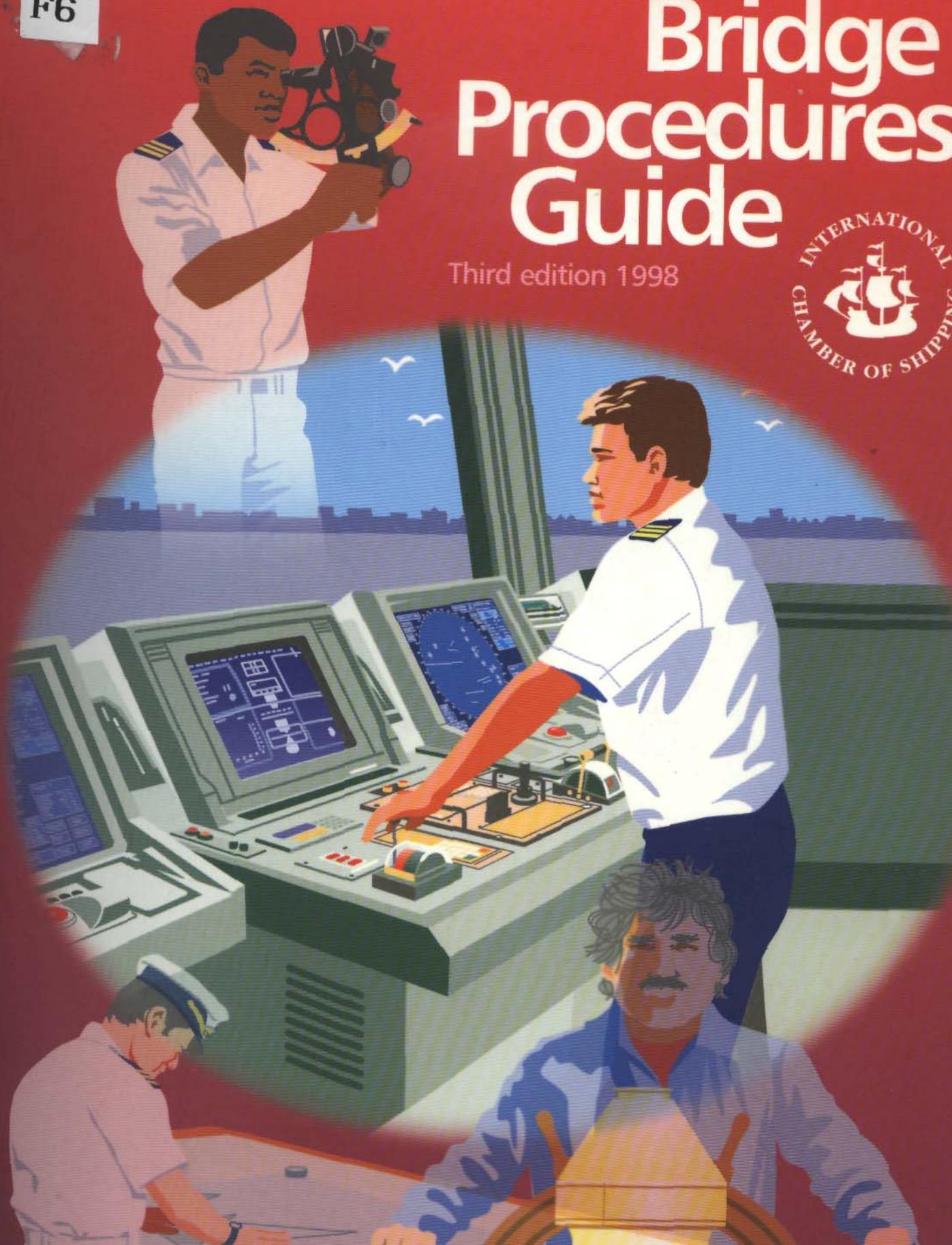


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Bridge Procedures Guide

Third edition 1998



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Safe navigation is the most fundamental attribute of good seamanship. An increasingly sophisticated range of navigational aids can today complement the basic skills of navigating officers, which have accumulated over the centuries.

But sophistication brings its own dangers and a need for precautionary measures against undue reliance on technology. Experience shows that properly formulated bridge procedures and the development of bridge teamwork are critical to maintaining a safe navigational watch.

The first edition of the *Bridge Procedures Guide* was published 21 years ago, in 1977. Written to encourage good bridge watchkeeping practices, the Guide, updated in 1990, quickly made its mark and became acknowledged as the standard manual on the subject.

This third edition is the product of many months of revision and is intended to reflect best navigational practice today. Close attention has been paid to guidance on bridge resource management and in particular on passage planning, while the section on bridge equipment has been considerably expanded to take account of the more widespread use of electronic aids to navigation.

The assistance of experts from ICS member national shipowners' associations in the preparation of this Guide is warmly acknowledged. Special thanks are also due to colleagues from other maritime organisations, particularly the International Federation of Shipmasters' Associations, the International Maritime Pilots' Association and the Nautical Institute, who have willingly given their time and expertise to ensure that the *Bridge Procedures Guide* continues to offer the best possible guidance on the subject.

This *Bridge Procedures Guide* is divided into three parts and embraces internationally agreed standards, resolutions and advice given by the International Maritime Organization. Bridge and emergency checklists have been included for use as a guide for masters and navigating officers.

In particular, this Guide has been revised to take into account the 1995 amendments to STCW, the ISM Code and also the provision of modern electronic navigation and charting systems which, on new ships, are often integrated into the overall bridge design.

Above all the Guide attempts to bring together the good practice of seafarers with the aim of improving navigational safety and protecting the marine environment. The need to ensure the maintenance of a safe navigational watch at all times, supported by safe manning levels on the ship, is a fundamental principle adhered to in this Guide.

Finally, an essential part of bridge organisation is the procedures, which should set out in clear language the operational requirements and methods that should be adopted when navigating. This *Bridge Procedures Guide* has attempted to codify the main practices and provide a framework upon which owners, operators, masters, officers and pilots can work together to achieve consistent and reliable performance.

Seafaring will never be without its dangers but the maintenance of a safe navigational watch at all times and the careful preparation of passage plans are at the heart of good operating practice. If this Guide can help in that direction it will have served its purpose.

ICS attaches the utmost importance to safe navigation. Safe navigation means that the ship is not exposed to undue danger and that at all times the ship can be controlled within acceptable margins.

To navigate safely at all times requires effective command, control, communication and management. It demands that the situation, the level of bridge manning, the operational status of navigational systems and the ships' engines and auxiliaries are all taken into account.

It is people that control ships, and it is therefore people, management and teamwork which are the key to reliable performance. People entrusted with the control of ships must be competent to carry out their duties.

People also make mistakes and so it is necessary to ensure that monitoring and checking prevent chains of error from developing. Mistakes cannot be predicted, and once a mistake has been detected, it is human nature to seek to fit circumstances to the original premise, thus compounding a simple error of judgement.

Passage planning is conducted to assess the safest and most economical sea route between ports. Detailed plans, particularly in coastal waters, port approaches and pilotage areas, are needed to ensure margins of safety. Once completed, the passage plan becomes the basis for navigation. Equipment can fail and the unexpected can happen, so contingency planning is also necessary.

Ergonomics and good design are essential elements of good bridge working practices. Watchkeepers at sea need to be able to keep a look-out, as well as monitor the chart and observe the radar. They should also be able to communicate using the VHP without losing situational awareness. When boarding or disembarking pilots, handling tugs or berthing, it should be possible to monitor instrumentation, particularly helm and engine indicators, from the bridge wings. Bridge notes should be provided to explain limitations of any equipment that has been badly sited, pointing out the appropriate remedies that need to be taken.

The guiding principles behind good management practices are:

- clarity of purpose;
- delegation of authority;
- effective organisation;
- motivation.

Clarity of purpose

If more than one person is involved in navigating it is essential to agree the passage plan and to communicate the way the voyage objectives are to be achieved consistently and without ambiguity. The process starts with company instructions to the ship, as encompassed by a safety management system supported by master's standing orders and reinforced by discussion and bridge orders. Existing local pilotage legislation should also be ascertained to enable the master to be guided accordingly.

Before approaching coastal and pilotage waters, a ship's passage plan should ensure that dangers are noted and safe-water limits identified. Within the broad plan, pilotage should be carried out in the knowledge that the ship can be controlled within the established safe limits and the actions of the pilot can be monitored.

In this respect early exchange of information will enable a clearer and more positive working relationship to be established in good time before the pilot boards. Where this is not practicable the ship's plan should be sufficient to enable the pilot to be embarked and a safe commencement of pilotage made without causing undue delay.

Delegation of authority

The master has the ultimate responsibility for the safety of the ship. Delegation of authority to the officer of the watch (OOW) should be undertaken in accordance with agreed procedures and reflect the ability and experience of the watchkeeper.

Similarly, when a pilot boards the master may delegate the conduct of the ship to the pilot, bearing in mind that pilotage legislation varies from country to country and from region to region. Pilotage can range from optional voluntary pilotage that is advisory in nature, to compulsory pilotage where the responsibility for the conduct of the navigation of the ship is placed upon the pilot.

The master cannot abrogate responsibility for the safety of the ship and he remains in command at all times.

If the master delegates the conduct of the ship to the pilot, it will be because he is satisfied that the pilot has specialist knowledge, shiphandling skills and communications links with the port. In doing so the master must be satisfied that the pilot's intentions are safe and reasonable. The OOW supports the pilot by monitoring the progress of the ship and checking that the pilot's instructions are correctly carried out. Where problems occur which may adversely affect the safety of the ship, the master must be advised immediately.

The process of delegation can be the cause of misunderstanding and so it is recommended that a clear and positive statement of intention be made whenever handing over and receiving conduct of the ship.

When navigating with the master on the bridge it is considered good practice, when it is ascertained that it is safe to do so, to encourage the OOW to carry out the navigation, with the master maintaining a monitoring role.

The watch system provides a continuity of rested watchkeepers, but the watch changeover can give rise to errors. Consequently routines and procedures to monitor the ship's position and to avoid the possibility of mistakes must be built into the organisation of the navigational watch.

The risks associated with navigation demand positive reporting at all times, self verification, verification at handover and regular checks of instrumentation and bridge procedures. The course that the ship is following and compass errors must be displayed and checked, together with the traffic situation, at regular intervals and at every course change and watch handover.

Effective organisation

Preparing a passage plan and carrying out the voyage necessitates that bridge resources are appropriately allocated according to the demands of the different phases of the voyage.

Depending upon the level of activity likely to be experienced, equipment availability, and the time it will take should the ship deviate from her track before entering shallow water, the master may need to ensure the availability of an adequately rested officer as back-up for the navigational watch.

Where equipment is concerned, errors can occur for a variety of reasons and poor equipment calibration may be significant. In the case of integrated systems, it is possible that the failure of one component could have unpredictable consequences for the system as a whole.

It is therefore essential that navigational information is always cross checked, and where there is doubt concerning the ship's position, it is always prudent to assume a position that is closest to danger and proceed accordingly.

Motivation

Motivation comes from within and cannot be imposed. It is however the responsibility of the master to create the conditions in which motivation is encouraged.

A valuable asset in any organisation is teamwork and this is enhanced by recognising the strengths, limitations and competence of the people within a team, and organising the work of the bridge team to take best advantage of the attributes of each team member.

Working in isolation when carrying out critical operations carries the risk of an error going undetected. Working together and sharing information in a professional way enhances the bridge team and the master/pilot relationship. Training in bridge resource management can further support this.

AMVER

Automated Mutual-Assistance Vessel Rescue System: a worldwide voluntary system operated exclusively to support SAR and to make information available to all RCCs

ARCS

Admiralty Raster Chart Service: electronic raster charts produced by the United Kingdom Hydrographic Office

ARPA

Automatic Radar Plotting Aid

ASF

Additional Secondary Factor: corrections to be applied when plotting Loran C positions on charts, to take into account variations in the conductivity of the earth's surface over which the signals pass

ATA

Automatic Tracking Aid: electronic plotting device for radars

CES

Coast Earth Station: maritime name for an Inmarsat shore-based station linking ship earth stations with terrestrial communication networks

COLREGS

Convention on the International Regulations for Preventing Collisions at Sea, 1972, as amended

COSPAS-SARSAT

A satellite system designed to detect distress beacons transmitting on the frequency 406 MHz

DATUM

A datum is a reference system for specifying positions on the earth's surface. Each datum is associated with a particular reference spheroid that can be different in size, orientation and relative position from the spheroids associated with other horizontal datums. Positions referred to different datums can differ by several hundred metres

DGPS

Differential Global Positioning System (see GNSS)

DOC

Document of Compliance under the ISM Code

DSC

Digital Selective Calling: a technique using digital codes which enable a radio station to establish contact with, and transfer information to, another station or group of stations

EBL

Electronic Bearing Line: a radar feature

ECDIS

Electronic Chart Display and Information System

ECS

Electronic Chart System

EGC

Enhanced Group Call: part of the Inmarsat system that complements the NAVTEX system to supply SafetyNET and similar information broadcast services

ENC

Electronic Navigational Chart

EP

Estimated Position

EPA

Electronic Plotting Aid: electronic plotting device for radars

EPIRB

Emergency Position Indicating Radio Beacon: a device that transmits distress alerting signals via satellites (406 MHz using COSPAS-SARSAT; 1.6 GHz using INMARSAT) and aircraft homing signals on 121.5 MHz

GLONASS

Global Navigation Satellite System (see GNSS)

GMDSS

Global Maritime Distress and Safety System: a global communications service based upon automated systems, both satellite and terrestrial, to provide distress alerting and promulgation of maritime safety information for mariners

GNSS

Global Navigation Satellite System: a worldwide position and time determination system that includes one or more satellite constellations and receivers

GOC

General Operator's Certificate: a GMDSS radio operator's certificate for use on ships trading beyond GMDSS Sea Area A1

GPS

Global Positioning System (see GNSS)

HF

High Frequency

IAMSAR

International Aeronautical and Maritime Search and Rescue Manual: published jointly by ICAO and IMO

IBS

Integrated Bridge System

ICAO

International Civil Aviation Organization: Montreal based United Nations intergovernmental body

IHO

International Hydrographic Organization: Monaco based intergovernmental body

IMO

International Maritime Organization: London based United Nations intergovernmental body

INMARSAT

International Mobile Satellite Organization: operator of a system of geostationary satellites for worldwide mobile communications services and which supports GMDSS

ISF

International Shipping Federation: global maritime employers' organisation

ISM Code

International Safety Management Code

ITU

International Telecommunication Union: Geneva based United Nations intergovernmental body

LL

International Convention on Load Lines, 1966, as amended

LSA

Life Saving Appliance(s)

MARPOL

International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978, as amended

MERSAR

Merchant Ship Search and Rescue Manual: published by IMO

MF

Medium Frequency

MMSI

Maritime Mobile Service Identity: 9-digit ITU identification number allocated to ships operating DSC

MOB

Man Overboard

MSI

Maritime Safety Information: navigational and meteorological warnings, forecasts and other urgent safety related messages broadcast to ships

NAVAREA

One of 16 areas into which the world's oceans have been divided for the dissemination of long-range navigational and meteorological warnings under the WWNWS

NAVTEX

Telegraphy system for broadcasting marine weather forecasts, navigational warnings, SAR alerts and other warnings and urgent information to ships in coastal waters (up to 400 nautical miles) under the WWNWS

NBDP

Narrow-Band Direct Printing telegraphy used for radiotelex and NAVTEX

NOAA

National Oceanic & Atmospheric Administration: United States producer of electronic raster charts

OMBO

One Man Bridge Operations: when a sole OOW maintains a navigational watch on the bridge without the support of additional personnel, other than a helmsman engaged in steering

OOW

Officer of the Watch

RCDS

Raster Chart Display System

RCC

Rescue Co-ordination Centre: a unit responsible for promoting the efficient organisation of SAR services and for co-ordinating the conduct of SAR operations within a SAR region

RENC

Regional Electronic Navigational Chart Co-ordinating Centre: supplier of official chart data

RNC

Raster Navigational Chart

ROC

Restricted Operator's Certificate: a GMDSS radio operator's certificate for use on ships trading only in GMDSS Sea Area A1

R/T

Radio Telephony

S-57 Edition 3

IHO's latest transfer standard for digital hydrographic data for use with ECDIS

SafetyNET

INMARSAT service for promulgating MSI to ships on the high seas; it includes shore-to-ship relays of distress alerts and communications for SAR co-ordination

SAR

Search and Rescue/International Convention on Maritime Search and Rescue, 1979

SART

Search and Rescue Transponder: a portable radar transponder for use in survival craft, which transmits homing signals in the 9 GHz band

SENC

System Electronic Navigational Chart: a database that comprises ENC data, ENC updates and other data added by the mariner that is accessed by, and displayed on, the ECDIS

SES

Ship Earth Station: shipborne satellite communication station, used for exchanging messages with shore subscribers and ships

SMCP

Standard Marine Communication Phrases: an updated version of SMNV that includes phrases that have been developed to cover the most important safety-related fields of verbal communications

SMNV

Standard Marine Navigational Vocabulary: adopted by IMO for communications on board ship as well as for those between ship and shore

SMS

Safety Management System under the ISM Code

SOLAS

International Convention for the Safety of Life at Sea, 1974, as amended

SOPEP

Shipboard Oil Pollution Emergency Plan

STCW

International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended

STCW Code

Seafarers' Training, Certification and Watchkeeping Code, appended to the STCW Convention

TMC

Transmitting Magnetic Compass

UMS

Unmanned Machinery Space

VRM

Variable Range Marker: a radar feature

VTS

Vessel Traffic Services

WEND

World Electronic Navigational Chart Database

WGS84

World Geodetic System 1984 datum

WMO

World Meteorological Organization: Geneva based United Nations intergovernmental body

WWNWS

World-Wide Navigational Warning Service: established by IMO in collaboration with IHO for the dissemination of navigational warnings to ships

WWRNS

World-Wide Radio Navigation System: terrestrial and satellite radio-navigation systems that have been accepted by IMO as capable of providing adequate position information to an unlimited number of ships

XTE

Cross Track Error



1 Bridge organisation

1.1 Overview

General principles of safe manning should be used to establish the levels of manning that are appropriate to any ship.

