view, the safety of navigation is a level of reliability of transportation process, based on economical, political, technical, social and organization foundations in a particular State and in a particular historical period.

All international and national bodies which regulate and supervise the safety of navigation in accordance with the rules of conventional normative documents; companies, the activity of which is connected with navigation; vessels, constructed and maintained according to the established technical requirements; masters and crews, employed and working in accordance with prescribed personnel standards; research and design organizations which carry out monitoring of transport process and developing of basis for enhancing the safety of the process, - just this totality represents the safety management system (SMS).

Accordingly there are international and national safety management systems. If natural conditions in a particular sea region of a country, for example in the Arctic seas of the Russian Federation, require specific regulation of navigation, and such regulation has been established as regional (local) bodies of State management, local rules of navigation, special constructive requirements to vessels, specific technology of navigation, - in this case we can speak of a local safety management system (local SMS).

It is necessary to emphasize, that IMO does not principally interfere in regulation-making activity of coastal States' governments (Administrations). Such approach found its reflection in resolution A.741 (18) "International Management Code for the Safe Operation of Ships and for Pollution Prevention" (ISM-Code) accepted on November 04, 1993, and received a binding status as chapters IX "Management of the Safe Operation of Ships" of the International Convention for the Safety of Life at Sea, 1974 (SOLAS-74). The ISM Code represents an international standard for safety management of navigation. The ISM Code requirements apply to shipping companies and vessels.

The ISM Code requires all companies to develop, implement and maintain SMS including the following functional requirements:

1 safety and environmental protection policy;

2 instruction and procedures to ensure safe operation of ships and protection of the environment in conformity with relevant international and flag State legislation;

3 defined levels of authority and lines of communication between and amongst shore and shipboard personnel;

4 procedures for reporting accidents and non-conformities with the provisions of the ISM Code;

5 procedures to prepare for and respond to emergency situations; and

6 procedures for internal audits and management reviews.

The responsibility, authority and mutual relations of the personnel involved in functioning of the Company's SMS, should be documented.

The Company should designate a person or persons ashore, the responsibility and authority of which include monitoring the safety and pollution prevention aspects of the operation of each ship, and ensuring the application of adequate resources and shore based support, as required.

The Company should ensure that each vessel is manned with qualified, certified and medically fit seafarers in accordance with international and national requirements.

The Company's SMS should establish procedures to ensure that the ship is maintained in conformity with the provisions of relevant rules and regulations.

The basic requirements of chapter IX of the 1974 SOLAS Convention can be reduced to the following: "the Ship is operated by a Company which is issued a Document of Compliance..."; "the Document of Compliance is issued for every Company complying with the relevant requirements of the International Safety Management Code"

Since the overwhelming part of cargo traffic along the NSR is carried out by the five largest Russian shipping companies: Murmansk, Northern, Arctic, Primorskoye and Far Eastern shipping companies, - CNIIMF has taken part in developing of safety management systems and normative base for the above companies. As a result, the above mentioned shipping companies (except Arctic) have been surveyed by the Russian Shipping Register, which is a member of the International Association of Classification Societies, on conformity with the provisions of the ISM Code, and certified i.e. issued a Document of Compliance. The Arctic Shipping Company is under the survey now.

The present report contains the analysis of normative base of Company's SMS, which should give a complete picture of safety management of navigation along the Northern Sea Route.

In developing the normative base of the Company's SMS the provisions of the following resolutions were taken into account:

IMO Resolution A.740(18) "Interim Guidelines to assist flag States", 04 November 1993;

IMO Resolution A.788(19) "Guidelines for introduction of the International Safety Management Code (ISM Code) by Administrations", 23 November 1995;

IMO Resolution A.787(19) "Port State Control Procedures", 23 November 1995;

IMO Resolution A.739(18) "Guidelines for the Authorization of Organizations Acting on behalf of the Administrations", 04 November 1993;

Circular letter MSC/Circ.710/MEPC/Circ/307 "Standard Agreement on the Authorization of Recognized Organizations Acting on behalf of the Administrations", 17 October 1995.

The fact that the Russian Federation has acceded to the main international conventions relating to the safety of navigation and marine environment protection, to the Paris and Tokyo Memorandums of Understanding on port State control of the safe operation of ships and pollution prevention, and, therefore, has recognized the legal base of these Memorandums, is taken into account.

1.2. Objectives of the ISM Code and Company's SMS

The objectives of the international maritime community, as set out in the ISM Code and, accordingly, the purposes of the national Administration consist in maintenance of safety at sea, prevention of human injury or loss of life and avoidance of harm to the marine environment and to property.

The authorized purpose of any shipping company is to make profit from transport activity. Besides, the transport activity the company must be safe activity.

Proceeding from united international and national approaches and objectives of the Company, the general purpose of the Company's SMS can be formulated in terms of maintenance of a proper level of safe operation of ships and environmental protection as a basic condition of competitiveness of the Company at the market of transport services and of maximum profit making. In this case the proper level of the standard is understood as a level corresponding to the international requirements, unless the national standard provides for a higher level.

It is obvious, that the objectives of national, regional (local) Safety Management Systems and of each company are the same.

The Company's SMS ensures the attainment of the established objectives by:

.1 compliance with mandatory rules and regulations;

.2 creation of conditions in which the applicable codes, guidelines and standards recommended by IMO, Administration, classification societies and organizations of maritime transport complex are taken into account;

.3 systematic control of the shore and ship personnel on compliance with the requirements of mandatory rules and regulations;

1.3. Company's Policy

The policy of each company in the field of safe operation of ships and pollution prevention is documented in accordance with the ISM Code standards and contains the following sections:

.1 Concept;
.2 Objectives and methods to attain the objectives;
.3 Structural policy;
.4 Personnel selection;
.5 Anti-narcotic and anti-alcoholic policy;
.6 Personal safety policy;
.7 Ship maintenance policy;
.8 Technological policy and safe transportation of cargoes;
.9 Safe navigation policy.

The concept of Company's policy in the field of safe operation of ships and pollution prevention represents clear-cut philosophy of administrative actions, based on the authentic data on international and national standards in the field of safety management; on capabilities

and limitations of transport vessels of the Company; on a certain skill level of the masters, crews and shore experts; on specific features of cargo base.

The concept of the Company's policy should be known and shared by all officials of the Company involved in safety management, as well as by the masters and crews.

The existing structure of each company, no matter what number of ships it operates, provides the fulfillment of the ISM Code standards in relation to the following items:

.1 Presence of a nominated person having a certain authority and bearing responsibility for fulfillment of the requirements established by international and national rules and Company's standards;

.2 Reliable and continuous functioning of specialized groups of the personnel which manage, take and check actions on safe operation of ships and pollution prevention with specification of their responsibilities, authorities and interactions;

.3 Monitoring of: ship technical conditions, manning of ships with qualified personnel, operative safety management.

The structural policy of every company should motivate active participation of all experts in effective SMS functioning. The motivation of active participation of the expert in SMS is a part of the contract.

The Company's policy in the field of employment, dismissal, training and retraining, improvement of qualification, promotion or demotion, organization of labour and rest, stimulation and punishment of the personnel of ships and shore-based divisions is also a part of the contract concluded with each worker. The responsibility, authority and cooperation of the whole personnel of ships and shore divisions are precisely specified and made familiar to everybody.

Each company has the annual and perspective plans of realization of personnel selection concerning the personnel of ships, including the following items:

.1 Regular medical examination of seamen;

.2 Technical training of crews;

.3 Maintenance of personal safety;

.4 Upgrading courses and simulator training for masters and senior ship officers;

.5 Promotion of ship officers;

.6 Emergency ship drills;

.7 Certification of masters;

.8 Certification of chief mates, chief engineers (on electric ships - chief electric-engineers), second mechanics (on electric ships - second electric-engineers), chief radio operators.

Each company has the annual and perspective plans of personnel selection concerning the personnel ashore, including the following items:

.1 Periodic medical examination and testing;

.2 Specialized seminars for experts of the high channel, practical training of experts of the middle channel, technical training of the other workers;

.3 Maintenance of personal safety;

.4 Referral of the main specialists to upgrading courses;

.5 Promotion of the employees;
.6 Organization of business games including actions in unusual situations;
.7 Certification of the main specialists.

The disciplinary policy of each company provides for termination of contract with any worker, addicted to drug and alcohol.

The policy in the field of maintenance of proper technical condition of ships includes a plan of actions of the company for:

.1 Classification of ships;
.2 Organization of qualitative using and servicing of hulls, superstructures, machines, mechanisms, systems and devices of ships in the process of operation;
.3 Equipment of ships with modern technology;
.4 Regular docking and repair of ships;
.5 Organization of inspections.

The policy of each company in relation to the maintenance of safe transportation of cargoes includes a relevant organization and plan of actions with regard to:

.1 Monitoring system of technological safety of cargo transportation, regulated by international instruments (IMO conventions, codes and resolutions) and national rules;
.2 Familiarization of ship's personnel with characteristics of cargoes offered for transportation (especially cargoes dangerous to persons, vessel or other cargoes for any conditions or reasons); with the requirements to their trimming, fastening and carriage; with necessary preventive actions to be taken to avoid human injuries; with possible medical procedures in case of human injuries;
.3 Preparation of ship's cargo rooms, special equipment and relevant signalling devices for transportation of particular cargoes; monitoring of behaviour and condition of cargo in the process of loading and transportation; completing of the ship first-aid set with necessary medicines.

The policy in the field of safe navigation maintenance includes a plan of the Company's actions on:

.1 Equipment of vessels with conventional and additional navigational aids, organization of their competent servicing and using in various regions and conditions of navigation with due regard for limitations peculiar to each kind of the equipment;
.2 Selection of ship collections of navigational charts and publications, their completing and updating;
.3 Study of navigational, hydrographic and hydrometeorological conditions of forthcoming voyage by navigating officer;
.4 Duly reception and use of the current navigational information;
.5 Hydrometeorological support of vessel on voyage;
.6 Technology of sea navigation;
.7 Organization of watchkeeping during the voyage and berthing conditions with due regard for special features of region of navigation and ports of call, weather forecast, characteristics of vessel and cargo carried;
.8 Organization of ship communication at sea and at berth.

