Guidelines for the Development of a Polar Water Operational Manual

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OCIMF

International Chamber of Shipping

Shaping the Future of Shipping

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The International Chamber of Shipping (ICS)

is the global trade association representing national shipowners' associations from Asia, the Americas and Europe and more than 80% of the world merchant fleet.

Established in 1921, ICS is concerned with all aspects of maritime affairs particularly maritime safety, environmental protection, maritime law and employment affairs.

ICS enjoys consultative status with the United Nations International Maritime Organization (IMO).

The Oil Companies International Marine Forum (OCIMF)

is a voluntary association of oil companies with an interest in the shipment and terminalling of crude oil, oil products, petrochemicals and gas.

Our mission is to be the foremost authority on the safe and environmentally responsible operation of oil tankers, terminals and offshore support vessels, promoting continuous improvement in standards of design and operation.

OCIMF was formed in April 1970 in response to the growing public concern about marine pollution, particularly by oil, after the Torrey Canyon incident in 1967.

In the early 1970s, a variety of anti-pollution initiatives were starting to emerge nationally, regionally and internationally, but with little coordination.

Through OCIMF, the oil industry was able to play a stronger, coordinating role in response to these initiatives, making its professional expertise widely available through cooperation with governments and intergovernmental bodies.

OCIMF was granted consultative status at the IMO in 1971 and continues to present oil industry views at IMO meetings. Since then, its role has broadened to take account the changing maritime activities of its membership.

Its remit now covers tankers, barges, offshore support vessels and terminals and its advice extends to issues like shipping in ice and large-scale piracy, which rarely troubled the oil industry when OCIMF was first created in the 1970s.

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Cover photo by Viacheslav Misiurin

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Abbreviations

AARI	Arctic and Antarctic Research Institute
AIS	Automatic Identification System
ASPeCt	Antarctic Sea Ice Processes and Climate
ASSIST	Arctic Shipborne Sea Ice Standardization Tool
ATBA	Area To Be Avoided
ECDIS	Electronic Chart Display and Information System
FFA	Fire Fighting Appliances
FFE	Fire Fighting Equipment
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite System
GSK	Group Survival Kit
HSE	Health, Safety and Environment
HVAC	Heating Ventilation and Air Conditioning
LAN	Local Area Network
LSA	Life Saving Appliances
MANICE	Manual of Standard Procedures for Observing and Reporting Ice Conditions
MARPOL	International Convention for the Prevention of Pollution from Ships
MDLT	Mean Daily Low Temperature
MRSC	Maritime Rescue Sub-Centres
NLS	Noxious Liquid Substances
NOAA	National Oceanic and Atmospheric Administration
OSR	Oil Spill Response
PSK	Personal Survival Kit
PWOM	Polar Water Operational Manual
RCC	Rescue Coordination Centre
SMPEP	Shipboard Marine Pollution Emergency Plan
SMS	Safety Management System
SOPEP	Shipboard Oil Pollution Emergency Plan
VHF	Very High Frequency
WMO	World Meteorological Organization

Glossary

Within this publication, the terms below have the following meanings:

Bergy waters An area of freely navigable water in which ice of land origin is present in concentrations less than 1/10. There may be sea ice present, although the total concentration of all ice shall not exceed 1/10 (from the Polar Code).

Beset A situation when a ship is stationary due to sea ice conditions (typically a result of ice compression acting on the ship or the presence of thick/ridged ice beyond the vessel's icebreaking capability).

Chokepoint An area where ice is forced into a restricted area, while the water is free to flow underneath, resulting in ice pressure and dangerous ice conditions.

Convoy Multiple (ice-strengthened) ships escorted by icebreakers.

De-icing Measures to remove ice accretion using the ship's equipment.

Growlers A piece of ice smaller than a bergy bit, extending less than one metre above the sea surface and normally occupying an area of about 20m2. Growlers generally appear white but sometimes transparent or blue-green and can be difficult to distinguish when surrounded by sea ice or in high seas.

Icebreaker Any ship whose operational profile may include escort or ice-management functions, whose powering and dimensions allow it to undertake aggressive operations in ice-covered waters (from the Polar Code).

Icebreaking A ship's capability to navigate in a specific thickness or type of ice.

Ice class The notation assigned to the ship by the administration or by a Recognised Organisation (RO) showing that the ship has been designed for navigation in sea-ice conditions (from the Polar Code).

Icing Ice accretion from freezing rain, snow or sea spray which may form on the exposed and low-temperature structure of the ship.

Lead An expanse of open water or thin/broken ice between sea ice, sometimes referred to as a polynya.

Low temperature A generic term to describe the range of temperatures expected in an area where the lowest Mean Daily Low Temperature (MDLT) is below -10°C.

Mean Daily Low Temperature (MDLT) The mean value of the daily low temperature for each day of the year over a minimum ten-year period. A data set acceptable to the administration may be used if ten years of data is not available (from the Polar Code).

Notch The stern arrangement on icebreakers for towing operations.

Noxious Liquid Substance (NLS) Any substance indicated in the pollution category column of chapter 17 or 18 of the International Bulk Chemical Code or provisionally assessed under the provisions of regulation 6.3 of MARPOL as falling into category X, Y or Z.

Operator The owner of the ship, or any other organisation such as a ship manager or bareboat charterer that has assumed responsibility for the operation of the ship from the owner, including the duties and responsibilities imposed by the International Safety Management (ISM) Code. The operator would normally be the company recorded on the ship's Safety Management Certificate (SMC).

Pack ice Used in a wide sense to include any area of sea ice other than fast ice no matter what form it takes or how it is disposed. When concentrations are high, i.e. 7/10 or more, drift ice may be replaced by the term pack ice (from the Sea-Ice Nomenclature).

Polar low A small-scale, intense, short-lived atmospheric low-pressure system (depression) found over the ocean areas poleward of the main polar front in the northern and southern hemispheres. Polar lows can be difficult to detect using conventional weather reports and are a hazard to high-latitude operations.

Ridging A conglomeration of ice fragments formed by pressure at the contact line between ice floes, usually along earlier existing cracks and leads or at the boundary between ice floes of different ages.

SMS The Safety Management System is a structured and documented system enabling a company's personnel to implement effectively the company safety and environmental protection policy.

Winterisation Protection measures for crew, materials, equipment and systems against low temperatures and icing.

Useful sources of additional information

Solberg, K. E., Brown, R., Skogvoll, E., Gaustad, S. E. and Gudmestad, O. T.: "Risk reduction as a result of implementation of the functional based IMO Polar Code in the Arctic cruise industry". University of the Arctic Congress, Published by Springer, 2017, Chapter 26, pp 257–268.