At all times, ships need to be navigated safely in compliance with the COLREGS and also to ensure that protection of the marine environment is not compromised.

An effective bridge organisation should efficiently manage all the resources that are available to the bridge and promote good communication and teamwork.

The need to maintain a proper look-out should determine the basic composition of the navigational watch. There are, however, a number of circumstances and conditions that could influence at any time the actual watchkeeping arrangements and bridge manning levels.

Effective bridge resource and team management should eliminate the risk that an error on the part of one person could result in a dangerous situation.

The bridge organisation should be properly supported by a clear navigation policy incorporating shipboard operational procedures, in accordance with the ship's safety management system as required by the ISM Code.

1.2 Bridge resource management and the bridge team

1.2.1 Composition of the navigational watch under the STCW Code

In determining that the composition of the navigational watch is adequate to ensure that a proper look-out can be continuously maintained, the master should take into account all relevant factors including the following:

- visibility, state of weather and sea;
- traffic density, and other activities occurring in the area in which the ship is navigating;
- the attention necessary when navigating in or near traffic separation schemes or other routeing measures;
- the additional workload caused by the nature of the ship's functions, immediate operating requirements and anticipated manoeuvres;

- the fitness for duty of any crew members on call who are assigned as members of the watch;
- knowledge of and confidence in the professional competence of the ship's officers and crew;
- the experience of each OOW, and the familiarity of that OOW with the ship's equipment, procedures and manoeuvring capability;
- activities taking place on board the ship at any particular time, including radiocommunication activities, and the availability of assistance to be summoned immediately to the bridge when necessary;
- the operational status of bridge instrumentation and controls, including alarm systems;
- rudder and propeller control and ship manoeuvring characteristics;
- the size of the ship and the field of vision available from the conning position;
- the configuration of the bridge, to the extent such configuration might inhibit a member of the watch from detecting by sight or hearing any external development;
- any other relevant standard, procedure or guidance relating to watchkeeping arrangements and fitness for duty.

1.2.2 Watchkeeping arrangements under the STCW Code

When deciding the composition of the watch on the bridge, which may include appropriately qualified ratings, the following factors, inter alia, must be taken into account:

- the need to ensure that at no time should the bridge be left unattended;
- weather conditions, visibility and whether there is daylight or darkness;
- proximity of navigational hazards which may make it necessary for the OOW to carry out additional duties;
- use and operational condition of navigational aids such as radar or electronic position-indicating devices and any other equipment affecting the safe navigation of the ship;
- whether the ship is fitted with automatic steering;
- whether there are radio duties to be performed;
- unmanned machinery space (UMS) controls, alarms and indicators provided on the bridge, procedures for their use and limitations;
- any unusual demands on the navigational watch that may arise as a result of special operational circumstances.

1.2.3 Reassessing manning levels during the voyage

At any time on passage, it may become appropriate to review the manning levels of a navigational watch.

Changes to the operational status of the bridge equipment, the prevailing weather and traffic conditions, the nature of the waters in which the ship is navigating, fatigue levels and workload on the bridge are among the factors that should be taken into account.

A passage through restricted waters may, for example, necessitate a helmsman for manual steering, and calling the master or a back-up officer to support the bridge team.

1.2.4 Sole look-out

Under the STCW Code, the OOW may be the sole look-out in daylight conditions (see section 3.2.1.1).

If sole look-out watchkeeping is to be practised on any ship, clear guidance should be given in the shipboard operational procedures manual, supported by master's standing orders as appropriate, and covering as a minimum:

- under what circumstances sole look-out watchkeeping can commence;
- how sole look-out watchkeeping should be supported;
- under what circumstances sole look-out watchkeeping must be suspended.

It is also recommended that before commencing sole look-out watchkeeping the master should be satisfied, on each occasion, that:

- the OOW has had sufficient rest prior to commencing watch;
- in the judgement of the OOW, the anticipated workload is well within his capacity to maintain a proper look-out and remain in full control of the prevailing circumstances;
- back-up assistance to the OOW has been clearly designated;
- the OOW knows who will provide that back-up assistance, in what circumstances back-up must be called, and how to call it quickly;
- designated back-up personnel are aware of response times, any limitations on their movements, and are able to hear alarm or communication calls from the bridge;
- all essential equipment and alarms on the bridge are fully functional.

1.2.5 The bridge team

All ship's personnel who have bridge navigational watch duties will be part of the bridge team. The master and pilot(s), as necessary, will support the team, which will comprise the OOW, a helmsman and look-out(s) as required.

The OOW is in charge of the bridge and the bridge team for that watch, until relieved.

It is important that the bridge team works together closely, both within a particular watch and across watches, since decisions made on one watch may have an impact on another watch.

The bridge team also has an important role in maintaining communications with the engine room and other operating areas on the ship.

1.2.6 The bridge team and the master

It should be clearly established in the company's safety management system that the master has the overriding authority and responsibility to make decisions with respect to safety and pollution prevention. The master should not be constrained by a shipowner or charterer from taking any decision which in his professional judgement, is necessary for safe navigation, in particular in severe weather and in heavy seas.

The bridge team should have a clear understanding of the information that should be routinely reported to the master, of the requirements to keep the master fully informed, and of the circumstances under which the master should be called (see bridge checklist B13).

When the master has arrived on the bridge, his decision to take over control of the bridge from the OOW must be clear and unambiguous (see section 3.2.7).

1.2.7 Working within the bridge team

1.2.7.1 Assignment of duties

Duties should be clearly assigned, limited to those duties that can be performed effectively, and clearly prioritised.

Team members should be asked to confirm that they understand the tasks and duties assigned to them.

The positive reporting on events while undertaking tasks and duties is one way of monitoring the performance of bridge team members and detecting any deterioration in watchkeeping performance.

1.2.7.2 Co-ordination and communication

The ability of ship's personnel to co-ordinate activities and communicate effectively with each other is vital during emergency situations. During routine sea passages or port approaches the bridge team personnel must also work as an effective team.

A bridge team which has a plan that is understood and is well briefed, with all members supporting each other, will have good situation awareness. Its members will then be able to anticipate dangerous situations arising and recognise the development of a chain of errors, thus enabling them to take action to break the sequence.

All non-essential activity on the bridge should be avoided.

1.2.8 New personnel and familiarisation

There is a general obligation under the ISM Code and the STCW Convention for ship's personnel new to a particular ship to receive ship specific familiarisation in safety matters.

For those personnel that have a direct involvement in ship operations such as watchkeeping, a reasonable period of time must be allocated for new personnel to become acquainted with the equipment that they will be using and any associated ship procedures. This must be covered in written instructions that the company is required to provide to the master.

A knowledgeable crew member must be assigned to new personnel for one-to-one training in a common language, ideally supported by checklists (see bridge checklist B1). Self-teaching manuals, videos or computer based training programmes, are examples of other methods that could be used on board ship.

1.2.9 Prevention of fatigue

In order to prevent fatigue, the STCW Code stipulates that bridge team members must take mandatory rest periods. Rest periods of at least 10 hours in any 24-hour period are required. If the rest is taken in two separate periods, one of those periods must be at least 6 hours. However, the minimum period of 10 hours may be reduced to not less than 6 consecutive hours provided that any such reduction does not extend beyond two days, and not less than 70 hours rest is provided during each seven-day period. Detailed guidance is available in the ISF publication 'International Shipboard Work Hour Limits'.

The STCW Code also advises governments to prescribe a maximum blood alcohol level of 0.08% for ship's personnel during watchkeeping and to prohibit alcohol consumption within 4 hours prior to commencing a watch. Port states, flag state administrations and companies may have more stringent policies.

1.2.10 Use of English

The STCW Code requires the OOW to have knowledge of written and spoken English that is adequate to understand charts, nautical publications, meteorological information and messages concerning the ship's safety and operations, and adequate to communicate with other ships and coast stations. A handbook on Standard Marine Navigational Vocabulary (SMNV) has been published, and Standard Marine Communication Phrases (SMCP) are being introduced by IMO.

Communications within the bridge team need to be understood. Communications between multilingual team members, and in particular with ratings, should either be in a language that is common to all relevant bridge team members or in English.

When a pilot is on board, the same rule should apply. Further, when a pilot is communicating to parties external to the ship, such as tugs, the ship should request that the pilot always communicate in English or a language that can be understood on the bridge. Alternatively, the pilot should always be asked to explain his communications to the bridge team, so that the ship is aware of the pilot's intentions at all times.

1.2.11 The bridge team and the pilot

When the pilot is on board a ship, he will temporarily join the bridge team and should be supported accordingly (see section 3.3.3).



1.3 Navigation policy and company procedures

Every management or shipowning company should have a safety management policy. It should provide practical guidance concerning safe navigation and include:

- a clear statement that safety of life and safety of the ship take precedence over all other considerations;
- allocation of bridge watchkeeping duties and responsibilities for navigational procedures;
- procedures for voyage planning and execution;
- chart and nautical publication correction procedures;
- procedures to ensure that all essential navigation equipment and main and auxiliary machinery are available and fully operational;
- advice concerning emergency responses;
- ship position reporting procedures;
- accident and near miss reporting procedures;
- recording of voyage events;
- procedures for familiarisation training and handover at crew changes;
- a recognised system for identifying special training needs;
- company contacts, including the designated person under the ISM Code.

1.3.1 Master's standing orders

Shipboard operational procedures manuals supported by standing instructions based upon the company's navigation policy should form the basis of command and control on board.

Master's standing orders should be written to reflect the master's own particular requirements and circumstances particular to the ship, her trade and the experience of the bridge team employed at that point in time.

Standing orders and instructions should operate without conflict within the ship's safety management system.

Standing orders should be read by all officers before the commencement of the voyage and signed accordingly. A copy of the orders should be available on the bridge for reference.

1.3.1.1 Bridge order book

In addition to general standing orders, specific instructions may be needed for special circumstances.

At night the master should write in the bridge order book what is expected of the OOW. These orders must be signed by each OOW when going on watch.

2 Passage planning

2.1 Overview

Passage planning is necessary to support the bridge team and ensure that the ship can be navigated safely between ports from berth to berth. The passage plan should cover ocean, coastal and pilotage waters.

The plan may need to be changed during the voyage; for example, the destination port may not have been known or may alter, or it may be necessary to amend the plan following consultation with the pilot.

If the plan is changed during the voyage, the bridge team on each watch should be consulted and briefed to ensure that the revised plan is understood.

The passage plan should aim to establish the most favourable route while maintaining appropriate margins of safety and safe passing distances offshore. When deciding upon the route, the following factors are amongst those that should be taken into account:

- the marine environment;
- the adequacy and reliability of charted hydrographic data along the route;
- the availability and reliability of navigation aids, coastal marks, lights and radar conspicuous targets for fixing the ship along the route;
- any routing constraints imposed by the ship e.g. draught, type of cargo;
- areas of high traffic density;
- weather forecasts and expected current, tidal, wind, swell and visibility conditions;
- areas where onshore set could occur;
- ship operations that may require additional searoom e.g. tank cleaning or pilot embarkation;
- regulations such as ships' routing schemes and ship reporting systems;
- the reliability of the propulsion and steering systems on board.

The intended voyage should be planned prior to departure using appropriate and available corrected charts and publications. The master should check that the tracks laid down are safe, and the chief engineer should verify that the ship has sufficient fuel, water and lubricants for the intended voyage.

In addition, the duty of the master to exercise professional judgement in the light of changing circumstances remains a basic requirement for safe navigation.

2.2 Responsibility for passage planning

In most deep sea ships it is customary for the master to delegate the initial responsibility for preparing the passage plan to the officer responsible for navigational equipment and publications.



In small ships the master may plan the voyage himself.

While responsibility for the plan in pilotage waters rests with the ship, the pilot on boarding, or before if practicable, should advise the master of any local circumstances so that the plan can be updated (see section 2.6).

2.3 Notes on passage planning

2.3.1 Plan appraisal

Before planning can commence, the charts, publications and other information appropriate for the voyage will need to be gathered together and studied. A passage appraisal checklist is included in this Guide as bridge checklist B5.

2.3.2 Charts and publications

Only official nautical charts and publications should be used for passage planning, and they should be fully corrected to the latest available notices to mariners and radio navigation warnings. Any missing charts and publications needed for the intended voyage should be identified from the chart catalogue and obtained before the ship sails (see sections 4.9.2 and 4.9.3).

For coastal and pilotage planning and for plotting each course alteration point (or waypoint) large scale charts should be used. For ocean passage planning and open water legs smaller scale charts should be used.

2.3.3 The route plan

The route plan should incorporate the following details:

- planned track showing the true course of each leg;
- leg distances;
- any speed changes required en route;
- wheel over positions for each course alteration, where appropriate;
- turn radius for each course alteration, where appropriate;
- maximum allowable off-track margins for each leg.

At any time during the voyage, the ship may need to leave the planned route temporarily at short notice. Marking on the chart relatively shallow waters and minimum clearing distances in critical sea areas is but one technique which will assist the OOW when having to decide quickly to what extent to deviate without jeopardising safety and the marine environment. However, in using this technique, care should be taken not to obscure chart features. On paper charts, only pencil should be used.

The route plan should also take into account the need to monitor the ship's position along the route, identify contingency actions at waypoints, and allow for collision avoidance in line with the COLREGS.

The main details of the route plan should be recorded using sketches, if appropriate, so that the plan can be readily referred to at the main conning position.

2.3.4 Passage planning and electronic navigation systems

2.3.4.1 Planning using electronic chart display systems

Passage planning can be undertaken either on paper charts or using an electronic chart display and information system (ECDIS) displaying electronic navigational charts (ENC), subject to the approval of the flag state administration. Raster chart display systems (RCDS) displaying raster navigational charts (RNC) can be used for passage planning in conjunction with paper charts (see section 4.9).

When passage planning using ECDIS, the navigating officer should be aware that a safety contour can be established around the ship. The crossing of a safety contour, by attempting to enter water which is too shallow or attempting to cross the boundary of a prohibited or specially defined area such as a traffic separation zone, will be automatically indicated by the ECDIS while the route is both being planned and executed.

