

Analysis of a Voyage Plan from Barcelona to Las Palmas

Bachelor's Degree Final Project



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Greetings

I want to be grateful to Suardiaz shipping for make possible my period on board as a Deck Cadet.

Also thank the 'Facultat de Nàutica de Barcelona' for helping me to make this project, in special to Agustí Martí Mallofré and Clàudia Barahona.

And finally I want to thank my family, my friends and my girlfriend for being always by my side.

Abstract

This final project for a Bachelor's Degree will be about a Voyage Plan of a short sea shipping Ro – Ro vessel including the factors that composes it. It will be a followed tracking from “berth to berth”.

This trip study will start in Barcelona and ending in Las Palmas of Grand Canaries (Spain). It will be a track following checking the accomplishment of the IMO Guidelines.

It will be carried out a revision of the certificates on board, checking the up to date; the paper charts, the Nautical Publications on board that gives us information about the geographical conditions to perform the voyage plan; the agent's functions and how he influents; the “guide port entry”, a book which gives us all necessary information about the arrival port (VHF communication channels, approaches to the entrance buoy, arrival procedures, etc.); the electronic charts (ECDIS) and the Route planning on the GPS including their waypoints and the purposed information (depth, currents, tides, etc.) and how to make the pilot chart. The containing information and how it can change depending on the different parameters.

In the other hand, it will be an explanation about the different stages of the route. Planning, carry out, follow-up and arrival to port. Having present the meteorological information in function of the year period, how is that affecting in the route planning. It will be also a revision of the procedures to entry and leaving the port. (Pilot on board, tugs requirement or not and mooring procedures).

Besides, I will explain the voyage plan like the navigation officer. The motivation for this project is due to the contact that I have with this type of vessels and the good access for trusty information. Moreover, I think that navigation is a beautiful thing so I have a great motivation to analyse this investigation.

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Table 1. Voyage Plan Table

Chapter 1. Introduction

The safe navigation of the vessel has historically always been the responsibility of the Master. However, it is customary for the Master to delegate navigational duties to his officers and in particular to identify an individual who acts as the 'navigation officer'. The principle of passage planning generally falls into his/her expected duties whether for ocean passage or coastal passage.

The expected standards of 'Passage Planning' are now new but the procedures have become more formalised over recent years and must conform principles published in SOLAS *Chapter 'V' Safety of Navigation*. These principles expand on four essential areas of activity required to achieve a safe passage between ports.

The voyage plan is a procedure to develop a complete description of a vessel's voyage from start to finish. The plan includes leaving the dock or harbour area, the different parts of the voyage, approaching the destination, and mooring. This is known as "berth to berth". According to the IMO, the captain is legally responsible but the duty is usually delegated to the second officer.

The practice of a voyage planning has evolved from drawing lines on nautical charts to a process of risk management¹.

The voyage planning consists of four stages: appraisal, planning, execution and monitoring. These stages are specified in *International Maritime Organization Resolution A.893(21), Guidelines For Voyage Planning*, which will be explained later in details.

The Guidelines specify three key items to consider in the practice of a voyage planning:

1. Having a voyage plan is "of essential importance for safety of life at sea, safety and efficiency of navigation and protection of the marine environment.
2. Voyage plan is necessary for all types of vessels on all types of voyages.
3. The plan scope should be based on all information available, should be "berth to berth", including when under pilotage, and the plan includes the execution and the monitoring of the process.

By necessity these individual operations must follow on from each other to achieve the objective.

¹ Risk management is the identification, assessment and prioritization of risks (defined in ISO 31000) followed by application of resources to minimize and control the probability of unfortunate events.

Once completed, the plan is for use by the 'bridge team', and to this end it should be presented as a complete product, to the Master, by the navigation officer. This is not to say that the plan is rigid in its guidelines. On the contrary, any passage plan must retain operational flexibility to take account of the unexpected. The plan in its entirety must therefore cover the period from when the vessel departs her berth to her arrival at her new berth. The saying 'berth to berth' is appropriate, but contingency plans, where applicable should be included.

The practical construction of a passage plan becomes the personal composition of the navigator and can be effectively achieved by alternative methods. The Department of Trad's Guide contains a recommended check-list and any method employed should incorporate all these features. Many navigators complete the objective by means of:

1. **Use of a data notebook:** No one can pre-empt passage conditions or anticipate ETA's prior to the event. Certain aspects must, by the nature of the beast, be carried out en route or when an arrival time is released.

