INTERNATIONAL MARITIME ORGANIZATION

E

SUB-COMMITTEE ON POLLUTION PREVENTION AND RESPONSE
7th session
Agenda item 14

PPR 7/14
14 November 2019
Original: ENGLISH
Pre-session public release: ☐

DEVELOPMENT OF MEASURES TO REDUCE RISKS OF USE AND CARRIAGE OF HEAVY FUEL OIL AS FUEL BY SHIPS IN ARCTIC WATERS

Report of the Correspondence Group

Submitted by the Russian Federation

SUMMARY

Executive summary:	This document provides the report of the Correspondence Group on Development of Guidelines on Measures to Reduce Risks of Use and Carriage of Heavy Fuel Oil as Fuel by Ships in Arctic Waters
Strategic direction, if applicable:	6
Output:	6.11*
Action to be taken:	Paragraph 18
Related documents:	PPR 6/12/3, PPR 6/20; MEPC 71/14/4; MEPC 72/17; MEPC 73/9 and MEPC 73/9/1

Introduction

1 The Sub-Committee on Pollution, Prevention and Response (PPR) agreed at its sixth session to establish a Correspondence Group on Development of Guidelines on Measures to Reduce Risks of Use and Carriage of Heavy Fuel Oil as Fuel by Ships in Arctic Waters under the coordination of the Russian Federation.

2 Representatives of the following Member States participated in the Group:

CANADA
CHINA
DENMARK
FINLAND
FRANCE
INDONESIA
JAPAN
MARSHALL ISLANDS
NETHERLANDS
NEW ZEALAND
REPUBLIC OF KOREA
RUSSIAN FEDERATION
THAILAND
UNITED STATES

* Refers to the list of outputs for the 2018-2019 biennium.

WORLD MARITIME DAY 2019
EMPOWERING WOMEN
IN THE MARITIME COMMUNITY

from the following intergovernmental organization:

INTERNATIONAL OIL POLLUTION COMPENSATION FUNDS (IOPC FUNDS)

and observers from the following non-governmental organizations in consultative status:

INTERNATIONAL CHAMBER OF SHIPPING (ICS)
BIMCO
FRIENDS OF THE EARTH INTERNATIONAL (FOEI)
ITOPF LIMITED (ITOPF)
CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA)
CLEAN SHIPPING COALITION (CSC)

Terms of reference

3 The Correspondence Group was instructed, taking into account the comments and decisions made at PPR 6, to:

.1 develop draft guidelines on measures to reduce risks of use and carriage of heavy fuel oil as fuel by ships in Arctic waters on the basis of document PPR 6/12/1, and existing IMO instruments, in particular the Polar Code, regional and national measures, industry guidance and experience in the following areas:

.1 navigational measures;

.2 ship operations;

.3 infrastructure (onshore and offshore) and communications;

.4 enhanced preparedness for emergencies of oil spills, early spill detection and response;

.5 drills and training; and

.6 economic assessment of potential measures;

.2 identify any additional topics, if appropriate, to be included in the guidelines; and

.3 submit a written report to PPR 7.

Method of work and discussion

4 The Correspondence Group coordinator outlined to the Group the terms of reference as set out above, and the timeline together with identified tasks the Group had to complete. In step 1, participants were requested to provide feedback and comments on paragraph 2 of the ToR as well as provide information concerning relevant domestic legislation.

5 Under step 2, the coordinator distributed the drafts of separate sections of the draft Guidelines, which were developed by Russian experts, in order to facilitate consideration by each participant's domestic experts with relevant knowledge.

6 Using the input provided by the participants, the coordinator then developed the first version of the draft Guidelines and requested participants to provide comments and proposals taking into consideration the whole document, not separate sections.

7 In total there were three rounds of consideration of the draft Guidelines, the last one with the draft report of the Correspondence Group to PPR 7.

General comments

8 The majority of participants expressed concern that the draft Guidelines should not duplicate the contents of existing instruments. Thus, the duplications with the provisions of the Polar Code were deleted as much as possible. Further work in this regard may be required prior to finalization of the Guidelines.

9 Some participants suggested that the draft Guidelines should be focused on IMO activities only and not include description of relevant work carried out within the Arctic Council. Consequently, the description of activities of the Arctic Council Protection of the Arctic Marine Environment Working Group (PAME) was deleted.

10 Additionally, as proposed by a number of participants, the paragraphs of the draft Guidelines were marked as OP – recommendations for ship operators, and MA – recommendations for maritime administrations.

11 A short text regarding the early detection of oil spills was included in section 4 as suggested by one participant, namely, the recommendations for both Administrations and ship operators.

12 The title of section 4 was changed from "Ship Construction" to "Ship Construction and HFO Bunkering" to describe clearly the context of the section.

13 Most of the participants supported the removal of information on the national legislation of the Arctic coastal States from the body of the draft Guidelines. As suggested by some participants, in order to keep that information which may be of value for the purpose of the Guidelines, it was included as an annex to the draft Guidelines, subject to the Sub-Committee's decision on whether to keep it or not.

14 Most of the participants agreed that economic evaluation/assessment of potential risk mitigation measures associated with the use of HFO as fuel and its carriage for use as fuel in Arctic waters should be included, in brief, in each relevant section of the draft Guidelines.

15 In the course of discussion and development of the draft Guidelines, a minority of participants were not in favour of the inclusion of requirements for the OSR equipment to be placed on board the vessel. Concerns were expressed that ship crews were encouraged to take measures for a first response to marine pollution, and that such an approach would contradict the OPRC Convention.

16 In that respect it was noted that, in accordance with the OPRC Convention (article 6(2)), "each Party, within its capabilities either individually or through bilateral or multilateral co-operation and, as appropriate, *in co-operation with the oil and shipping industries*, *port authorities and other relevant entities,* shall establish: (a) minimum level of pre-positioned oil spill combating equipment, commensurate with the risk involved, and programmes for its use".

17 The draft Guidelines are being developed for the purpose of proposing additional measures aimed at reduction of HFO spill risk. In most cases they are based on long-standing experience in providing safety of navigation and marine pollution prevention. Clearly, some of the recommended measures would represent a financial and administrative burden for the Arctic coastal States, flag States and operators, if implemented in full or to a certain extent. It would be up to each party involved to consider the need or extent to which any of the proposed relevant measures could be enforced according to national or corporate environmental policies and practices.

Action requested of the Sub-Committee

18 The Sub-Committee is invited to:

.1 consider the draft Guidelines, as set out in the annex;

.2 consider whether there is a need to keep the information on national legislation of Arctic coastal States as an annex to the draft Guidelines (paragraph 13);

.3 consider supporting further work on the development of the Guidelines, with a view to finalizing them; and

.4 take action as appropriate.

***

ANNEX

DRAFT GUIDELINES ON MITIGATION MEASURES TO REDUCE RISKS OF USE AND CARRIAGE FOR USE OF HFO AS FUEL BY SHIPS IN ARCTIC WATERS

CONTENT

PREAMBLE

These Guidelines on risk mitigation measures are intended to address the use, and carriage for use as fuel of heavy fuel oil (HFO) by ships in Arctic waters to reduce the probability of pollution as well as minimize any adverse environmental impact caused by such HFO spills.

The Guidelines have been developed in consideration of existing experience and for the purpose of assisting in implementing measures to assist crew members, companies and administrations.

The Guidelines are in alignment with the requirements of the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS), the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, and as further amended by the Protocol of 1997 (MARPOL), the International Code for Ships Operating in Polar Waters (Polar Code) and other relevant IMO mandatory instruments.

It is recognized that ship traffic in Arctic waters has increased and is predicted to increase further. Despite an increasing number of ships using alternative fuel, such as LNG, the majority of ships use and carry HFO as fuel.

The Guidelines use definitions, including the boundaries of the Arctic region, as they are used in SOLAS, MARPOL and the Polar Code.

1 INTRODUCTION

1.1 People and communities in remote Arctic regions rely extensively on safe, reliable and economic marine transportation. In recent years there has been a rise in economic activity in the Arctic associated with community resupply, mineral resources developments, scientific research and the development of tourism, which has led to growth in shipping activity in the region including transit shipping, as the navigation season in the Arctic has lengthened.

1.2 The Arctic region is a unique ecosystem due to both biological diversity and vulnerability of local ecosystems and may therefore be at risk due to potential HFO pollution related, inter alia, to shipping.

1.3 Ships operating in the Arctic are exposed to various risks not experienced in other trading regions. Such risks include complex and changeable weather and ice conditions (including the impact of wind and currents on the movement of ice); low temperatures; long polar nights and prevailing overcast conditions affecting astronomic or visual observations; incomplete knowledge of underwater hazards and shallow areas; potential ice accretion of ships; and magnetic anomalies.