Solberg, K. E. and Gudmestad, O. T.: "Search and rescue operations in Polar Regions", Submitted to Polar Geography July 2018 for publication.

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Sollid, M. P., Gudmestad, O. T. and Solberg, K. E.: Hazards originating from increased voyages in new areas of the Arctic, in proceedings of IAHR, Vladivostok, June 2018.

SARex Spitzbergen: Search and Rescue exercise conducted off North Spitzbergen: Exercise report, Report No. 58, University of Stavanger, April 2016, https://brage.bibsys.no/xmlui/handle/11250/2414815

SARex2: Surviving a maritime incident in cold climate conditions, Report No. 69, University of Stavanger, November 2017, https://brage.bibsys.no/xmlui/handle/11250/2468805.

SARex3: Evacuation to shore, survival and rescue, Report, No. 75, University of Stavanger, December 2018, https://brage.bibsys.no/xmlui/handle/11250/2578301.

American Bureau of Shipping. IMO Polar Code Advisory, January 2016.

Bureau Veritas. Guidelines for Existing Ships Operating in Polar Waters, Guidance Note NI 650 DT R00 E. May 2018.

DNV GL. Polar code, SE 05/2017.

Lloyd's Register. The International Code for Ships Operating in Polar Waters, A regulatory interpretation guide. September 2016.

Russian Maritime Register of Shipping, Guidelines on the application of the international code for ships operating in Polar Waters. ND No. 2-030101-031-E. 2017.

Indian Register of Shipping / Guidelines on Operational Assessment of Polar Ships 2017 (IRS-G-SAF-01 pages 10-11).

IMO Resolution A.893(21), ICS Bridge Procedures Guide and Part 1-A Chapter 11 of the Polar Code.

1 Introduction

Background

The International Maritime Organization (IMO) Polar Code entered into force on 1 January 2017. It requires ships operating in polar waters to submit a Polar Water Operational Manual (PWOM) to be able to obtain a Polar Ship Certificate. ICS and OCIMF members consider that how a ship is operated in Polar waters, and especially in ice, is a critical aspect for safe operations. The quality of the PWOM will have an impact on achieving safe operations. Appendix II of the Polar Code provides a model PWOM. While this is a useful starting point, ICS and OCIMF members have found that additional information is needed to develop a quality PWOM.

Ships operating in polar regions are exposed to a number of unique risks that challenge mariners. These include frequent poor weather conditions, extended periods of daytime and night time, lack of availability of charts with up to date information, limitations to communication systems and navigational aids. The remoteness of some areas can also make rescue or clean-up operations difficult and costly. The extremely low temperatures may reduce the effectiveness of the ship's equipment, e.g. deck machinery, emergency equipment, sea suctions, etc. Sea ice can add loads on the hull and propulsion system. The PWOM should address these issues.

Purpose and scope

These guidelines will help shipping companies and ship's Masters to develop a PWOM suitable for individual ships, environmental conditions and operations.

Section two provides a PWOM contents list and guidance for developing the PWOM. The guidance is generic, however, and ship operators and Masters will need to tailor the PWOM to suit the specifics of the ship, environmental conditions and operations.

This information paper only gives guidance for developing a PWOM and should not be considered as a complete PWOM. The process of carrying out operational assessments and writing the PWOM will give the ship operator and Master insights into the risks associated with voyages in polar waters and a deeper understanding of the process.

How to develop a Polar Water Operational Manual

Preparation is required for a PWOM and the documentation and calculations that are needed for its validation. Before a PWOM is developed it is recommended that the shipping company or Master understand the specific requirements of the relevant Administration or Recognised Organisation regarding the level of detail in drawings, plans, manuals and documentation as well as requirements for the approval of the Polar Code Operational Assessment and the PWOM. The PWOM encompasses a wide range of subjects from engineering systems details to monitoring procedures, and emergency provisions and planning. As such, the PWOM is also an amalgamation of owner/operator procedures and other information as appropriate.

The following steps are recommended to prepare a PWOM:

- Identifying associated hazards.
- Confirm or define the operating area.
- Assess or anticipate the operational limitations.
- Carry out a detailed operational assessment.
- Update procedures based on results of the operational assessment.
- Install or upgrade equipment or systems if necessary.
- Prepare the PWOM.
    - Base the PWOM contents around the outcome of the operational assessment and include a copy of the assessment in the appendix.

- Include references to the company's Safety Management System (SMS), and also any relevant procedures in the PWOM in full.
- Check with the validating organisations what contents are required; as variations may occur.
- Ensure the PWOM is tailored to the specific type of ship, operation and environmental conditions.
- PWOM should reference International Convention for the Prevention of Pollution from Ships (MARPOL) documents, such as the Shipboard Oil Pollution Emergency Plan/ Shipboard Marine Pollution Emergency Plan (SOPEP/SMPEP).

Structure of the recommended PWOM

The guidance in section two is based on the IMO Polar Code Appendix II (text in blue), with additional guidance provided by OCIMF and ICS in black.

In these guidelines:

- To be considered means that guidance is suggested for inclusion.
- To be addressed means that guidance should be included.

The numbering in appendix 2 of the IMOs Polar Code is mapped alongside the numbering in this paper. The structure has also been changed to reflect the content and make the format clearer. The table below shows the difference in structure from the IMO Polar Code Appendix II model PWOM and the revised model PWOM.

Text from the PWOM has been reproduced with permission from the IMO.

Table 1.1: Change from the IMO Polar Code Appendix II PWOM structure to the revised PWOM structure

	IMO PWOM structure	PWOM structure in this paper
1	**1 – Operational capabilities and limitations**	**1 Operational capabilities and limitations**
	Chapter 1: Operation in ice	1.1 Operation in ice
	1.1 Operator guidance in safe operations	1.1.1 Operator guidance in safe operations
	1.2 Icebreaking capabilities	1.1.2 Icebreaking capabilities
	1.3 Manoeuvring in ice	1.1.3 Manoeuvring in ice
	1.4 Special features	1.1.4 Special features
	Chapter 2: Operation in low air temperatures	1.2 Operation in low air temperatures
	System design	
	Chapter 3: Communication and navigation capabilities in high latitudes	1.3 Communication and navigation capabilities in high latitudes
	Chapter 4: Voyage duration	1.4 Voyage duration