Such items that might useful be employed towards the plan which the navigator could be expected to hold are:

- Times of sunset/sunrise at landfall positions, fairways or harbours
- Tidal data for rivers, harbours, locks, etc.
- Rising and dipping ranges of navigational lights, prominent to the plan
- Port signals for destination
- Frequencies for radio beacons intended for use on route
- Call signs/VHF channels for respective coast radio stations on passage
- Departure draughts and expected arrival draughts of the vessel
- Detail of clocks advancing or being turned back as longitude is changed.
- Special hazards and prominent features of the overall plan.
- Details on contingency plans for unusual occurrences, such as no pilot available, poor visibility in congested areas, engine or steering gear failure in areas of reduced sea room.

2. **Tabular presentation:** The use of a table related directly to the passage plan can be the ideal check for the navigator. It can provide a running

update on the distance and subsequently deliver a continually revised ETA. The basic table entries would be comparable with the charted legs of the passage and this in itself ensures an additional check against the measured distance.

3. Chart – passage plan – check-list: Without doubt the completed chart, which illustrates the proposed route, is the most central and the most essential visual presentation of the ‘passage plan’. It is required to carry all items that could effect the safe navigation of the vessel, without obscuring relevant detail. The plan should reflect continuity which will allow all waters officers to take over the navigational duties and to this end will be required to indicate the following items:

- Course tracks and distances with respective margins of safety.
- Radar conspicuous targets should be prominent.
- Projected ETA’s at alter course positions.
- Tidal streams with indicated maximum/minimum rates and directions.
- Tidal landmarks, transits or clearing bearings.
- VHF calling/communication points.
- Where expected use of the echo sounder would be anticipated.
- Next chart indication to allow position transfer.
- Crossing traffic or known areas of heavy traffic density.
- Traffic separation schemes and relevant references.
- Those positions on route where extra personnel may be required.
- Station call points for advising the Master, engine room, pilot stations, etc.
- Positions where anchors should be prepared.
- Advance warning of potential hazards or dangers.
- Raising/dipping ranges of lights that would aid position fixing methods.
- Alternative position fixing methods for night or day passage.

- Those positions where manual steering must be engaged.
- Navigational warnings which might be currently effecting the chart.
- Navigational radio aids and their accuracy with charted area.
- Highlight 'NO GO AREAS'.

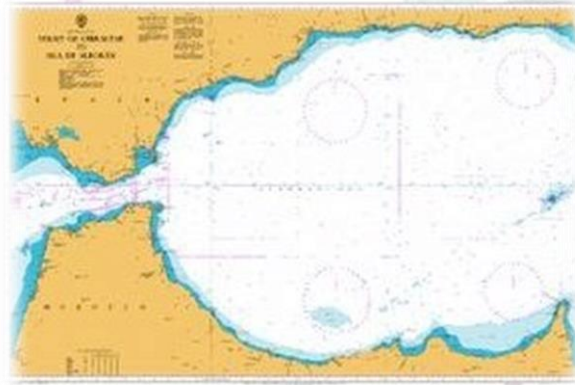


Figure 1. Admiralty Chart 773, Strait of Gibraltar – www.mdnautical.com

Chapter 2. Guidelines for Voyage Planning

2.1 Passage Planning Principles

The International Maritime Organization² Resolution A.893(21), Guidelines for Voyage Planning specify fifty elements of voyage planning, some of which are only applicable in certain situations.

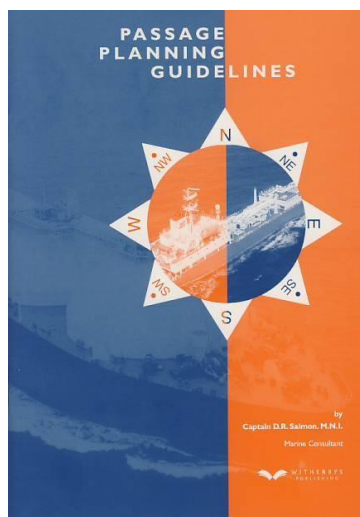


Figure 2. Passage Planning Guidelines example – www.mandibooks.com

The development of a plan for voyage or passage, as well as the close and continuous monitoring of the vessel's progress and position during the execution of such a plan, are of essential importance for safety of life at sea, safety and efficiency of navigation and protection of the marine environment.

The need for voyage and passage planning applies to all vessels. There are several factors that may impede the safe navigation of all vessels and additional factors that may impede the navigation of large vessels or vessels carrying hazardous cargoes. These factors will need to be taken into account in the preparation of the plan and in the subsequent monitoring of the execution of the plan.³

Voyage and passage planning includes appraisal: gathering all information relevant to the contemplated voyage or passage; detailed planning of the whole voyage or passage from berth to berth, including those areas necessitating the presence of a pilot; execution of the plan; and the monitoring of the progress of the

² IMO

³ Resolution A.893(21) (See ANNEX 25)

vessel in the implementation of the plan. These components of voyage/passage planning are analysed below:

2.2. The Navigators Data Notebook

No one can pre-empt passage conditions or anticipate ETA's prior to the event. Certain aspects must, by the nature of the beast, be carried out en route or when an arrival time is realised.