1.4 As the climate changes, the ice-covered areas in the Arctic have decreased in the summer period, shipping routes in the Arctic waters have become more accessible, and safe navigation seasons have increased. At the same time, whilst existing and known risks of Arctic shipping remain valid, some new challenges have emerged, such as more intense calving of icebergs, changes of areas at risk of meeting icebergs or growth in areas covered by ice ridges.

1.5 In the harsh Arctic environment, the removal of an HFO spill could be a difficult task and the consequences of such HFO spill could dramatically affect the local ecosystems.

1.6 Accordingly, Arctic navigation imposes certain additional obligations on States that operate ships in the Arctic and particularly on Arctic coastal States in terms of ensuring safe conditions for navigation and protection of the Arctic marine environment.

1.7 The goals of the Polar Code are to provide for safe ship operation and the protection of the polar environment by addressing risks present in polar waters and not adequately mitigated by other instruments of the Organization. As such, the Polar Code contains requirements in addition to SOLAS, MARPOL and STCW regarding ship structure, equipment, operation, voyage planning in polar waters, crew training and prevention of pollution by oil and oily waters, noxious liquid substances, sewage and garbage.

1.8 In addition to the international regulatory framework, some of the Arctic coastal States have their own relevant national legislation, which should be referred to when planning voyages in Arctic waters. (Note: Article 234 of the United Nations Convention on the Law of the Sea allows coastal States to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas within the limits of their exclusive economic zones).

1.9 Within the framework of the Arctic Council, Arctic coastal States also carry out work to preserve the Arctic marine environment. The Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic (MOSPA) as a legally binding agreement has been adopted by the Governments of Canada, the Kingdom of Denmark, the Republic of Finland, the Republic of Iceland, the Kingdom of Norway, the Russian Federation, the Kingdom of Sweden, and the United States of America.

1.10 In addition, there are bilateral cooperation arrangements between Arctic States regarding the safety of navigation and marine pollution prevention, which could be considered as risk mitigation measures for use and carriage for use as fuel of HFO in Arctic waters. Examples are:

.1 The joint United States of America/Russian Federation proposal to IMO to establish ship recommendatory routes and areas to be avoided in the Bering Sea and the Bering Strait. These are voluntary measures for ships of 400 GT and above; the routeing measures were approved by MSC 99 and came into force on 1 December 2018.

.2 The Agreement between the Government of the Union of Soviet Socialist Republics and the Government of the United States of America Concerning Cooperation in Combating Pollution in the Bering and Chukchi Seas in Emergency Situations, signed on 11 May 1989, and the Joint Contingency Plan of the Russian Federation and the United States of America on Combating Pollution in the Bering and Chukchi Seas.

1.11 In order to maintain an acceptable level of risk when operating ships and carrying out operations in the Arctic region, these Guidelines contain recommendations on potential additional measures to reduce the risks of the use and carriage for use as fuel of HFO by ships in Arctic waters. These recommendations include consideration of the structural characteristics of the ships, establishment of recommendatory shipping routes and precautionary areas (taking into account icebergs, ice stresses and ice drift), navigation in shallow and coastal waters in various ice conditions or with icebreaker assistance, and manning and training of crew. Such measures, where they are put into practice, should be in addition to existing measures.

1.12 Mitigation measures to reduce risks of use and carriage for use as fuel of HFO by ships in Arctic waters may also take due account of ICS/OCIMF document "Guidelines on developing a Polar Code Operational Manual" or any other relevant national, international or industry guidelines.

2 NAVIGATIONAL MEASURES

2.1 OP/MA Planning for Arctic navigation should be in full compliance with the relevant Polar Code provisions and relevant requirements of the Administration of the Arctic coastal State within whose waters the Arctic sea routes are located. Coastal State permissions required, if any, should be obtained in due time.

2.2 OP/MA The risks associated with the use and carriage for fuel of HFO on board ships in Arctic waters may be mitigated by the knowledge and use of traffic separation schemes, areas to be avoided, recommended routes, precautionary areas, and mandatory ship reporting systems.

2.3 MA For coastal States the most demanding among these navigational measures are hydrographic survey and mapping of the Arctic area and issuing marine charts as well as regular updating of surveys and charted data for areas where enhanced requirements apply to ensure safety of navigation and pollution prevention. The general target is to expand these measures throughout most of the Arctic Region.

2.4 MA The hydrographic survey should be supported by sensitivity (vulnerability) mappings, covering both the avoidance of the most vulnerable areas and the prioritization of oil recovery work. The seasonality of marine nature and its vulnerable characteristics should be clearly addressed in the material and considered in the recommendations, e.g. bird rest periods, whale calving.

Operational assessment and risk assessment

2.5 OP/MA The Polar Code requires that an operational assessment be undertaken prior to the development of a ship-specific Polar Water Operational Manual (PWOM). Ship-specific capabilities and limitations should be included in PWOM in compliance with the *Guidance on methodologies for assessing operational capabilities and limitations in ice* (MSC.1/Circ.1519).

2.6 OP/MA The company (as defined in SOLAS regulation IX/1 and the ISM Code) should identify potential emergency shipboard situations, and establish procedures to respond to them, as well as programmes for drills and exercises addressing necessary emergency actions. The Safety Management System should provide for measures ensuring that the Company's organization can respond at any time to hazards, accidents and emergency situations involving its ships.

2.7 OP The risk assessment and crew preparedness measures should be updated and implemented in the course of the Arctic voyage as required by any changing conditions.

2.8 OP In compliance with the Polar Code (Chapter 11 – Voyage Planning), the Risk Assessment for Arctic Navigation includes the following factors:

.1 low temperatures; impact on ships systems and machinery;

.2 presence of ice of varying thickness;

.3 long polar days or polar nights;

.4 poor reliability of hydrographic and chart data;

.5 lack of infrastructure for oil spill response and search and rescue (SAR);

.6 communication in polar latitudes;

.7 the area of coverage by satellite radio navigation systems; and

.8 winterization requirements.

2.9 OP The operational and risk assessment should specifically address the following:

.1 suitability of the ship for the intended voyage, including class notation, ice class and operability and reliability of the ship;

.2 safety margin of critical supplies (e.g. bunker fuel, fresh water, provisions and critical spare parts);

.3 probability of ice accumulation and its effect on ship decks, equipment, ship stability and means of de-icing;

.4 ice accumulation in seawater intake for engine cooling systems;

.5 reliability of communication equipment in the anticipated weather conditions and high latitudes;

.6 efficiency and protection of fixed and portable ship fire-fighting systems in the anticipated weather conditions and low temperatures;

.7 efficiency and protection of ship life-saving appliances in the anticipated weather conditions and low temperatures;

.8 efficiency and protection of deck machinery and hydraulic systems in the anticipated weather conditions and low temperatures;

.9 maintaining quality and behaviour (temperature, viscosity, etc.) of bunkers and lubricants in the anticipated low temperatures;

.10 efficiency and behaviour of cargo and ballast venting systems in the anticipated weather conditions and low temperatures, when they can become blocked by ice and snow;

.11 protection against icing of equipment and freezing of liquids that are not designed for operation in low temperatures, e.g. by heating, insulation and restricting ventilation in the forecastle, engine-room and steering gear room;

.12 protection of hatches, doors and openings against freezing;

.13 operating temperature ranges of all lifting appliances including ancillary equipment;

.14 response in the event of medical emergency;

.15 sewage water management for the whole length of transit allowing for delays;

.16 garbage and waste management for the whole length of transit allowing for delays;

.17 response in the event of oil or heavy fuel spill at various stages of the voyage;

.18 protection of personnel when outdoor (suitable clothes, effect of clothing on ability to operate machinery safety, safe access to the deck, etc.); and

.19 systematic risk assessment in relation to navigation, as well as management of change (MOC) in conditions and weather.

Importance of accurate hydrographic and charted data for risk mitigation

2.10 MA Sea routes or marine corridors, as recommended for Arctic navigation by coastal State Administrations, should be subject to proper hydrographic survey using state-of-the-art equipment. The officially published navigation charts (both paper and electronic) should provide accurate and reliable data on depths and bottom configuration. Detailed information on newly identified navigational obstacles, banks, and other navigational hazards should be properly circulated via relevant means (NAVAREA and notices to mariners).

2.11 MA Icebreakers and other ships are encouraged to carry out, and record, soundings on the route during each voyage in Arctic waters so that previously unknown shallows and hazards can be identified. Soundings and/or navigational data should be delivered to each national point of contact within 60 days after leaving the area of the contact point.

2.12 MA For passage in sea routes or marine corridors, as recommended for Arctic navigation by the coastal state Administrations, up-to-date marine charts (both paper and electronic) in line with the relevant SOLAS provisions should be available on board, as appropriate, and should be regularly updated. Also, information about local rest seasons of wildlife (start/end) and connected areas should be clearly available.