When passage planning using a combination of electronic and paper charts, particular care needs to be taken at transition points between areas of electronic and paper chart coverage. The voyage involves distinct pilotage, coastal and ocean water phases. Planning within any one phase of the voyage should be undertaken using either all electronic or all paper charts rather than a mix of chart types.

Where a passage is planned using paper charts, care should be taken when transferring the details of the plan to an electronic chart display system. In particular, the navigating officer should ensure that:

- positions are transferred to, and are verified on, electronic charts of an equivalent scale to that of the paper chart on which the position was originally plotted;
- any known difference in chart datum between that used by the paper chart and that used by the electronic chart display system is applied to the transferred positions;
- the complete passage plan as displayed on the electronic chart display system is checked for accuracy and completeness before it is used.

2.3.4.2 Transferring route plans to other navigation aids

Care must be taken when transferring route plans to electronic navigation aids such as GPS, since the ship's position that is computed by the navaid is likely to be in WGS84 datum. Route plans sent to the GPS for monitoring cross track errors must therefore be of the same datum.

Similarly in the case of radars, routes and maps displayed on the radar will be referenced to the position of the ship. Care must therefore be taken to ensure that maps and plans transferred to, or prepared on, the radar are created in the same datum as the navaid (typically a GPS) which is connected to, and transmitting positions to, the radar.

2.4 Notes on passage planning in ocean waters

In open waters, the route selected will be either a great circle, composite great circle or rhumb line route.

When planning ocean passages, the following should be consulted:

- small scale ocean planning and routing charts providing information on ocean currents, winds, ice limits etc.;
- gnomonic projection ocean charts for plotting great circle routes;
- the load line zone chart to ensure that the Load Line (LL) Rules are complied with;
- charts showing any relevant ships' routing schemes.

Anticipated meteorological conditions may have an impact on the ocean route that is selected. For example:

- favourable ocean currents may offer improved overall passage speeds offsetting any extra distance travelled;
- ice or poor visibility may limit northerly or southerly advance;
- the presence of seasonal tropical storm activity may call for certain waters to be avoided and an allowance made for searoom.

Details of weather routing services for ships are contained in lists of radio signals and in Volume D of the World Meteorological Organization (WMO) Publication No. 9. Long-range weather warnings are broadcast on the SafetyNET Service along with NAVAREA navigational warnings as part of the World-Wide Navigational Warning Service (WWNWS).

Landfall targets need to be considered and identified as to their likely radar and visual ranges and, in respect of lights, their rising and dipping ranges and arcs/colours of sectorised lights.

2.5 Notes on passage planning in coastal or restricted waters

By comparison with open waters, margins of safety in coastal or restricted waters can be critical, as the time available to take corrective action is likely to be limited.

The manoeuvring characteristics of the ship and any limitations or peculiarities that the ship may have, including reliability problems with its propulsion and steering systems, may influence the route selected through coastal waters. In shallow water, particularly if the ship is operated at speed, ship squat can reduce underkeel clearances.

Ships' routing schemes and reporting systems along the route, as well as vessel traffic services, should be taken into account (see sections 2.7, 2.8 and 2.9).

Coastal weather bulletins, including gale warnings and coastal navigational warnings broadcast by coast radio stations and NAVTEX, may require changes to be made to the route plan.

2.5.1 Monitoring the route plan

It is important that when a route is planned through coastal or restricted waters, due consideration is given to ensuring that the progress of the ship can be effectively monitored.

Of particular importance is the need to monitor the position of the ship approaching the wheel over position at the end of a track, and checking that the ship is safely on the new track after the alteration of course.

Distinctive chart features should be used for monitoring the ship's position visually, by radar and by echo sounder, and therefore need to be an integral part of the route plan.

2.5.1.1 Visual monitoring techniques

Ahead, transits can provide a leading line along which a ship can safely steer. Abeam, transits provide a ready check for use when altering course. At anchor, several transits can be used to monitor the ship's position.

Bearing lines can also be effectively used. A head mark, or a bearing line of a conspicuous object lying ahead on the track line, can be used to steer the ship, while clearing bearings can be used to check that a ship is remaining within a safe area.

2.5.1.2 Radar monitoring techniques

When radar conspicuous targets are available, effective use can be made of radar clearing bearings and ranges.

Ships with good arthwartship track control can use clearing bearings to monitor the advance of a ship towards a wheel over position, while parallel indexing can be used to check that the ship is maintaining track and not drifting to port or starboard. For details on radar and navigation, refer to section 4.2.3 of this Guide.

2.6 Passage planning and pilotage

2.6.1 Pre-arrival planning

A preliminary plan should be prepared covering pilotage waters and the roles of the bridge team personnel.

A plan should still be prepared even if the master of the ship has a Pilotage Exemption Certificate for the port.

Planning for anchoring off the port or aborting port entry in the event of problems arising should feature as part of the plan. The plan should also identify charted features that will assist monitoring progress and include contingency measures in the event of primary equipment failure, poor visibility etc.

The Pilot Card should also be updated. The Card contains information on draught and ship's speed that is liable to change as the loading condition of the ship changes, as well as a checklist of equipment available and working (see annex A3).

2.6.2 Pre-arrival information exchange with the pilot

Particularly where the master has limited local knowledge of the pilotage waters, it is recommended that a pre-arrival exchange of information take place with the pilot before boarding.

An information exchange initiated by the ship approximately 24 hours before the pilot's ETA will allow sufficient time for more detailed planning to take place both on the ship and ashore. The exchange will also allow communications between the ship and the pilot to be firmly established before embarkation.

Ship to Shore Master/Pilot Exchange and Shore to Ship Pilot/Master Exchange forms can be used for this purpose (see annexes A1 and A2).

These forms are intended only to provide a basis; the exact detail of the forms can vary from ship to ship, trade to trade, or indeed from port to port. It is nevertheless recommended to keep preliminary information exchange to a minimum, and limit the information to that which is strictly necessary to assist in planning the pilotage. If appropriate, the Shore to Ship Pilot/Master Exchange form can be supported by a graphical route plan.

In certain pilotage areas, the passage can last for several hours, in which time circumstances can alter significantly necessitating changes to the plan. The preferred way of working within any pilotage area can also vary between pilots.

Detailed exchanges can take place when the pilot arrives on board, as indeed can discussions on berthing.

2.6.3 Pilot on board

The pilotage passage plan will need to be discussed with the pilot as soon as he comes on board. Any amendments to the plan should be agreed, and any consequential changes in individual bridge team responsibilities made, before pilotage commences.

Where pre-arrival exchange has not taken place extra time and sea room may need to be allowed before pilotage commences in order to discuss the plan fully (see section 3.3.3.3).

The pilot should be handed the Pilot Card and shown the Wheelhouse Poster (see annex A4). The Wheelhouse Poster provides a summary of ship manoeuvring information. A manoeuvring booklet containing more detailed information may also be available on the bridge.

2.6.4 Preparing the outward bound pilotage plan

After berthing and before the pilot departs the ship, the opportunity should be taken to discuss the outward bound pilotage passage plan with the pilot, bearing in mind that the precise way of working within any pilotage area can vary between pilots.

2.7 Passage planning and ships' routing

Ships' routing measures have been introduced in a number of coastal waters to:

- reduce the risk of collision between ships in areas of high traffic densities;
- keep shipping away from environmentally sensitive sea areas;
- reduce the risk of grounding in shallow waters.

The use of ships' routing measures should form part of the passage plan.

Ships' routing measures can be adopted internationally by IMO. Such schemes are recommended for use by, and may be made mandatory for, all ships, certain categories of ships or ships carrying certain cargoes. Mandatory ships' routing schemes should always be used unless the ship has compelling safety reasons for not following them.

IMO routing schemes will be shown on charts with a note of any pertinent provisions as to their use. Fuller details may be described in Sailing Directions. The IMO publications Ships' Routing and Amendments to Ships' Routing contain full descriptions of each scheme and any rules applying, but this publication is produced primarily for the benefit of administrations. It is not kept up to date as regularly as nautical publications, which should always be consulted for the latest information.

Elements used in routing systems include:

- traffic separation scheme - a routing measure aimed at the separation of opposing streams of traffic by establishing traffic lanes;
- traffic lane - areas within defined limits in which one-way traffic flows are established;
- separation zone or line - a means to separate traffic lanes in which ships are proceeding in opposite or nearly opposite directions in order to separate traffic lanes from adjacent sea areas or to separate different traffic lanes;
- roundabout - a separation point or circular zone and a circular traffic lane within defined limits;
- inshore traffic zone - a designated sea area between the landward boundary of a traffic separation scheme and an adjacent coast;
- recommended route - a route of undefined width, for the convenience of ships in transit, which is often marked by centreline buoys;
- deep water route - a route which has been accurately surveyed for clearance of sea bottom and submerged articles;
- archipelagic sea lane - sea lanes designated for the continuous and expeditious passage of ships through archipelagic waters;
- precautionary area - an area where ships must navigate with particular caution and within which the direction of flow of traffic may be recommended;
- area to be avoided - an area in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all ships, or by certain classes of ships.

2.8 Passage planning and ship reporting systems

Ship reporting has been introduced by a number of coastal states so that they can keep track, via radio, radar or transponder, of ships passing through their coastal waters. Ship reporting systems are therefore used to gather or exchange information about ships, such as their position, course, speed and cargo. In addition to monitoring passing traffic, the information may be used for purposes of search and rescue and prevention of marine pollution.

The use of ship reporting systems should form a part of the passage plan.

Ship reporting systems can be adopted internationally by IMO. Such systems will be required to be used by all ships or certain categories of ships or ships carrying certain cargoes.

The master of a ship should comply with the requirements of ship reporting systems and report to the appropriate authority all information that is required. A report may be required upon leaving as well as on entering the area of the system, and additional reports or information may be required to update earlier reports.

Ship reporting requirements may be referred to on charts and in sailing directions, but lists of radio signals provide full details. Details of IMO adopted systems are contained in Part G of the IMO publication Ships' Routeing updated by the 1996 Amendments to Ships' Routeing.

2.9 Passage planning and vessel traffic services

Vessel traffic services (VTS) have been introduced, particularly in ports and their approaches, to monitor ship compliance with local regulations and to optimise traffic management. VTS may only be mandatory within the territorial seas of a coastal state.

VTS requirements on ships should form part of the passage plan. This should include references to the specific radio frequencies that must be monitored by the ship for navigational or other warnings, and advice on when to proceed in areas where traffic flow is regulated.

VTS reporting requirements may be marked on charts but fuller details will be found in sailing directions and lists of radio signals.

3 Duties of the officer of the watch (OOW)

3.1 Overview

3.1.1 Master's representative

Under the STCW Code, the OOW is the master's representative and is primarily responsible at all times for the safe navigation of the ship and for complying with the COLREGS.

As the master's representative, the OOW is in charge of the bridge and therefore in charge of the bridge team for that watch, until properly relieved. In compliance with shipboard operational procedures and master's standing orders, the OOW should ensure that bridge watch manning levels are at all times safe for the prevailing circumstances and conditions.

3.1.2 Primary duties

In order to maintain a safe navigational watch, the primary duties of the OOW will involve watchkeeping, navigation and GMDSS radio watchkeeping.

3.1.2.1 Watchkeeping

The watchkeeping duties of the OOW include maintaining a lookout and general surveillance of the ship, collision avoidance in compliance with the COLREGS, recording bridge activities and making periodic checks on the navigational equipment in use. Procedures for handing over the watch and calling for support on the bridge should be in place and understood by the OOW.

3.1.2.2 Navigation

The navigational duties of the OOW are based upon the need to execute the passage plan safely, and monitor the progress of the ship against that plan.

3.1.2.3 Radiocommunications

With the introduction of the Global Maritime Distress and Safety System (GMDSS) radiocommunications have now become an important element in the functions of the OOW, who will be responsible for maintaining a continuous radio watch at sea. During distress incidents, one of the qualified radio personnel should be designated to have primary responsibility for radiocommunications. On passenger ships that person can have no other duties during a distress situation.

3.1.3 In support of primary duties

3.1.3.1 Controlling the speed and direction of the ship

The OOW will need to be conversant with the means and best practices of controlling the speed and direction of the ship, handling characteristics and

stopping distances. The OOW should not hesitate to use helm, engines or sound signalling apparatus at any time.

3.1.3.2 Pollution prevention, reporting and emergency situations

The OOW also needs to be fully conversant with shipboard obligations with regard to pollution prevention, reporting and emergency situations. The OOW should know the location of all the safety equipment on the bridge and how to operate that equipment.

3.1.4 Additional duties

There may also be a number of additional duties for the OOW to undertake while on watch. General communications, cargo monitoring, the monitoring and control of machinery and the supervision and control of ship safety systems are typical examples.

Additional duties should under no circumstances interfere with the exercise of primary duties.

3.1.5 Bridge attendance

The OOW should not leave the bridge unattended. However, in a ship with a separate chartroom the OOW may visit that room for short periods of time to carry out necessary navigational duties after first ensuring that it is safe to do so.

3.2 Watchkeeping

3.2.1 Maintaining a look-out

In compliance with the COLREGS, a proper look-out must be maintained at all times to serve the purposes of:

- maintaining a continuous state of vigilance by sight and hearing as well as by all other available means, with regard to any significant change in the operating environment;
- fully appraising the situation and the risk of collision, stranding and other dangers to navigation;
- detecting ships or aircraft in distress, shipwrecked persons, wrecks, debris and other hazards to safe navigation.

Full attention to look-out duties must be given by the bridge team on watch. A helmsman while steering, except in small ships with an unobstructed all-round view at the steering position, should not be considered to be the look-out.

On ships with fully enclosed bridges, sound reception equipment will need to be in operation continuously and correctly adjusted to ensure that all audible sounds on the open deck can be clearly heard on the bridge.

3.2.1.1 Sole look-out

Under the STCW Code, the OOW may be the sole look-out in daylight provided that on each such occasion:

- the situation has been carefully assessed and it has been established without doubt that it is safe to operate with a sole look-out;
- full account has been taken of all relevant factors, including, but not limited to:
 - state of weather
 - visibility
 - traffic density
 - proximity of dangers to navigation
 - the attention necessary when navigating in or near traffic separation schemes;
- assistance is immediately available to be summoned to the bridge when any change in the situation so requires.

If sole look-out watchkeeping practices are to be followed, clear guidance on how they should operate will need to be given in the shipboard operational procedures manual (see section 1.2.4).

3.2.2 General surveillance

The OOW needs to maintain a high level of general awareness about the ship and its day-to-day operations.

This may include maintaining a general watch over the ship's decks to monitor, where possible, people working on deck, and any cargo or cargo handling equipment. Special watchkeeping arrangements may be appropriate in waters where there is thought to be a risk of piracy or armed attack.

Whenever work is being carried out on deck in the vicinity of radar antennae, radio aerials and sound signalling apparatus, the OOW should be particularly observant and should post appropriate warning notices on the equipment controls.

3.2.3 Watchkeeping and the COLREGS

3.2.3.1 Lights, shapes and sound signals

The OOW must always comply with the COLREGS. Compliance not only concerns the conduct of vessels under the steering and sailing rules, but displaying the correct lights and shapes and making the correct sound and light signals.

A vessel drifting off a port with her engines deliberately shut down is not, for example, a 'vessel not under command' as defined by rule 3(f) of the COLREGS.

Caution should always be observed when approaching other vessels. Vessels may not be displaying their correct light or shape signals, or indeed their signals

could be badly positioned and obscured by the ship's structure when approached from certain directions. In sea areas where traffic flow is regulated, such as port approaches and traffic separation schemes, it may be possible to anticipate movements from certain ship types. In these circumstances it is prudent to allow extra searoom, as long as it is safe to do so.

3.2.3.2 Collision avoidance action

In general, early and positive action should always be taken when avoiding collisions, and once action has been taken, the OOW should always check to make sure that the action taken is having the desired effect.

VHP radio should not be used for collision avoidance purposes. Valuable time can be wasted attempting to make contact, since positive identification may be difficult, and once contact has been made misunderstandings may arise.

3.2.3.3 Collision avoidance detection

In clear weather, the risk of collision can be detected early by taking frequent compass bearings of an approaching vessel to ascertain whether or not the bearing is steady and the vessel is on a collision course. Care however must be taken when approaching very large ships, ships under tow or ships at close range. An appreciable bearing change may be evident under these circumstances but in fact a risk of collision may still remain.