A clear-cut and documented policy in the field of pilot, tug and icebreaker support is to be implemented in SMS of each company.

In each company the system of collecting, handling and reporting of information about local rules and customs of ports of call to the shipboard and shore personnel, should be organized.

1.4. Designated person

Under the ISM requirements the company should designate a person ashore having direct access to the head of the company and having necessary authority and resources to maintain relevant safety and pollution prevention standards on every company's vessel.

The designated person is thought, first of all, to monitor changes in international and national normative base and provide adequate response of the company and its ships to these changes. This is the reason why he should have direct access to the highest level of management in order to obtain necessary information and take relevant decision. This is the reason why the designated person should have available resources for acquiring necessary documents (equipment, devices), reserving communication lines and etc.

The designated person, as far as possible, should not be vested with other functions or duties, except those that have relation to safety management and pollution prevention.

Pursuant to the Resolution of the Council of Ministers of the Government of Russia of 30.08.1993 N 876 the posts of executive chiefs and experts of transport enterprises irrespective of patterns of ownership, if the posts relate to the safety of traffic, can be held only by the persons specially trained, regularly attested and properly certificated.

For development of the above-mentioned Resolution of Government the joint order of the Transport and Labor Ministries of the Russian Federation of 11.03.1994 #13/11 authorizes the Rules of certification procedures for persons holding posts of executive chiefs and experts of transport enterprises; the Rules have entered into force since 01.07.1994. As the purpose of certification the above Rules establish the assessment of fitness of attested persons to safe operation of means of transportation.

Accordingly the Rules specify the following purposes of certification:

.1 Determination of knowledge of normative legal acts and other documents regulating the safety of navigation and skill of application of the acts and documents in work;

.2 Formation of a highly qualified stuff of executive chiefs and experts including masters to ensure safe operation of means of transportation.

The purposes and problems of certification are to completely meet the ISM requirements.

1.5. Shipmaster

The ISM Code establishes that the Company should specify and document the powers and responsibility of the shipmaster concerning safety and pollution prevention decisions; the

shipmaster should be properly qualified, fully conversant with the Company's SMS, provided by the Company with necessary resources for implementation of its policy; the shipmaster should issue appropriate orders and instructions aboard the ship.

First of all, each company should be guided by the provisions of national legislative and normative acts with regard to the rights, duties and responsibilities of the shipmaster. In this case the Company may entrust the shipmaster with additional powers and necessary material resources in accordance with the ISM regulations.

The companies have developed and implemented programs of training of navigators for the post of the shipmaster as well as a program of upgrading training of masters.

As a rule, the shipmaster is not assigned without additional training to a vessel of types unfamiliar to him.

The fitness of the shipmaster to the provision of safe operation of vessel under the order of the Ministry of Transport of the Russian Federation of 31.10.1994 #80 shall be determined by the procedure of certification, which will be carried out under the Ministry of Transport of Russia.

The shipmaster controls the vessel on the basis of undivided authority and is placed under the direct authority of the head of the Company. All instructions relating to ship's operations, should be addressed only to the shipmaster, who is responsible for following them.

No person may join the vessel without sanction of the shipmaster, as well as the lawful requirement of the master concerning dismissal of any crew's member should be satisfied.

Nothing in regulations of the company's SMS has to limit the master in taking decisions adequate to particular conditions and circumstances. The shipmaster should without delay notify the Company of any departure from the SMS regulations.

If the vessel is engaged in charter operations, the master is placed under the Charterer's authority in respect of ship operation, except for the orders relating to ship navigation, internal regulations and manning.

The shipmaster provides:

.1 for observance of the international contracts, national legislation, instructions and recommendations of the shipowner;

.2 fulfillment of the lawful requirements of bodies of state and technical supervision;

.3 maintenance of image and dignity of persons onboard the vessel and protection of their interests;

.4 availability onboard and validity of all ship certificates including the certificate of withdrawal, required by the international contracts or legislation of Russia;

.5 availability of the valid special ship certificates, required whether for the purpose for which the vessel is intended (chemical tankers, gas carriers etc.) or for region of navigation (while engaging in a single voyage outside usual regions of operation of the vessel), or for regional agreements, or for legislation of the State of port of call;

.6 availability of the ship documents, required for transportation/securing of separate cargoes (grain, timber cargo on deck, petroleum cargoes etc.) and approved by the Administration (codes, information, manuals, guidelines, instructions, regulations etc.);

.7 availability of an insurance certificate or other documents of financial security involving civil liability for damage from pollution;

.8 availability and maintenance of ship log books in accordance with established regulations;

.9 availability of ship documents on ship stability and unsinkability in undamaged and damaged condition of the vessel;

.10 working condition and good appearance of all ship facilities, systems, devices and equipment;

.11 availability of manufacturer's name plates and/or certificates for all facilities, devices and equipment;

.12 availability of certificates and/or proper marks on fibre and steel wire ropes, tackles, chains, blocks, hoses etc., used in cargo and boat equipment and for fastening cargoes;

.13 availability of check, operation and maintenance instructions placed in the vicinity of all equipment and devices, with relevant data cards filled by appropriate responsible crew members;

.14that all critical devices and arrangements (gangways, tackles, railings etc.) made on the vessel for the purposes of safety or even for temporary works, and/or all firm devices and arrangements repaired in ship conditions, are repaired/made by the most qualified persons of ship crew, externally appeared to be convincingly reliable and tested with drawing up of a relevant ship act certified by the shipmaster;

.15 availability of standard transitive connections of pipelines for connection with a coast (fire main, mains for delivery of a various sort of polluted waters etc.), devices of the control for air composition in holds/tanks, required for transportation of a certain kind of loads (gas-analyzer and/or oxygen-meter).

1.6. Personnel and resources

Each vessel should be properly manned with qualified, certificated and medically fit members of crew so as to ensure the safety of navigation.

The Company within the limits of state standards may regulate manning of crews and establish:

.1 category of vessels in terms of manning, proceeding from design features, quality of the ship equipment, cargo capacity, character of cargo carried, regions and duration of navigation;

.2 minimum manning of various categories of vessels, the number of officers and their specialties, necessity and the number of qualified doctors and cooks, and also the number of other members of crew according to their specialty;

.3 conditions concerning citizenship of the master, officers and other members of crew who are engaged in international voyages or voyages in national waters;

.4 requirements, that, in all cases including those on vessels operating in national waters, the masters, chief mates, chief engineers, second engineers, radio experts on vessels as well as officers of deck and engine teams who are in charge of bridge and engine room

watches, will comply with the provisions of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers;

.5 requirements, that all members of crew performing stated functions on vessel, should hold certificates of professional training, of background experience, of skill level, and also permits for prescribed works and health certificate; the crew members should also satisfy other conditions, which can be established including the requirement for citizenship;

.6 conditions of founding, licensing and work of educational centers of the Company for training of seamen and persons, who are going to pass examinations for certificates of competence;

.7 programs of training and educational plans on training of persons for ship specialties; rules of organization and examinations for certificates of competence, level of training of candidates and conditions of exemption of particular persons, having a high level of qualification and operational background, from all examinations or from a part of examination questions; qualification, procedure of appointment, discharge and payment of the examiners;

.8 procedure of issue, cancellation, prolongation, legalization, suspension, confirmation, replacement, and also registration of certificates of competence;

.9 periodic determination of educational institutions suitable for training of personnel of the Company.

The companies have developed techniques of verification (control) of professional fitness of personnel (commission method included), and criterion of selection of personnel.

The major criteria of professional fitness of experts of shore-based divisions are a skill to carry out effective communication with vessels, readiness for actions in non-standard situations, readiness to take responsible decisions.

The Company should documentary confirm, that results of internal audits and surveys, analysis of accident rate as well as remarks of the inspectors involved, have been applied to correct personnel selection and practice.

In developing documents the Company has taken into account the applicable conventions of the International Labour Organization.

1.7. Maintenance of technical readiness of vessels

Organization of technical operation. The national requirements to technical operation of vessels flying the flag of Russia are stated in appropriate normative documents.

Companies have developed their documents and have given effect to the provisions of these documents, taking into account special features of technical operation of the vessels in the following directions:

.1 technical use i.e. maintenance of ship operations in operational aspect;

.2 maintenance i.e. maintenance of serviceable condition of vessels without removing them from service;

.3 repair is restoration of a necessary technical condition of vessel, carried out with removing the vessel from service.

The technical operation of a vessel, structures and equipment should come into effect in accordance with the manufacturer's instructions and national normative documents. All structures and equipment should be used for the purposes they are intended. In the vicinity of the most critical of them the relevant instructions should be placed to explain how to prepare them for operation, how to start-up, to control modes of operations, to stop and remove them from service.

The control of condition and modes of operations of a vessel, of its structures and equipment should be made according to indications of standard instrumentation and means of warning system, control measurements of basic parameters by means of special measuring equipment. All means of measurements should be serviceable, have relevant working certificates or marks of certification.

All means of warning system and emergency protection should be in a state of continuous readiness for operation; the readiness should periodically be checked according to the documentation.

When detecting failures and defects, which may constitute a danger to the safety of navigation, the shipmaster is obliged to take steps to eliminate them before proceeding to sea.

The management of technical operation includes planning, organization, regulation, account and corrective actions.

The tasks of management include:

.1 systematic analysis of technical operation of vessels;
.2 continuous updating of engineering specifications;
.3 determination of need for repair of vessels and placing of orders for repair;
.4 planning expenses on maintenance, repair, logistics;
.5 measures to improve technical operation of vessels and accident prevention;
.6 Control.

Technical operation of vessels will be organized by an appropriate chief of the Company, who carries out the policy of the Company in this area, with technical experts assisted.

This chief is responsible for planning and organization of technical operation of vessels, their technical condition, preparation and provision of maintenance and repair, classification survey and inspection surveys.

This chief is also responsible for application of new technique, meteorological support, safety precautions, development of technical documentation, organization of technical information, work on standardization and quality management of technical operation.

Planning technical operation includes development of plans of repair, maintenance, logistics, introduction of new equipment and advanced technology.

Mutual relations and responsibility of divisions and experts of the Company for technical operation of vessels should be established by means of appropriate documents.