2.13 MA Priority should be given to ensuring the availability of accurate and reliable nautical charts (both paper and electronic) for areas where enhanced requirements apply (main recommended routes and corridors, shallows, remote sea terminals, and port waters and approaches to them).

2.14 OP When planning a voyage in Arctic waters, the availability, currency and accuracy of necessary hydrographic and charted data should be considered, inter alia, for:

.1 chart availability and accuracy;

.2 soundings;

.3 shoreline features;

.4 navigational aids accuracy;

.5 position fixing accuracy; and

.6 tide and current data accuracy.

Development of established routeing systems

2.15 MA There are currently no sophisticated routeing systems for Arctic navigation. The Northern Sea Route (NSR) has been established as a combination of recommended tracks along the Siberian Coast. Canada does not recommend any specific routeing within its waters, although its Administration offers some guidance based on icebreaker assistance, prevailing ice conditions, etc.

2.16 MA Bearing in mind the potential increase of Arctic shipping, where practicable, some routeing measures may become necessary, including low-impact marine corridors, recommended routes, deep-water routes, traffic separation schemes, areas to be avoided by certain categories of ships or areas to be avoided by all ships at certain times of the year (e.g. breeding season for certain sea mammals).

2.17 MA Whenever necessary and practicable, any future routeing should be established on the basis of following principles:

.1 Deep-water routes, recommended routes and traffic separation schemes, if deemed necessary and appropriate, should be established by an Administration of the Arctic coastal State concerned within waters under its jurisdiction and be included on official marine navigation charts (paper and electronic).

.2 In developing ships routeing, note should be taken of the following documents:

- *General Provisions on Ships' Routeing* (resolution A.572(14), as amended);

- *Guidance Note on the preparation of proposals on ships' routeing systems and ship reporting systems* for submission *to the Sub-Committee on Safety of Navigation* (MSC/Circ.1060, as amended); and

- *Procedure for the submission of documents containing proposals for the establishment of, or amendments to, ships' routeing systems or ship reporting systems* (MSC.1/Circ.1608).

.3 Deviation from such established deep-water routes and recommended routes should only be allowed when supported by local maritime authorities, considered necessary for avoiding heavy ice (preferably under icebreaker escort), for vessel's safe navigation, or if deviation is necessary in emergency situations. Where local maritime authorities have not given prior support for such deviation, consideration should be given to the need afterwards for justification.

.4 For ease of manoeuvring, including manoeuvring in ice, deep-water routes for ships, where possible, should be established between 1.5 and 10 miles wide.

.5 Deep-water routes in areas of 40 m deep and below should be thoroughly surveyed and charted and special electronic marine navigation charts should be provided for the entire length of the route. Also, in areas with more dynamic conditions regular surveys should take place.

.6 Environmental sensitivity/vulnerability mapping should be included.

Guidelines and publications for navigation

2.18 MA For Arctic sea routes, relevant marine navigation guidelines and nautical publications should be provided and regularly updated (paper and/or electronic) in line with SOLAS provisions. Such guidelines should include, as a minimum:

.1 navigational description of the area and sea routes;

.2 routeing recommendations;

.3 services providing regular broadcasting of navigational, hydrographic and meteorological information and ice information;

.4 designated systems and ship reporting requirements during the voyage;

.5 contact information of relevant shore services;

.6 contact information and format of emergency messages;

.7 data of shore facilities for ship bunkering and supply, as well as assisting ships and tugs, where necessary;

.8 details of the shore infrastructure providing navigational assistance;

.9 icebreaker contact details; and

.10 other useful reference information.

General recommendations on sea watch organization on board vessels

2.19 OP In accordance with provisions of the Polar Code and relevant sections of the STCW-78 Convention, watchkeeping in Arctic waters should be taken into account during voyage planning and execution. The following should be considered:

.1 The bridge watch organization should, at all times, be appropriate for navigating conditions. For example, during ice navigation, the master, deputy master or ice pilot should be on the bridge at all times, when the ice concentration is three or more by the ice concentration scale.

.2 Doubling the sea watch, where appropriate, should be arranged during ice navigation or in areas adjacent to ice when the ice concentration is two or more by the ice concentration scale.

.3 Full staff of personnel with the relevant experience and appropriate training in ice navigation should be provided.

.4 All watchkeeping personnel should receive proper hours of rest in accordance with the relevant national and international requirements.

.5 Due consideration should be given to the effect of long polar nights or days, as well as the effect of noise and hull vibration due to impacts while navigating in ice.

2.20 OP The bridge watch organization should include the following:

.1 additional lookouts (in view of low temperatures and the need to keep hours of rest);

.2 an additional lookout (if necessary) on the forecastle to monitor the icebreaker, its actions and distance to it;

.3 a properly qualified helmsman (manual steering is required in ice navigation); and

.4 knowledge of the language, or a qualified interpreter on the bridge, to communicate with the icebreaker master, shore facilities and for communication with the ice pilot and ice helmsman (in case of language problems).

2.21 OP The engine department:

.1 during heavy ice conditions, or in narrow, confined or shallow areas, or whenever there is a risk of losing cooling water (because of icing), the machinery spaces should be manned (unmanned engine room status should not be used in such conditions); and

.2 when in convoys or with icebreaker assistance, the capability to connect all engine power to support steering or force through ice may need more members of the engine department to be present in machinery spaces.

Ice pilotage

2.22 OP/MA Although it is above and beyond the requirements in the Polar Code, whenever available and practicable an "ice pilot" (or "ice advisor") with essential local knowledge is recommended for safety of navigation and pollution prevention in complicated ice conditions.

2.23 OP An ice pilot (or ice advisor) may often prefer to also bring on board an experienced ice helmsman who may be allowed to make autonomous decisions about course direction, particularly when avoiding smaller ice features or pieces of ice that appear astern of the icebreaker.

Voyage planning in the Arctic

2.24 OP/MA In planning an Arctic voyage the company should bear in mind the fundamentals of the ISM Code, consider the operational assessment required under the Polar Code and, as reflected in the vessel's Polar Waters Operational Manual, take into account the season, ice forecast, ship ice class and technical particulars. Additionally, consideration should be given to the remoteness of the area, the lack of bunkering and supply points along the route, the availability of icebreakers, and the lack of other resources and arrangements to assist the ship effectively in case of an accident or emergency. The recommendations by the coastal State Administration should also be taken into account when planning the voyage.

2.25 OP/MA By utilizing reliable charted and hydrographic information, it should be ensured that the planned route provides sufficient depths of navigable water and acceptable ice conditions. Generally, a route should be chosen in compliance with IMO principles of voyage planning. Moreover, a voyage may be based on the routes recommended by the coastal State Administration taking account of the existing and forecasted ice conditions. It is recommended to select a route which was previously successfully navigated by other ships. Due to the potential for poor quality and reliability of the hydrographic data, caution should be exercised when selecting a route through shallow areas.

2.26 OP In selecting the optimal route, it is recommended to collect the relevant data from other ships that have navigated the same route during the same season and to establish close contacts with such ships for sharing the ice data and other relevant information.

2.27 OP/MA In some cases, if deemed appropriate to reduce risks, an icebreaker escort or assistance from a hydrographic ship may be considered in order to have a regular understanding of the depth on the route ahead of the ship.

2.28 OP High-latitude routes normally encounter more complicated ice conditions; however, the navigable water can be deeper, so they may be chosen by deep draught ships. Alternative routes should be selected with due consideration of the ship draught, class notations, ice class, the season and the existing ice conditions.

2.29 OP/MA A risk assessment for the intended route should be undertaken with due consideration to the ship's ice class and particulars, the ice forecast on the planned route, reliability of hydrographic and chart data on the route, type of voyage (unassisted or in a convoy) and availability of icebreaker assistance. Advice and recommendations by the appropriate vessel traffic monitor service and ice control service should be taken into account where available.

2.30 OP The initial risk assessment should be regularly revised and updated in view of any relevant changes regarding the route or the ship’s capabilities.

Safe navigation methods in the Arctic

2.31 OP Whilst the voyage may follow established or recommended routes, it does not mean, however, that the ships will remain on the recommended route throughout the passage or at the anticipated times. Ships in the Arctic often have to deviate from their planned route, due to being affected by changes in expected weather, ice conditions, ice thickness and ice coverage.

2.32 OP/MA Timely information from the ice observation services and radio stations broadcasting the data on the ice conditions can be of great assistance. Timely recommendations from icebreakers can also be useful as well as data exchange with any ships in the same voyage area. Active use of satellite ice images, weather forecast and immediate information from shore facilities, where available, will provide updated information and assist in avoiding potential navigational problems in ice.

2.33 OP/MA Timely information is paramount in areas of high ice compaction, hummocks and ice floes where even ships with powerful engines may lose manoeuvrability.

2.34 OP Short-term information is required for updating the route. This data can be obtained from shipboard radars, ice radars and by using night-vision equipment, where available.