In restricted visibility, conduct of vessels is specifically covered by the COLREGS. In these conditions, radar and in particular electronic radar plotting can be effectively used for assessing risk of collision. The OOW should take the opportunity to carry out radar practice in clear visibility, whenever it is possible.

For details concerning the use of radar for collision avoidance, refer to section 4.2.2 of this Guide.

3.2.4 Recording bridge activities

It is important that a proper, formal record of navigational activities and incidents, which are of importance to safety of navigation, is kept in appropriate logbooks.

Paper records from course recorders, echo sounders, NAVTEX receivers etc. should also be retained at least for the duration of the voyage, suitably date and time marked if practicable.

In order to allow the ship's actual track to be reconstructed at a later stage, sufficient information concerning position, course and speed should be recorded in the bridge logbook or using approved electronic means. All positions marked on the navigational charts also need to be retained until the end of the voyage.

3.2.5 Periodic checks on navigational equipment

3.2.5.1 Operational checks

Operational checks on navigational equipment should be undertaken when preparing for sea (see bridge checklist B2) and prior to port entry (see bridge checklist B3).

After lengthy ocean passages and before entering restricted coastal waters, it is important also to check that full engine and steering manoeuvrability is available.

3.2.5.2 Routine tests and checks

The OOW should undertake daily tests and checks on the bridge equipment, including the following:

- manual steering should be tested at least once a watch when the automatic pilot is in use (see annex A7);
- gyro and magnetic compass errors should be checked once a watch, where possible, and after any major course alteration;
- compass repeaters should be synchronised, including repeaters mounted off the bridge, such as in the engine control room and at the emergency steering position.

3.2.5.3 Checks on electronic equipment

Checks on electronic equipment should both confirm that the piece of equipment is functioning properly and that it is successfully communicating to any bridge system to which it is connected.

Built-in test facilities provide a useful health check on the functional state of the piece of equipment and should be used frequently.

Electronic equipment systems should be checked to ensure that configuration settings - important for correct interfacing between pieces of equipment - have not changed.

To ensure adequate performance, information from electronic equipment should always be compared and verified against information from different independent sources.

3.2.5.4 Checking orders

Good practice also requires the OOW to check that orders are being correctly followed. Rudder angle and engine rpm indicators, for example, provide the OOW with an immediate check on whether helm and engine movement orders are being followed.

3.2.6 Changing over the watch (see bridge checklist B12)

The OOW should not hand over the watch if there is any reason to believe that the relieving officer is unfit to, or is temporarily unable to, carry out his duties effectively. If in any doubt, the OOW should call the master.

Illness or the effect of drink, drugs or fatigue could be reasons why the relieving officer is unfit for duty.

Before taking over the watch, the relieving officer must be satisfied as to the ship's position and confirm its intended track, course and speed, and engine controls as appropriate, as well as noting any dangers to navigation expected to be encountered during his watch.

The relieving officer should also be satisfied that all other members of the bridge team for the new watch are fit for duty, particularly as regards their adjustment to night vision.

If a manoeuvre or other action to avoid a hazard is taking place at the moment the OOW is being relieved, handover should be deferred until such action has been completed.

3.2.7 Calling the master

The OOW should notify the master, in accordance with standing orders or special instructions, when in any doubt as to what action to take in the interests of safety.

Guidance on specific circumstances for calling the master or other back-up support should be given in the shipboard operational procedures, supported by standing and bridge orders, as appropriate. Situations where the master should always be called are listed in bridge checklist B13.

The OOW will continue to be responsible for the watch, despite the presence of the master on the bridge, until informed specifically that the master has assumed that responsibility, and this is mutually understood. The fact that the master has taken command on the bridge should be recorded in the log book.

3.3 Navigation

3.3.1 General principles

It is important that the OOW executes the passage plan as prepared and monitors the progress of the ship relative to that plan.

3.3.1.1 Deviating from or leaving the passage plan

If the OOW has to make a temporary deviation from the passage plan for any reason, the OOW should return to the plan as soon as it is safe to do so.

If the OOW has to leave the passage plan - a reporting of ice may, for example, require an alteration of course - the OOW should prepare and proceed along a new temporary track clear of any danger. At the first opportunity, the OOW should advise the master of the actions taken. The plan will need to be formally amended and a briefing made to the other members of the bridge team.

3.3.1.2 Monitoring the progress of the ship

Good navigational practice demands that the OOW:

- understands the capabilities and limitations of the navigational aids and systems being used and continually monitors their performance;
- uses the echo sounder to monitor changes in water depth;
- uses dead reckoning techniques to check position fixes;

- cross checks position fixes using independent sources of information: this is particularly important when electronic position-fixing systems such as GPS or Loran-C are used as the primary means of fixing the position of the ship;
- uses visual navigation aids to support electronic position-fixing methods i.e. landmarks in coastal areas and celestial navigation in open waters;
- does not become over reliant on automated navigational equipment, including electronic chart systems, thereby failing to make proper navigational use of visual information.

3.3.1.3 Plotting positions from electronic position-fixing systems

Care should also be exercised when taking geographical positions from electronic position-fixing systems like GPS, and plotting these onto charts (see section 4.7.3.3).

The OOW should bear in mind that:

- if the chart datum differs from the datum (usually WGS84) used by the electronic position-fixing system, a datum shift will have to be applied to the position co-ordinates before they are plotted on the chart: it should be noted that where an appreciable datum shift does exist for a particular chart, a 'satellite-derived position' note providing latitude and longitude datum shift values will appear on the chart;
- on charts whose survey source data is very old, the accuracy of those charts may be poor in certain areas: under these circumstances the OOW should not rely totally on position fixing using electronic systems, and should where possible use visual and radar navigational techniques to maintain safe distances off the land.

3.3.2 Navigation in coastal or restricted waters (see bridge checklist B6)

This section should be read in conjunction with section 2.5 - Notes on passage planning in coastal or restricted waters.

As a general rule, navigation should be carried out on the most suitable large-scale charts on board, and the position of the ship should be fixed at frequent intervals. All relevant navigation marks should be positively identified by the OOW before they are used. Visual and radar position fixing and monitoring techniques should be used whenever possible.

In coastal waters, the OOW should be aware that ships' routing schemes (see section 2.7) and ship reporting systems requiring reports to be made to coast radio and vessel traffic stations (see sections 2.8 and 2.9) may exist.

Knowledge of the ship's draught, stability conditions and manoeuvring characteristics is also important. As the ship enters shallow water, squat may have a critical effect on the manoeuvrability of the ship and cause an increase in draught. Squat effect varies in proportion to the square of the ship's speed, and will therefore reduce as speed is reduced.

The importance of all the bridge team fully understanding the coastal waters phase of the passage plan, as well as understanding their individual roles and those of their colleagues, cannot be stressed too strongly.

3.3.3 Navigation with a pilot on board

This section should be read in conjunction with section 2.6 - Passage planning and pilotage.

3.3.3.1 Responsibilities

Once the pilot has embarked and has arrived on the bridge, the pilot will join the bridge team. The pilot has a specialised knowledge of navigation in local waters. Depending on local pilotage laws the master may delegate the conduct of the ship to the pilot who directs the navigation of the ship in close co-operation with the master and/or the OOW. It is important that the responsibilities of the pilot and the master are agreed and clearly understood.

The presence of a pilot does not relieve the master or the OOW of their duties and obligations for the safety of the ship. Both should be prepared to exercise their right not to proceed to a point where the ship would not be able to manoeuvre, or would be in any danger.

3.3.3.2 Pilot embarkation/disembarkation

For information on pilot boarding arrangements refer to annex A5.

3.3.3.3 Master/pilot information exchange on boarding (see bridge checklist B4)

The preliminary pilotage passage plan prepared in advance by the ship should be immediately discussed and agreed with the pilot after boarding. There should be sufficient time and sea room to allow this to happen safely.

Where lack of time or searoom does not allow the plan to be discussed fully, the bare essentials should be covered immediately and the rest of the discussion held as soon as it is safe to do so.

Indeed, on a long pilotage passage, it may be appropriate to review and update the plan in stages.

3.3.3.4 Monitoring the pilotage

The safe progress of the ship along the planned tracks should be closely monitored at all times. This will include regularly fixing the position of the ship, particularly after each course alteration, and monitoring underkeel clearance.

Verbal orders from the pilot also need to be checked to confirm that they have been correctly carried out. This will include monitoring both the rudder angle and rpm indicators when helm and engine orders are given.

It is recommended that communication between the pilot and the bridge team is conducted in the English language (see section 1.2.10).

If the master leaves the bridge, the OOW should always seek clarification from the pilot when in any doubt as to the pilot's actions or intentions. If a satisfactory explanation is not given, the OOW should notify the master immediately, taking whatever action is necessary before the master arrives. Whenever there is any disagreement with decisions of the pilot, the cause of concern should always be made clear to the pilot and an explanation sought.

The OOW should bear in mind that during pilotage, the ship will need to be properly secured for sea. Excessive use of deck lighting at night may cause visibility interference.

3.3.4 At anchor (see bridge checklist B8)

On anchoring, a fix on the anchor drop position should be made and the ship's swinging circle ascertained, based upon the length of cable in use. Landmarks and transits should be selected for ease of monitoring the position of the ship as it lies at anchor and appropriate light and shape signals should be exhibited according to the COLREGS and any local regulations.

While at anchor, the OOW should maintain a check on the ship's position to monitor that the ship does not drag its anchor or move too close to any other anchored ship.

A proper look-out must be maintained and ship inspection rounds periodically made, particularly if the ship is anchored in waters which might present a risk of attack by pirates or armed robbers.

The master should be immediately notified if the ship drags her anchor, and if sea conditions or visibility deteriorate.

3.4 Controlling the speed and direction of the ship

3.4.1 Use of the engines

In order not to jeopardise the safety of the ship, the OOW should not hesitate to use the engines to change speed on passage if the situation so requires.

Whenever possible, timely notice of intended changes to engine speed should be given to the engine room. If the ship is fitted with UMS engine controls, direct control of the engines will be possible from the bridge.

3.4.1.1 Safe speed

In compliance with the COLREGS, ships should at all times proceed at a safe speed. In restricted visibility safe speed may require a reduction in service speed to reduce the stopping distance of the ship. Near ice, ships are specifically required to proceed at moderate speeds. Speed changes may be required to avoid a collision in circumstances where the ship is unable to alter course.

3.4.1.2 Control, and different engine types

To control the main engines effectively, the OOW should be familiar with their operation from the bridge, as well as the operation of the propeller mechanism. The OOW should also be aware of any limitations the system may have, and appreciate that the type and configuration of the ship's engines could have implications when changing speed. Direct-drive diesel, diesel through gearbox/clutch, turbo-electric and gas turbine engines all have relatively quick responses to change, provided the engines are on stand-by. Geared turbines are less responsive.

3.4.2 Steering control

Steering control of the ship will comprise manual steering, probably supplemented by an automatic pilot (autopilot) or other track control system.

In areas of high traffic density, in conditions of restricted visibility and in all other potentially hazardous situations a helmsman should be available on the bridge, ready at all times to take over steering control immediately.

When steering the ship under autopilot, it is highly dangerous to allow a situation to develop to a point where the OOW is without assistance and has to break the continuity of the look-out in order to take emergency action and engage manual steering.

Changing between automatic and manual steering should always be made in good time under the supervision of the OOW. Manual steering should be tested after prolonged use of the autopilot (see annex A7).

3.4.2.1 Use of override controls

Manual steering override controls can be used on those occasions when the autopilot is engaged and the OOW needs to take immediate and direct control of the steering.

Override controls typically have a non follow-up type of operation and are likely to differ from the main steering control position where follow-up control is usual.

The OOW needs to be familiar with the operation of the steering control systems on the bridge, as well as the method of control at the emergency steering position.

3.4.2.2 Manoeuvring data

Ship's manoeuvring data is contained on the Pilot Card and Wheelhouse Poster (see annexes A3 and A4). Some ships also have a manoeuvring booklet. The OOW needs to be familiar with this data.

It is important not only to record on the Pilot Card the ship's draught, but also any permanent or temporary ship idiosyncrasies that could affect the manoeuvrability of the ship. A ship may, for example, have a tendency to steer to port at full speed, but steer to starboard at slow speed.

3.5 Radiocommunications

3.5.1 General

The following basic principles apply to all communication carried out by radio:

- absolute priority should be given to distress, urgency and safety communications;
- interference with other radio users should be avoided;
- frequencies should be used for their correct purpose.

The ITU publication Manual for Use by the Maritime Mobile and Maritime Mobile-Satellite Services contains relevant extracts from the ITU Radio Regulations, setting out the correct procedures to be followed.

3.5.2 Safety watchkeeping on GMDSS ships

The OOW should normally be in possession of a General Operator's Certificate (GOC). For ships operating only in GMDSS Area A1 a Restricted Operator's Certificate (ROC) is sufficient. The OOW will be responsible for ensuring compliance with the radio watchkeeping requirements of SOLAS, the ITU Radio Regulations and any local watchkeeping rules.

3.5.2.1 VHP watchkeeping

The VHP watchkeeping range is 20 to 30 nautical miles, depending upon antenna height. All ships must keep a continuous watch on:

- DSC Channel 70 (1 56.525 MHz;)
- Channel 16 (1 56.8 MHz) when practicable;
- Channel 13 (156.650 MHz) when practicable.

3.5.2.2 MF (300 - 3000 kHz) watchkeeping

Medium frequency (MF) broadcasts will typically have a R/T range of between 1 50 and 250 nautical miles by day and a DSC range of 600 to 700 nautical miles. Reception range will be greater at night. Ships must keep a continuous watch on:

- the NAVTEX frequency 518 kHz, when in an area where the service is provided;
- the DSC frequency 2187.5 kHz;
- the R/T distress frequency 2182 kHz by means of a bridge watch receiver (until 1 February 1999.)

3.5.2.3 HF (3000 kHz - 30 MHz) watchkeeping

High frequency (HF) broadcasts have an unlimited range. Ships fitted with HF must keep a continuous watch on:

- the DSC distress frequency 8414.5 kHz;
- at least one of the frequencies 4207.5, 6312, 12577, 16804.5 kHz, as appropriate to the time of day and the position of the ship.

3.5.2.4 Satellite watchkeeping

Ships fitted with a ship earth station (SES) must keep a continuous watch on the satellite appropriate to the ship's position. The range of satellite broadcasts is unlimited (except polar regions).

3.5.2.5 Maritime safety information

Maritime safety information (MSI) is defined as navigational and meteorological warnings, meteorological forecasts and other urgent safety related messages broadcast to ships.

A continuous MSI watch should be kept at sea at all times by all ships. The NAVTEX receiver meets this requirement while the ship is within a NAVTEX coverage area. Beyond such coverage, watchkeeping should be undertaken using the appropriate MF, HF or satellite frequencies on which MSI is broadcast.

3.5.3 Log keeping

A radio log must be maintained containing up to date records of all incidents connected with radiocommunications that appear to be of importance to the safety of life at sea. In particular, the following are normally required:

- a summary of communications relating to distress, urgency and safety traffic;
- a reference to important radio service incidents;
- the position of the ship at least once per day.

The log should contain the identities of other stations with which the ship communicates or attempts to communicate, and records of any difficulties experienced owing to congestion, interference, atmospheric noise or ionospheric disturbances.

Incidents involving obscene language or unnecessary transmissions should be recorded with the identities of the stations concerned, if known. This is particularly relevant to VHF Channel 16.

3.5.4 Testing of equipment and false alerts

Radio equipment should be tested at the intervals stated by the manufacturer and in accordance with flag state requirements. Great care should be taken to avoid the transmission of false alerts when testing equipment.

3.5.4.1 Cancellation of false alerts

If a distress alert is inadvertently transmitted by either VHF, MF or HF DSC:

- the equipment must be reset immediately;
- as appropriate the equipment should be:
 - set to VHF Channel 16, or
 - tuned for R/T on MF 2182 kHz, or
 - tuned for FvT on the HF distress and safety frequency in each band in which the false alert was transmitted;
- a broadcast message to 'all stations' must be transmitted, cancelling the false alert.