	IMO PWOM structure	PWOM structure in this paper
2	**2 – Ship operations**	**2 Ship operations**
	Chapter 1: Strategic planning	2.1 Strategic planning
		2.1.1 Passage planning (including routeing)
	1.1 Avoidance of hazardous ice	2.1.2 Avoidance of hazardous ice
	1.2 Avoidance of hazardous temperatures	2.1.3 Avoidance of hazardous temperatures
	1.3 Voyage duration and endurance	2.1.4 Voyage duration and endurance
		2.1.5 Port requirements
	1.4 Human resources management	2.1.6 Human resources management
		2.1.7 Indigenous communities
	Chapter 2: Arrangements for receiving forecast of environmental conditions	2.2 Arrangements for receiving forecast of environmental conditions
	2.1 Ice information	2.2.1 Ice information
	2.2 Meteorological information	2.2.2 Meteorological information
	Chapter 3: Verification of hydrographic, meteorological and navigational information	2.3 Verification of hydrographic, meteorological and navigational information
	Chapter 4: Operation of special equipment	2.4 Operation of special equipment
	4.1 Navigation systems	2.4.1 Navigation systems
	4.2 Communications systems	2.4.2 Communications systems
	Chapter 5: Procedures to maintain equipment and system functionality	2.5 Procedures to maintain equipment and system functionality
	5.1 Icing prevention and de-icing	2.5.1 Icing prevention and de-icing
	5.2 Operation of seawater system	2.5.2 Operation of seawater system
	5.3 Procedures for low temperature operations	2.5.3 Procedures for low temperature operations

	IMO PWOM structure	PWOM structure in this paper
3	**3 – Risk management**	**3 Risk management**
	Chapter 1: Risk mitigation in limiting environmental condition	3.1 Risk mitigation in limiting environmental condition
	1.1 Measures to be considered in adverse ice conditions	3.1.1 Measures to be considered in adverse ice conditions
	1.2 Measures to be considered in adverse conditions	3.1.2 Measures to be considered in adverse conditions
	Chapter 2: Emergency response	4 Emergency response and search and rescue
	2.1 Damage control	4.1.1 Damage control
	2.2 Firefighting	4.1.2 Firefighting
	2.3 Escape and evacuation	4.1.3 Escape and evacuation
	Chapter 3: Coordination with emergency response services	4.2 Coordination with emergency response services
	3.1 Ship emergency response	4.2.1 Ship emergency response
	3.2 Salvage	4.2.2 Salvage
	3.3 Search and rescue	4.2.2 Search and rescue
	Chapter 4: Procedures for maintaining life support and ship integrity in the event of prolonged entrapment by ice	4.3 Procedures for maintaining life support and ship integrity in the event of prolonged entrapment by ice
	4.1 System configuration	4.3.1 System configuration
	4.2 System operation	4.3.2 System operation
4	**4 – Joint operations**	**5 Joint operations**
	Chapter 1: Escorted operations	5.1 Escorted operations
	Chapter 2: Convoy operations	5.2 Convoy operations
		6 Pollution prevention
		6.1 Prevention of pollution from oil and/or Noxious Liquid Substances (NLS)
		6.2 Waste management

2 New model Polar Water Operational Manual

Polar Code - Appendix II

Model Table of Contents for the Polar Waters Operational Manual (PWOM)

1 Operational capabilities and limitations

Introduction

This section provides information about the ship's operational capabilities and limitations required by the operator, Master and crew to help the decision-making process.

1.1 Operation in ice

1.1.1 Operator guidance for safe operation

Guidance: The PWOM should establish how decisions as to whether ice conditions exceed the ship's design limits should be made, taking into account the operational limitations on the Polar Ship Certificate. An appropriate decision support system, such as Canada's Arctic Ice Regime Shipping System, and/or the Russian Ice Certificate as described in the Rules of Navigation on the water area of the Northern Sea Route, can be used. Bridge personnel should be trained in the proper use of the system to be utilized. For ships that will operate only in ice-free waters, procedures to ensure that the ship will be kept from encountering ice should be established.

The following should be considered:

- Season of operation.
- Intended area and duration of operation.
- Ice class and temperature rating.
- Historical and current ice data and anticipated environmental conditions.
- Weather forecasts.

The following should be addressed:

- Selection of decision support system.
- Training of bridge and engine personnel in use of decision support system.
- Establishing safe ice navigational limits.
- Mitigation measures to take where safe ice navigational limits are exceeded.

For additional information on types of support systems, refer to coastal State requirements.

1.1.2 Icebreaking capabilities

Guidance: The PWOM should provide information on the ice conditions in which the ship can be expected to make continuous progress. This may be drawn, for example from numerical analysis, model test or from ice trials. Information on the influence of ice strength for new or decayed ice and of snow cover may be included.

The following should be considered:

- Ice class.
- Ice draught and displacement.
- Mode of operation (bow or stern first).
- Ship characteristics, including hull form, propulsion and appendages.
- Ice conditions:
  - Type.
  - Thickness.
  - Age.
  - Pressure.

  - Concentration.
  - Air temperature.
  - Snow cover.

The following should be addressed:

- Ship-specific operational capabilities for continuous progress in ice.
- Company-defined operational parameters for the ship.
- Coastal State requirements.

1.1.3 Manoeuvring in ice

Guidance: Where available, the PWOM should provide information on ship-specific manoeuvring capabilities and limitations in ice conditions. This may be drawn, for example, from numerical analysis, model test or from ice trials. The PWOM should contain guidance for manoeuvring in, and in the proximity of, hazardous ice.

The following should be considered:

- Turning circle diameters.
- Expected environmental conditions.
- Proximity to lee shore.
- Reliability of hydrographic information.
- Crew experience.

The following should be addressed:

- Policy for:
  - Safe speed.
  - Ramming ice.
  - Moving stern first, i.e. keeping the rudder amidships.
- Practices and procedures for manoeuvring in ice, including:
  - Entering an ice edge.
  - Manoeuvring in ice conditions, such as drifting ice, bergy waters and between floes.
  - Pack ice.
  - Beset in ice.
  - Using leads in ice.
  - Bergy waters.

To avoid duplication, also consider the items listed in section 3.1.1: Measures to be considered in adverse ice conditions and section 5: Joint operations when developing this part of the PWOM.

1.1.4 Special features

Guidance: Where applicable, the PWOM should include the results of any equivalency analyses made to determine polar ship category/ice class. The manual should also provide information on the use of any specialized systems fitted to assist in ice operations.

The following should be considered:

- Ice friction reduction measures.
- Heeling and trimming tanks.
- Specialised propulsion systems.

1.2 Operation in low air temperatures

System design

Guidance: The PWOM should list all ship systems susceptible to damage or loss of functionality by exposure to low temperatures, and the measures to be adopted to avoid malfunction.

Items that should be considered include:

- Cargo system.
- Ballast system.
- Cargo Ventilation system.
- Bunker system.
- Propulsion and manoeuvring systems.
- Life Saving Appliances (LSA).
- Fire Fighting Appliances (FFA).
- Domestic Heating ventilation and air conditioning (HVAC) system.
- Deck machinery.
- Navigational equipment.
- Steering gear.
- Control system mediums, i.e. electric, hydraulic, steam, pneumatic.
- Fresh water systems.
- Communication systems.