2.35 OP/MA Significant deviations from the planned route should be avoided as much as possible as the ship may find itself in unknown water depths. It should also be noted that using the recommended areas, vessels are more easily reached by assisting resources.

2.36 OP If an icebreaker escort is used, it should be noted that icebreakers would normally plot the safest and most efficient route through the ice. Whichever way is taken by the icebreaker, the escorted ships remain fully responsible for their own navigational safety.

2.37 OP Navigation and communication equipment should be in good working condition throughout an Arctic voyage, in all operation zones and under any anticipated conditions.

Technical aids to navigation in high latitudes

2.38 OP Normal course indicators are, in many cases, unreliable in high latitudes. The higher the latitude, the less reliable a magnetic compass becomes, and the declination may be considerable, bearing in mind the difference between the geographic and magnetic poles.

2.39 OP Ship gyrocompasses remain reliable in latitudes up to approximately 70º; however, above that parallel, they may become unstable and may need to be shut down. For Arctic voyages, where ships may go up to 78º and beyond, "satellite compasses" (working on GPS or GLONASS signals) are more effective and are recommended as a second non-magnetic means to determine and display the heading.

2.40 OP Satellite radio navigation systems are the main source of ship positioning in Arctic waters, as radar or visual position fixing can be difficult. Significant refraction may occur when position fixing; however, all available means should be used to update the ship position at all times.

2.41 OP Echo-sounding apparatus should be kept switched on at all times during an Arctic voyage and under-keel clearance readings should continually be compared with the chart readings and the bottom configuration.

Fog and limited visibility

2.42 OP Limited visibility, Arctic haze and fog are common in Arctic waters. Visual navigational methods can therefore be of limited use. Long polar nights and low (often zero) visibility can make it nearly impossible to use coastal landmarks. There are virtually no lighthouses and, more importantly, restricted visibility can preclude visual ice identification.

2.43 OP When in a convoy or in close vicinity to an icebreaker, good communication and interaction is paramount between the icebreaker and the ships in the convoy. Searchlights are recommended to check on the distances between the ships in the convoy or distance to the ice. Ship radar should also be used for this.

Radar navigation

2.44 OP Conventional ship radar has some limitations for navigation in Arctic waters. Shore ice often causes problems with radar returns and imaging. Shore ice floes and shore ice make it difficult to identify shore radar reference points and can cause significant "object mis-readings", as when part of the reference point is reflecting the echo-signal may be unclear and can therefore cause large inaccuracies and faults in radar observations. Ship radar stations should, nevertheless, be used on all range scales.

2.45 OP Interpretation of a conventional ship radar display is often difficult in ice navigation. It should be noted, however, that X-band Radar performance is better than S-band Radar performance as a way of identifying objects and displaying a clear picture in ice conditions. Conventional ship radars, with appropriate tuning, can however be good for identifying separate ice floes, cracks, ice leads, etc.

2.46 OP Specialized "ice radars" are considered an effective measure for ships navigating in Arctic waters. An ice radar is better at recognizing and displaying features in ice conditions, especially where ice slides and small icebergs are concerned, and will assist in plotting the best route through ice.

Satellite radio navigation systems

2.47 OP Satellite navigation systems working on medium-high orbits, i.e. GPS and GLONASS, are generally available in Arctic waters. However, navigational information from GPS can be less reliable in higher latitudes due to the specific orbital parameters of the satellites. It is therefore recommended that ships navigating in Arctic waters carry both GPS and GLONASS satellite receivers. Both systems used together should provide adequate positional coverage for the region.

Infrared equipment

2.48 OP Infrared equipment may be useful for ice detection in conjunction with ship radars, particularly if transit is at night or visibility is restricted. If infrared cameras are not fitted, the 3-cm (X-band) Radar is more efficient in detecting ice at night or when visibility is restricted.

2.49 OP Night visibility equipment installed on board may also contribute to detecting and identifying ice conditions in restricted visibility.

Safe manoeuvring in the Arctic

2.50 OP Safe speed must be maintained at all times. In ice, speed may also be limited by the ship hull strength and ice concentration thickness and hardness. The *Guidance on methodologies for assessing operational capabilities and limitations in ice* (MSC.1/Circ.1519) may be used to determine the recommended safe speed limit. The chosen safe speed must ensure that interaction with ice does not cause hull damage.

2.51 OP Attainable speed is the maximum ship speed in specified ice conditions that can be reached using the maximum continuous rating of ships' engines.

2.52 OP When manoeuvring in ice, common sense should be applied and account taken of previous ice experience, existing ice conditions, the extent of the ship's ice belt (varies in different parts of the hull), and the ship steering and manoeuvring capabilities, safe speed and fuel consumption.

2.53 OP Ships with strengthened ice class and with Azipods may be capable of moving either bow or stern first, and whilst it is more cost-effective to move bow first, stern first may be considered for more complicated ice conditions. For ships capable of moving either bow or stern first, the following may be taken into consideration:

.1 Ice concentration: in consolidated ice the ship can move bow first, but in ice thickness over 0.5 m and ice concentration 9-10 it will be more comfortable moving stern first, on even areas and floes. Where there are gaps, ice openings or small cracks and ice concentration is under 8, the ship, even in a one-meter ice, will be more comfortable bow first pushing ice aside and pressing down small ridges.

.2 Ice compaction: hull washing with the Azipod jet is the only efficient way to manage this, and only possible when moving stern first.

.3 Ice ridges: in moving stern first, the risk is high of damaging Azipods; in most cases, however, in moving through ice ridges, this is the only way possible for the ship. In some cases, when moving bow first, ridges may be overcome with ramming, but there is a risk of the ship being stranded on the heavy ice.

.4 Steering capabilities: ship manoeuvrability is very limited when moving stern first, the radius of the turn becomes greater, and the ship will likely need to, as far as practicable, move in straight tacks with gradual token turns in the required direction.

.5 Speed: moving in ice stern first is more dangerous for Azipods than bow first, and so the safe speed will be lower. Speed should also be lowered in the vicinity of heavy ice areas, sharp turns (in channel), gaps or open-water areas. Azipods are better protected when moving bow first and the safe speed can be higher.

.6 Visibility: in similar conditions, the bow bridge visibility is better than the stern visibility. Psychological considerations should also not be neglected as from the stern area it is more difficult to follow the ship's motions, and can be visually disorientating.

2.54 OP Conclusion: stern first is preferable when in heavy/compact ice with strong ridges. The route should be plotted beforehand, and it is preferable to make a timely turn in a lighter ice and in an opening than spend additional time and fuel for this purpose subsequently. If the ship is stable when moving bow first, this may be preferable.

Icebreaker escort navigation

2.55 OP/MA The decision on the type of voyage (unassisted, in convoy, or under icebreaker escort) should be taken by the company and shipmaster. However, it may be a requirement from the relevant coastal state Administration that an icebreaker escort be employed.

2.56 OP/MA When considering the need to have icebreaker assistance or escort, the following should be considered:

.1 national requirements of the relevant coastal State on mandatory ice escort, including its conditions of use;

.2 ship type, construction and technical condition;

.3 ship ice class;

.4 category of the cargo carried;

.5 carriage of HFO for use as fuel;

.6 existing and forecasted ice conditions on the intended route; and

.7 previous experience of ice navigation of the shipmaster and crew.

Special cases in ice navigation

2.57 OP Where strong ice compaction is present during the voyage, it may be necessary to avoid forcing a passage through the ice in order to avoid high fuel consumption, with the potential of having insufficient fuel for the remainder of the intended voyage. In such circumstances, it may be preferable to stop and wait until the ice conditions have improved before resuming passage. Improvements in ice conditions may occur due to changing wind or current, and allow the ship to resume the voyage.

2.58 OP In difficult ice areas with no icebreaker escort, an option may be two ships transiting in tandem, with one ship ahead and the other following. In such cases, it is important that the speed of each vessel is coordinated to avoid the second ship lagging behind. If this does occur, then the first ship should slow down to maintain the tandem progress through the ice. The following vessel should be ready stop immediately or be prepared to force its bow into the ice, outside of the channel if the first vessel loses speed. Extreme caution should be exercised when transiting in tandem or in convoy as the risk of collision is increased due to the close proximity of the ships.