If a distress alert is inadvertently transmitted by an SES the appropriate rescue co-ordination centre (RCC) should be notified that the alert is cancelled by sending a distress priority message by way of the same coast earth station (CES) through which the false distress alert was sent.

If a distress alert is inadvertently transmitted by an EPIRB the appropriate RCC should be contacted through a shore station and the distress alert should be cancelled.

3.6 Pollution prevention

The OOW should be aware of the serious effects of operational and accidental pollution of the marine environment and should be familiar with MARPOL and the ship's Shipboard Oil Pollution Emergency Plan (SOPEP).

3.6.1 Reporting obligations

All ships should make a report to the relevant authorities when an incident involving another ship is observed or an incident on their own ship involves:

- a discharge or probable discharge of oil or of noxious liquid substances above the permitted level for whatever reason, including securing the safety of the ship or saving life; or
- a discharge or probable discharge of harmful substances in packaged form, including those in containers, portable tanks, vehicles and barges; or
- a discharge during the operation of the ship of oil or noxious liquid substances in excess of that which is allowed.

A report is also required if the ship suffers damage, failure or a breakdown that affects the safety of the ship or impairs safe navigation, and results in a discharge or probable discharge into the sea of a harmful substance. However, reports are not required simply because there has been a breakdown or failure of machinery or equipment.

3.6.1.1 Reporting points

The SOPEP should include as an appendix the list of agencies or officials of administrations designated to receive and process reports from ships.

In the absence of a local agency or if there is any delay in contacting a listed reporting point the nearest coastal radio station, designated ship movement reporting station or RCC should be contacted by the fastest available means.

3.7 Emergency situations

3.7.1 General

The OOW should be fully conversant with the emergency checklists contained in Part C of this Guide and should know what initial action to take in response to emergency situations.

A collision (see emergency checklist C2) or grounding (see emergency checklist C3) or a man overboard (see emergency checklist C4) are examples of situations that will require immediate action from the OOW before the master arrives on the bridge.

SOLAS requires emergency training, drills and mustering exercises to be carried out. These drills will involve the OOW on those ships where the bridge is the designated emergency control station. The OOW should be fully conversant with

the general emergency alarm signals, the actions to be taken on hearing or instigating an alarm and the ship's emergency plans.

An illustrated table describing the ship's life saving appliances should also be kept on the bridge. Ships or persons in distress should use the prescribed signals when communicating with life-saving stations, maritime rescue units and aircraft engaged in search and rescue operations.

3.7.2 Reporting

The OOW should be aware that ships have an obligation under SOLAS to broadcast danger messages to ships in the area and the nearest coast station notifying the following conditions:

- dangerous ice;
- a dangerous derelict or any other direct danger to navigation;
- a tropical storm;
- sub-freezing air temperatures associated with gale force winds causing severe ice accretion on superstructures;
- winds of force 10 or above on the Beaufort scale for which no storm warning has been received.

The safety signal should be used when announcing danger messages (see section 4.10.3.3).

3.7.3 Search and rescue (see emergency checklist C7)

The OOW should be aware that ships have search and rescue (SAR) obligations under SOLAS.

Ships that are in a position to provide assistance, on receiving a signal from any source that persons are in distress at sea, are bound to proceed with all speed to their assistance. Ships can also be requisitioned to provide assistance.

During SAR operations, ship-to-ship communication should be by VHP or MR Satellite channels should be kept free for communications with rescue co-ordination centres.

Guidance on search and rescue activity can be found in the MERSAR/IAMSAR Manuals, published by IMO.

3.7.4 Helicopter operations

The OOW of a ship that is likely to be engaged in the transfer of personnel or stores by helicopter should become familiar with the ICS 'Guide to Helicopter/Ship Operations'.

3.7.5 Piracy

The OOW of a ship that is likely to operate in waters that may present a risk of attack by pirates or armed robbers should be familiar with the ISF publication 'Pirates and Armed Robbers: A Master's Guide'.

4 Operation and maintenance of bridge equipment

4.1 General

It is important that watchkeeping officers are completely familiar with all the navigational and communications equipment, charts and publications on board.

Bridge watchkeeping officers should acquaint themselves with the contents of operating manuals for equipment, particularly with regard to the setting up of controls and the procedures to be followed in the event of equipment failure.

Periodic checks on the equipment (see section 3.2.5) should be carried out. Equipment found to have operational defects should be brought to the attention of the master and recorded in the logbook and on the Pilot Card (see annex A3).

Regular preventive maintenance of all equipment should be carried out according to instructions set out in the shipboard maintenance procedures manual and manufacturers' manuals.

A full set of charts and publications appropriate for the intended voyage should be available on board and kept up to date.

4.2 Radar

The OOW should be familiar with the differences between X and S-band radars, and be aware that the X-band radar will be capable of operating in the 9 GHz frequency band for the detection of search and rescue transponder (SART) devices.

On ships fitted with a radar installation that includes an inter-switching unit to allow radar displays to change transceivers, the OOW should be familiar with arrangements to by-pass the unit should it fail.

4.2.1 Good radar practice

It is recommended that a radar is kept running and fully operational at all times.

When using radar the OOW should bear in mind the following:

- the quality of performance of the radar needs to be continuously monitored: a performance monitor, if fitted, should be used for this purpose;
- an incorrectly aligned heading marker can give rise to misleading interpretations of potential collision situations: heading marker alignment needs periodically checking against both the compass heading and the fore and aft line of the ship;

- small vessels, ice and other floating objects such as containers may not be detected by the radar;
- video processing techniques should be used with care;
- echoes may be obscured by sea or rain clutter: the careful use of clutter controls will assist;
- masts or other structural features may cause shadow or blind sectors on the display: the OOW should be aware of these sectors.

4.2.1.1 Clear weather practice

Operating the radar at sea in clear weather will provide an incentive for watchkeepers to practise their radar collision avoidance and navigation skills; for example, radar observations and target vectors can be checked visually, and in safe waters parallel index techniques can be perfected.

4.2.1.2 Range scales

The choice of range scales will depend upon factors such as traffic density, speed of own ship and how often the radar is being observed.

Detection of targets, particularly small targets, is generally better at short ranges. However, if the radar is to be used for plotting it is not advisable to use a scale that is too short.

Advance warning of approaching vessels and land is an important factor in deciding upon a safe speed and requires the monitoring of longer range scales.

4.2.2 Radar and collision avoidance

4.2.2.1 Accuracy of own ship speed and heading inputs

In radar plotting, measurement of the course, speed and aspect of a target is used to determine the closest point of approach of that target and to indicate whether or not there is a risk of collision.

The accuracy of the target plot will depend upon an accurate input of own ship's course and speed during the plotting interval; a yawing ship or inaccurate speed and heading inputs into the radar will reduce the accuracy of calculated target vectors.

Plot inaccuracies will be most apparent in head-on situations and may make a target appear to be passing clear when in fact it is crossing ahead or nearly ahead.

4.2.2.2 The plotting period

A single observation of the range and bearing of a target cannot give any indication of target course and speed. Multiple observations are required, and the longer the plotting period, the greater will be the accuracy.

Accuracy in the plot will however be lost if either own ship or the target changes course or speed during the plotting period. A change in the course or speed of the target may not be immediately detected.

The estimation of the course and speed of the target and risk of collision is only valid up to the time of the last observation. The situation must therefore be kept closely under review.

4.2.2.3 Changing target bearing

It should not be assumed that because the relative bearing of a target is changing, there is no risk of collision. An alteration of course and/or speed of own ship may alter the relative bearing, and at close quarters, risk of collision can exist even with a changing compass bearing (see section 3.2.3.3).

4.2.3 Radar and navigation

When using radar for position fixing and monitoring, the OOW should check:

- the overall performance of the radar;
- the identity of the fixed objects being observed;
- gyro error and accuracy of the heading line alignment;
- accuracy of the variable range markers (VRM), electronic bearing lines (EBL) and fixed range rings;
- that the parallel index lines are correctly set.

4.2.3.1 Parallel indexing

Parallel index techniques can be useful when monitoring the ship's progress in relation to the passage plan (see section 2.5.1.2).

Parallel indexing does not fix the ship's position, but provides a method on the radar of verifying that the ship is maintaining a safe course to pass a fixed object, such as a headland, at the desired passing distance. Parallel indexing does not therefore replace the need to fix the ship's position on the chart at regular intervals.

The technique requires an index line to be drawn to pass through the radar echo of a fixed object, tangential to a VRM set to a range equal to the desired passing distance. The index line will line up parallel to the ground track that the ship will need to follow to maintain a safe passing distance.

Parallel indexing can be used on both relative motion and ground stabilised true motion modes of radar operation. With a relative motion display the echo of a fixed object will move in a direction and at a speed which is the reciprocal of own ship's ground track, and the echo should move along the index line. On a ground stabilised true motion display, the echo will remain stationary and the edge of the VRM should move along the index line as the ship passes the echo.

4.2.3.2 Electronic mapping

Electronic mapping facilities are commonly available for displaying on the radar picture, the passage plan and local area maps.

Maps can be drawn to include chart features such as buoys, channel limits, separation zones and anchorages using a number of different lines and symbols. Once complete the map can be stored in the radar.

Any map or passage plan needs to be geographically referenced so that it will appear on the radar correctly orientated and positioned relative to the ship's position.

Any errors in the ship's position used by the radar, errors in the accuracy of the maps or poor radar ground stabilisation could cause map interpretation problems (see section 2.3.4.2).

Maps electronically overlaid on radar pictures should always be used with caution.

4.2.4 Electronic plotting devices

On larger ships, at least one of the radars carried is likely to have automatic radar plotting aid (ARPA) functions. Radars on smaller ships may be fitted with either automatic tracking aid (ATA) or electronic plotting aid (EPA) functions.

ATA uses ARPA hardware but with limited functionality: no trial manoeuvre, target past position or guard zone features, and manual acquisition limited to 10 targets. EPA offers basic electronic plotting functions that are as good as a reflection plotter.

In comparison with standard radar, ARPA and ATA offer a number of automated collision avoidance features. However, watchkeepers should be aware of the dangers of being over-reliant on these devices and:

- understand the types of errors that are possible and recognise the operational warnings that appear on the display;
- understand the limitations of the devices;
- regularly test the devices using the built-in operational test facilities.

4.2.4.1 Heading and speed inputs

Correct and reliable speed and heading inputs into the ARPA or ATA are vital if targets are to be processed correctly.

Speed and heading inputs need to be sea stabilised (water tracked) to provide the ARPA or ATA with speed and course through the water. The use of these devices in a ground stabilised (bottom tracked) mode for assessing risk of collision could be particularly hazardous in sea areas that experience significant tidal streams and currents.

4.2.4.2 Automatic target acquisition

Features such as guard zones and target acquisition footprints are commonly used for the automatic acquisition of ARPA targets.

Such features should always be used with caution, especially in sea areas where radar inconspicuous targets can be expected.

4.3 Steering gear and the automatic pilot

4.3.1 Testing of steering gear

The OOW should ensure that the SOLAS requirements for the operation and testing of the steering gear are observed (see annex A7).

4.3.2 Steering control

These paragraphs should be read in conjunction with section 3.4.2 of this Guide.

Steering control of the ship will comprise manual steering, probably supplemented by an automatic pilot (autopilot) or other track control system. At each steering position there should be a gyro repeater and rudder angle indicator. An emergency back-up steering position, usually in the steering gear flat, is also required.

If an autopilot is fitted, a steering mode selector switch for changing between automatic and manual steering, and a manual override control to allow the OOW to gain instant manual control of the steering, will be required.

4.3.2.1 The autopilot (heading/track controller)

The role of the autopilot is to steer the ship automatically. The autopilot can either be operated independently or, in an integrated bridge, controlled by a navigation system (see section 4.8.2).

When operated as an independent system, the course to steer will need to be manually set on the autopilot and the autopilot will steer that course until a new course is entered. When linked to an integrated system, the autopilot will be able to receive cross track error (XTE) commands and track-keep automatically.

4.3.2.2 Automatic track-keeping (if fitted)

Track-keeping control allows the ship to maintain its planned track, whereas course-keeping only ensures that the ship is pointing in the right direction. Wind and currents can, for example, move the ship sideways and off its track while the ship's heading remains unchanged.

For a ship to operate an automatic track-keeping system, the autopilot should be adaptive and able to perform turns automatically between track legs, using either pre-set turn radius or rate of turn values.

Turns are commenced at a wheel over position, only after the OOW has acknowledged the wheel over position alarm and is satisfied that it is safe to execute the turn.

If a malfunction occurs when track-keeping, the system should alarm and revert immediately to course-keeping mode.

If the malfunction occurs while the autopilot is on a track, the autopilot should continue to steer the pre-set course of that track. If the autopilot is performing a turn when the malfunction occurs, the autopilot should complete the turn at the pre-set turn value and take up the course of the next track.

An autopilot performing automatic track-keeping functions and its alarm outputs should always be closely monitored.

The ability of the autopilot closely to follow a planned track will depend upon the accuracy of the XTE information sent to the autopilot from the navigation system (see sections 4.8.2 and 4.8.3).

4.3.3 Off-course alarm

As part of the steering control system there should be an off-course alarm facility to warn the OOW when the ship excessively deviates from its course. The alarm should be in use at all times that the autopilot is in operation.

The use of the off-course alarm does not relieve the OOW from frequently checking the course that is being steered.

Non-activation of the off-course alarm will not always mean that the ship is maintaining its planned track. The ship may be moved off its track by wind and currents even though the heading remains unchanged.

4.4 Compass system

4.4.1 Magnetic compass

The magnetic compass is generally fitted above the bridge on the centreline with a periscope so that the compass is readable from the helmsman's position.

Where the magnetic compass is needed to provide heading outputs to other bridge systems, a transmitting magnetic compass (TMC) is fitted. TMC outputs should be corrected for compass error and the TMC should be tested once a week, in clear visibility.

A compass deviation card should be maintained and posted on the bridge. The compass will need to be swung at intervals during the ship's life, and particularly after major steel conversion work to the ship. Caution should be observed when using the magnetic compass on ships that carry magnetic cargoes such as iron and steel.

Compass safe distances are specified on all electrical bridge equipment and provide the minimum distances that equipment can be installed from the magnetic compass.

4.4.2 Gyro compass

It is recommended that the gyro compass should be run continuously. Should a gyro compass stop for any reason, it should be restarted and subsequently checked before use to ensure it has 'settled' and is reading correctly.

Speed and latitude corrections need to be applied to the gyro compass. Where the gyro has no direct speed log or position input, manual corrections will have to be made as required.

The gyro will support a number of repeaters, including a repeater at the emergency steering position. Gyro repeaters on the bridge should be checked against the main gyro at least once a watch, and after excessive manoeuvring. Other repeaters should be checked frequently.

4.4.3 Compass errors

As a safeguard against the gyro and gyro repeaters wandering, frequent checks should be made between the magnetic and gyro compasses.

Magnetic and gyro compass errors should be checked and recorded each watch, where possible, using either azimuth or transit bearings.

A record of magnetic and gyro compass courses to steer and compass errors should be maintained and available to the helmsman.

4.4.4 Rate of turn

Rate of turn measurement is used by automatic track-keeping systems to perform controlled turns. When ships are manoeuvring, particularly large ships where the distance between the bow and the pivot point of the ship is considerable, rate of turn indication provides the ship handler with feedback on how quickly the ship is turning.

4.5 Speed and distance measuring log

Speed logs, depending upon their type, will provide either speed through the water or speed over the ground measurements.

4.5.1 Types of speed measurement

In general terms, speed through the water is used for radar collision avoidance, and speed over the ground is used for navigation. Speed made good can also be measured on ships, and represents the speed that the ship has achieved over a period of time. Speed made good can be measured from the chart between position fixes, and is also calculated and transmitted by electronic position-fixing systems.

4.5.2 Direction of speed measurement

Doppler-type logs can both be single-axis and measure speed in the fore and aft direction or dual-axis and measure fore and aft and athwartship movement. Coupled with rate of turn measurement, dual-axis logs are also able to calculate the speed and direction of movement of the bow and stern. Electro-magnetic logs provide single-axis measurement only.