All ship facilities, pieces of equipment and ship spaces should be placed under responsibility of designated crew's members with a view to ensure their reliable work, maintenance servicing, readiness for action and undamaged state.

A member of crew, who has an area of responsibility, should within "his own section":

.1 know the equipment placed under his responsibility as well as special features of its servicing and repairing;

.2 present the equipment placed under his responsibility for survey at fixed terms;

.3 prepare the equipment for sea and report on their readiness to the chief mate (chief engineer);

.4 submit requests for logistics and removable spare parts;

.5 present the repair sheets to the chief engineer;

.6 maintain established documentation.

A crew's member, when being decommissioned, should hand over (under the certificate) his duties, equipment and spaces under his responsibility to the new nominated person or a person, named by his direct chief.

The control and account of technical operation should be carried out by surveys and inspections of vessels, when they are staying in ports and proceeding to sea.

The control and record keeping of technical operation of vessels are to be carried out by surveys and inspections of vessels in ports and in voyages (if the required experts are on board the vessel at sea), and also by relevant analysis of accounting documents received from vessels.

Control officers engaged in inspection of the vessel are obliged:

.1 to make sure that the remarks and recommendations of the previous inspection are fulfilled;

.2 to make survey of the vessel;

.3 to check that appropriate ship documentation is available and maintained properly;

.4 to check up records in log books;

.5 to make sure that the plans - diagrams of maintenance service are available and put into effect;

.6 to receive information on technical condition of the vessel from the ship's administration;

.7 to coordinate measures to be taken for the forthcoming voyage or repair.

Results of inspection should be entered into the inspection log book.

Maintenance planning. The maintenance of a vessel in operation should be carried out according to a plan, made by the ship administration on the basis of the plans - diagrams, actual need and the diagrams of presentation of objects to a classification society. The plans - diagrams should be corrected as appropriate.

The development of the plans - diagrams of maintenance servicing of a series of vessels should be carried out by experts of the Company on the basis of maintenance instructions, actual condition of ship structures and equipment, constructing and other documentation. The plan - diagram should specify the name, periodicity, working hours and executors. The account of works carried-out should also be made under the plans - diagrams.

The vessel should be supplied with spare parts according to the rules of a classification society.

All basic ship equipment should be supplied by a set of special tools and fixtures, necessary for its disassembly and assembly.

Maintenance and repair. The attitude of the Company to maintenance and repair of vessels should be determined by universally acknowledged premise: prevention of failures is cheaper than elimination of failures.

Maintenance of the main engine, ship machinery, mechanisms, devices and gears should be carried out in time and in order as stated in the documents of the firm - manufacturer. The experts of the Company may supplement and detail these documents proceeding from operational experience and individual features of the ship personnel, but they may not exclude any operations specified in the firm documents.

Each company has developed a procedure of the request of a vessel for technical assistance, when the ship personnel cannot without outside assistance to eliminate a failure in work of the equipment; the procedure of urgent assistance on the part of particular coastal experts has also been developed by the Company.

Reports on maintenance of the vessel and ship equipment, on failures and malfunctions revealed and reported to the Company, on actions of the personnel are an objective evidence of efficiency of SMS functioning.

The equipment and systems, which are not capable to ensure reliable operation, should be detected and replaced, before any further failures occur.

Technical monitoring. From the moment of designing and up to the writing off each vessel is subject to an obligatory technical monitoring in relation to compliance with the international and national requirements and the requirements of the shipowner.

Inspections of vessels and estimation of their technical condition should be carried out by commissions of the shipowner according to the plan - diagram.

Inspections should cover:

.1 Structures of the hull and superstructures;
.2 ME and auxiliary equipment of the engine room;
.3 Aids of navigation and means of communication;
.4 Steering device;
.5 Anchor and mooring gears;
.6 Cargo equipment and systems;

.7 Fire fighting appliance;
.8 Inert gas system;
.9 Pollution prevention equipment;
.10 Pipelines and basic fixtures;
.11 Automation systems.

The inspections should be conducted by competent personnel; besides, each member of the personnel must hold a ship post not junior than the post of any person being under inspection.

The procedures of inspections should be documented.

1.8. Organization of safe transportation of cargoes and passengers

Preparation of vessel for sea. When drawing up a cargo plan and loading cargoes one should take into account the changes in draft, that may occur during the forthcoming voyage, so as to avoid navigation with a freeboard lower than the statutory freeboard of vessels of this loadline category.

The master should consider a preliminary cargo plan, make sure that the planned variant of loading provides the safety of navigation, to approve the plan.

The shipmaster should be provided with all documents necessary for passenger transportation or for transportation of particular types of cargo and among these documents: instructions on complex servicing of passengers; technical specifications for the given type of cargo; instructions on application of various types of fastenings and slings; medical recommendations for cases of injury of persons by transported load etc.

During cargo operations the shipmaster should supervise how correct the cargo is being stowed and fastened and the ballast and bunker is being disposed. The master should stop cargo operations, if cargo handling technology is not complied with or there are departures from the cargo plan.

In preparing the vessel for sea all ship structures and equipment should be put in a state that ensures the capability to use them in required operational modes.

While preparing the vessel for sea the shipmaster should:
.1 fix in advance the time of departure and notify the crew of it;
.2 verify that all updated navigational charts, guidelines and correction documents necessary for voyage are available;
.3 supervise supplying of the vessel with fuel, water, food products and logistics.

Transportation of bulk and dangerous cargoes. Loading and transportation of bulk cargoes (in particular, grain and dangerous cargoes) require special safety measures to be taken because the above cargoes are of special danger to vessels and persons onboard. Such measures are specified in the Code of Safe Practice for Solid Bulk Cargoes accepted by IMO Resolution A.434 (XI) with amendments adopted.

The transportation of grain in bulk is regulated by the provisions of the International Convention SOLAS-74 and the International Code for the Safe Carriage of Grain in Bulk as accepted by IMO Resolution MSC.23 (59) with amendments adopted.

The cargo ship carrying grain in bulk, should meet the requirements the International Code for the Safe Carriage of Grain in Bulk and hold a relevant permit for transportation of such types of cargoes according to this Code or to a relevant document of withdrawal.

When loading grain all necessary and reasonable safety measures should be accepted onboard to avoid displacement of the grain during transportation. If such measures are not taken, the vessel is considered unsafe for the reason of wrong loading of cargo.

The carriage of dangerous cargoes is regulated by the rules of the International Convention SOLAS-74 and by the International Maritime Dangerous Good Code accepted by IMO Resolution A.716 (17).

No dangerous goods should be accepted for carriage without preliminary marking of relevant packages according to the provisions of the International Maritime Dangerous Good Code. The marks put on packages should include distinctive signs of danger, precisely indicating dangerous properties of the cargo inside.

The shipowner, shipmaster or an agent of the vessel should not accept for transportation any bulk or other dangerous cargo without shipping requisites and without fairly complete information on cargo properties, submitted beforehand so that all necessary steps can be taken in due time to ensure proper stowage and safe carriage of this cargo.

Before loading bulk cargo the shipmaster should be completely informed of ship's stability and cargo disposition in comparison with typical cargo disposition on board. Bulk cargoes should be shipped and distributed at regular intervals up to the borders of cargo rooms to reduce risk of their displacement and for necessary stability to be maintained during the whole voyage.

When there is an incident connected with loss or likely loss overboard of dangerous goods in packaged form, the master or other person responsible for the vessel, should inform specified addressees of peculiarities of this incident without delay and with the all possible completeness in conformity with "General principles for ship reporting systems and ship reporting requirements, including guidelines for reporting incidents involving dangerous goods, harmful substances and / or marine pollutants" as accepted by IMO Resolution A.648 (16).

All documents relating to carriage of dangerous goods by sea should show the correct technical name of good on board and the correct description of the good in accordance with the classification of the International Convention SOLAS-74.

Each vessel carrying dangerous goods, should have a special inventory of dangerous cargoes or a manifest or a detailed cargo plan, with classes of all dangerous cargoes and with places of their location on board being given. The copy of the cargo plan should be presented to the authorities when clearing the ship outwards.

The shipmaster or owner of any vessel has the right to refuse in acceptance packages or bales aboard, if he suspects, that there are any dangerous good inside; he has the right to order the good to be unpacked with a view to determine its nature.

The master should refuse to take aboard any dangerous cargoes, if the vessel is not adapted to carry them, and any separate goods if the transportation of them is dangerous by virtue of particular circumstances.

The dangerous cargo should be so shipped, stowed and secured as to avoid, as far as practicable, damages or harm to the vessel and persons onboard and loss of cargo overboard during the whole voyage.

Maintenance of safe navigation. The shipmaster chooses the route that he considers it to be right.

During the voyage the shipmaster:

.1 should supervise sea and harbour watches;

.2 should provide, that the crew's members receive sufficient rest before taking over the duties;

.3 should proceed to the bridge immediately when having been called by the watch mate;

.4 should personally operate the vessel in the regions of heavy traffic, pilotage, ice conditions, leaving the bridge only for necessary rest, handing over his duties to the chief mate (backup, navigator);

.5 should supervise the reception of hydrometeorological and navigational information for seafarers as well as information on movement of other vessels; should analyze and apply the information received;

.6 may, if necessary, take a pilot, when passing the regions of free pilotage;

.7 may, in case of wrong orders given by the pilot, suspend the pilot from the exercise of his duties, may require replacement of the pilot, and, before the replacement, may control the vessel by himself;

.8 may use tug and icebreaker support to the extent, he considers to be necessary;

.9 should use radar-tracking pilotage and information of VTS systems;

.10 should supervise the safety of embarkation and disembarkation of the pilot, to provide meals and a cabin for rest to him. While leaving the bridge, the master should name a person responsible for ship control in his absence;

.11 should supervise periodic checks of the equipment listed in the international conventions, conducted by ship experts, and also registration of such checks in ship-, engine room- and radiotelegraphic log books, if the record on the particular check is stipulated in the convention.

A member of crew appeared at his working place, or came out for taking over the watch while being under the influence of drink or drugs, must not be permitted to discharge his duties.