1.3 Communication and navigation capabilities in high latitudes

Guidance: The PWOM should identify any restrictions to operational effectiveness of communications and navigational equipment that may result from operating in high latitudes.

The following should be considered:

- Effect of high latitude.
- Proximity to a magnetic pole.
- Availability and effectiveness of the communication systems.
- Proximity, concentration and type of ice.
- Anticipated environmental conditions.

The following should be addressed:

- Ship-specific equipment restrictions and effectiveness such as:
  - Radars, Electronic Chart Display and Information System (ECDIS), sonar equipment.
  - Communication equipment.
  - Ice detection equipment.
  - Heading indication equipment.
  - Position fixing equipment.
  - Echo Sounder.
  - Availability and quality of hydrographic data.
  - Sound and navigation light equipment.
- Specific operating procedures for ships' equipment:
  - Impairment of equipment due to icing or impact with ice.
  - Functionality of equipment exposed to low temperatures and mitigation measures to take.
  - Mitigating measures and effectiveness of equipment in high latitudes.

1.4 Voyage duration

Guidance: The PWOM should provide information on any limitations on ship endurance such as fuel tankage, fresh water capacity, provision stores, etc. This will normally only be a significant consideration for smaller ships, or for ships planning to spend extended periods in ice.

The following should be considered:

- Waste management, i.e. garbage, food waste, sewage, cargo residue, grey water, engine room waste, engine oil and sludge and incinerator.

- Increased fuel consumption, i.e. for propulsion and heating.
- Consumable safety margins.
- Coastal State restrictions.

2 Ship operations

Introduction

When developing a plan for voyages to remote areas, special consideration should be given to environmental aspects of the operation area, the limited resources and navigational information. The presence of sea ice along the planned route adds importance to passage planning. The entire process needs to be continually reviewed throughout the voyage. Where possible, transit through areas of ice should be avoided.

Passage planning in polar waters is based on standard navigational principles for passage planning in IMO Resolution A. 893(21), Guidelines For Voyage Planning. Additional guidance for ships operating in remote polar areas can be found in IMO Resolution A.999(25), Guidelines On Voyage Planning For Passenger Ships Operating in Remote Areas.

2.1 Strategic planning

Assumptions used in conducting the analyses referred to below should be included in the Manual.

2.1.1 Passage planning (including routeing)

The first stage of strategic planning is a well-thought-out passage plan.

The purpose of this section is to provide guidance in addition to that contained in the company SMS and other recognised standards and publications.

The following should be considered:

- Location and availability of icebreakers.
- Concentration of other traffic in the area.
- Awareness of Source data information.
- Availability and use of specialists in ice navigation and the area of operation.
- Use of recently surveyed marine corridors.
- Procedures relating to safety parameters, including:
  - Conditions when it is not safe to enter areas containing ice or icebergs because of darkness, swell, fog and ice under pressure.
  - Safe distance to icebergs.
  - Presence of ice, icebergs and growlers, and safe speed in these areas.
- Limited availability of third-party resources for assistance.
- Monitoring requirements for updated routeing instructions and forecasts.

2.1.2 Avoidance of hazardous ice

Guidance: For ships operating frequently in polar waters, the PWOM should provide information with respect to periods during which the ship should be able to operate for intended areas of operation. Areas that pose particular problems, e.g. chokepoints, ridging, as well as worst recorded ice conditions should be noted. Where the available information is limited or of uncertain quality, this should be recognized and noted as a risk for voyage planning.

The following should be considered:

- Detail the ice conditions and formations to be avoided and subsequent actions to be taken.
- Ice navigation risks and mitigation measures to be taken.
- Visual and electronic means for monitoring signs of ice in the immediate vicinity.
- Provision of up-to-date and relevant detailed ice information from different sources (whenever possible), and also for regions adjacent to the route that may have ice drift.

2.1.3 Avoidance of hazardous temperatures

Guidance: For ships operating frequently in polar waters, the PWOM should provide information with respect to, the daily mean daily low temperature as well as the minimum recorded temperature for each of the days during the intended operating period. Where the available information is limited or of uncertain quality, this should be recognized as a risk for voyage planning.

The following should be addressed:

- Define the operational date range for the area of operation.
- Document the Mean Daily Low Temperature (MDLT) and equipment safe operating temperatures.
- Provide means to obtain long-range temperature forecast.
- Define the operational abort parameters.
- Define the temperature when mitigation measures are required for:
  - Personnel (include wind chill).
  - Ship's structure and equipment.
  - Ship's services, i.e. fresh/saltwater, hydraulics, etc.

2.1.4 Voyage duration and endurance

Guidance: Procedures to establish requirements for supplies should be established, and appropriate levels for safety margins determined taking into account various scenarios, e.g. slower than expected steaming, course alterations, adverse ice conditions, places of refuge and access to provisions. Sources for and availability of fuel types should be established, taking into account long lead times required for deliveries.

The following should be considered:

- Slower progress than expected or additional fuel required to maintain planned transit.
- Adverse ice and environmental conditions requiring multiple course and/or route changes.
- Ship temporarily beset in ice.
- Non-availability of suitable icebreaker escort.
- Procedures for management and supply of fuel, water consumables, spare parts and provisions before and during the planned operating period.
- Define the parameters for reserves of fuel, water, provisions, consumable supplies and spare parts. These requirements should meet applicable coastal State regulations as a minimum.

2.1.5 Port requirements

Guidance: To ensure proper voyage planning, the ship should receive the latest information on port requirements in polar waters where it will call during planned operations or can call at in case of emergency for repairs, bunkering or supply.

The following should be addressed:

- Description of ice conditions that may be encountered in the port and the approaches.
- Periods of port's operation, e.g. seasonal or year-round.
- Availability and capability of icebreaker and ice-capable tug support.
- Communication and icebreaking procedures.
- Port and terminal-specific requirements.
- Ship safety requirements and procedures for the port call.

This section can contain references to publications and other sources of the above information, which should be available on board.

2.1.6 Human resources management

Guidance: The PWOM should provide guidance for the human resources management, taking into account the anticipated ice conditions and requirements for ice navigation, increased levels of watch keeping, hours of rest, fatigue and a process that ensures that these requirements will be met.