3 SHIP OPERATION

3.1 Taking due account of the existing experience of a ship's operation in Arctic waters, the following measures to mitigate risks associated with the use and carriage for use of HFO on ships in Arctic waters could be considered:

.1 OP the safety of operations and the crew should be paramount at all times;

.2 OP before entering the ice area, HFO should be pumped from the tanks which are potentially more prone to damage in ice navigation (for example, tanks adjacent to the shell plating) into tanks protected by cofferdams, double skin or other areas less vulnerable in case of an accident;

.3 OP bunker fuel tanks in Arctic voyages should preferably have sufficient empty space so that in case of ice damage to the hull the HFO could be pumped from a damaged tank to other suitable spaces;

.4 OP hoses and an extra deep-well pump should be available on board in case of an urgent need for pumping of HFO from damaged tanks into other tanks or into a different ship;

.5 OP an emergency plan should be prepared specifying details of pumping arrangements and available tank spaces for use in an emergency situation;

.6 OP fuel level in bunker tanks should be carefully monitored during ice navigation;

.7 OP fuel transfer pumps should be operable throughout the voyage in Arctic waters, as well as water-removing means, in case of hull damage and the need to promptly transfer fuel from the breached tank to mitigate discharge of fuel overboard;

.8 OP/MA communication with the shore operation centres or the relevant bodies of the coastal state should be maintained throughout the voyage;

.9 OP before commencing an Arctic voyage, additional drills should be conducted to repair, or reduce consequences of, shell plating damage, stop bunker leakage from fuel tanks and prepare for oil spill response; relevant training should be provided for the crew, and crew members should have sufficient knowledge of emergency actions required in response to a particular accident or emergency situation (see also section 7 of the Guidelines); and

.10 OP only MARPOL Annex VI compliant fuel should be used.

3.2 OP To implement the foregoing measures to mitigate risks relating to the use and carriage for use of HFO on ships in Arctic waters and on the basis of circular MEPC.1/Circ.875, companies responsible for the ISM Code are encouraged to develop and implement relevant procedures on ships operating in Arctic waters, including the following:

.1 the shipboard oil pollution emergency plan (SOPEP) should be supplemented with a procedure specifying crew actions in case of an HFO spill in low temperatures, a detailed plan of HFO transfer during the voyage in the Arctic waters, emergency oil spill response equipment on board, and number and capacity of additional pumps available on board for heavy fuel oil transfer; and

.2 emergency procedures of voyage planning in Arctic waters including ship-to-ship bunker fuel oil transfer and bunkering operations, where applicable, covering all operational aspects, risk assessment, control system, communication both between ships and with the responsible shore facility.

4 SHIP CONSTRUCTION AND HFO BUNKERING

4.1 OP When planning bunker fuel operations in Arctic waters, it is necessary to take into account that the main causes of spills are damage to the hoses when receiving or unloading fuel or damage to the hull of the vessel due to collision with another vessel, contact with the coast, grounding or ice damage.

4.2 OP To prevent HFO spills, all operations involving the transfer of fuel should be carried out only by crew members who are familiar with the location and design of tanks and pipelines on the vessel and with relevant training for such operations. Operations should be carried out according to ship procedures, with which all personnel should be familiar. Prior to the transfer of fuel, a reliable communication connection should be established between the ship and the responsible personnel ashore or on the other ship.

4.3 OP Measures should be taken to prevent the occurrence of water hammer and ensure the proper use of bunker hoses. During the transfer process, in order to prevent kinking and twisting, there should be no bends with a radius of less than the minimum allowable for this type and size of hose to prevent kinking and twisting. In order to avoid rupture of the bunker hose or breakdown of the stander, the maximum pressure surge arising in the pipeline during the quick closing of the valve on the shore should not exceed the burst pressure of the hose.

4.4 OP The location of HFO tanks should prevent oil fuel from leaking overboard if the hull of the ship is damaged. To that end, tanks should either be located at a distance of 0.76 m from the outer plating, or all parts of the tank must be located below the ship's waterline under all loading conditions, so that, in case of damage to the tank, the pressure created by the static oil fuel column would be less than the water pressure at the potential damage site resulting in a flow of water into the tank rather than the fuel flowing outside (hydrostatic balance).

4.5 OP In order to prevent HFO spills during bunkering of a ship, the following should be considered:

.1 Before taking on fuel, supply hoses should be visually examined and test records checked and all deck scuppers should be securely closed with special plugs to prevent oil from going overboard in case of overflow.

.2 Hoses and cargo booms should be supplied before and after loading with only flanged seals.

.3 After the start of the bunker operations with oil fuel, it is necessary to take regular measurements on the shore and on the ship. In the case of significant discrepancies, it is necessary to temporarily stop bunker operations and check for leaks into the sea or into other spaces on the ship.

4.6 OP To prevent damage during operation, hoses for pumping or bunkering heavy fuels oil should:

.1 have a design ambient temperature lower than that expected to be experienced in operation;

.2 be used in compliance with minimum bend radius;

.3 have a design pressure at least 1 MPa and burst pressure at least 4 times higher than design pressure;

.4 be hydrotested (both rubber and composite) by bunker barge operators or shore terminal, as applicable, to their design pressure annually as per manufacturer's recommendations; and

.5 if floating, be marked with high visibility colours.

Note that, when unloading fuel, a pumped heavy liquid fuel can create a pressure in the pipeline that exceeds the allowable operating pressure of the hose and there may be no relief valve on the pump. In such a case, such a valve should be installed in the discharge pipe and the safety valve should open at a pressure of no more than 10% higher than the design pressure of the hose.

5 INFRASTRUCTURE AND COMMUNICATION

5.1 MA In order to ensure a high level of safety of navigation in the Arctic, the following arrangements have been provided:

.1 Global Maritime Distress and Safety System (hereinafter referred to as GMDSS);

.2 vessel traffic service (VTS); and

.3 onshore control and correction stations (DGNSS Reference Station) of the maritime differential sub-system of Global Navigation Satellite Systems (GNSS).

5.2 OP/MA The following, inter alia, should be considered: effective battery life for portable communication systems for salvage ships, maintenance of sound signal capability, procedures for optimizing communication resources in case of an emergency and additional equipment or portable power sources.

5.3 The Arctic region belongs to GMDSS A3 and A4 sea areas. The criteria for selection of mobile satellite communications systems have been defined by IMO.

GMDSS

5.4 MA Considering the potential increase of ship traffic, it is considered feasible to provide full coverage of the areas of existing and potential shipping in the Arctic by GMDSS services. The consideration should be given to potential faults in navigational equipment in Arctic waters as the proximity to the North Pole can cause discrepancies that are not normally seen at lower latitudes.

5.5 MA The establishment and technical upgrade of radio communications centres of A2/A3/A4 GMDSS sea areas would provide a 24/7 duty, call and response using emergency channels of the Digital Selection Call in the range of 2, 4, 6, 8, 12, 16 and 22 MHz, as well as the communication with ships using the narrow-band type letter device and transmission of maritime safety information in the Arctic region.

AIS

5.6 OP/MA In order to create effective monitoring of ship traffic in the Arctic region, regional arrangements and intergovernmental agreements among Arctic States on AIS data exchange could be feasible. It is necessary to provide very high frequency (VHF)/AIS coverage as well as aeronautical Search and Rescue (SAR) band radios which will ensure both prevention of pollution and safety of navigation in the Arctic.

DGNSS Reference Station

5.7 MA DGNSS Reference Stations are intended for the generation and transmission of differential corrections of GNSS signals to users, which provides for high precision navigation. DGNSS Reference Station allows the user (recipient of signal) to define its position with accuracy of not more than 1-5 meters, being positioned up to 300 km from DGNSS Reference Station.

5.8 MA The deployment of DGNSS Reference Station in the Arctic region would allow the users of GNSS to define their positions with better accuracy.

Financial assessment of potential measures to mitigate risks associated with the use and carriage for use as fuel of HFO by ships in Arctic waters, in part of crew training and drills

5.9 These measures might be associated with major expenses for coastal states. This is due to the remoteness of the Arctic regions, lack of infrastructure and expensive construction in this region.

6. ENHANCEMENT OF THE HFO SPILL PREPAREDNESS, EARLY DETECTION AND RESPONSE

6.1 OP/MA Along with relevant preventive measures to mitigate risks of HFO spills, a robust response system needs to be established for such an incident. A key aspect of such a system, bearing in mind the specific features of the Arctic region, should be enhancement of services and arrangements to provide adequate response, broadening cooperation among the Arctic States.

6.2 OP/MA Provision of relevant equipment, in line with the risks identified, for response in case of an oil spill on board ships using and carrying for use HFO as fuel and in sea ports will ensure the required regional preparedness for a pollution incident and will contribute to pollution risks mitigation and minimization of any of its consequences.

6.3 OP The OPRC Convention is the basic standard defining both the national system of preparedness and response to incidents of oil pollution and regional cooperation. Therefore, in the context of potential negative consequences of pollution incidents this Convention is important for the purposes of mitigating risks of pollution.

6.4 OP The Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic, adopted by the Arctic Council ministerial session on 15 May 2013, is a useful instrument governing cooperation and information sharing on fuel oil, including heavy oil, pollution incidents in the Arctic region.

6.5 OP In case of an HFO pollution incident, the country/countries affected should, where practicable, monitor the incident to facilitate timely and efficient response actions and to minimize any negative effects on the environment.