Monitoring of region of activity. Each company binds the masters to make reports containing the following data on carried-out voyages:

.1 selected route and arguments for selection;
.2 navigational, hydrographic and hydrometeorological conditions of passage;
.3 local rules and customs in ports of call;
.4 use of pilot, tug, icebreaker support;
.5 rate of taxes;
.6 characteristic of cargoes, their disposition and fastening, cargo plans, estimation of stability;
.7 estimation of agents.

The company should analyze and generalize the master's reports, provide available information on forthcoming voyage to the masters.

Ship reports. Each company has charged the masters to report on current condition of their vessels, consisting of the reports on completed voyages presented by:
.1 chief engineer;
.2 chief mate;
.3 chief passenger mate;
.4 chief electric engineer;
.5 chief radio officer.

Each of the senior officers should within their purview report on:
.1 cases and circumstances of any failures of mechanisms, apparatus, devices, systems;
.2 cases and circumstances of non-execution of an order and other violations of discipline including those while staying in port;
.3 consumption of fuel, materials and spare parts, necessity of their replenishment;
.4 Evaluation of ship equipment and suggestions on replacement of or addition to the equipment;
.5 Evaluation of business qualities of the subordinates, estimation of their personal accommodating characteristics and prospects
.6 suggestions on changes to be made in established procedures;
.7 suggestions on planning officer and technical training.

The shipmaster should submit a separate report on cases and circumstances of:
.1 arrest of the vessel or a member of crew;
.2 pollution of environment;
.3 remarks made after inspection in a port;
.4 remarks or claims made by passengers;
.5 loss or displacement of cargo; listing of the vessel;
.6 damage of the hull, inflammation, detection of leakage, explosion, pirate attack.

A separate report by the shipmaster should provide information on conducted training and drills, especially emphasizing the cases of deviation from established periodicity.

1.9. Readiness for emergencies

General principles. Each company has developed a system of provisions of actions of crew in emergencies including:

.1 plans of fitting of vessels with special equipment;

.2 plans of theoretical and simulator training of the masters, ship officers and crew members;

.3 Ship Muster Lists for all vessels;

.4 a procedure of the ship reporting about emergencies and accidents; a procedure of processing of relevant data in the company;

.5 order of actions of the officials and divisions of the Company on receiving emergency messages, especially at night.

All crew members are obliged to know and to observe the safety code, fire protection rules and regulations as well as sanitary rules.

The organization of ship damage control is aimed at rational distribution and use of the personnel, equipment, emergency stock and materials for effective actions aimed to maintain watertightness of the hull, fire and explosion prevention, stability, integrity and unsinkability.

The work on preparation for abandonment of the vessel should be in parallel organized, if necessary.

The development of events in emergencies cannot be precisely predicted. Therefore, practical experience of the masters and crews in emergencies (assistance rendering, fire, collision, displacement of cargo, pirate attack etc.) are set out in the form of recommendations, which should not limit the master in making decisions, which he considers to be effective in particular conditions and circumstances.

Purpose of alarm. The purpose of general alarm is mobilization of crew with a view to face and to resist any danger (hole, probable collisions, grounding, pirate attack etc.). Therefore the Ship Muster List should provide for:

.1 stationing of crew members for watches; emergency parties (group);

.2 muster stations - basic and reserve muster stations for the passengers and crew's members, who are not included in the watchkeeping personnel (those members of crew, who are on watch at the moment of alarm signal should proceed to their muster stations after being properly relieved or under the instruction of the master);

.3 duties to establish radio-communication with the shipowner and other vessels;

.4 duties to enter current coordinates into automatic emergency transmitter and emergency buoys (if possible);

.5 responsible persons for preparation and launching of survival craft and for other actions according to Reg.53 SOLAS-74.

The purpose of the fire alarm is to inform the passengers and crew of the detection of a fire, to save persons, to contain and extinguish the fire as quickly as possible. Therefore in addition to the persons listed in the Ship Muster List the Fire Muster List should provide for:

.1 persons responsible for mustering and evacuation of the passengers (on passenger ship);

.2 persons responsible for initiation of fire-fighting systems and appliances

.3 persons allowed to work with self – contained breathing apparatus put on for evacuation of persons from the rooms filled with smoke, for scouting of the center of fire and for fire extinguishing;

.4 persons responsible for rendering medical aid.

The Rescue Boat Muster List ("Man Overboard") should provide for:

.1 the muster station on the navigating bridge for additional look-outs;

.2 persons responsible for preparation and launching of the rescue boat;

.3 the officer in charge of the rescue boat, the second-in-command and crew of the rescue boat;

.4 duties of notification by various means of connection (radio, telegraph, radiotelephone, ISS flags, searchlights etc.);

.5 persons responsible for rendering medical help and taking persons aboard, muster stations for crew's members (except persons on watch).

The Abandon Ship Muster List provides:

.1 crew's members responsible for making the rounds of ship's spaces to verify that there are no persons in them (at least two members of crew for each living compartment or group of rooms);

.2 chief officers and second-in-command officers responsible for preparation of survival craft for launching and launching of each particular life raft or boat;

.3 accommodation of passengers and crew in survival craft, with the necessity to ensure work of the engine, radio-communication and medical aid being taken into consideration;

.4 duties to deliver additional pieces of equipment to survival craft including portable radio-station and emergency buoy, to enter ship's position into an automatic emergency transmitter and to transmit a distress alert, to switch off the ship's ventilation, to save the nautical chart, ship's document and valuables.

Organization of readiness of crews. The system of training and drills in rescue and damage control actions is aimed to provide each crew's member with the skill that makes him capable of:

.1 distinguishing alarm signals;

.2 donning a lifejacket and hot-water suit, jumping into the water;

.3 keeping afloat;

.4 launching and operating life rafts;

.5 preparing a rescue boat for launching;

.6 starting boat's engine, casting off boat tackle, getting clear of ship;

.7 operating emergency boat's radio stations, portable VHF radio-sets;

.8 finding and using boat's equipment pack;

.9 making use of pyrotechnics;

.10 rendering first medical aid using medicines of the first-aid set and medical supply;

.11 making use of jack ladder and pendant with knots;

.12 reporting on the situation in a concise and precise manner;

.13 making use of life buoys;

.14 operating various types of fire extinguishers and portable foam generators;

.15 acting as a nozzle-man;

.16 making use of self-contained breathing apparatus and equipment of the fireman;

.17 applying various techniques of fire extinguishing;

.18 sealing holes.

Each member of crew should know about the own vessel:

.1 its design features;

.2 in detail his place to keep watches, room under his responsibility;

.3 his alarm duties;

.4 disposition of life buoys, fire hydrants, fire extinguishers, exits to boats, emergency fire pump and emergency diesel-generator, fire stations, boats, life rafts, spare life-jackets, emergency posts, rooms with fire-fighting equipment, boxes with pyrotechnics, boards with keys;

.5 telephone numbers on the bridge and by the gangway.

The officers also should know:

.1 the duties of their subordinates in an emergency party or group in case of emergency;

.2 order of launching of life boats;

.3 basis of how to manage survival craft;

.4 fire systems and how to use them;

.5 a method of calculation of outside water volume coming through openings in the hull and capacity of stationary and portable pumps.

The individual preparedness of members of crew can be reached by systematic training and drills conducted under the officers of the emergency parties and groups. The practical skills developed during these drills are estimated by the officers who are responsible for quality of training and drills.

Shipmaster's duties. On detecting signs of emergency conditions or receiving a relevant warning, the main task of the shipmaster and crew is to save human life. All further actions must be subordinate to this task.

As a rule, the best conditions for saving life of passengers and crew's members at sea are provided on the vessel rather than on rescue craft. Therefore the damage control of a vessel in distress is the most well-taken way to fulfil the main task.

Any doubt in capability of maintaining damage control of a vessel should be treated for the benefit of evacuation of the passengers and crew, for the delay with evacuation may result in loss of human life.

The shipmaster is responsible for the crew to be familiarized with and instructed on the arrangement and peculiarities of use of the fire equipment and supply, for special training and drills stipulated by international and national rules, for supervising each crew member in relation to how he (a crew member) knows his duties and how skilled he is in operation of ship's equipment in emergencies.

The shipmaster is obliged to take all measures to rescue a person fallen overboard.

The master is obliged, as far as it is possible to carry out without any special danger to the vessel and persons on board, to proceed at full speed to the aid of persons in distress at sea.

While staying in port, the master at request of port authorities should place the vessel, crew and ship equipment at disposal of the authorities for fire extinguishing purposes and for rendering assistance in emergency cases if there is no great danger to the safety of the vessel and crew.

Readiness of watchkeeping personnel. While being on watch a crew member should be equipped so as to act reliably in emergencies, with portable VHF radio-sets and emergency books being included.

While taking over the watch, the relieving officer of the watch should check the functioning of fire alarm systems, the absence of sparks out of funnel, communication with the engine room; he also should obtain information on open flame jobs, garbage incineration, functioning of sauna, service and cargo rooms ventilation, temperature of air in holds (if remote gauges are available), malfunctions of fire fighting systems and equipment as well as on relevant measures taken.

In addition to his routine actions the reliving officer of the watch should check cargo handling and bunkering operations for fire safety, familiarize himself with situation around the vessel, verify the number of telephone of the shore-based fire team (both for himself and for a seaman on watch by the gangway).

While taking over the watch, the watch engineer should obtain information on all repair and preventive works involving ship equipment and fuel operations.

During the time of the watch the fire safety in engine rooms should be checked by rounds at regular intervals. During the evening and night hours the officer of the watch should organize periodic rounds of other rooms of the vessel paying special attention to fire hazardous places and objects. A special fire watch should be nominated for this purpose on passenger and training vessels, this watch establishes the order of rounds to be carried out.

On an alarm signal the watch officers should:

.1 intensify a look out;

.2 check a state (closure) of doors in watertight bulkheads;

.3 determine a current position of the vessel, transfer the coordinates to the radio-house and enter them into the automatic emergency transmitter;

.4 switch on and test ship's internal communication;

.5 if necessary, hoist an ISC flag signal and made an initial announcement on the air;

.6 switch on the portable VHF radio-set on the bridge on the distress frequency specified in the Muster List;

.7 provide illumination;

.8 notify the persons working in places, where the alarm signal could be not heard;

.9 provide the collection of information on the case.