4.5.3 Recording of distance travelled

As well as indicating ship's speed, logs record and display distance travelled. It is good navigation practice to initialise the log distance trip at the start of each new track, and record log distances in the logbook at the end of each watch.

4.6 Echo sounders

The navigational echo sounder should be expected to operate down to depths of at least 200m (approximately 110 fathoms).

The echo sounder should always be used when making a landfall and kept switched on in coastal waters. If the echo sounder is fitted with a shallow water alarm, the alarm should be set to an appropriate safe depth to warn of approaching shallow water.

Care should be taken to check that the units of soundings on the echo sounder are the same as those used on the chart in use. When comparing echo and chart soundings, allowance must be made for the draught of the ship, and any water stand or tidal effects.

4.7 Electronic position-fixing systems

Electronic position-fixing systems provide an automatic and continuous position update for ships fitted with a suitable receiver using either a terrestrial hyperbolic radio navigation system such as Loran C, or a global satellite system such as GPS.

4.7.1 Hyperbolic positioning systems

The use of hyperbolic positioning systems at sea is declining. Omega is no longer operational and Decca is being phased out. Loran C, as a back up to the global navigation satellite system, is to be retained for the time being.

The use of lattice charts showing hyperbolic lines of position has also declined, and most receivers convert the readings to latitude and longitude.

4.7.1.1 Loran C

Loran C has a basic range of approximately 1200 miles using ground-wave signals, although extended range coverage is possible using skywaves.

Corrections need to be applied to Loran C signals to take into account variations in the conductivity of the earth's surface over which the signals pass. These are known as additional secondary factor (ASF) corrections. The corrections may need to be manually applied before plotting the position on the chart.

4.7.2 Global navigation satellite system

A global navigation satellite system (GNSS) is a satellite system that provides ships fitted with suitable receivers with a means of obtaining continuous worldwide position, time and speed information.

The Global Positioning System (GPS) operated by the United States and the Global Navigation Satellite System (GLONASS) operated by the Russian Federation are currently available for civilian use on ships.

4.7.2.1 GPS and DGPS

GPS offers commercial users a global positioning capability with accuracy of the order of 100 metres.

Differential GPS (DGPS) receivers apply corrections to raw GPS signals determined and transmitted by terrestrial monitoring stations. Differential signals can be transmitted to ships via satellites or using HF radio links. Within DGPS coverage, positional accuracy of the order of 10 metres at the receiver antenna is possible.

4.7.3 Use of electronic position-fixing systems

Care should be taken when using electronic position-fixing systems.

Watchkeepers need to understand the capabilities and limitations of the systems they are using and continually monitor and validate the information given.

4.7.3.1 Use of electronic position-fixing systems in integrated bridges

When position-fixing systems transmit data to other navigation systems, the integrity and quality of the data transmitted need to be safeguarded.

Techniques used should include:

- using pre-set quality limits to monitor the fix quality of each position-fixing system connected to the integrated bridge;
- comparing all positions to identify and reject any rogue positions or positions that are clearly incorrect;
- comparing electronic positions with the ship's estimated position (EP) calculated using direct inputs from the log and gyro;
- checking the status of the data transmitted and ensuring that only valid data messages are used.

4.7.3.2 Route monitoring

Route storage and cross track error (XTE) monitoring are common GPS features. By entering the passage plan in the GPS as well as the navigation system, the GPS can provide an integrated bridge system (IBS) with an independent route monitoring capability.

4.7.3.3 Chart datums and accuracy (see section 3.3.1.3)

Electronic position-fixing systems, and in particular GPS receivers, calculate positions referenced to the global datum WGS84. This may not be the same as the datum of the chart in use, with the result that the position when plotted may be wrong in the context of the chart.

Where the difference or datum shift is known, a 'satellite-derived positions' note on the chart provides the offset to apply to the position before it is plotted.

Many receivers have facilities to transform positions from WGS84 to the datum of the chart internally, so eliminating the need to apply datum offsets manually. It is nevertheless recommended that the receiver is kept referenced to WGS84 and that position shift values are manually applied. The transformation parameters used in the receiver may differ from those parameters used by the hydrographic office that produced the chart.

The precision of chart features (e.g. dangers) on navigational charts is of the order of 0.3 mm - equivalent to an accuracy of 1.5 metres or more at scales of 1:50,000 or greater. Many coastal charts are of such scales and therefore may not be as precise in displaying dangers as DGPS is. The OOW should therefore always allow a sensible safety margin to take account of any such discrepancies.

4.8 Integrated bridge systems (IBS)

An integrated bridge system is a combination of systems which are interconnected to allow the centralised monitoring of sensor information and control of a number of operations such as passage execution, communications, machinery control, safety and security.

There is no single standard IBS design for ships and nor is IBS mandatory. Classification societies do offer optional class notations for ships; the 'NAV1' class from Lloyd's Register (LR), the 'W1-OC' class from Det Norske Veritas (DNV), the 'NAV-OC' class from Germanischer Lloyd (GL) and 'OMBO' class from the American Bureau of Shipping (ABS) are examples of class notations for IBS arrangements designed to support periodic one man bridge operations.

Factors including the design of the bridge, the type of equipment that is fitted and the layout of that equipment on the bridge will determine the extent to which the IBS design allows certain bridge functions to be automated.

4.8.1 Workstations, bridge design and layout

Centralised control and monitoring requires a workstation design approach. At the main operating position on the bridge, referred to variously as the workstation for navigation and traffic surveillance/manoeuvring, the navigation workstation or the conning position, the OOW should be able to undertake all his primary duties unassisted with efficiency and safety.

The design should also allow two bridge team members to work unhindered side by side.

Bridge design and the layout of the workstations, together with the equipment and instrumentation at those workstations, is an important part of IBS design. There should be proper access into and around the bridge, a good working environment and adequate bridge visibility from all the workstations.

A detailed review of the principles of IBS design is outside the scope of this Guide but the design should ensure that the failure of one sub-system does not cause the failure of another, and that any failure is immediately brought to the attention of the OOW.

4.8.2 IBS equipment

To permit centralised monitoring and control of navigational functions on the bridge, the following systems will be required:

4.8.2.1 Navigation management system

The navigation management system provides the mechanism for planning, executing and monitoring the passage plan and will therefore provide the link between the charts on which the voyage has been planned, the position-fixing systems, the log and gyro and the autopilot.

An electronic chart display system will typically function as the navigation management system within an IBS, supported by a dedicated route planning terminal to allow route planning activities to be undertaken while on passage and without interfering with the OOW.

4.8.2.2 Alarm system

The IBS has an alarm system to warn the OOW if potentially dangerous situations could arise. Failure of the OOW to acknowledge alarms - usually within 30 seconds - will transfer the alarm to remote alarm units in cabins, offices and messes to call for back-up assistance.

The main navigational sensors, in particular the radar which provides traffic alarms, the gyro and autopilot which provide course-related alarms, and the position-fixing systems which provide position-related alarms, need to be connected to the alarm system. ECDIS, the steering gear, power distribution panels etc. may also be connected.

Included in the alarm system should be a watch safety or fitness alarm to monitor the alertness of the OOW. An interval timer for setting alarm intervals of up to 12 minutes should be part of the system. A number of alarm acknowledgement points, each with a pre-warning alarm to give the OOW notice that the alarm is about to be activated should be available around the bridge. As with the failure of the OOW to acknowledge a navigation alarm, if the fitness time interval expires, an alarm should sound away from the bridge.

4.8.2.3 Conning display

The display should be available at the conning position to show information summaries of the important navigational sensors used on passage and while docking.

The display also provides the OOW with a central place to monitor sensors and compare actual settings with those ordered.

4.8.3 IBS and the automation of navigation functions

The process of planning a passage through to its execution and monitoring the progress of the ship against the plan is one bridge operation that can be safely automated as long as certain procedures and disciplines are followed:

- the plan needs to be thoroughly prepared on charts (see section 2);
- the details of the plan, and in particular the waypoints, need to be carefully prepared on or transferred to the navigation system (see section 2.3.4);
- the position of the ship needs to be safely calculated and quality monitored by the navigation system (see section 4.7.3.1);
- if the position of the ship is accurate and reliable and the passage plan has been safely entered, the XTE deviations off track as calculated by the navigation system and transmitted to the autopilot will be accurate, and allow the autopilot to control the direction of the ship automatically and safely (see section 4.3.2.2).

4.8.4 Using IBS

Where fitted, clear guidance on IBS operations should be contained in the shipboard operational procedures manual. In particular, advice on when to commence and when to suspend automatic track-keeping should be provided.

Over-reliance on automatic systems, coupled with the OOW paying too little attention to visual navigational and watchkeeping techniques, can be dangerous.

4.9 Charts, ECDIS and nautical publications

4.9.1 Carriage of charts and nautical publications

All ships should carry adequate and up-to-date official nautical charts, sailing directions, lists of lights, notices to mariners, tide tables and all other nautical publications necessary for the intended voyage.

An on board chart and publication management system is recommended to ensure that records are kept of what charts and publications are carried, and when they were last corrected.

4.9.2 Official nautical charts

Official nautical charts can be either paper or electronic charts produced by, or on the authority of, a national hydrographic office.

Unlike paper charts, electronic charts need to be displayed on an electronic chart display system. Official nautical charts can be in one of two electronic formats:

- Electronic navigational charts (ENC) are official vector nautical charts. When displayed on ECDIS equipment they are equivalent to paper charts;
- Raster navigational charts (RNC) are official raster nautical charts. British Admiralty ARCS format charts and United States NOAA format charts are examples. However, when displayed on ECDIS (or RCDS) equipment they are not currently equivalent to paper charts (see section 4.9.4.3).

4.9.3 Use of charts and nautical publications

Only official nautical chart data, which is up-to-date and adequate, should be used for passage planning or navigation. The charts can either be paper charts, or electronic charts that are equivalent to paper charts. All other chart data should only be used as a supplementary navigation tool.

For advice on planning using a combination of electronic and papers charts refer to section 2.3.4.1.

When navigating using electronic charts, care should be taken to ensure that the display shows sufficient 'look-ahead' distance and the next chart can be readily accessed.

4.9.4 Electronic charts and electronic chart display systems (if fitted)

Electronic charts can either be in vector or raster chart format. The mariner using electronic chart systems should be aware of the differences between the two types of chart formats.

4.9.4.1 Vector chart format electronic charts

Vector charts are compiled by attributing to each and every chart feature a set of values, and each chart feature is stored in a layered digital database. Storage in a database allows the chart data to be displayed as a seamless chart, while layering enables fields of data that are not required at the time to be removed from display to reduce chart clutter.

Chart features can be interrogated to display additional information about charted objects.

The inherent 'intelligence' of vectorised charts allows three dimensional route safety zone monitoring. Chart depth contours and air draught clearances around the ship can be automatically monitored, both while the route is being planned and while the ship is on passage (see section 2.3.4). Alarms will automatically be triggered if a safety zone around a ship is breached.

An international standard for vector charts has been finalised by IHO (S-57 Edition 3) and vector charts complying with this standard produced by, or on the authority of, a national hydrographic office are known as electronic navigational charts (ENC).

4.9.4.2 Raster chart format electronic charts

Raster charts are exact copies of paper charts and are produced by digital scanning techniques. Information on raster charts cannot be layered, and the move from one chart to another will not be seamless. Raster charts have to be individually selected and displayed.

Raster charts have no inherent 'intelligence'. The chart data itself cannot trigger automatic alarms without the addition of user-inserted information that has been entered manually during route planning.

Without selecting different scale charts, the look-ahead capability using raster charts may be limited, causing some inconvenience when determining the identity of distant objects. Datums and projections may differ between raster charts, and care must be taken to take account of such differences.

A facsimile of a paper chart originated by or distributed on the authority of a national hydrographic office is known as a raster navigational chart (RNC).

4.9.4.3 Electronic chart display systems

Standard features of electronic chart display systems include the display of electronic vector and/or raster charts overlaid with the position of the ship and its track, and facilities to route plan and automatically update charts using digital notices to mariners. Navigation sensors such as GPS, log and gyro will be connected to provide positional information. An autopilot may also be connected when the electronic chart display system is installed as part of an integrated bridge system.

Some electronic chart display systems offer the capability to display radar data overlaid on the chart. This can be either selected targets or a full radar picture that can be independently controlled. Caution should always be exercised where target vectors based on the ship's speed through the water are overlaid on an electronic chart that is displaying speed over the ground.

Factors that will determine to what extent an electronic chart display system can be used will include the type of system that has been fitted, the ability of that system to display official nautical charts, and whether or not the flag state administration allows its use for navigational purposes.

Electronic chart displays systems can be categorised as ECDIS, RCDS or ECS.

Electronic Chart Display and Information System (ECDIS):

- ECDIS, with adequate back-up arrangements, may be accepted as complying with the SOLAS requirement for ships to carry up-to-date charts, when displaying ENC chart data. A performance standard exists for ECDIS.

Raster Chart Display System (RCDS):

- RCDS, or an ECDIS used in a RCDS mode of operation, displaying RNC chart data should at the present time only be used as a supplementary navigation tool together with a complete folio of up-to-date paper charts. No performance standard currently exists for RCDS. A review is currently underway in IMO as to whether or not RCDS, supported by a reduced folio of small scale paper charts and adequate back-up arrangements, will be acceptable as complying with the SOLAS requirement for the carriage of charts.

Electronic Chart System (ECS):

- ECS should only be used as a supplementary navigation tool together with a complete folio of up-to-date paper charts.

4.10 Radiocommunications

4.10.1 GMDSS radiocommunication functions

Only qualified radio personnel should operate equipment for GMDSS purposes. GMDSS equipped ships are required to be able to do the following wherever they operate:

- transmit ship-to-shore distress alerts by two independent means;
- receive shore-to-ship alerts (usually relayed by RCCs);
- transmit and receive:
 - ship-to-ship alerts
 - SAR co-ordinating communications
 - on-scene communications
 - locating signals
 - maritime safety information
 - routine or general communications to and from shore
 - bridge-to-bridge communications.

4.10.2 GMDSS equipment

Ships operating GMDSS are equipped according to carriage requirements that relate to trading areas i.e. Areas A1, A2, A3 and A4 as stipulated in SOLAS. All ships operating GMDSS can be expected to have at least the following equipment:

- VHP radiotelephone (Channels 6, 13 and 16):
 - Channel 6 may be used ship-to-ship for SAR operations
 - Channel 13 is used for safety of navigation ship-to-ship
 - Channel 16 is used for distress and urgency traffic, and may be used by aircraft for safety purposes;
- VHP DSC (Channel 70) transmitter and watch receiver:
 - Digital selective calling (DSC) is used for calling and replying, and for transmitting, acknowledging and relaying distress alerts. It allows a specific station to be contacted and made aware that the calling station wishes to communicate with it, and to indicate how to reply, or which station to listen to for subsequent distress traffic. Calls can also be addressed to 'all ships' or 'all stations';
- Search and rescue transponder (SART) used for providing homing signals from survival craft for detection by 9 GHz radar;

- NAVTEX receiver used for receiving maritime safety information which is automatically printed by the receiver. Enhanced group call (EGC) facilities will also be required for ships operating outside NAVTEX range for the receipt of SafetyNET broadcasts;
- Emergency position indicating radio beacon (EPIRB) used in SAR for alerting and for providing homing signals for use by aircraft.

Ships sailing beyond range of a VHF DSC coast station must also have an MF DSC transmitter and watch receiver. If sailing beyond MF DSC range, they must have a ship earth station or an HF DSC transmitter and watch receiver including a radio telex system. Ships operating in polar regions will not have Inmarsat satellite coverage.

4.10.3 Emergency communications

Emergency communications include distress, urgency and safety messages.

4.10.3.1 Distress alert, distress message and distress relay

The distress alert is an automated form of distress signal and indicates that a ship, aircraft or other vehicle, or a person, is in grave and imminent danger and requires immediate assistance. It may contain all or some of the information contained in the distress message.

The distress alert may be sent using DSC on one or more of the frequencies dedicated exclusively to the purpose, or by satellite (see annex A6).