6.6 MA In areas outside national jurisdiction (i.e. on the high seas beyond territorial waters), action should be taken under the relevant national and international legislation.

6.7 MA In the event that a country volunteers to manage the response operation on the high seas beyond territorial waters, that country should initiate the development of the relevant requirements for the response, including whether assistance would be requested from another country/other countries.

6.8 MA For prompt response to possible HFO spills in the Arctic, early detection of slicks is recommended. Satellite environmental monitoring and unmanned aerial vehicles (UAVs) can be used for these purposes in cases when usage of such vehicles is possible and acceptable. As a recommendation, equipment for HFO detection in the infrared band can be installed on ships. National aerial surveillance capacities in the Arctic Region and exchange information could be enhanced through international cooperation.

Route and bunkering operation

6.9 OP/MA Ships should navigate in the Arctic waters after the relevant route has been agreed with the competent national body of the Arctic coastal State responsible for preparedness for an HFO pollution incident, if required.

6.10 OP/MA The route should provide for the safest way between ports considering current and forecasted ice conditions and specify locations for bunkering operations with fuel oil.

6.11 OP/MA In order to reduce the risk of water area pollution with HFO and ensure rapid response in case of an accident, it is recommended that cargo (bunkering) operations with heavy fuel be carried out within the boundaries of seaports with notification of seaport captains about the beginning/end of cargo operations and the amount of fuel being reloaded.

6.12 OP During bunkering operations involving HFO in an ice-free area or in ice concentration not exceeding 10% coverage, all ships and units engaged should have an oil containment boom, preventing the HFO spread beyond the boom in case of a spill. The harbour master should decide on the use of booms during bunkering operations involving HFO. No bunkering operations should be allowed in wind conditions above 14 m per second or wave heights over 1.25 m.

6.13 OP Where bunkering operations involving HFO cannot be carried out within seaport areas, relevant services and arrangements for response to emergency HFO spills may be in attendance of such operations under these Guidelines, deployed in close proximity to the location of such bunkering operations on board a ship not involved in the above operations. The harbour master of the nearest seaport should be notified about the start and completion of bunkering operations, and about the amount of HFO.

Preparedness for response

6.14 MA For the delivery and deployment of heavy fuel spill response equipment, it is recommended to organize a sea tug duty. The maritime administration should determine the number of sea tugs and their location, based on the intensity of vessel traffic and particular routes of vessels using heavy fuel. Those tugs may be engaged for rescue support for cargo (bunkering) operations carried out in accordance with paragraph 6.12 of these Guidelines, with reimbursement of the costs of such operation at the expense of the operator of the vessel in accordance with the applicable national legislation.

6.15 MA The sea tug/response vessel should have unlimited navigation area, should preferably have a radar system to detect oil and ice (Rutter Sigma S6 OSD/Ice Navigator or similar) and may carry on board an unmanned aircraft for the air reconnaissance of the water area and monitoring of the spill spread.

6.16 MA In case of an accident, a helicopter deployment of trained specialists can be arranged to the vessel using and transporting HFO as fuel to assess the situation and determine the most efficient way of responding to the spill. The procedures and conditions of such deployment should be determined by the Administration.

6.17 MA In each seaport it is recommended to have a fuel spill response capability that meets the requirements of this Manual. These services and arrangements can be created by the maritime administration, shipowners, the union of shipowners or other organizations.

6.18 MA Services and arrangements for response to an emergency HFO spill should have attestation, accreditation or other verification of their preparedness under the national legislation of the port State dealing with prevention of and response to emergency oil spills, if such accreditation is provided for by national legislation.

6.19 OP Accession to the OPRC Convention means that all Parties undertake to take appropriate measures to ensure preparedness and control against an oil pollution incident (article 1 of the OPRC Convention). Since shipowners are part of a national system that establishes the minimum level of pre-positioned oil spill response equipment at the locations corresponding to the threat that has arisen, as well as the programme for its use (article 6 of the OPRC Convention), they are encouraged to provide early detection and an initial response to an oil spill, in order to reduce the total cost to the State in combating an oil pollution incident.

Recommendations on the extended content of shipboard oil pollution emergency plans (SOPEP)

6.20 OP Shipowners and operators of vessels using heavy fuel are advised to include the following in ship plans:

.1 Possible scenarios of heavy fuel spill accidents, including those already established by the *Guidelines for the development of the shipboard marine pollution emergency plans for oil and/or noxious liquid substances* (resolution MEPC.85(44)), so the most likely:

- spill associated with overfilling of the fuel tank during fuel bunkering or fuel transferring between ship tanks; and

- spill associated with damage to the hull of a vessel in the area of fuel tanks by ice.

.2 In order to reduce the overall cost of eliminating an HFO spill, ship plans may include procedures for eliminating HFO pollution in ice-free waters and in ice conditions. These procedures are developed according to the principle of maximum safety for the ship's crew members and the efficiency of work in the water area by the ship's crew members. In cases of deviation in the external environment of the envisaged procedures for the liquidation of pollution, such work by the crew shall not be held and the ship where possible should remain in the area of pollution and monitor the spread of the pollution. The decision to leave the vessel out of the area where there was or is pollution from the HFO spill is taken by the maritime administration.

Provisions for the ship's crew to take measures to contain any HFO spread on the water surface (oil boom along the ship side) and response to the HFO spill (operation of skimmers) followed by gathering of emulsion into empty ship tanks or into a floating barge for further disposal. Sorbents, where applicable, should be used for area fine cleaning and small quantities, they are to be disposed of after the cleaning. In case of application of sorbents of organic origin capable of independent biodegradation with oil pollution and not causing harm to environment, utilization of the used sorbents cannot be carried out.

.3 In order to be ready to respond, ship operators should send ship crew members to specialized training centres for training. Training by conducting theoretical classes on the treatment of oil-gathering equipment, sorbents and passing tests at the end of training.

.4 Ensuring safety during possible works on pollution elimination is achieved by carrying out regular training and exercises on actions according to the procedures provided in ship plans.

.5 In order to be able to receive oil spill response specialists from a helicopter, this procedure must be described in the ship's plans.

Emergency response equipment

6.21 OP Oil spill response equipment is recommended to be placed on the vessel as far as it is possible and efficient. Priority for placement should be oil collection systems and elastic tanks for the organization of pollution collection before the approach of specialized organizations.

The following emergency response equipment could be considered for placing on board a ship operating in Arctic waters, when practical or on an accompanying ice breaker, to address potential HFO spills:

.1 oil boom capable of containment in wave height up to 1.25 m and wind speed up to 10 m per second, not less than 3 times the ship length, which will create a barrier around the ship in case of emergency that will prevent the HFO spread;

.2 floating beacons with a VHF/GNSS position transmitter to monitor the spread of the HFO spill in case of emergency – at least four pieces;

.3 autonomous small-scale oil-gathering systems to remove HFO from ice and from ice-free areas, with capacity of 5 to 15 cubic meters per hour – one set;

.4 autonomous oil-pumping systems suitable for high viscosity oil capable of the maximum oil quantity pumping during six hours;

.5 hot water high pressure washers – at least one set;

.6 one suitable (work/life) boat capable of installing/towing the oil boom;

.7 elastic floating tanks, which are more compact for placement aboard the ship, for oil removal and storage – 50% of the maximum amount of the HFO carried as fuel;

.8 sorbents and absorbing materials with the absorbing capacity of 20% of the maximum amount of the HFO carried as fuel;

.9 individual protection against oil pollution, including for use in Arctic conditions (suits, gloves, goggles) – for 200% of the ship crew;

.10 filter respirators protecting against oil vapours – for 200% of the ship crew; and

.11 one gas detector for oil vapours.

6.22 OP Specific features to be considered when the response equipment for HFO spills is used in ice conditions:

.1 where HFO is stuck in ice, time factor is of no importance, but where wind is present ice may drift away from the site of removal;

.2 preferred types of skimmers: brush skimmers, vertical cable skimmers, drum skimmers, mop skimmers, drum-and-mop skimmers and disc systems;

.3 belt skimmers are allowed if ice pieces are manually pushed away in front of the skimmer or picked up from the belt;

.4 skimmers colliding with ice floes should be avoided (except the brush, mop and drum-and-mop skimmers that are most suitable for pushing away small ice but will most likely pick up light ice); and

.5 issues of storage of the removed sludge and light ice.

6.23 OP Factors to be considered when using oil skimmers:

.1 deployment of the skimmer from the ship's high freeboard;

.2 availability of water platform from which to operate a skimmer;

.3 availability of trained and specialized crew;

.4 time and resources available at time of an incident to respond to a spill;

.5 they are inefficient in strong winds;

.6 oil flow is restricted by the concentration of the oil in situ, the shield of oil, if ice is present they need booms to be efficient;

.7 access to oil is limited;

.8 oil and ice separation (skimmer must have ice processing capability) in tanks, if disk skimmers are used;

.9 low viscosity of the spilt oil (oil products) in low temperature, heating is needed; and

.10 heating possibility for the skimmer body and pump is most efficient way.