In case of repair at a shipyard the shipmaster should organize fire protection of the vessel according to the requirements of the shipyard.

Muster List. Before proceeding to sea the shipmaster should draw up the Muster List, where he specifies special duties of each crew's member in case of accident and a location, where he should arrive on an alarm signal.

The Muster List should be made on the basis of the typical schemes developed by the shipowner for each type of vessels.

The Muster List provides for a sea watch to be kept under way during damage control actions; this watch should provide all kind of observations, safe navigation of the vessel, operation of ship born technical aids and equipment, records of events. If necessary and possible, the vessel should be stopped.

The Damage Control Muster List should provide for an emergency party (group) capable of acting in emergencies, in such party crew members are professionally trained for performing specific functions.

On a vessel there may be one or several emergency parties in accordance with the number of crew's members, design features of the vessel and ship equipment.

In emergency parties or outside them there may be the specialized groups of medical aid, preparation of life saving appliances, engine room (providing operation of ship equipment in emergencies) and others.

Numerical strength of emergency parties, basic functional duties of each member of crew in terms of safety of human life and damage control actions should be determine with due account of background of each seaman, knowledge of the vessel, presence of passengers onboard the vessel.

The emergency parties and groups are placed under party (group) officers nominated by the shipmaster. The second in command of the parties (groups) should be nominated simultaneously.

If there is a single emergency party on the vessel, as a rule, the chief mate is nominated for the party officer, and the second mate - for the deputy party officer.

The damage control in the engine room is carried out by the chief engineer. As a rule, the second engineer is nominated for his deputy (on the electric vessels – the chief electric engineer).

Each emergency party or group should know the arrangement and equipment of the whole vessel and be ready to act for damage control purposes in any part of the vessel.

On an alarm signal the members of crew should:

.1 switch on portable VHF radio-sets on a frequency as specified in the Muster List;

.2 close manually open windows and portholes;

.3 switch off electric appliances;

.4 leave the cabin doors unlocked;

.5 bring to the muster station a life jacket, hard hat, electrical lantern, emergency book, keys to the rooms placed under his responsibility, personal and ship documents being on hand;

.6 pay attention to the environmental conditions with a view to obtain any information about the situation.

While berthing in port or riding on road the damage control is carried out by the crew's members staying on board under the command of the watch mate. The numerical strength of a harbor watch is to be established by the shipmaster proceeding from berthing and mooring conditions, and nature of the cargo.

The primary actions of the persons aboard on an alarm signal include:

.1 mustering by the gangway or by another specified location for the purpose of prompt evacuation;

.2 obtaining the information about the situation on board the vessel in order to determine a level of danger;

When riding on road, the basic task is to make a necessary number of survival craft ready for launching and, whenever possible, to accommodate the passengers and unauthorized persons in them.

At the muster stations the officers in charge of the emergency parties or their deputies should:

.1 verify availability and condition of the persons;

.2 gather the initial information on the situation;

.3 establish communication with the main command station, standby command station and report on the persons and situation;

.4 give commissions to the crew's members, first of all, in relation to the search and evacuation of persons, in accordance with the instructions of the main command station or the standby command station.

1.10. Estimation of the efficiency of SMS of the Company.

Estimation of the efficiency of SMS should be carried out on a regular scheduled basis.

The off-schedule estimations (re-estimations) of the efficiency will be carried out on the basis of and proceeding from:

.1 external and internal audits of the Company and/or of the vessels;

.2 cases of human injuries or loss of life, emergency cases, cases of environmental pollution;

.3 instructions and recommendations of the inspectors of flag States and port, classification society;

.4 introduction of the new international or national applicable rules of law;

.5 essential structural and organizational changes in the Company, addition of new vessels to the fleet, opening of new cargo ship lines, essential changes of cargo base.

The results of the estimation of SMS efficiency should operatively be transmitted to the shore and ship personnel of the Company, not waiting for the beginning of corrective actions.

The documents of internal audits including all subsequent corrective actions are an objective proof of the fact that the Company functions and strives for greater efficiency.

Internal audits and estimations of SMS efficiency should be carried out according to documentary procedures, including:

.1 selection of the personnel to be checked;
.2 planning (individual and general checks);
.3 realization;
.4 registration of results;
.5 approval of the reports;
.6 information of the SMS entities about results of audits (checks);
.7 development of corrective actions;
.8 realization of corrective actions.

The Company should establish and support in working order the procedures of determination, documentary registration, verification and approval of all changes and modifications in the SMS.

The documentation management should provide certain actions, including:

.1 establishment and maintenance in working order of procedures of management of the documents and data relating to the requirements of the quality standard. The SMS documents should be considered and their conformity should be confirmed by the powerful personnel before the documents are come into force;

.2 maintenance of availability of appropriate documents in all divisions, including the vessels, where works which condition the effective functioning of the quality system, will be carried out;

.3 duly withdrawal of the out-of-date documents from all places to which they were dispatched or where they were applied;

.4 changes in the documents to be made after analysis and approval of the changes within the same functions and/or organizational structures of the Company, which carried out the initial analysis and approved the initial text of the document, if it was not expressly provided otherwise. These structures should have access to the appropriate information on which the analysis and decisions are based;

.5 development of a continuous review of the documents in order to avoid the use of obsolete documents;

.6 republication of the document after a certain number of changes made.

The absolute criterion of due quality of safety management is the absence of human injuries and loss of life on the vessels of the Company as well as the absence of cases of environmental pollution.

An official criterion of safety quality management accepted by the Russian marine is the relative accident rate, that is, the ratio of the number of emergency cases with vessels of the Company to the number of Company's vessels, taken for a certain period of time.
Besides, it should be taken into account that investigation of any emergency case in the Company is carried out according to the Regulations for ship emergency classification, investigation and registration procedures (PRAS-90).

REFERENCES

1. IMO Resolution A.740(18) "Interim Guidelines to assist flag States", 04 November 1993;
2. IMO Resolution A.788(19) "Guidelines for introduction of the International Safety Management Code (ISM Code) by Administrations", 23 November 1995;
3. IMO Resolution A.787(19) "Port State Control Procedures", 23 November 1995;
4. IMO Resolution A.739(18) "Guidelines for the Authorization of Organizations Acting on behalf of the Administrations", 04 November 1993;
5. Circular letter MSC/Circ.710/MEPC/Circ/307 "Standard Agreement on the Authorization of Recognized Organizations Acting on behalf of the Administrations", 17 October 1995.
6. Collection N1 Management of the safety of navigation. International and national documents. CNIIMF, Saint-Petersburg, 1997

PART 2: SATELLITE COMMUNICATION USED FOR SAFETY MANAGEMENT OF NSR NAVIGATION

2.1. Introduction

The safety management of navigation includes organization, legal and technical aspects. The first two aspects have been considered in detail in the previous parts of this report. The safety management covers all the scope of problems of sea transportation including ships, shore – based services and shipping companies operations. The detailed aspects of these problems have been investigated in different projects of the INSROP program. This project deals with problems of communication.

The projects of the first phase INSROP I.1.2. "Operational Aspects" (sections I.1.2.4. "Communications", Volume 1,2,3.) reflect an actual state of communication means in the Russian Arctic I.1.2 and further prospects for its perfection and development.

The results of the previous research will be summarized, with the development of national and global means of communication for the last few years being taken into account. Special attention will be given to the promising tendencies of development of communication means and data transmission. The material will be set out mainly in connection with the safety management problems.

Practically all communication services have a certain relation to the safety of navigation excluding private correspondence and some commercial messages (which are not related to transportation of dangerous cargoes).

The maritime radio communication services include a wide spectrum of various types of messages and forms of information exchange between users. The basic types of the communication involved directly in the safety management can be described as follows:

1. Commercial communication. It provides all official and commercial information exchange between vessels and shore users (companies, shore services, port authorities, agents and some others) with terrestrial telephone, telegraph and data networks interface.

2. Vessel traffic control communication. It is a type of communication ensuring vessel position control and directions of vessel movement. Vessel's position information should come to the vessel traffic control centers of shipping companies and in the marine operations headquarters (The Marine Operations Headquarters of West and East sectors of the Russian Arctic).

3. Operational communication. It has a wide scope of application. First of all it involves the information exchange between a vessel and ports of call, maintenance service requests, reception of meteorological information, as well as reception of data on current and predicted ice conditions.

4. Ship-to-ship communication. In general it is a type of vessel-to-icebreaker communications while in convoy. This type is a specific feature of navigation in the Arctic.

5. Emergency communication. Emergency communication formal procedures and technical facilities are defined by the IMO standards for GMDSS system.

The variety of problems determines a variety of means to solve them.

Only reliable, qualitative and operative communication available at any time and in any position, between all possible users - participants of transport process can ensure the efficiency of safety management of navigation.

A system of communication should meet the international requirements to systems of distress and safety communications in accordance with the International Conventions for the Safety of Life at Sea (SOLAS - 74) and with the GMDSS standards (IMO Resolutions, Radio Regulations etc.).

These documents define both tasks and requirements to ship and shore-based means of communication used for navigation in various geographical zones. In this relation the Arctic region includes all defined sea areas of navigation as established by GMDSS i.e. A1, A2, A3 and A4 sea areas.

The most promising types of communication under Arctic conditions are satellite types. Among the existing systems the maritime satellite communication system INMARSAT is of special interest. In the long-term outlook the use of IRIDIUM and GLOBALSTAR systems is quite possible.

2.2. Communication providing at low elevation angles

The feasibility of the satcom aids operating on the NSR in the INMARSAT system and in the high latitude Arctic regions is limited by the satellite coverage areas. The boundary is usually taken to be a line for which an angle of elevation is at least 5 degrees. This fact is reflected in IMO Resolution A.801 (19) "Provision of radio services for the global maritime distress and safety system (GMDSS)", where Annex 3 states that "Sea area A3 is a sea area not being a part of sea areas A1 or A2 within which an angle of elevation of an INMARSAT satellite is at least 5 degrees".

At the same time, the Russian and foreign operational experience in high latitudes shows that proper quality communication on satellite channels at angles of elevation not exceeding 0 degree is possible.