Messages concerning safety of life and navigation should be transmitted in a standard form containing the following information, whichever mode of transmission is used:

- name of ship;
- call sign of ship;
- maritime mobile service identity (MMSI) of ship;
- position of ship;
- nature of distress (or other emergency);
- type of assistance required (if appropriate);
- any other information that may help those whose assistance is required.

The master should order the relaying of a distress message whenever it is clear that the ship in distress cannot transmit the message itself, or if further help is thought to be necessary. The master should make clear in the relay message that his own ship is not in distress by using the prefix 'MAYDAY RELAY'.

4.10.3.2 Urgency messages

An urgency message is one containing urgent information relating to a ship, aircraft or person. For example:

- man overboard;

- lost propeller;
- permanent loss of power;
- announcing and identifying medical transports;
- communications concerning medical advice.

The urgency signal should only be sent on the authority of the master.

If using terrestrial communications, the urgency announcement should be made on one or more of the DSC distress frequencies contained in annex A6. The actual urgency message which follows should be sent on one or more of the radio telephony/telex frequencies for follow-up distress traffic.

If using satellite communications, it should be noted that ship earth stations only have 'distress' and 'routine' priority levels. Inmarsat has therefore devised a system of two-digit codes for urgency and safety communications. Not all coast earth stations accept all the codes.

4.10.3.3 Safety messages

A safety message is one containing an important navigational or meteorological warning. As well as the items listed in section 3.7.2, information reports concerning the position of buoys and the working of lighthouses and other aids to navigation can be made.

When transmitting safety messages, the safety message format should be used using the same frequencies and procedures as for urgency messages.

4.10.3.4 Emergency over

Whenever the emergency is clearly over, it should be cancelled by a broadcast to 'all stations'.

4.10.4 Routine or general communications

Routine or general communications include ship-to-ship communication, pilotage messages, port operations, ship movements, ship's business messages and other public correspondence.

The frequencies used by coast stations, port stations etc. can be ascertained from the ITU List of Coast Stations.

4.10.4.1 Routine communications using DSC

When transmitting on DSC the OOW should listen on the ship's transmission frequency and when it is free, make the call. The call should contain information on:

- the mode of transmission to be used for the follow-up message (i.e. telephony, telex);
- the frequency to be used to transmit the message.

Coast stations usually monitor two DSC channels - national and international. The national channel should be tried first. The acknowledgement to the call will

normally be on the frequency that is paired with the frequency on which the call was made. The station that is called should either confirm the frequency for the follow-up traffic or indicate another frequency.

On receiving a DSC call that gives no indication of follow-up frequency to use, the receiving ship should indicate a suitable frequency in its acknowledgement.

4.10.4.2 Routine communications using radio telephony

Before commencing any transmission, check whether the frequency is already occupied.

A simplex call in which both stations use the same frequency involves listening on that frequency. A duplex call in which separate frequencies are used involves listening on the ship's transmit frequency; when the channel is free the receiver should be retuned to the coast station reply frequency and the call made in the normal way.

When calling, speak clearly. First give the name of the station being called followed by own ship's name (and call sign if necessary). If it is necessary to spell the name of the ship the phonetic alphabet should be used. Give the other station time to answer; it may have heard you but be unable to reply immediately.

4.10.4.3 Routine communications using radio telex

Before transmitting to a coast station, listen on its answering frequency for the 'channel free' signal. This is interspersed with the coast station call sign in morse.

4.11 Emergency navigation lights and signalling equipment

The OOW is responsible for ensuring that the emergency navigation lights and signalling equipment are in working order and ready for immediate use at all times.

The condition of flags and shapes should be checked at regular intervals.

Sound signalling equipment must be checked daily and maintained in an operational condition. Where roller guides and wires operate the whistle, these should be examined frequently to ensure easy operation. Electric and automatic whistles should be maintained according to manufacturers' instructions.

SHIP TO SHORE Master/Pilot Exchange

SHIP IDENTITY

Name Call sign Flag
 Ship's agent Year built IMO No
 Cargo type Ship type Last port

ADDITIONAL COMMUNICATION INFORMATION

Fax Telex Other

PILOT BOARDING

Date/ETA (UTC/LT) Freeboard
 Boarding station (if there is more than one)

SHIP PARTICULARS

Draught fwd Draught aft Draught amidships (salt water)
 Air draught Length Beam
 Displacement Dwt Gross Net

ANCHORS

Port anchor Stbd anchor (length of cable available)

MANOEUVRING DETAILS AT CURRENT CONDITION

Full speed Half speed
 Slow speed Min. steering speed
 Propeller direction of turn left/right Controllable pitch yes/no
 Number of propellers Number of fwd thrusters Number of aft thrusters

MAIN ENGINE DETAILS

Type of engine motor/turbine/other
 Max. number of engine starts Time from full ahead to full astern

EQUIPMENT DEFECTS RELEVANT TO SAFE NAVIGATION

OTHER IMPORTANT DETAILS e.g. berthing restrictions, manoeuvring peculiarities



SHORE TO SHIP Pilot/Master Exchange

SHIP REQUESTING PILOTAGE DETAILS

Ship Name Call sign

ORIGINATING AUTHORITY

Contact name VHF channel

Other means of contact

PILOT BOARDING INSTRUCTIONS

Date/arrival time at pilot boarding station (UTC/LT)

Position pilot will board

Embarkation side port/starboard/TBA Approach course and speed

Requested boarding arrangement

BERTH & TUG DETAILS

Intended berth and berthing prospects

Side alongside port/starboard Estimated transit time to berth

Tug rendezvous position Number of tugs

Tug arrangement Total bollard pull

LOCAL WEATHER AND SEA CONDITIONS at the pilot boarding station on arrival

Tidal information (heights/times)

Expected currents

Forecast weather

DETAILS OF THE PASSAGE PLAN including abort points/emergency plans

REGULATIONS including VTS reporting, anchor/lookout attendance, max. allowable draught

OTHER IMPORTANT DETAILS including navigation hazards, ship movements

PILOT CARD

SHIP'S PARTICULARS

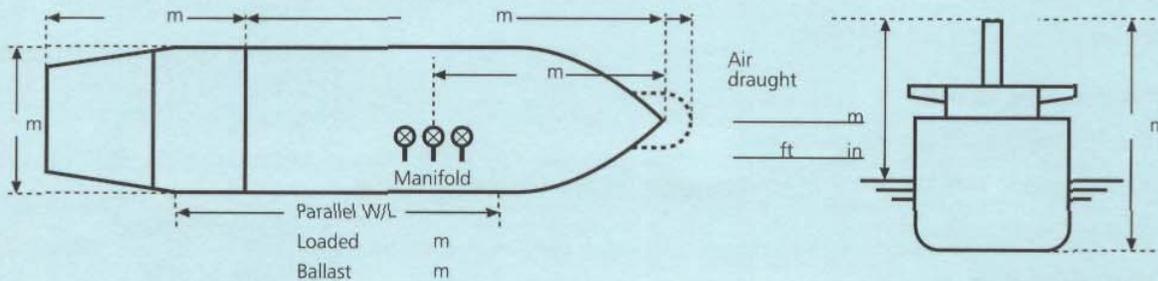
Name Call sign

Displacement (tonnes) Deadweight (tonnes) Year built

Length OA (m) Breadth (m) Bulbous bow: yes/no

Draught fwd (m) Draught aft (m) Draught amidships (m)

Port anchor (shackles) Stbd anchor (shackles) (1 shackle=27.4 m/15 fathoms)



ENGINE

Type of engine Maximum power (kW) (HP)

	rpm/pitch	loaded speed	ballast speed
Full ahead	<input type="text"/>	<input type="text"/> (kts)	<input type="text"/> (kts)
Half ahead	<input type="text"/>	<input type="text"/> (kts)	<input type="text"/> (kts)
Slow ahead	<input type="text"/>	<input type="text"/> (kts)	<input type="text"/> (kts)
Dead slow ahead	<input type="text"/>	<input type="text"/> (kts)	<input type="text"/> (kts)
Dead slow astern	<input type="text"/>		
Slow astern	<input type="text"/>		
Half astern	<input type="text"/>		
Full astern	<input type="text"/>	<input type="text"/> (% of full ahead power)	

Engine critical rpm Maximum number of consecutive starts

Time full ahead to full astern (sec) Time limit astern (min)

STEERINGRudders (number) (type) ° (maximum angle)Time hard-over to hard-over (sec) Rudder angle for neutral effect °Propellers (number) Direction of turn left/right Controllable pitch yes/noThrusters (number) Bow power (kW/HP) Stern power (kW/HP)Steering idiosyncrasies **EQUIPMENT CHECKED AND READY FOR USE**

Anchors	<input type="text"/>	Cleared away	<input type="text"/> yes/no
Whistle	<input type="text"/>		
Flags	<input type="text"/>		
X-Band radar	<input type="text"/>	ARPA	<input type="text"/> yes/no
S-Band radar	<input type="text"/>	ARPA	<input type="text"/> yes/no
Speed log	<input type="text"/>	<input type="text"/> Water/Ground	<input type="text"/> single axis/dual axis
Echo sounder	<input type="text"/>		
Electronic position-fixing	<input type="text"/>	Type	<input type="text"/>
Compass system	<input type="text"/>	Gyro compass error	<input type="text"/> °
Steering gear	<input type="text"/>	Number of power units in use	<input type="text"/>
Rudder/RPM/ROT indicators	<input type="text"/>	Engine telegraphs	<input type="text"/>
VHF	<input type="text"/>		
Mooring winches and lines	<input type="text"/>		

EQUIPMENT OPERATIONAL DEFECTS

OTHER IMPORTANT DETAILS

Master's name Date 

REQUIRED BOARDING ARRANGEMENTS FOR PILOT

In accordance with I.M.O. requirements and I.M.P.A. recommendations

INTERNATIONAL MARITIME PILOTS' ASSOCIATION

H.Q.S "Wellington", Temple Stairs, Victoria Embankment, London WC2R 2PN Tel: +44 171-240 3973 Fax: +44 171-240 3518



RIGGING FOR FREEBOARDS OF 9 METRES OR LESS

HANDHOLD STANCHIONS
Min. diam. 33mm
max. 80cm apart

MAN-ROPES
without knots
min. diam. 28mm
180cm long
IF REQUIRED BY PILOT

Always flat side of ship

SIDES ROPES
Min. diam. 18mm

STEPS
Must rest against ship's side

SPREADER
Min. 180cm long

Max. 8 steps between

5th step must be a spreader

Height required by pilot

SHIPS WITH HIGH FREEBOARD (MORE THAN 9M)

When no side door available

PILOT LADDER
Must extend at least 2 metres above lower platform

Officers in contact with bridge

ACCOMMODATION LADDER
Should rest firmly against ship's side
Maximum 55° slope
Lower platform horizontal
Rigid handrails preferred

A PILOT LADDER COMBINED WITH AN ACCOMMODATION LADDER
is usually the safer method of embarking or disembarking a pilot on ships with a freeboard of more than 9 metres

Recommended 9 metre mark

Stern → Bow

0.5m
3 to 7 metres depending on size

MECHANICAL PILOT HOIST

Two main ropes ready for immediate use.
Min. diam. 28mm

Deck

Guard ring

Rigid part

Flexible part

A pilot hoist made and rigged in accordance with SOLAS Chapter V requirements for a pilot ladder, rigged alongside for immediate use, may be used subject to agreement between the Master and the Pilot. It should be noted that the distance between the nearest side ropes of the pilot hoist and pilot ladder will be at least 1.4 metres.

NO!

NO!
No shackles
No knots
No splices

NO!
The steps must be equally spaced

NO!
The steps must be horizontal

NO!
Spreaders must not be lashed between steps

NO!
The side ropes must be equally spaced

NO!
The loops are a tripping hazard for the pilot and can become foul of the pilot launch

NO!

Very dangerous ladder too long

PILOT

Two handhold stanchions rigidly secured to ship's structure

Responsible officer

NO OBSTRUCTIONS

Lifebuoy with self-igniting light

Butwalk ladder secured to ship

AT NIGHT

Pilot ladder and ship's deck lit by forward shining overside light

PILOT

Approved by I.M.O

March 1995

Distress alert and the frequencies to use

Terrestrial radiocommunication

The distress alert may be sent using digital selective calling (DSC) on one or more of the following frequencies which are dedicated exclusively for the purpose:

VHF	Channel 70
MF	2187.5 kHz
HF	4207.5 kHz
HF	6312 kHz
HF	8414.5 kHz
HF	12577 kHz
HF	16804.5 kHz

The distress alert should indicate:

- on which frequency the follow-up distress message will be transmitted; and
- the mode of transmission (telephony or telex).

The frequencies that should be used for the follow-up distress message:

Radio Telephone (R/T)	Radio Telex
Ch.16 VHF	
2182 kHz	2174.5 kHz
4125 kHz	4177.5 kHz
6215 kHz	6268 kHz
8291 kHz	8376.5 kHz
12290 kHz	12520 kHz
16420 kHz	16695 kHz

Satellite radiocommunication

The distress alert by satellite should be transmitted, with absolute priority, to a Rescue Co-ordination Centre (RCC).

Guidance on steering gear test routines

Manual steering positions

After prolonged use of the autopilot, and before entering coastal waters, test the steering gear at all the manual steering positions on the bridge.

Multiple steering gear power units

In coastal waters use more than one steering gear power unit when such units are capable of simultaneous operation.

Before departure from port

Within 12 hours before departure, check and test the steering gear including, as applicable, the operation of the following:

- the main steering gear;
- the auxiliary steering gear;
- the remote steering control systems;
- the main steering position on the bridge;
- the emergency power supply;
- the rudder angle indicators in relation to actual rudder position;
- the remote steering gear control system power failure alarms;
- the steering gear power unit failure alarms; and
- automatic isolating arrangements and other automatic equipment.

Checks and tests

Checks and tests should include:

- the full rudder movement according to the required capabilities of the steering gear;
- the timing of rudder movement from hardover-to-hardover to ensure consistency with previous tests;
- a visual inspection of the steering gear and its connecting linkage; and
- the operation of the means of communication between the bridge and the steering gear compartment.

Changeover procedures

All officers concerned with the operation or maintenance of the steering gear should acquaint themselves with the changeover procedures.

Emergency steering drills

Emergency steering drills should take place at least every three months and must include direct control from within the steering gear compartment, the communications procedure with the bridge and, where applicable, the operation of alternative power supplies.

Records

The dates on which these checks and tests are conducted and the date and details of emergency steering drills carried out must be recorded in the log book.

Note These checklists have been included as a guide

Masters and navigating officers may wish to add to or modify these checklists to suit the particular operational needs of the ship

B1 Familiarisation with bridge equipment

Has the operation of the following equipment been studied and fully understood?

- bridge and deck lighting
- emergency arrangements in the event of main power failure
- navigation and signal lights, *including*
searchlights, signalling lamp, morse light
- sound signalling apparatus, *including*
whistles
- fog bell and gong system
- safety equipment, *including*
LSA equipment including pyrotechnics, EPIRB and SART
bridge fire detection panel
- general and fire alarm signalling arrangements
- emergency pump, ventilation and water-tight door controls
- internal ship communications facilities, *including*
portable radios
- emergency 'batteryless' phone system
- public address system
- external communication equipment, *including*
VHF and GMDSS equipment
- alarm systems on bridge
- echo sounder
- electronic navigational position fixing systems
- gyro compass/repeaters
- magnetic compass
- off-course alarm
- radar including ARPA
- speed/distance recorder
- engine and thruster controls
- steering gear, *including manual, auto-pilot and emergency changeover and testing arrangements (see annex A7)*
- automatic track-keeping system, if fitted
- ECDIS and electronic charts, if fitted
- IBS functions, if fitted
- Location and operation of ancillary bridge equipment
(e.g. binoculars, signalling flags, meteorological equipment)?
- Stowage of chart and hydrographic publications?

Other checks:

B2 Preparation for sea

Has a passage plan for the intended voyage been prepared? (see section 2)

Has the following equipment been checked and found ready for use?

- anchors
- bridge movement book/course and engine movement recorder
- echo sounder
- electronic navigational position fixing systems
- gyro/magnetic compass and repeaters
- radar(s)
- speed/distance recorder
- clocks

Has the following equipment been tested, synchronised and found ready for use?