6.24 OP Ships nearby should provide assistance and equipment, when available, to a ship in environmental distress if requested to do so by the local authority.

Services and arrangements for response to HFO spills in ports and areas of the Arctic

6.25 MA Technical requirements (mass-dimensional characteristics) for equipment should be determined by port conditions, hydro-meteorological and infrastructural features. The following minimum set of equipment should be provided in ports within the relevant services and arrangements for emergency response:

.1 oil boom for open water to contain an HFO spill in open waters with air inflatable displacer chambers for efficient containment in wave height up to 2 m and wind speed up to 20 m per second, in each port up to 200 m in length;

.2 oil boom around vessels: for efficient containment in wave height up to 1.25 m and wind speed up to 15 m per second – in each port, at least three times the ship length for ships that use or carry HFO for use as fuel, and one ship length for bunkering ships (tankers);

.3 boom defence for operations in shallow areas and by the coast with wall height in the range of 450 – 750 mm – in each port, at least 600 mm, for connection with the shore point where the HFO spill is most likely to get ashore and for preventing any potential shore contamination or secondary pollution of the water area;

.4 autonomous oil-gathering systems to gather and pump oil products both in the open water and in compacted ice – at least one set in each port – capable of gathering and pumping the maximum amount of HFO carried as fuel within 24 hours;

.5 high pressure high temperature washers – at least one set in each port to heat and reduce viscosity of the spilt HFO while working on gathering the spill;

.6 at least one port tug or suitable (salvage) vessel/workboat in each port to install an oil boom in all described weather conditions;

.7 tanks for oil recovery and storage, total capacity should reach 250% of the maximum amount of HFO carried for use, tanks should be equally distributed between ports along the ship route; and

.8 at least 300 kg of sorbents and absorbing materials in each port.

Financial assessment of potential measures to mitigate risks associated with the use and carriage for use of HFO as fuel in Arctic waters

6.26 OP The deployment of equipment on board ships that use and carry HFO for use as fuel would ensure:

.1 prompt containment and response to fuel spill in close proximity of the ship side by the crew or by relevant experts flown in by helicopter;

.2 reducing environmental damage due to a shorter response time;

.3 lower cost of the relevant equipment delivery to the site for response to the fuel oil spill, savings due to the fact that no specialized ship needs to be sent to the site of the accident in case of small fuel spills; and

.4 larger total amount of response equipment in the Arctic region will increase the overall level of preparedness for response in case of HFO spills.

6.27 MA Deployment and maintenance of services and arrangements in ports and areas of the Arctic, and their preparedness for response in case of an HFO spill is the most cost-intensive part of all the measures to mitigate risks of HFO spills.

6.28 MA To reduce the costs of shipowners, each country may establish special bodies that would be responsible for deployment of the required services and arrangements in ports and would ensure preparedness for response under these Guidelines. The conditions of the provisions of service and arrangements should be determined by the Administration. In regions where it is cost-effective and practicable, the shipowners or shipowners' unions may independently organize HFO spill response systems or enter into contracts with already established specialized organizations. Total annual expenses incurred by such bodies for establishing and maintaining the equipment, personnel, means of communication, ships and helicopter support in case of HFO spills may be covered by shipowners and/or operators of ships on a pro rata basis depending on the amount of HFO used and/or carried for use as fuel. In a region where shipowners or the shipowners' union have established specialized units or entered into contracts with specialized organizations, such shipowners should be exempt from government fees for the establishment and maintenance of a heavy fuel spill response system.

6.29 MA Information on the number of vessels using heavy fuel and the volume of bunkering operations with heavy and light fuel should be collected in each country in order to analyse the economic impact of the measures applied.

7. DRILLS AND TRAINING

7.1 MA Masters, officers in charge of a navigational watch, officers in charge of an engineering watch and other crew members whose duties may involve handling HFO on board ships operating in the Arctic polar waters should receive relevant instructions on the measures below and actions to be taken in case of an HFO emergency spill.

7.2 OP It is considered useful to familiarize all crew members involved in emergency response in case of spills of HFO from ships on measures to mitigate risks associated with the use and carriage for use of HFO on ships as fuel in the Arctic waters.

7.3 OP Ship drills and training on HFO spill prevention should comply, in their scope and frequency, with the SOPEP requirements and those of the Polar Water Operational Manual (PWOM). The PWOM should provide guidance for the crew management, taking into account the anticipated ice conditions and requirements for ice navigation, increased levels of watchkeeping, hours of rest, fatigue and a process to ensure that these requirements will be met.

7.4 OP/MA Crew training and drills should be carried out with due account and on the basis of the Polar Code, these Guidelines and other applicable documents by the Organization, in particular:

.1 SOLAS, chapter 14;

.2 MARPOL Annex I;

.3 STCW Code section A-V/4;

.4 Polar Code;

.5 *Guidelines on voyage planning for passenger ships operating in remote areas* (resolution A.999(25)); and

.6 *Guidance on best practice for fuel oil purchasers/users for assuring the quality of fuel oil used on board ships* (MEPC.1/Circ.875).

Navigational Training

7.5 OP Crew training as per SCTW Code section A-V/4 already covers navigational risks arising in ship navigation in polar waters, including the Arctic.

7.6 OP The use of HFO does not cause any new navigational risks. For this reason, the known measures should be considered to minimize the risks, and consequences thereof, arising from navigational reasons in shipping in the Arctic waters, including ships using and carrying heavy fuel oil. Also refer to the *Guidelines on voyage planning for passenger ships operating in remote areas* (resolution A.999(25)).

Environmental training

7.7 MA Training of crew members under the SCTW Code section A-V/4, covers environmental risks caused by any ship navigating in polar waters including Arctic waters. These risks give consideration to the existing natural conditions and the features of the shore infrastructure.

Enhanced preparedness for a fuel oil spill and actions to be taken in an emergency

7.8 OP Limitations of the ship equipment for responding to spills of HFO and oily waters should be taken into account, as well as physical and chemical characteristics of HFO affecting the efficiency of ship-generated waste collection, storage and disposal of ship-generated waste in polar regions. HFO bunkering is a critical operation requiring boom defence (see paragraphs 6.16 to 6.18), etc.

7.9 MA Ship contingency plans should include actions dealing with bilge water, oily wastes, etc., pollution in a cold climate and its consequences. Crew preparedness to respond in case of accidents and emergencies involving spills of HFO should be one of a ship's drill priorities (see paragraph 6.26).

7.10 OP Emergency preparedness training should take into account an understanding of any limitations to the external services for SAR operations including communication quality and level in the GMDSS A4 area and limitations of means of communication in the Arctic. Training should also cover search and rescue in the Arctic, awareness of contingency plans, knowledge of emergency tugging procedures and communication with other ships and local SAR services.

7.11 OP Crew should be aware of:

.1 potential damages to the hull and equipment and ways to avoid them;

.2 limitations of fire-fighting systems, including fire fighting in fuel tanks;

.3 levels of filling of HFO tanks and their importance for heating and prevention of fuel escape through fuel tank air pipes;

.4 working procedures to mitigate environmental pollution;

.5 recognition of hazards where crew members are exposed to low temperatures;

.6 procedures and ways of abandoning ship and survival on ice;

.7 issues of fatigue caused by noise and vibration;

.8 extra resources on board including fuel, food, and additional clothing; and

.9 awareness of exceptionally serious consequences of any incidents in Polar waters.

7.12 OP It is necessary to determine how the existing ship equipment is suitable and will respond to low temperatures in case of an emergency involving a spill of HFO during navigation in the Arctic. The determining criteria should include:

.1 physical-mechanical properties of the means to respond to emergency spills;

.2 availability of ship portable and fixed technical means to remove polluting materials and substances;

.3 suitability of sorbents and absorbent materials to remove oily liquids from water and on ice; and

.4 sufficiency of availability of individual and group protection for crew members.

Training on board and training under the STCW Code section A-V/4

7.13 OP The training on crew management on board should cover (but not be limited to) the following elements:

.1 bridge manning requirements aligned with additional external factors affecting fatigue and quality of lookout abilities;

.2 additional engine-room manning requirements when navigating in ice, when relevant; and

.3 familiarization and training for specialized procedures and equipment relevant to assigned duties, including actions to minimize ice accretion and protection of the ship's critical equipment from freezing and ice accretion.

7.14 MA Under the ISM Code, the use and carriage for use of HFO in Arctic waters should be qualified as a key operation requiring special procedures to be developed, and crew members engaged in this procedure should be familiar with the procedure. A familiarization checklist should be developed.