For the first time such results were received during the experiment conducted on the research vessel *Professor Vise* (Ship Earth Station (SES) INMARSA-A) in the Atlantic Ocean and the Pacific Ocean regions via satellite transponders MARECS-B2 and INTELSAT V-MCSD, 1986.

Among other maritime trials the following experiments should be emphasized:

1. Russian INMARSAT-A SES experiment

Episodic operational tests were conducted aboard the nuclear-powered icebreaker *Sibir* during the first voyage across the Arctic to the North Pole in July-August 1987. The test messages were carried out via the Indian Ocean Region satellite (INTELSAT V-MCS A) both in telephone and telegraph modes. The elevation angle during the tests varied between 0 and 8 degrees.

The result of test messages showed the stable reception at an elevation angle up to 2.5 degrees in a telephone mode (quality 3 on the quality scale from 0 to 4) and no errors were observed in messages under the telegraph test QBF. The quality of the telephone channel was becoming worse (quality 2) only at elevation angles of 1 degree and under and telegraph test messages were received with some errors.

2. Norwegian INMARSAT's EGC sea trial

Norwegian INMARSAT's EGC sea-trials were carried out 3-7 July 1987 on the passenger ship m/s *Nordnorge* and 31 July-17 August on board m/s *Nornen.*

M/s "Nordnorge" sailed along the coast of Norway from Bergen via Nordkapp (the North Cape) to Kirkenes and back. The ship's route takes it into narrow fjords, and between islands with quite high mountains.

For the Indian Ocean Region satellite (MCS-A) the elevation angle varied between 5.5 and 8.1 degrees, for the Atlantic Ocean Region satellite (Marecs B2) the elevation angle varied from 0.7 to 16.6 degrees.

The result of the tests indicated that the EGC receiver functioned satisfactorily when the elevation angle was at least 6 degrees. When under 6 degrees, mountains affected the receiver. The potentially good reception was observed with elevation angles of from 0 to 5 degrees. Ten out of sixty-one (16%) test messages were lost due to high mountains and the low elevation angles (6 - 0.7 degrees). A faultless test message was received with an elevation angle of 0.77 degree.

M/s *Nornen* sailed in the waters around Svalbard and Bjornoya (the Bear Island). The result of the test indicated that seven out of thirty-three messages were received with an elevation angle less than 2.2 degrees, and only one of thirty-four messages was received with an elevation angle of 0.35 degree.

Besides the low elevation angle, the reason as to why messages were not received was that the EGC receiver had not been resynchronized for a long time after a long idle period without signals.

3. Japan field trial of INMARSAT-C system

The field trials were conducted in December 1987 and in June 1988 in the Osaka Bay on a small vessel. Test items were multi-path fading, bit error rate (BER) and packet error probability (PEP) characteristics.

The measurement of multi-path fading indicated that a significant signal fading occurred in the case of antenna gain fluctuation, the level of which was changed within a low elevation angle range (because the omnidirectional antenna using in Standard-C system reduced its gain at a significant rate in a low elevation range).

The fast variation of S/N characteristics is mainly caused by incoherent fading whilst the slow variation is mainly caused by coherent fading. The measurement of BER and PEP characteristics indicated that BER/PEP characteristics are degraded only by the incoherent fading and can be regained.

For this purpose the fading margin for the coherent fading should be included in INMARSAT link budget with a careful consideration of satellite power limitation.

4. Norwegian maritime INMARSAT-M sea trials

During the summer 1995 an INMARSAT-M maritime telephony trials were carried out on the research vessel *Gauss*, which was navigating in high latitude waters to the North of Western Europe. During the voyage approximately half of the calls were made at elevation angles of just below 5 degrees. Seventy-nine call attempts out of ninety-five (83%) were success with an elevation angle of less than 5 degrees.

It should be noted that the INMARSAT-M telephone service is relatively tolerant of short-term fading and operates down to a BER of around 0.01 (but with reduced voice quality).

The INMARSAT-M field measurements and service-availability testing were made aboard the Norwegian coastguard ship *Lance*, which was navigating in Arctic waters, between latitude 68-80 degrees North, with satellite elevation angles within the range 0-10 degrees.

The field measurement concludes that INMARSAT-M service availability was found to be good on a 24-hour basis for latitudes up to 75 degrees North, falling to around 12 hours per day for latitudes approaching 80 degrees North.

5. The experimental calls via Nera Compac-T INMARSAT-A terminals were carried out during the expedition to the magnetic North Pole in the Canadian Arctic in 1996. These calls indicated that even from extreme latitude (78 degrees, 30 minutes north, 104 degrees west) the BBC in London was able to receive the messages via the link to Goonhilly.

All attempts to establish calls at extreme angles had usually a casual character. The communication was carried out via second generation INMARSAT satellites. Special tests using a representative sample technique were not carried out.

In 1996 and 1997 the third-generation INMARSAT satellites were launched and brought into regular operation; special features of these satellites are increased power (power capacity of the satellites in an L-band transponder makes 48 dBW, which is 8 times more than with the second generation satellites), and the use of five highly directional spot beams besides global beams.

The feasibility of practical maintenance of reliable communication via the third generation satellites at low elevation angles is not determined.

Taking into account that one of basic elements of reliable communication in the Arctic will be satellite communication, it is supposed to conduct a special experiment to investigate problems connected with maintenance of a guaranteed reception for INMARSAT A/B and INMARSAT-C communications terminals at low elevation in various modes.

The main purpose of these trials is to determine the operational possibilities of the INMARSAT system (the third generation satellites) providing reliable communication at low elevation angles.

During the experiment it is supposed:

1. to determine the boundary of satellite coverage areas for the third generation Inmarsat satellites for INMARSAT-A/B and INMARSAT-C maritime SES;

2. to determine a degree of influence of multibeam propagation on signals receiving;

A perfect variant of a similar experiment could be periodically carried out in commercial voyages of a nuclear icebreaker to the North Pole. Using of this idea has organizational difficulties, first of all financial. At the same time this opportunity is not excluded.

Unfortunately, it was not possible to conduct this experiment in 1998, because the number of commercial voyages was limited (only two) and the price of the voyage was very high (30000 USD per person). From the technical point of view, only INMARSAT-A SES was installed on board a nuclear icebreaker, but INMARSAT-C SES will have been installed by the navigation of 1999. In any case, all result and materials of this trial will be passed to INSROP.

The developed program and the technique of sea large-scale trial are given in the Annex 1.

In any case, INMARSAT system, each on favorable conditions can not be provided the highest latitude routes. Therefore, alternative variants should be found out.

2.3. New global satellite communication systems

Of the new global satellite communication systems, IRIDIUM and GLOBALSTAR were approved by the Russian Committee of Communication for the use on the Russian territory.

IRIDIUM was designed for continuos global coverage. This is a LEO constellation of 66 satellites in polar orbits at an altitude of 780 km. The choice of LEO was dictated by the desire to minimize power in both the satellite and the mobile handset, minimize the time delay and maximize the angle of elevation.

The orbital period is 100 minutes and a given satellite is in view for only ten minutes before handover of a call to a following satellite. An IRIDIUM satellite has extensive onboard processing and a telephone call is routed through the constellation via intersatellite links.

IRIDIUM will provide voice, data, fax and paging service to those individuals who need global communications.

Handheld phones manufactured by Motorola and Kyocera Corporation will be available in a single mode for Iridium satellite service and multi-mode for cellular and satellite service. The handset kit, including satellite phone, cellular phone, pager, extra batteries and charger, is expected to retail for $ 3000 and be available for commercial service in September 1998. Twelve gateways, including two in Russia, will provide global service initially.

GLOBALSTAR employs a constellation of 48 satellites in orbits inclined at 52 degrees at an altitude of 1,406 km. This system concentrates coverage over the temperate regions of the earth from 70 degrees S to 70 degrees N. A technique called spatial diversity is used, wherein signals received simultaneously from two satellites are combined in the receiver to mitigate losses due to blockage and multipath effects. Thus an inclined, non-polar orbit constellation was chosen to ensure that at least two satellites are visible at all times.

GLOBALSTAR will provide telephony and other digital telecommunications services such as data transmission, paging, fax and position location. GLOBALSTAR expects its customers to include international travelers, commercial vehicle operators, commercial ships and general aviation aircraft.

Qualcomm is manufacturing a trimode handset that will switch automatically from terrestrial analog or digital cellular to the Globalstar satellite network. Dual mode handsets (will cost roughly $750) are being developed by Ericsson and Telital. The gateways are constructing in different countries, including nine in Russia.

2.4. Russian tracking system KURS

The satellite tracking system for mobile objects and data collection KURS has been developed and put into experimental operation in Russia in 1995. This system has considerable promise for use in the Arctic.