- bridge and engineroom telegraphs, *including*
- rpm indicators
- emergency engine stops
- thruster controls and indicators, if fitted
- controllable pitch propeller controls and indicators, if fitted
- communications facilities, *including*
- bridge to engineroom/mooring station communications
- portable radios
- VHF radio communications with port authority
- navigation and signal lights, *including*
- searchlights, signalling lamp, morse light
- sound signalling apparatus, *including*
- whistles
- fog bell and gong system
- steering gear, including manual, auto-pilot and emergency changeover arrangements and rudder indicators (see annex A7)
- window wiper/clearview screen arrangements

Is the ship secure for sea?

- cargo and cargo handling equipment secure
- all hull openings secure and watertight
- cargo/passenger details available
- stability and draught information available
- Are all the crew on board and all shore personnel ashore?
- Are the pilot disembarkation arrangements in place? (see annex A5)

Other checks:

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B4 Pilotage

- Immediately on arrival on the bridge, has the pilot been informed of the ship's heading, speed, engine setting and draught?
- Has the pilot been informed of the location of lifesaving appliances provided on board for his use?

Have details of the proposed passage plan been discussed with the pilot and agreed with the master, *including*

- radio communications and reporting requirements
- bridge watch and crew stand-by arrangements
- deployment and use of tugs
- berthing/anchoring arrangements
- expected traffic during transit
- pilot change-over arrangements, if any
- fender requirements
- Has a completed Pilot Card (see annex A3) been handed to the pilot and has the pilot been referred to the Wheelhouse Poster? (see annex A4)
- Have the responsibilities within the bridge team for the pilotage been defined and are they clearly understood?
- Has the language to be used on the bridge between the ship, the pilot and the shore been agreed?
- Are the progress of the ship and the execution of orders being monitored by the master and officer of the watch?
- Are the engine room and ship's crew being regularly briefed on the progress of the ship during the pilotage?
- Are the correct lights, flags and shapes being displayed?

Other checks:

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B3 Preparation for arrival in port

- In preparing the passage for arrival in port, has a pre-pilotage information exchange taken place? (see annexes A1 and A2)
- Has the passage plan been updated following receipt of the Shore to Ship Pilot/Master Exchange form and all latest navigational warnings?
- Has the ETA been sent with all relevant information required by local regulations (e.g. details of dangerous/hazardous goods carried)?
- Is it necessary to rearrange cargo/ballast?

Has the following equipment been prepared and checked?

- course and engine movement recorders
- clock synchronisation
- communications with the engine control room and mooring stations
- signalling equipment, including flags/lights
- deck lighting
- mooring winches and lines including heaving lines
- pressure on fire main
- anchors cleared away
- stabilisers and log tubes housed, if fitted
- Has the steering gear been tested, and has manual steering been engaged in sufficient time for the helmsman to become accustomed before manoeuvring commences?
- Have the engines been tested and prepared for manoeuvring?
- Has the Pilot Card (see annex A3) been completed and are the pilot embarkation arrangements (see annex A5) in hand?
- Have VHF channels for the various services (e.g. VTS, pilot, tugs, berthing instructions) been noted and a radio check carried out?
- Has the port been made fully aware of any special berthing requirements that the ship may have?

Other checks:

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B5 Passage plan appraisal

Have navigation charts been selected from chart catalogue, *including*

- large scale charts for coastal waters
- small scale charts for ocean passages
- planning charts
- routeing, climatic, pilot and load line zone charts

Have publications been selected, *including*

- sailing directions and pilot books
- light lists
- radio signals
- guides to port entry
- tide tables and tidal stream atlas

Have all navigation charts and publications have been corrected up to date, *including*

- the ordering of new charts/publications, if necessary
- notices to mariners
- local area warnings
- NAVAREA navigational warnings

Have the following been considered?

- ship's departure and arrival draughts
- ship's cargo and any special cargo stowage/carriage restrictions
- if there are any special ship operational requirements for the passage

Have the following been checked?

- planning charts and publications for advice and recommendations on route to be taken
- climatological information for weather characteristics of the area
- navigation charts and publications for landfall features
- navigation charts and publications for Ships' Routeing Schemes, Ship Reporting Systems and Vessel Traffic Services (VTS)

Has weather routeing been considered for passage?

Have the following preparations been made for port arrival?

- navigation charts and publications studied for pilotage requirements
- Ship to Shore Master/Pilot Exchange form prepared (see annex A1)
- Pilot Card updated (see annex A3)
- port guides studied for port information including arrival/berthing restrictions

Other checks:

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B6 Navigation in coastal waters

Have the following factors been taken into consideration in preparing the passage plan?

- advice/recommendations in sailing directions
- ship's draught in relation to available water depths
- effect of 'squat' on underkeel clearance in shallow water
- tides and currents
- weather, particularly in areas prone to poor visibility
- available navigational aids and their accuracy
- position-fixing methods to be used
- daylight/night-time passing of danger points
- traffic likely to be encountered – flow, type, volume
- any requirements for traffic separation/routeing schemes

Are local/coastal warning broadcasts being monitored?

Is participation in area reporting systems recommended including VTS?

Is the ship's position being fixed at regular intervals?

Has equipment been regular checked/tested, *including*

- gyro/magnetic compass errors
- manual steering before entering coastal waters if automatic steering has been engaged for a prolonged period
- radar performance and radar heading line marker alignment?
- echo sounder

Is the OOW prepared to use the engines and call a look-out or a helmsman to the bridge?

Have measures been taken to protect the environment from pollution by the ship and to comply with applicable pollution regulations?

Other checks:

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B7 Navigation in ocean waters

- Is keeping a look-out being given due priority?
- Are NAVAREA, HYDROLANT and HYDROPAC navigational warning broadcasts and other long-range weather reports being closely monitored?
- Are changes to the local weather being monitored and is the barometer regularly observed?
- Is participation in area reporting systems (e.g. AMVER) recommended?
- Is the ship's position being fixed at regular intervals?
- Are celestial navigational techniques being practised?
- Are gyro/magnetic compass errors and radar performance being regularly checked?
- Have radar techniques been practised (in clear visibility)?
- Have preparations been made for landfall?
- Have measures been taken to protect the environment from pollution by the ship and to comply with applicable pollution regulations?

Other checks:

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B8 Anchoring and anchor watch

Has an anchoring plan been prepared taking into account

- speed reduction in ample time
- direction/strength of wind and current
- tidal stream when manoeuvring at low speeds
- need for adequate sea room particularly to seaward
- depth of water, type of seabed and the scope of anchor cable required

Have the engineroom and anchor party been informed of the time of 'stand-by' for anchoring?

Are the anchors, lights/shapes and sound signalling apparatus ready for use?

Has the anchor position of the ship been reported to the port authority?

While at anchor, the OOW should

- determine and plot the ship's position on the appropriate chart as soon as practicable
- when circumstances permit, check at sufficiently frequent intervals whether the ship is remaining securely at anchor by taking bearings of fixed navigation marks or readily identifiable shore objects
- ensure that proper look-out is maintained
- ensure that inspection rounds of the ship are made periodically
- observe meteorological and tidal conditions and the state of the sea
- notify the master and undertake all necessary measures if the ship drags anchor
- ensure that the state of readiness of the main engines and other machinery is in accordance with the master's instructions
- if visibility deteriorates, notify the master
- ensure that the ship exhibits the appropriate lights and shapes and that appropriate sound signals are made in accordance with all applicable regulations
- take measures to protect the environment from pollution by the ship and comply with applicable pollution regulations

Other checks:

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B9 Navigation in restricted visibility

Has the following equipment been checked to ensure that it is fully operational?

- radar, ARPA or other plotting facilities
- VHF
- fog signalling apparatus
- navigation lights
- echo sounder, if in shallow waters
- watertight doors, if fitted

- Have lookout(s) been posted and is a helmsman on standby?
- Have the master and engine room been informed, and the engines put on standby?
- Are the COLREGS being complied with, particularly with regard to rule 19 and proceeding at a safe speed?
- Is the ship ready to reduce speed, stop or turn away from danger?
- If the ship's position is in doubt, has the possibility of anchoring been considered?

Other checks:

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B10 Navigation in heavy weather or in tropical storm areas

- Have the master, engine room and crew been informed of the conditions?
- Have all movable objects been secured above and below decks, particularly in the engine room, galley and in storerooms?
- Has the ship's accommodation been secured and all ports and deadlights closed?
- Have all weather deck openings been secured?
- Have speed and course been adjusted as necessary?
- Has the crew been warned to avoid upper deck areas made dangerous by the weather?
- Have safety lines/hand ropes been rigged where necessary?

Have instructions been issued on the following matters?

- monitoring weather reports
- transmitting weather reports to the appropriate authorities or, in the case of tropical storms, danger messages in accordance with SOLAS

Other checks:

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B11 Navigation in ice

Have the master, engine room and crew been informed of the ice conditions?

Have watertight doors been shut, as appropriate?

Has speed been moderated?

Has the frequency of sounding tanks and bilges been increased?

Have instructions been issued on the following matters?

monitoring ice advisory service broadcasts

transmitting danger messages in accordance with SOLAS

Other checks:

B12 Changing over the watch

When changing over the watch relieving officers should personally satisfy themselves regarding the following:

- standing orders and other special instructions of the master relating to navigation of the ship
 - position, course, speed and draught of the ship
 - prevailing and predicted tides, currents, weather, visibility and the effect of these factors upon course and speed
 - procedures for the use of main engines to manoeuvre when the main engines are on bridge control and the status of the watchkeeping arrangements in the engine room
- navigational situation, including but not limited to:
- the operational condition of all navigational and safety equipment being used or likely to be used during the watch
 - the errors of gyro and magnetic compasses
 - the presence and movements of ships in sight or known to be in the vicinity
 - the conditions and hazards likely to be encountered during the watch
 - the possible effects of heel, trim, water density and squat on underkeel clearance
- any special deck work in progress

Other points:

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B13 Calling the master

The OOW should notify the master immediately:

- if restricted visibility is encountered or expected
- if traffic conditions or the movements of other ships are causing concern
- if difficulties are experienced in maintaining course
- on failure to sight land, a navigation mark or obtain soundings by the expected time
- if, unexpectedly, land or a navigation mark is sighted or a change in soundings occurs
- on breakdown of the engines, propulsion machinery remote control, steering gear or any essential navigational equipment, alarm or indicator
- if the radio equipment malfunctions
- in heavy weather, if in any doubt about the possibility of weather damage
- if the ship meets any hazard to navigation, such as ice or a derelict
- in any other emergency or if in any doubt

Other points:

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When the vessel is at sea

Inform master

Prepare for anchoring if the vessel is unable to manoeuvre

Note These checklists have been included as a guide

It is recommended that appropriate checklists should be devised to suit the particular needs of the ship type and trade, taking into account that other personnel and passengers may be on board

Prepare emergency fire contingencies

Other actions

C1 Main engine or steering failure

Action to be carried out:

- Inform master
- Prepare for anchoring if in shallow water
- Exhibit 'not under command' shapes/lights
- Commence sound signalling
- Broadcast URGENCY message to ships in the vicinity, if appropriate

In case of a STEERING FAILURE:

- inform engine room
- engage emergency steering
- take way off the ship
- prepare engines for manoeuvring

Other actions:

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C2 Collision

Action to be carried out:

- Sound the general emergency alarm
- Manoeuvre the ship so as to minimise effects of collision
- Close watertight doors and automatic fire doors
- Switch on deck lighting at night
- Switch VHF to Channel 16 and, if appropriate, to Channel 13
- Muster passengers, if carried, at emergency stations
- Make ship's position available to radio room/GMDSS station, satellite terminal and other automatic distress transmitters and update as necessary
- Sound bilges and tanks after collision
- Check for fire/damage
- Offer assistance to other ship
- Broadcast DISTRESS ALERT and MESSAGE if the ship is in grave and imminent danger and immediate assistance is required, otherwise broadcast an URGENCY message to ships in the vicinity

Other actions:

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C3 Stranding or grounding

Action to be carried out:

- Stop engines
- Sound general emergency alarm
- Close watertight doors, if fitted
- Maintain a VHF watch on Channel 16 and, if appropriate, on Channel 13
- Exhibit lights/shapes and make any appropriate sound signals
- Switch on deck lighting at night
- Check hull for damage
- Sound bilges and tanks
- Visually inspect compartments, where possible
- Sound around ship
- Determine which way deep water lies
- Determine the nature of the seabed
- Obtain information on local currents and tides, particularly details of the rise and fall of the tide
- Reduce the draught of the ship
- Make ship's position available to radio room/GMDSS station, satellite terminal and other automatic distress transmitters and up-date as necessary
- Broadcast DISTRESS ALERT and MESSAGE if the ship is in grave and imminent danger and immediate assistance is required, otherwise broadcast an URGENCY message to ships in the vicinity

Other actions:

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C4 Man overboard

Actions to be carried out:

- Release lifebuoy with light and smoke signal on the side the crew member has fallen overboard
- Take immediate avoiding action so as not to run over the man overboard
- Sound three prolonged blasts of the ship's whistle and repeat as necessary
- Post a lookout with binoculars and instructions to maintain a continuous watch on the man overboard
- Hoist signal flag 'O'
- Commence a recovery manoeuvre, such as a Williamson turn
- Engage hand steering, if helmsman available
- Note ship's position, wind speed and direction and time
- Inform master, if not already on the bridge
- Inform engine room
- Place engines on stand-by
- Muster rescue boat's crew
- Prepare rescue boat for possible launching
- Distribute portable VHF radios for communication
- Rig pilot ladder/nets to assist in the recovery
- Make ship's position available to radio room/GMDSS station
- Broadcast URGENCY message to ships in the vicinity

Other actions:

C5 Fire

Action to be carried out:

- Sound the fire alarm
- Call master if not already on bridge and notify engine room
- Muster crew
- Establish communications
- Check for missing and injured crew members
- On locating the fire, notify all on board of that location
- If an engine room fire, prepare for engine failure

Assess fire and determine:

- the class of fire
- appropriate extinguishing agent
- appropriate method of attack
- how to prevent the spread of the fire
- the necessary personnel and firefighting methods
- Close down ventilation fans, all doors including fire and watertight doors and skylights
- Switch on deck lighting at night
- Make ship's position available to radio room/GMDSS station, satellite terminal or other automatic distress transmitters and update as necessary
- Broadcast DISTRESS ALERT and MESSAGE if the ship is in grave and imminent danger and immediate assistance is required otherwise broadcast an URGENCY message to ships in the vicinity

Other actions:

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C6 Flooding

Actions to be carried out:

- Sound the general emergency alarm
- Close watertight doors, if fitted
- Sound bilges and tanks
- Identify location of incoming water
- Cut off all electrical power running through the area
- Shore up area to stem water flow
- Check bilge pump for operation
- Check auxiliary pumps for back-up operation, as required
- Make ship's position available to radio room/GMDSS station, satellite terminal and other automatic distress transmitters and update as necessary
- Broadcast DISTRESS ALERT and MESSAGE if the ship is in grave and imminent danger and immediate assistance is required otherwise broadcast an URGENCY message to ships in the vicinity

Other actions:

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C7 Search and rescue

Actions to be carried out:

- Take bearing of distress message if radio direction finder fitted
- Re-transmit distress message
- Maintain continuous listening watch on all distress frequencies
- Consult MERSAR/IAMSAR manuals
- Establish *communications with all other surface units and SAR aircraft involved in the SAR operation*
- Plot position, courses and speeds of other assisting units
- Monitor X-band radar for locating survival craft transponder (SART) signal using 6 or 12 nautical mile range scales
- Post extra look-outs for sighting flares and other pyrotechnic signals

Other actions:

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C8 Abandoning ship

Actions to be carried out:

- Broadcast DISTRESS ALERT and MESSAGE on the authority of the master
- Instruct crew members to put on lifejackets, and wear adequate and warm clothing
- Instruct crew members to put on immersion suits, if carried, if water temperature is below 16°C
- Order crew members to lifeboat stations
- Prepare to launch lifeboats/liferafts
- Ensure that lifeboat sea painters are attached to the ship
- Embark all crew in the lifeboats/liferafts and launch
- Ensure lifeboats/liferafts remain in safe proximity to the ship and in contact with each other

Other actions:

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