7.15 OP Issues of safety and prevention of environmental pollution from the use and carriage for use of HFO should be included in instructions to crew members prior to entry into Arctic waters. Ship operation in polar waters should be reflected in the relevant oil record books, ship guidelines, oil pollution emergency plans or marine pollution emergency plans as required by MARPOL Annex I.

7.16 OP Onboard drills and training, as far as their scope and frequency is concerned, should comply with the onboard oil spill prevention drills as prescribed in the ship's SOPEP.

7.17 OP Training on navigational and operational measures and on extra precautions in case of the use or carriage for use of HFO should form part of additional professional programmes on "Basic Training for Navigation in Polar Waters" and "Advanced Training for

Work on Ships in Polar Waters for Chief Mates and Ship Masters". Refresher training should be arranged every 5 years. Engineers and officers in charge of an engineering watch may receive training through a new additional professional programme to be developed. For other crew members already covered by the training under the Polar Code, it is useful to restructure the training under the existing programme of Basic Training on Navigation in Polar Waters.

7.18 MA Engineers and officers in charge of an engineering watch may receive training through a new additional professional programme if developed. Such additional professional training programme may be developed on "Training for Navigation in Polar Waters for Officers in Charge of an Engineering Watch" would be expected to cover the provisions of the STCW Code section B-V/g, including theoretical knowledge and practical work with simulators on operational measures to ensure safety of the ship, power equipment, propulsion system and rudder, heeling and trim system, onboard technical aids in polar waters and in low ambient temperatures. Such a programme would also be expected to cover practical ways of HFO transfer in low ambient temperatures, safe switching between heavy and light fuel oils and between light fuel oil and gaseous fuel, oil-spill equipment limitations, etc.

7.19 MA Additional professional training programme for officers in charge of a navigational watch may include, but not be limited to:

.1 weather characteristics of the polar region;

.2 basic concepts of the Polar Code;

.3 quality characteristics of fuel oils allowed for use in the Arctic shipping;

.4 requirements for ships operating in the Arctic, including international standards and the requirements of the marine administrations in the area of navigation;

.5 hazards in the Arctic area, operating conditions of the main engine and ship systems in ice navigation;

.6 crew survival in cold water and in low ambient temperatures;

.7 survey procedures and the relevant requirements for the ship to be issued with a Polar Ship Certificate;

.8 functional requirements for machinery to maintain the capacity required for safe operation of ship including ice ingestion in machinery sea chests;

.9 procedures to protect crucial equipment from freezing and ice accretion;

.10 construction requirements for ship oil and sludge tanks in the Arctic zone;

.11 construction and operation of the certified sewage water treatment system;

.12 MARPOL requirements on protection against pollution of the Arctic waters by HFO including sensitive sea areas regarding discharge and special areas in MARPOL;

.13 provisions of the Polar Code on mitigating environmental risks during operations in the Arctic area;

.14 provisions of the Guidelines to mitigate risks associated with the use and carriage for use of HFO on ships as fuel in the Arctic waters;

.15 proper handling of HFO in the Arctic area (fuel bunkering, storage and preparation);

.16 use of personal survival kits (PSKs) and group survival kits (GSKs); and

.17 required actions of the crew and the officer in charge of a navigational watch in response to an emergency spill of HFO including oil-spill equipment limitations.

7.20 MA Additional professional training programmefor officers in charge of an engineering watch may include, but not be limited to basic knowledge of carrying out drills on prevention of, and response to, oil spills in accordance with SOPEP and PWOM.

7.21 OP Drills on response in case of an emergency spill of oil products should be done on board prior to entry into Arctic waters and repeated as required by the ship's SOPEP.

Financial assessment of potential measures to mitigate risks associated with the use and carriage for use of HFO on ships as fuel in the Arctic waters, in part of crew training and drills

7.22 OP/MA No additional expense or special financial risks are envisaged when considering all appropriate training according to section 7.

ANNEX

National legislation of the Arctic States

CANADA

Canada has several instruments, which contribute to the reduction of risks of use and carriage for use of HFO by ships in Arctic waters. These include the following:

- Arctic Waters Pollution Prevention Act: AWPPA aims to prevent pollution in Canadian Arctic waters. AWPPA is a "zero discharge" act, which states, "no person or ship shall deposit or permit the deposit of waste of any type in the Arctic waters". AWPPA describes offences and punishments, and outlines the powers that may be given to Pollution Prevention Officers so that they may enforce the Act.

- Arctic Shipping Safety and Pollution Prevention Regulations: ASSPPRs (which incorporate the Polar Code) include specific safety and pollution prevention provisions that address the unique hazards associated with polar operations; the additional demands that polar operations place on ships, their systems, and operations (including navigation); and the vulnerability of coastal Arctic communities and polar ecosystems to ship operations.

- Northern Canada Vessel Traffic Services Zone Regulations: NORDREG CANADA is a mandatory vessel traffic services system that also provides the mariner with information pertaining to ice conditions, vessel routeing, icebreaker assistance and other government services. Mariners may obtain ice information and access shipping support services by sending a free message to NORDREG CANADA.

- Arctic Ice Regime Shipping System Standard: This standard provides an overview of the methodology to be used to assess a vessel's operational capabilities and limitations in ice when navigating in circumstances set out by the Arctic Shipping Safety and Pollution Prevention Regulations (ASSPPR), along with the form and manner by which ice regime routeing messages are to be sent.

- Guidelines for Passenger Vessel Operating in the Canadian Arctic: These guidelines are intended to assist passenger vessel operators with planning and achieving a successful voyage, in addition to promoting good relations with residents of Canada's Arctic. Specifically, these guidelines will assist the operator with making contact with all relevant authorities so that all relevant publications and certificates are on board the vessel, operators have studied the charts and read the publications prior to entering Canadian Arctic waters, the voyage complies with all applicable acts and regulations, the voyage adheres to land claim agreement provisions along the planned route and that permission from land claim authorities and private property owners is sought and, where appropriate, access to these areas is granted.

THE KINGDOM OF DENMARK

The Kingdom of Denmark has several systems to ensure safety of navigation around Greenland waters and the Arctic region:

- Order no.1697 regarding pilotage in Greenland stipulates that ships carrying more than 250 passengers shall take a pilot certified to perform pilotage assignments in the area concerned.

- Order no.170 regarding ships' reporting systems in the waters off Greenland puts in place Greenpos, which is a mandatory ship control systems in Greenland. The Greenpos system applies to all ships on voyage to and from Greenland waters and inside the Greenland continental shelf or Exclusive Economic Zone. The ships are to report their position, course, speed and actual weather information every six hours.

- To enhance safety of navigation in the Arctic, ArcticWeb is in place. ArcticWeb is a web application that collects and presents relevant information to persons who are navigating the waters of Arctic regions, including Greenland waters.

THE RUSSIAN FEDERATION

The Russian Federation has a number of federal laws and other regulations in the field of safety navigation and marine environment protection in the Arctic area. The most important of them, which deal with the Arctic marine environment directly, are the following:

- Federal Law "The Merchant Shipping Code of the Russian Federation" dated 30 April 1999, No.81-FL: regulates relations arising out of merchant shipping, including the matters of pilotage and ice-breaker assistance for convoy; sanitary, quarantine and other control; the protection and preservation of the marine environment, etc.

- Federal Law "On Inland Sea Water, Territorial Sea and the Approach Zone of the Russian Federation" dated 31 July 1998, No.155-FL: includes article 14 "Navigation in the water area of the Northern Sea Route".

- Federal Law "On the Exclusive Economic Zone Russian Federation" dated 17 December 1998, No.191-FL: includes article 32 "Protection and conservation of the ice-covered area", which declares the special attention to the vulnerable marine arctic area that should be applied by the special regulation of shipping.

- Rules of Navigation in the Water Area of the Northern Sea Route (Rules) dated 17 January 2013, with amendments, establish the procedures related to the organization of navigation, radio communication of ships in the water area of the Northern Sea Route, rules for the icebreaker assistance ice pilotage of ships, provision on the navigational, hydrographic and hydro-meteorological support of the navigation of ships along the Northern Sea Route, as well as requirements to ships in relation to the protection of the marine environment.

THE UNITED STATES OF AMERICA

The US Coast Guard utilizes national planning criteria to ensure vessels transiting within US waters, making port calls to US ports, are effectively equipped and prepared to respond to oil spills. Maritime shipping in Alaska, in general, faces many of the same issues that operators must mitigate anywhere in the Arctic: lack of response resources, geographically remote areas, insufficient infrastructure in most areas, etc. For these reasons (and many others), the US Coast Guard works with vessel owners and operators to ensure that vessel response plans are adequate for the specific types and areas of operation for these vessels. This includes finding alternative procedures (which are a combination of prevention and response measures), methods, or equipment standards to provide for an equivalent level of planning, response, or pollution mitigation strategies when the national planning criteria cannot be met.

_____