The structure of system is given in Fig.1

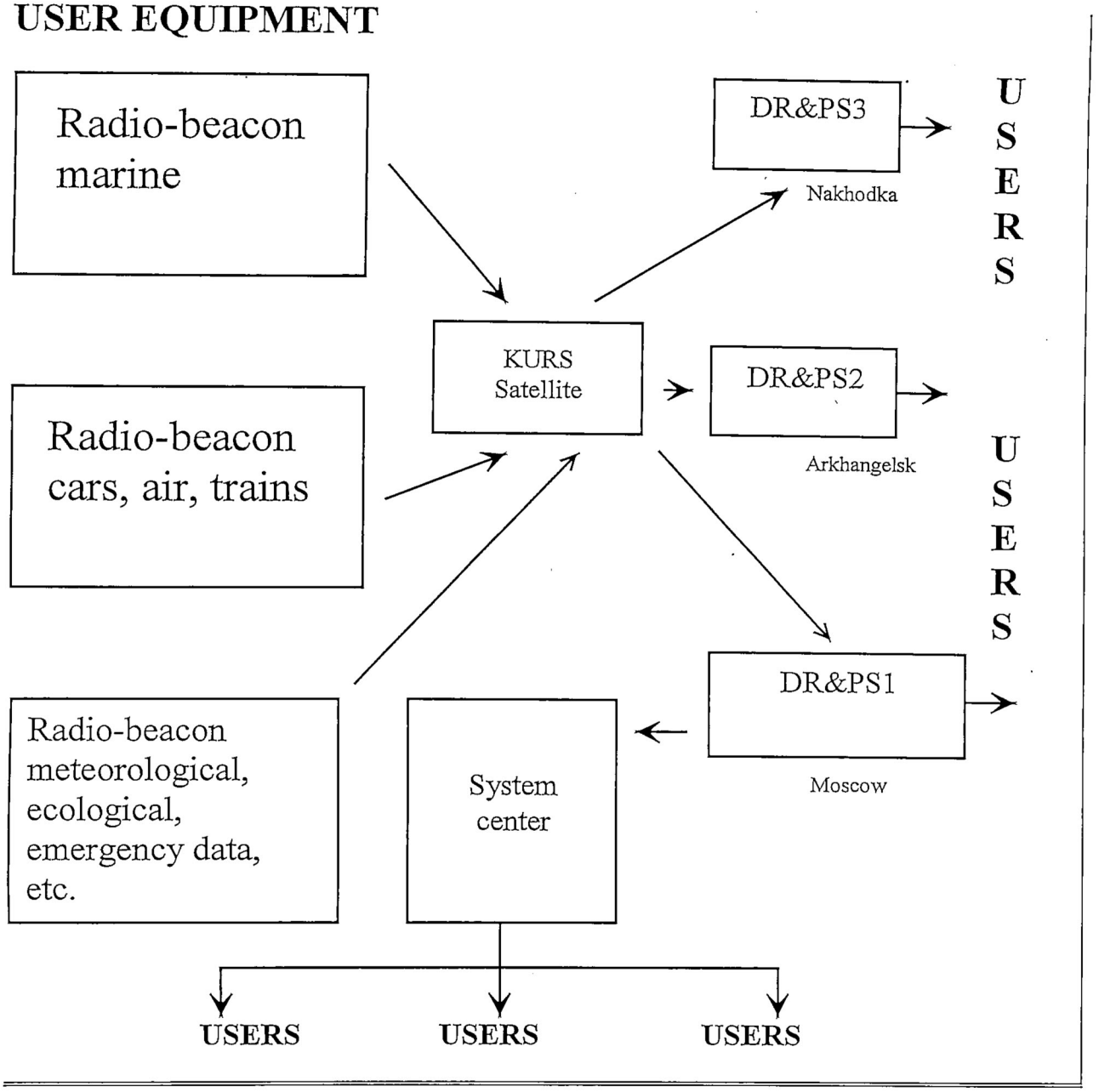


Figure 1. The Structure of the KURS System

Brief characteristics of the system are described below.

Main functions of the system:
* determination of different types mobile objects location and its data collection;
* transmission of remote objects condition parameters;
* transmission of non-operated measuring systems sensors indication.

The technical objects, which can use KURS for needs of hydrometeorological data supply of the Arctic Shipping are:
* ships, including ice-breakers, sailing regular or episodically along the NSR;

* scientific ships;
* the ships for providing polar stations, arctic airports and others remote objects;
* tourist, sport and other groups, moving along separate routes;
* drifting automated ice stations (determination of location and transmission of the measured hydrometeorological data);
* wide range of mobile objects: from ships to migrating birds and animals, (tracking for any mobile objects, determination of the current position);
* non-operated automatic meteorological units which are located in remote inaccessible regions (data transmission);
* ships (meteorological data transmission);
* radio beacons (conditions monitoring and control);
* tracking for mobile objects, such as migrating birds and animals.

Brief description of the structure and principles of operation:

The system consists of three parts:

a) space segment, including 4 satellites operating in full deployment.
The orbital parameters of satellite are the following:
circular polar orbit;
elevation of orbit - 83 degree.;
altitude - 1000 km.;
period - 105 min.;
working frequency - 405.975 MHz.

b) Earth segment, including Local User's Terminals (LUT) in Moscow, Arkhangelsk, Nakhodka and the System Center (SC) in Moscow.

c) Radio beacons, installed on mobile or stationary objects.

A radio beacon can be connected with sensors of different purpose, installed on a controlled object.

The radio beacons radiate a modulated radio signal, received by a satellite in the area of visibility of the radio beacons. The signal is processed and stored by the on-board equipment of the satellite and then is sent to LUT, while passing in the area of mutual visibility. LUT determinate the radio beacon location, its identification number and decodes parameters of the object under control. The processed data are sent to the SC and hereinafter to the user via terrestrial communication channels.

The first satellite of the system was launched on the 5th of July, 1995. At present a stage of an experimental evaluation of technical and operating characteristics of the system and its efficiency is carrying out. A wide range of tests with different objects was executed. The most interesting and extensive experimental test was carried out aboard the m/v *Akademik Fedorov*, during voyages from Saint-Petersburg to Antarctica and back in 1996 and 1997.

The main parameters of the system quality are its accuracy and efficiency. The following results of trials have been obtained:

The accuracy of the stationary object location was evaluated by data, collected during anchorage in ports. The total 463 determinations of locations were carried out. Radial Mean Square (RMS) error of location determination was equal 0.58 miles (1.0 km), with probability 0.9 the error did not exceed 1.5 km.

During the object moving, the error of location determination increased proportionally to the vector of velocity. For drifting objects (at velocity of 2-3 knots) the error practically did not increase. At velocity of 15-20 knots the error reached 3-5 km.

The efficiency is valued by two factors - discreteness and delay.

The discreteness is a number of location determinations. It depends on numbers of operating satellites and geographical latitude of the object under control. For circular Arctic orbits, this parameter increases while growing the ships latitude. For instance, for latitude of 65-75 degrees with one satellite per day 8-10 determinations of coordinates of the object under control and corresponding number of information messages will be ensured. Growth of satellite number increases the discreteness.

The delay is a time spent from the moment of the beginning session between the object and the satellite to the moment of receiving data by the user (traffic operator). It mainly depends on mutual location of the object and LUT. For the Arctic region, due to aptly chosen location of LUT (Arkhangelsk and Nakhodka), this delay in 50% of events is few minutes and in 50% - about an hour.

These values do not take into account a quality of the terrestrial communication channels between SC and the user's point where the processed data are received. This is a private problem of the users and it depends on organizing an interaction with the SC and technical aids.

Already at present, in a stage of demonstration of the system, even one satellite can solve many scientific and practical problems, concerned with the exploiting of the Arctic region.

Finally, it is necessary to mention that communication in the Arctic region possesses all the prospects to be effective and reliable in the near future.

REFERENCES

1. V.Volodin, S.Derevenko, F.Zharnovezkij - Characteristics of multiparth radiowave of 1-band on the satellite channel of maritime mobile satellite service, CNIIMF Leningrad. Transport, 1988.
2. Norvegian sea-trials, - Inmarsat Council 27 Session ACTOM/27/7, 1 October 1987.
3. Field Trials of Inmarsat -C system, Inmarsat Council 31 Session, ACTOM/31/3, 14 February 1989.
4. Report on Inmarsat-M telephony field trials, Annex COMSAR 1/INF.4.
5. Ultimate Challenge poses mighty test - Transat November 1996.
6. A.Vronets The practice realization of the new technologies of mobile and fixed radiocommunication in Russia 2-nd Business-Forum MOBILE SYSTEMS-97. Moscow, March 1997.
7. Robert A.Nelson. The art of communication via satellite. Via Satellite, July 1998.
8. V. Rogalskiy, V.Terekhin, A.Shigautdinov, E.Yakshevich. The satellite Tracking System KURS for the moving objects. 2-nd Business-Forum MOBILE SYSTEMS-97. Moscow, March 1997.

ANNEX: PROGRAM AND TECHNIQUE OF SEA-TRIAL

1. Object of tests

Object of tests is telephone and telegraph channels, formed:
- by L- INMARSAT C and C-L bands transponders, installed on the third generations satellites INMARSAT 64E IOR; 15,5 W AOR-E.
- by transmitter/receiver of Coast Earth Station (CES) - "Station 12" (PTT Telecom);
- by SES INMARSAT -A and INMARSAT C installed onboard the nuclear icebreaker sailed across the Arctic on the edge and outside INMARSAT satellite coverage area.

2. Purpose

The purpose of tests is to measure characteristics and statistics of maritime SES operation in real arctic navigation conditions at low elevation angles via the third generation satellites INMARSAT 64E IOR, INMARSAT 15,5 W AOR-E.

The following should be determined as a result of tests:
2.1. Operational potential of the INMARSAT system (third generation satellite) to provide maintenance of reliable communication at low elevation angles.
2.2. The limiting boundary of the third generation satellite coverage area with regard to maritime SES INMARSAT A and INMARSAT -C.

3. Program of tests

The following parameters are subject to checking:
3.1. Quality of voice transmission.
3.2. Error factor with telegraph and data transmission.
3.3. Quality of facsimile transmission.
3.4. Reliability of transmission of call and inquiry signals.
3.5. Parameters of reliability and stability of SES operation in view of: multibeam propagation of radio-waves, hydrometeorological conditions, influence of interference from ship's radio equipment, rolling and pitching of the vessel.

4. Organization of tests

4.1. The tests will be carried out by a commission nominated by Murmansk Shipping Company (MSC). The commission consists of a representative of communication service of MSC, a representative of CNIIMF and a representative of the icebreaker which is used for conducting the tests.

4.2. The commission is responsible for:
- Drawing up a work schedule;
- Preparation of the equipment and documentation;
- Organization and conducting of tests;
- Processing and preliminary analysis of results of tests.

The commission may supplement and specify the present technique in the course of tests.

4.3. The duration of tests is 15 days.

4.4. The instrumentation and auxiliary equipment essential for conducting of tests may be delivered, if necessary, for a period of tests by MSC.

4.5. MSC names an icebreaker for sailing to the North Pole; the icebreaker should be equipped with operating SES Inmarsat-A and Inmarsat-C.

5. Technique of tests

5.1. Quality of voice transmission (item 3.1 of the programs) is checked by a method of opinions and from articulation characteristics.

5.1.1. The checking by a method of opinions should be made on a scale of classes of quality (from 0 to 4 numbers), recommended by ITU According to this method a quantitative estimation of transmission quality is average number. The duration of one estimated session of communication should be within 1 - 3 minutes, a total of sessions of communication for the period of tests should be at least one hundred.

5.1.2. The parameter describing articulation is defined as a share of correctly accepted words, expressed in percentage from a general number of transmitted words.