The following should be considered:

- Bridge manning requirements:
  - Extended periods of activity during continuous operation in all potential types and concentrations of ice.
  - Increased bridge manning levels during icebreaker escort and additionally, when deemed appropriate. Requirement for additional lookouts and helmsmen.
  - The need for experienced certified Masters, chief mates and officers in charge of a navigation watch who have received the required basic or advanced training for ships operating in polar waters.
- Additional engine room manning requirements when navigating in ice.
- The need for more frequent deck watch changes due to cold conditions.
- Fatigue resulting from potential sleep deprivation, vibration, impact, noise and increased watch duration.
- Physical and psychological evaluation of fitness to work in polar waters for prolonged periods, e.g. circadian rhythm imbalance.
- Detail expected levels of shore-based management support during period of operation in ice.
- Certification, experience and training:
  - Provide information and procedures about the certification, training and familiarisation of personnel.
  - If relevant, document company policy on the use of a person other than the Master, chief officer or other certified ship's officer to fulfil the role of ice navigator.
  - Experience Matrix.
- Familiarisation and training for specialised procedures and equipment relevant to assigned duties, including:
  - Determining operations capabilities and limitations for operating in ice using the IMO Polar Operational Limit Assessment Risk Indexing System (POLARIS), as set out in the Appendix to IMO Circular MSC.1/Circ.1519 or any equivalent system such as the Canadian Arctic Ice Regime Shipping System (AIRSS) standard or the Russian Ice Certificate.
  - Navigating with icebreaker assistance.
  - Minimising ice accretion.
  - Ice removal techniques.
  - Ice ingestion in machinery sea chests.
  - Procedures to protect crucial equipment from freezing and ice accretion.
  - Use of Personal Survival Kits (PSKs) and Group Survival Kits (GSKs).

2.1.7 Indigenous communities

When developing a strategic plan, the interests and rights of any indigenous populations in the area should be considered and they should be consulted as appropriate.

2.1.8 Wildlife and Sites of Special Scientific Interest

The following should be considered:

- Nature reserves, Sites of Special Scientific Interest (SSSIs), Particularly Sensitive Sea Areas (PSSAs), Areas To Be Avoided (ATBAs).
- Migration patterns of wildlife.

2.2 Arrangements for receiving forecasts of environmental conditions

Guidance: The PWOM should set out the means and frequency for provision of ice and weather information. Where a ship is intended to operate in or in the presence of ice, the manual should set out when weather and ice information is required and the format for the information.

When available, the information should include both global and localized forecasts that will identify weather and ice patterns/regimes that could expose the ship to adverse conditions.

The frequency of updates should provide enough advance notice that the ship can take refuge or use other methods of avoiding the hazard if the conditions are forecast to exceed its capabilities.

The PWOM may include use of a land-based support information provider an effective method of sorting through available information, thereby providing the ship only with information that is relevant, reducing demands on the ship's communications systems. The manual may also indicate instances in which additional images should be obtained and analysed, as well as where such additional information may be obtained.

2.2.1 Ice information

Guidance: The PWOM should include or refer to guidance on how radar should be used to identify ice floes, how to tune the radar to be most effective, instructions on how to interpret radar images, etc. If other technologies are to be used to provide ice information, their use should also be described.

Sea ice information is required for guidance on:

- Present conditions.
- Forecasted conditions.
- Prior to departing.
- During the voyage.

The following ice monitoring and forecasting information for safe navigation should be provided (as each varies with timescale and geographic scope), if available:

- Weather forecasts from several sources, both private and governmental.
- Weather observations from various sources.
- Sea and bathymetric observations from remote sensors, ships, tidal predictions, etc.
- Ice observations by air, from ships, by satellite, coast stations, on ice, satellite tracking buoys, etc.

The PWOM should provide procedures for receiving ice data forecasts for the planned route and adjacent areas, to account for potential changes to the route. Ice data should include:

- Area, extent and concentration.
- Ice thickness.
- Ice type classification.
- Ice ridging.
- Ice drift.
- Icebergs.
- Ice pressure.
- Observational ice information, such as Manual of Standard Procedures for Observing and Reporting Ice Conditions (MANICE), Antarctic Sea Ice Processes and Climate (ASPeCt), Arctic Shipborne Sea Ice Standardisation Tool (ASSIST), Arctic and Antarctic Research Institute (AARI) and IceWatch.

List of service providers and examples of providers:

- Sea-Ice Information Services in the World, (WMO).
- National Oceanic and Atmospheric Administration (NOAA).
- Canadian Ice Service.

- Arctic and Antarctic Research Institute (AARI).
- Danish Meteorological Service.

2.2.2 Meteorological information

Guidance: The PWOM should include a summary of relevant meteorological and oceanographic features of the marine environment for the expected operational area. This summary may be supplemented by reference to publications maintained on board. If available, multiple sources should be consulted.

The following should be considered:

- Seasonal overview and outlook.
- Air temperature patterns:
  - Dates when the Mean Daily Low Temperature (MDLT) falls below 0°C.
  - MDLT during the intended operating period.
  - Expected daily minimum temperature during the intended operating period.
- Major storm tracks and wind conditions.
- Polar lows.
- Precipitation.
- Fog and visibility.
- Freezing spray and ice accretion including observations of the same in the area.
- Sea water temperature.
- Cloud cover and base height.

List reference material about ice and relevant important meteorological and oceanographic features of the marine environment that should be maintained on board.

2.3 Verification of hydrographic, meteorological and navigational information

Guidance: The PWOM should provide guidance on the use of hydrographic information as further described in the additional guidance to chapter 10.

The following should be considered:

- Hydrographic data availability and accuracy:
  - Soundings.
  - Shoreline features.
- Navigational aid accuracy.
- Position fixing accuracy.
- Tide and current data accuracy.

2.4 Operation of Special Equipment

2.4.1 Navigation systems

Guidance: When preparing the PWOM, consideration should be given to potential errors in navigational equipment in polar waters as the proximity to the poles can cause discrepancies that are not normally seen at lower latitudes.

The following should be considered:

- Magnetic compass performance in relation to proximity to the magnetic poles.
- Gyro compass and reduced horizontal force in higher latitudes.
- Global Navigation Satellite System (GNSS) elevation angles and coverage.
- Antenna icing and exposed navigation equipment.
- Auroral activity.
- ECDIS and chart projection near the poles.
- Ice searchlights.

- Thermal imaging cameras.
- Echo sounder and variable depth alarm.
- Means of receiving ice forecasts and satellite images.
- Ensuring visibility through bridge windows for safe lookout.

The following should be addressed:

- Provision of suitable navigational equipment for use in polar waters.
- Navigational systems hierarchy/reliability for the Arctic.
- Methods for de-icing bridge windows, antennae, etc.
- Source of ice forecasts and satellite images, and if onshore interpretation should be used.
- Remoteness of areas, e.g. redundancy, spare part inventories, etc.

