

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 through risk assessment of hazards and waypoint selection. 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 task of preparing the passage plan to the officer responsible for navigational equipment and publications. In other ships, the master may plan the voyage himself.

Irrespective of who carries out the task of passage planning, it remains the responsibility of the master to ensure that the passage plan provides the basis of safe navigation for the intended voyage.

While responsibility for the plan in pilotage waters rests with the master, 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 2.7).

While responsibility for the plan in pilotage waters rests with the master, any necessary amendments may take place subsequent to the Master/Pilot Exchange (see section 2.7).

2.3 NOTES ON PASSAGE PLANNING

In accordance with IMO Resolution A.893(21) Guidelines for Voyage Planning, there are four distinct stages in the planning and achievement of a safe passage:

- Appraisal;
- Planning;
- Execution;
- Monitoring.

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 section 4.11).

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, the largest scale charts that are appropriate should be used.

2.3.3 The passage plan

The passage plan should incorporate the following details:

- planned track showing the true course of each leg;
- leg distances;
- any speed changes required en route;
- abort/cancellation points for critical manoeuvres;
- 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, where appropriate.

At any time during the voyage, the ship may need to leave the planned leg temporarily at short notice. Marking on the chart relatively shallow waters and minimum clearing distances in critical sea areas is 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 passage 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.

Appropriate details of the passage plan may be copied 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 4.11.)

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 indicated automatically 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 mixture 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

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, when appropriate;
- 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 in high latitudes;
- requirements for ballast water exchange may cause the route selected to be amended in view of forecast or anticipated conditions;
- 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 the 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, allowance should be made for reduced underkeel clearance caused by ship squat, which increases with ship speed (see section 3.3.2).

Ships' routing schemes, restricted areas and reporting systems along the route, as well as vessel traffic services, should be taken into account (see sections 2.8, 2.9 and 2.10).

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.

2.6 MONITORING THE PASSAGE PLAN

It is important that, when navigation is planned through coastal or restricted waters, due consideration is given to ensuring that the progress of the ship can be monitored effectively. Therefore, the route plan should, if possible, be readily available at the main conning position so that continuous monitoring can be performed easily.

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.

The passage plan should include details regarding the required frequency of position-fixing, regardless of whether or not electronic navigation systems are used, and should also include details regarding cross-checking the ship's position by other means, including when electronic navigation systems are used.

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

2.6.1 Visual monitoring techniques

Ahead, transits can provide a leading line along which a ship can steer safely. 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 used effectively. 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.

2.6.2 Radar monitoring techniques

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

Ships with good athwartship 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.

2.7 PASSAGE PLANNING AND PILOTAGE

This section should be read in conjunction with section 3.3.3 (Navigation with a pilot on board) and section 6 (Maritime pilotage).

2.7.1 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 be included as part of the plan. The plan should also identify charted features that will assist in 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 that is available and working (see annex A3).

2.7.2 Pre-arrival information exchange with the pilot

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

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 station 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.

The master and the pilot should exchange information regarding navigational procedures, local conditions and rules and the ship's characteristics and, as appropriate, berthing. This information exchange should be a continuous process that generally continues for the duration of the pilotage.

2.7.3 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.

The pilotage passage plan should be discussed with all members of the bridge team prior to the pilot boarding the vessel. The master should advise the bridge team that the pilot will effectively be a new member of the ship's bridge team, who may not be familiar with the vessel's equipment or handling characteristics. The master should emphasise that the presence of a pilot aboard the vessel does not release the bridge team from their respective duties or responsibilities.

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

The pilot should be handed the Pilot Card (see annex A3) 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.

There will be circumstances when a debrief between one of the bridge team and the pilot could identify improvements in the conduct of future pilotage operations.

2.7.4 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. However, the outward pilot is the individual with whom the relevant Master/Pilot exchange takes place and with whom the outward bound pilotage plan should be discussed and agreed.

2.8 PASSAGE PLANNING AND SHIPS' ROUTEING

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 publication *Ships' Routing* contains 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 routeing systems include:

- traffic separation scheme – a routeing 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.

2.9 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, 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* (2002 edition).

AIS is used by coastal authorities and other ships to gather information regarding a ship's characteristics, cargo and passage. As such, AIS may be considered to be a constant ship reporting system. It is essential that both static and dynamic data programmed into AIS equipment remains accurate so as to avoid transmitting false data. (See section 4.3.)

2.10 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 can 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.