5.2. The factor of errors occurred by transmission of both telegraph messages and data is determined for communication session and for the whole cycle of tests.

5.2.1. The factor of errors occurred by transmission of telegraph messages is determined by calculation of a number of telegraph symbols distorted and missed during calls and a total of transmitted symbols. The volume of sample for all period of tests should be at least 100000.

5.3. The quality of facsimile transmission (item 3.3 of the program) should be estimated by means of shore-to-ship and ship-to-shore transmission of test table. For the period of tests the test table should be transmitted at least 10 times.

5.4. The reliability of transmission of call and inquiry signals (item 3.4 of the program) is determined for each direction ship - shore and shore - ship separately by calculation of quantity of sent calls and inquiries which were not acknowledged during the contact, and by calculation of a total of sent calls for all period of tests. The quantitative estimation of reliability of transmission of call and inquiry signals is calculated separately. The volume of sample should be not less than 40 sessions for all period of tests.

5.5. To estimate parameters of reliability and stability of operation of CES (item 3.5 of the programs) the vessel should register: failures in operation of SES, failures and phenomena of deterioration of communication caused by external factors (interference from other means of radio communication, from rolling and pitching of the vessel, vibration, shadowing of aerials).

6. Data registration and processing

6.1. In consequence of tests the following materials should be submitted for further processing:
- textual radiogram transmitted and received in printing;
- transmitted and received facsimile messages;
- protocols which reflects failures of the channel and cases of unstable communication;
- SES logbook, which should reflect time, data on transmission of call signals, registration of telephone talks, telegraphy, facsimile and data transmission, ship's position, course, antenna position, hydrimeteorological conditions, amplitude of rolling, data on failures and other information.

6.2. Proceeding from the results of tests:
- methodical recommendations should be prepared for practical use in high latitude areas by ship's radio-experts;
- projects of materials to be presented to INMARSAT and IMO are to be prepared;
- a report is to be issued.

OCEANS INSTITUTE OF CANADA

1226 LeMarchant Street, Halifax, N.S., B3H 3P7, Canada
Tel: 1-902-494-3879 -- Fax: 1-902-494-1334

REVIEW

INSROP Working Paper, No. 1998-I.1.3

Navigational Safety Management System of the NSR

by
A.Baskin, V. Vasilyev, E.Yakshevich, & A.Shigabutdinov

29 October, 1998

For those working in other INSROP areas, especially in those relating to commercial shipping and marine risk assessment, this paper would have been extremely helpful some time ago. It is a pity that it is completed at such a late stage in INSROP. Nevertheless, this is an excellent paper that provides very useful insights into two very critical areas of maritime safety management from the Russian perspective. These areas are the International Safety Management Code (ISM Code) and communications aspects related to NSR navigation.

The ISM Code, as developed under IMO auspices, and now in the first stage of international implementation, is one of the most important developments in maritime safety ever to be undertaken by the shipping industry. The first part of the paper illustrates that this importance has been carefully considered by the Russian government and is being implemented accordingly. As a result, INSROP's Russian partner, CNIIMF, where the authors of the paper are based, has been responsible in developing the required ISM safety systems for the various Russian shipping companies using the NSR. The first part of the paper thus contains the outcome of this development which has been actually implemented in practice today.

The paper explains that the new safety management systems (SMS) as implemented, closely follow the ISM Code requirements and, accordingly, confirm Russian commitment to the IMO requirement. As such the system is not specifically designed solely for NSR use but could be applied for navigation anywhere. In fact, this part of the paper provides an excellent outline for ISM Code implementation

anywhere. However, it is also made clear that for navigation in the especially vulnerable Arctic area, the ISM Code requirements are particularly necessary. This part of the paper provides quite specific details of what is actually required under these new rules. Although it is not made clear, it is assumed that foreign vessels on the NSR will be subject to similar requirements. Although the CNIIMF work was especially devoted to Russian shipping companies, it would have been helpful if it had been clearly stated that these are now requirements for **all** vessels.

There is also no information on how and by whom the systems, as implemented by shipowners, are actually audited. This is one of the main ISM Code requirements. For example, it is stated that required inspections are to be carried out by "competent personnel", but no further details are given. Are these competent persons government inspectors, private surveyors, classification society surveyors etc.? Furthermore, there is also no information on what sanctions are in place for non-compliance. The paper makes reference to the Paris and Tokyo Memoranda on Port State Control and confirms that Russia participates in the relevant inspection requirements. Can it be assumed that enforcement, if required, will take place under this system? This is not made clear and would be useful information for shipowners contemplating the use of the NSR.

Part II of the paper should really have been a separate working paper. Although it is closely related to maritime safety it concentrates much more on the technical aspects of communications systems in the high Arctic. This includes information on an actual sea trial in an Annex to the paper. Once again, this information would have been very helpful to other INSROP researchers some time ago. Marine insurers and shipowners have inquired frequently about the efficiency and efficacy of communications systems, both in terms of maritime safety and general communications, in the NSR region. This paper provides some excellent, practical answers and concludes that communications in the NSR region have the prospect of being effective and reliable in the near future—i.e. once some further adjustments and installations are carried out. It would have been helpful if some of the conclusions drawn had been spelled out a little more clearly and specifically. In fact it almost seemed that the paper would have benefited from some additional information and detail. However, it should be noted that this reviewer, although nautically trained and qualified, has little expertise in modern communications systems. Nevertheless, as this type of information will be perused by decision-makers who may not be communications specialists, some additional clarity might be helpful.

Unfortunately, the whole paper, but particularly Part II, suffers from the obvious fact that the authors are not expert in the English language. There are numerous grammatical errors, very lengthy, literally translated sentences and, in many cases, a general lack of clarity. Even the title of the paper should be *The Navigational Safety Management System of the NSR.* However, this can all be easily rectified by a more thorough editorial examination.

This is an excellent publishable paper containing important information from the Russian side of NSR development. However, as already indicated, it is

recommended that it be published as two separate papers with Part II somewhat expanded.

Prof. Dr. Edgar Gold, C.M., Q.C., FNI

1998 Contact Address:
P.O. Box 12 Roma Street
Brisbane, QLD. 4003, Australia
TEL: 61-7-3831-8693
FAX: 61-7-3831-8697
E-mail: golde@compuserve.com

REPLY TO THE REVIEWER

First of all I would like to thank Prof. Dr. Edgar Gold for his comprehensive and benevolent review. We tried to consider all his demands.

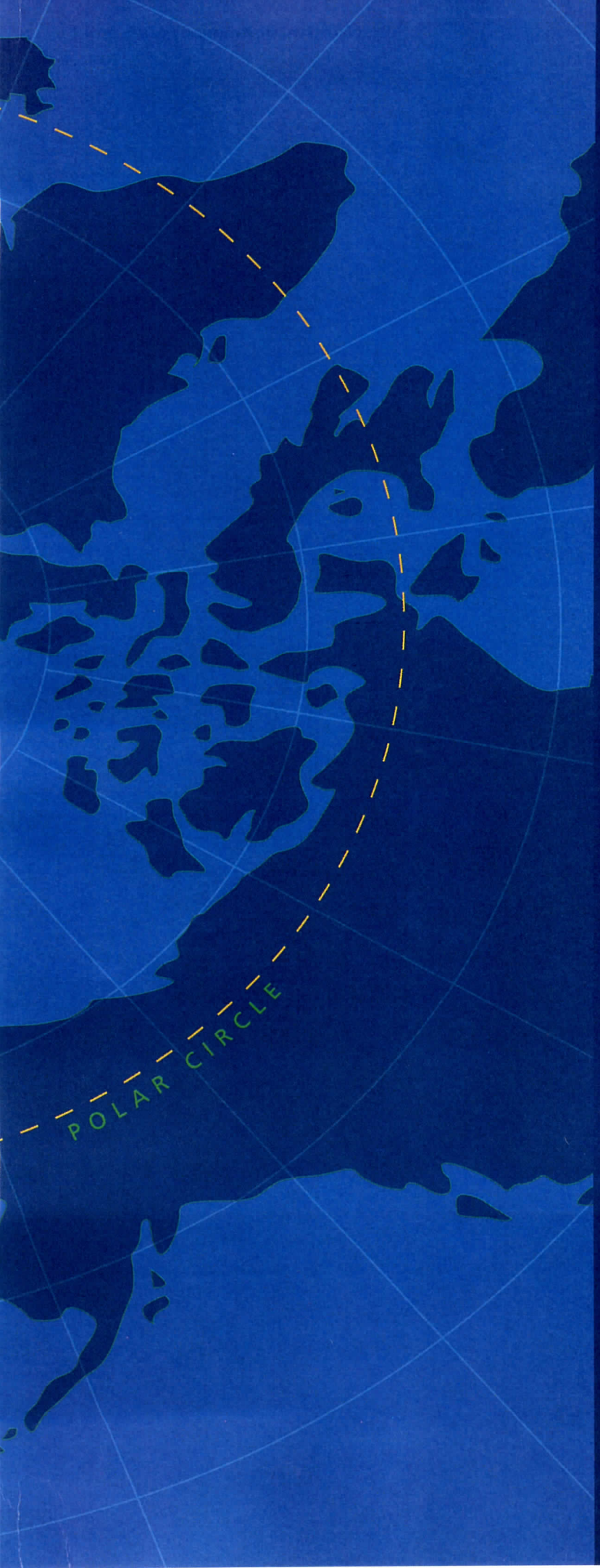
Here are the answers to his main questions:

1) The requirements by Port State Control would be the same for Russian and international vessels. Nevertheless, it is strongly recommended by the Administration to all shippers to check whether the vessels and shipping companies involved in Arctic shipping comply with ISM Code requirements.

2) Company (shipowner) audit is mainly made by the Russian Register of Shipping personnel, accordingly trained and classified. Also, the Russian Administration treats all IACS members as Recognised Organisations. For example, Det Norske Veritas (DNV) is very active in Russia.

3) Vessels Control is carried out by Port Authorities government inspectors. Vessels which were not issued Document of Compliance may be detained if mandatory rules of ISM Code for this type of vessel are already in force. (For bulk carriers, oil tankers and passenger vessels, those rules are already applicable.)

On behalf of the contributors Vladimir Vasilyev



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.