2.4.2 Communications systems

The following should be considered:

- Compliance with Global Maritime Distress and Safety System (GMDSS) requirements.
- Limitations of geo-stationary satellites.
- Use of low earth orbiting satellites/service interruptions.
- Setting up a Local Area Network (LAN) if not on a transit voyage.
- Very High Frequency (VHF)/Automatic Identification System (AIS) coverage.
- Aeronautical Search and Rescue (SAR) band radios.
- Sufficient bandwidth for effective tele-medicine.
- Reduced bandwidth.

The following should be addressed:

- Maintenance of sound signal capability.
- Effective battery life for portable communications systems for survival craft.
- Procedures for minimising wastage of communications resources in an emergency.
- Additional equipment or portable power sources.

2.5 Procedures to maintain equipment and system functionality

The following should be considered:

- Identify all deck and other machinery and systems that may be exposed to adverse temperatures.
- Procedures to prepare and maintain the ship before reaching and during operations in low air temperature areas.

2.5.1 Icing prevention and de-icing

Guidance: The PWOM should provide guidance on how to prevent or mitigate icing by operational means, how to monitor and assess ice accretion, how to conduct de-icing using equipment available on the ship, and how to maintain the safety of the ship and its crew during all of these aspects of the operation.

The following should be considered:

- Methods of prevention of ice accretion:
  - Reducing speed.
  - Changing course.
  - Seeking refuge.
- Protective covers and greasing.
- De-icing priorities with reference to critical systems and equipment.

- Methods of de-icing:
  - Inventory and location of de-icing equipment to be carried.
  - Trace heating.
  - Icephobic coatings.
- Safety of crew.

2.5.2 Operation of seawater systems

Guidance: The PWOM should provide guidance on how to monitor, prevent or mitigate ice ingestion by seawater systems when operating in ice or in low water temperatures. This may include recirculation, use of low rather than high suctions, etc.

The following should be considered:

- Location of sea chests and intakes.
- Type and operation of cooling system.
- Exposed pipelines.
- Ballast.
- Heating.
- Recirculation.
- Fire system.
- Sanitary system.
- Exposed pipelines, especially deadlegs.
- Additional fixtures, fittings and connections required to keep the system operating in polar waters.

2.5.3 Procedures for low temperature operations

Guidance: The PWOM should provide guidance on maintaining and monitoring any systems and equipment that are required to be kept active in order to ensure functionality, e.g. by trace heating or continuous working fluid circulation.

This section should provide ship specific guidance to ensure all equipment and machinery required for the safe operation of the vessel is accessible and functioning, taking in to consideration the anticipated environmental conditions, range of operations and the probability of conditions being more severe than predicted.

- If applicable, this guidance should include:
  - Machinery spaces.
  - Prevention of snow ingestion in the air intake.
  - Machinery compartment heating requirements.
  - Maintenance of air intake temperature for machinery at a temperature in compliance with manufacturer's requirements.
  - Control of ventilation and/or providing shields to avoid direct cold airflow against control and gauging equipment and small diameter piping systems.
  - Prevention of ingestion of ice and ensuring functionality of seawater supplies for machinery systems and action to be taken in the event of loss of seawater supply to essential machinery due to ingestion of ice in sea chests.
  - Protection of batteries or other stored energy devices.
  - Action required to ensure moisture-free air for control air, whistle and deck services.
  - Prevention of freezing of the domestic freshwater system and sanitary system.
  - Heating requirements for diesel oil or appropriate grades of diesel/gas oil for expected temperatures.
  - Action required to ensure satisfactory operation of lube oil and heavy oil purifiers.
  - Cleaning of diesel oil filters to prevent wax accumulation.
  - Operation and maintenance of heat tracing lines.

  - Oily-water separator operation and action required to prevent freezing of water, if exposed, including heating.
- Auxiliary machinery compartments, including hydraulic pump rooms, steering gear compartment, emergency generator compartment, bow thruster compartment, all under deck passages and the duct keel and the emergency fire pump compartment, water mist and water spray pumps:
  - Consider the increased viscosity of lubricants due to low temperatures.
  - Policy for the use of fluids designed for cold weather operational requirements.
  - Operation of space and oil tank heaters.
  - Compartment ventilation and/or use of a shield.
  - Use of suitable antifreeze in hydraulic oil.
  - Compartment heating or alternate procedure, i.e. run hydraulic pumps continuously, use low temperature oil or heat oil tank.
  - Fuel and lubricating oil requirements.
- Deck equipment:
  - Action required to ensure safe and efficient operation of cargo and hose handling cranes, including checks on sheave icing which may cause wires to jump out of sheave. Sluggish hydraulic control and slippery brakes is common.
  - Measures to be implemented to ensure satisfactory operation of small auxiliary hydraulic systems.
  - Protection and testing of safety devices and all safety switches, i.e. davit limit switches.
  - Protection of exposed electric and air motors, accommodation ladders and pilot ladders.
  - Control of cargo hold ventilation and preventing air intake snow/ice ingestion.
  - Measures required to ensure safe and efficient operation of hatch covers and a satisfactory seal.
  - Protection of anchor systems, mooring systems and lines and measures to be taken to ensure safe access and satisfactory functionality.
  - Protection of ballast tank vents and cargo tank pressure vacuum valves.
  - Suitable low temperature greasing of all exposed movable parts, e.g. butterfly nuts/bolts, flap hinges, vents, valve spindles, sounding pipe covers, hydrant wheel spindles, steel door dogs, wheels and rams, pilot ladder rollers and track ways, etc.
  - Protection, storage, and lubrication of loose lashing material, including type of material to be used. Use of manila ropes for any lashings on deck is not recommended. Polypropylene and some other synthetic ropes are best suited for severe low temperature use.
  - Inventory and storage of de-icing material, including shovels, crow bars, wooden mallets, hammers, spikes, sledge hammers, pickaxes and enough salt and sand.
  - Heating of store rooms.
  - Stripping of hold bilges, store bilges, chain lockers and bilges for the side passage ways.
  - Prevention of freezing and bursting of sounding pipes and scuppers.
  - Ensuring contamination showers and eyewash stations are accessible, suitable and ready for use in ambient temperatures.
- Life Saving Appliances, fire detection and extinguishing equipment:
  - Operation and maintenance of trace heating, if fitted.
  - Maintenance of battery systems.
  - Draining exposed sections of the fire and foam lines.
  - Protection of controls and equipment from freezing, snow accumulation and ice accretion.
  - Removal of snow and ice from access ways.
  - Protecting fire extinguisher medium from freezing. CO2 systems usually operate only in temperatures above -16°C.

  - Storage of fire hoses, nozzles in a protected location near the hydrant.
  - Storage of firefighting outfit in a warm and accessible location.
  - Survival craft fuel requirements.
  - Checking and using the thermal protection clothes provided, with instructions to personnel on the health dangers of severe cold temperatures.
  - Requirements for GSKs and PSKs, including contents, storage and maintenance.
- Living quarters and crew protection:
  - Keeping escape routes accessible and safe.
  - Availability and condition of adequate thermal protection for all persons on board considering the intended voyage.
  - Accommodation and control room heat and ventilation requirements, including ensuring adequate air humidity.
- Navigation:
  - Measures to ensure satisfactory radar and ice detection equipment operation.
  - Searchlight operation spare bulb requirements.
  - Measures to prevent snow and ice accumulation blocking foghorn(s).
  - Operation and maintenance of bridge heating.
  - De-icing bridge windows.
- Ballast operation:
  - Actions required to reduce the risk of frozen ballast water and actions to be taken in the event ballast water is frozen.

3 Risk management

Introduction

A risk assessment is to be undertaken as part of the operational assessment, and this section of the PWOM includes procedures for managing the identified risks.

Chapter 1

3.1 Risk mitigation in limiting environmental condition

3.1.1 Measures to be considered in adverse ice conditions

Guidance: The PWOM should contain guidance for the use of low speeds in the presence of hazardous ice. Procedures should also be set for enhanced watchkeeping and lookout manning in situations with high risks from ice, e.g. in proximity to icebergs, operation at night, and other situations of low visibility. When possibilities for contact with hazardous ice exist, procedures should address regular monitoring, e.g. soundings/inspections of compartments and tanks below the waterline.

Ice can cause severe damage to a ship if it is not properly understood or respected.

The following should be considered:

- Determination of severity and quantity of ice.
- Safe speed in the prevailing ice and when operating close to icebergs and growlers.
- Approaches to an ice edge.
- Posting of additional lookouts.
- Using searchlights at night/infra-red cameras.
- Range of visibility.
- Using ice experts.
- Additional assets for ice reconnaissance.

The following should be addressed:

- List of tanks and compartments adjacent to the hull and location of sounding points.
- Details of vulnerable parts of the hull, if the ice belt is discontinuous.
- Determination of the safe immersion of propellers.
- Safe navigation in ice that includes but is not limited to the following five fundamental ship handling rules when in ice:
  - Keep making or attempting progress, but recognise when continued progress is impossible before this point is reached.
  - Work with the ice movement, not against it.
  - Avoid excessive speed that will result in damage.
  - Keep the propeller turning, if possible, as ice damage to stationary propeller blades is likely.
  - Keep the rudder amidships during astern movements.

3.1.2 Measures to be considered in adverse temperature conditions

Guidance: The PWOM should contain guidance on operational restrictions in the event that temperatures below the ships polar service temperature are encountered or forecast. These may include delaying the ship, postponing the conduct of certain types of operation, using temporary heating, and other risk mitigation measures.

The following should be considered for all equipment and systems exposed to low temperatures, including the winterisation features:

- System criticality and redundancy.
- Protection methods, such as trace heating or covers.
- Materials selection, including greases and lubricants.
- Crew operations and routines.
- Maintenance intervals and spares.

The PWOM should include a section on Health, Safety and Environment (HSE) to improve preparation and awareness for specific aspects associated with temperatures below those expected when the voyage was planned. HSE content should include the following:

- Crew manning and training.
- Crew protection:
  - Clothing.
  - Fatigue.
  - Watch duration in exposed areas.
  - Perspiration, dehydration and nutrition.
  - Health effects.

4 Emergency Response and search and rescue

Introduction

This section provides guidance on emergency response measures and highlights specific considerations for search and rescue in polar waters.

4.1 Emergency response

Guidance: In general, where the possibility of low air temperatures, sea ice, and other hazards is present, the PWOM should provide guidance on procedures that will increase the effectiveness of emergency response measures.

4.1.1 Damage control

Guidance: the PWOM should consider damage control measures arrangements for emergency transfer of liquids and access to tanks and spaces during salvage operations.

The following should be considered:

- Intended area and duration of operation.

- Season of operation.
- Ice class and temperature rating.
- Likelihood of accelerated in-service structural degradation in ship's vulnerable areas due to ice damage.
- The amount of onboard damage control equipment.
- Shore support assistance and availability of repair material.
- Icebreaker support.
- Onboard crew's skill, knowledge and experience.
- Safe access to enclosed spaces for damage control.
- Environmental protection.
- Ships scheduled for polar waters operations should review their emergency response plan to ensure it covers:
  - Ice entrapment.
  - Encountering reduced propulsion power in ice.
  - Ice damage to the hull structure and propulsion equipment.
  - Flooding and stability issues.
  - Environmental issues, including pollution.

The following should be addressed:

- Crew training to cover effective damage control, minor hull repair, deck and overside spills.
- Portable gas welding and cutting equipment.
- Accessibility and operability of portable salvage equipment.

4.1.2 Firefighting

The following should be considered:

- Intended area and duration of operation.
- Ambient conditions.
- Temperature limitation and protection methods for each type of Fire Fighting Equipment (FFE).
- Preparation of fixed and portable firefighting for operation in polar waters.

The following should be addressed:

- Avoidance of icing, freezing and snow accretion on FFE.
- Existing ship's winterisation system (for fire detection, fixed and portable FFE and ventilation controls).
- Contingency plan to protect FFE when winterisation system has failed.
- The storage location of each piece of portable FFE to protect from low temperatures and ensure accessibility.
- Adequate firefighter outfits suitably protected from low temperatures.

4.1.3 Escape and evacuation

Guidance: Where supplementary or specialized lifesaving equipment is carried to address the possibilities of prolonged durations prior to rescue, abandonment onto ice or adjacent land, or other aspects specific to polar operations, the PWOM should contain guidance on the use of the equipment and provision for appropriate training and drills.

In polar waters, escape and evacuation differs from lower latitudes, as they may take place onto ice or land, rather than directly into survival craft.

The following should be considered before and during evacuation:

- Regular snow/icing patrols to detect and manage ice accretion and drifting snow on escape and evacuation routes.
- Trace heating on escape routes/lifeboat door seals.

- Protective covers on LSA/FFA.
- Deployability of GSKs onto the ice and ability to move on the ice.
- Collection of additional supplies/water prior to abandonment.
- The public address system and general emergency alarm system should be audible over the loudest ambient noise level during ice transit, icebreaking or ramming.

The following should be addressed:

- Procedures during any interaction with wildlife.
- Instructions for use of equipment in the GSK must be readable in reduced light conditions and available in text and pictures.
- Procedure for organising camp on ice for survival after abandonment.
- Abandonment scenarios on ice, land and sea.
- Ensuring the contents of GSKs and PSKs, and any additional survival resources required, such as extra food and water, are detailed in the PWOM.

4.2 Coordination with emergency response services

4.2.1 Ship emergency response

Guidance: The PWOM should include procedures to be followed in preparing for a voyage and in the event of an incident arising.

Information about communication channels to Maritime Rescue Sub-Centres (MRSC) in polar regions should be on board.

The following should be considered:

- External assistance in remote areas of the polar regions may not be readily obtainable due to lack of or limited infrastructure, facilities or maritime traffic.
- Challenges in communication, e.g. due to language barriers or technical issues.
- Establishing regular contact with ships in the vicinity to be aware of potential assistance in the region, if needed.
- Participating in reporting systems, such as NORDREG Canada and Greenpos, as appropriate.

4.2.2 Salvage

Guidance: The PWOM should include procedures to be followed in preparing for a voyage and in the event of an incident arising.

Lack of or limited infrastructure or facilities should be considered in this section and existing salvage plans reviewed for applicability in polar regions.

4.2.3 Search and rescue

Guidance: The PWOM should contain information on identifying relevant Rescue Coordination Centres for any intended routes, and should require that contact information and procedures be verified and updated as required as part of any voyage plan.

This section provides the ship information about Rescue Coordination Centres (RCCs) along the intended route, including emergency contact information. The PWOM should include contact information and geographical areas of responsibility, as well as the following:

- Search and rescue reference documents to be maintained on board.
- Reference documents where additional information can be obtained.
- Requirement for recording RCC information in the passage plan and posting emergency contact details at the communication centre.
- Requirement for the ship to verify PWOM relevant RCC emergency contact information prior to starting the voyage.
- Details of the assistance provided by each RCC on the route.
- Limitations on communications and the provision of timely medical assistance.

4.3 Procedures for maintaining life support and ship integrity in the event of prolonged entrapment by ice.

Guidance: Where any ship incorporates special features to mitigate safety or environmental risks due to prolonged entrapment by ice, the PWOM should provide information on how these are to be set up and operated. This may include, for example, adding additional equipment to be run from emergency switchboards, draining systems at risk of damage through freezing, isolating parts of HVAC systems, etc.

4.3.1 System configuration

If the operational assessment identifies prolonged entrapment by ice as a hazard, the PWOM must contain procedures for maintaining life support and integrity. This section should contain:

- A list of special features and/or equipment required to mitigate safety or environment risk.
- Procedures for monitoring the ship's position and ice drift to identify the risk of grounding or hull damage from ice pressure which may require evacuation or abandonment.
- Description of how equipment can be configured and deployed.
- Resource management plans for fuel, water and provisions.
- A cargo management plan if cargo properties pose a risk to the personnel, environment or ship, such as solidifying or reactive cargoes.

4.3.2 System operation

This section should include a list of essential systems and equipment required during the anticipated period of prolonged entrapment in ice, and procedures and operating instructions for them. To simplify the PWOM and avoid repetition, a reference to the manufacturer's instruction manual, its onboard location and who is responsible for maintaining the manual can be included instead.

5 Joint operations

Introduction

Ships operating in polar waters may require icebreaker assistance at some stage of their voyage, if ice conditions exceed the limitation for independent operation in the Polar Ship Certificate. Some coastal States require compulsory icebreaker escort in certain sea or port areas, depending on the ice conditions, period of operations and ice class of the ships. Following a risk assessment, the decision to use voluntary icebreaker assistance can be taken when existing or predicted ice conditions during the voyage exceed the normal operational icebreaking capabilities of the ship, to reduce the passage duration or to reduce the chances of machinery breakdown or hull damage.

5.1 Escorted operations

Guidance: The PWOM should contain or reference information on the rules and procedures set out by coastal States who require or offer icebreaking escort services. The manual should also emphasize the need for the master to take account of the ship's limitations in agreeing on the conduct of escort operations.

The following should be considered:

- Methods of escorting and safety precautions, as well as communication during escorting operations.
- Number of escorting icebreakers.
- Onboard crew's skill, knowledge and experience of towage and escort.

The following should be addressed:

- Procedure of granting permission for escorting ships in polar waters.
- Manning and watchkeeping requirements on the bridge and in the engine room during escort.
- Collision avoidance and channel breakout procedures.

5.2 Convoy operations

The following should be considered:

- Type of convoys, e.g. simple or compound convoy.
- Number of icebreakers in the convoy.
- Number of escorted ships in the convoy.
- Other ships' ice class, propulsion power and icebreaking capability.

The following should be addressed:

- Convoy safe speed and safe distance between ships in the convoy.
- Communication procedures and protocols between ships in the convoy.
- Responsibilities during convoy operations.
- When to start/stop convoy operations.
- Convoys in case of restricted visibility.
- Order and allocation of the ships in the convoy.
- Emergency actions to avoid collision.
- Taking action if the escorted ships become beset.
- Towage by icebreakers (in notch).

6 Pollution prevention

Introduction

This section provides guidance on measures to prevent pollution in polar waters.

6.1 Prevention of pollution from oil and/or Noxious Liquid Substances (NLS)

Due to the ecologically sensitive nature of polar waters and their remoteness from centres of population and oil spill response equipment, operators should ensure all precautions are in place to prevent pollution occurring.

The following items should be considered when updating the MARPOL-related plans/manuals for operations in polar regions:

- Reducing potential pollutants taken into polar waters.
- Waste tanks emptied as far as possible before entering polar waters.
- Pollutants should not be carried in tanks directly adjacent to the hull.
- Type of fuel used.
- Removal of ice/snow from deck.
- Tank vents kept ice free.
- Carriage of dispersant and applicators.
- Having the capability for limited overside response, over and above Shipboard Oil Pollution Emergency Plan (SOPEP) kit.

The following items should also be addressed:

- Any additional contents required in SOPEP kit.
- Additional procedures in SOPEP manual for overboard Oil Spill Response (OSR) in ice.
- Additional spill reporting requirements for polar waters, as applicable.

6.2 Waste management

Garbage disposal facilities are very limited in polar waters. Garbage is typically either incinerated or kept on board for disposal outside polar waters in line with MARPOL Annex V.

The following should be considered:

- Minimising the amount of packaging at source.
- Minimising food waste by careful preparation and planning.

- Managing storage and reducing attractiveness of garbage to wildlife.
- Handling of residues from selective catalytic reduction systems.

The following should be addressed:

- Sufficient waste storage capacity for the expected duration of the operations in ice.
- Waste handling procedures and capacity.
- Distance from ice shelf or ice exceeding 1/10 concentration for waste disposal in accordance with MARPOL requirements.
- Use of open loop scrubbers and pollution to water.

A voice for safety

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