Such items that might usefully be employed towards the plan which the navigator could be expected to hold are:

- Times of sunset/sunrise at landfall positions, fairways or harbours.
- Tidal data for rivers, harbours, locks, etc.
- Rising and dipping ranges of navigational lights, prominent to the plan.
- Port signals for destination.
- Frequencies for radio beacons intended for use on route.
- Call signs/VHF channels for respective coast radio stations on passage.
- Departure draughts and expected arrival draughts of the vessel.
- Detail of clocks advancing or being turned back as longitude is changed.
- Special hazards and prominent features of the overall plan.
- Details on contingency plans for unusual occurrences, such as no pilot available, poor visibility in congested areas, engine or steering gear failure in areas of reduced sea room.

2.2 Stages of the voyage plan

2.2.1 Appraisal

Voyage planning starts with the appraisal stage. Before each voyage begins, the navigator should develop a detailed mental model of how the entire voyage will proceed. The appraisal stage consists of gathering and contemplating all information relevant to the voyage. Much of this appraisal is done by consulting nautical charts, nautical publications and performing a number of technical tasks such as weather forecasting, prediction of tides and currents, and checks of local regulations and warnings.

The master, in consultation with the navigation officer and other deck officers who will be involved, should make an overall assessment of the intended voyage.

This appraisal will provide the master and his bridge team with a clear and precise indication of all areas of danger, and delineate the areas in which it will be possible to navigate safely taking into account the calculated draught of the vessel and planned under-keel clearance.

The following items should be taken into account in voyage and passage planning:

- The condition and state of the vessel, its stability, and its equipment; any operational limitations; its permissible draught at sea in fairways and in ports; its manoeuvring data, including any restrictions.
- Any special characteristics of the cargo (especially if hazardous), and its distribution, stowage and securing on board the vessel.
- The provision of a competent and well-rested crew to undertake the voyage or passage.
- Requirements for up-to-date certificates and documents concerning the vessel, its equipment, crew, passengers or cargo.
- Appropriate scale, accurate and up-to-date charts to be used for the intended voyage or passage, as well as any relevant permanent or temporary notices to mariners and existing radio navigational warnings.



Figure 3. Chart Table of vessel Bouzas – Own Source

- Accurate and up-to-date sailing directions, lists of lights and lists of radio aids to navigation.

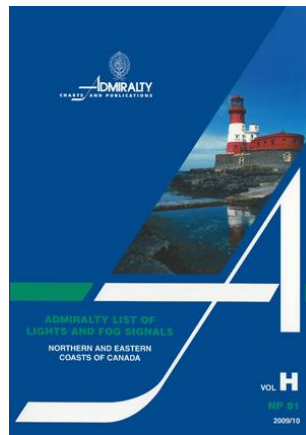


Figure 4. The front cover of a List of Lights volume – en.wikipedia.org

- Any relevant up-to-date additional information, including:
 - Mariners' routing guides and passage planning charts, published by competent authorities.
 - Current and tidal atlases and tide tables.
 - Climatological, hydrographical, and oceanographic data as well as other appropriate meteorological information.
 - Availability of services for weather routing (such as that contained in Volume D of the World Meteorological Organization's Publication No. 9).
 - Existing ships' routing and reporting systems, vessel traffic services, and marine environmental protection measures.
 - Volume of traffic likely to be encountered throughout the voyage or passage.
 - If a pilot is to be used, information relating to pilotage and embarkation and disembarkation including the exchange of information between master and pilot.
 - Available port information, including information pertaining to the availability of shore-based emergency response arrangements and equipment.
 - Any additional items pertinent to the type of the vessel or its cargo, the particular areas the vessel will traverse, and the type of voyage or passage to be undertaken.

2.2.2 Planning

The next stage of the process is known as the planning stage. Once information is gathered and considered, the navigation officer can begin the process of actually laying out the voyage.

Once a full appraisal has been carried out the navigation officer carries out the Planning process, acting on the master's instructions. The detailed plan should cover the whole voyage, from berth to berth, and include all waters where a pilot will be on board. The plan should be completed and include all the relevant factors listed in the Guidelines.

The appropriate charts should be marked clearly showing all areas of danger and the intended track taking into account the margins of allowable error. Where appropriate, due regard should be paid to the need for advanced warning to be given on one chart of the existence of a navigational hazard immediately on transfer to the next. The planned track should be plotted to clear hazards at as safe a distance as circumstances allow. A longer route should always be accepted in preference to a shorter more hazardous route. The possibility of main engine or steering gear breakdown at a critical moment must not be overlooked.

Additional information which should be marked on the charts include:

- All radar-conspicuous objects and RACONs, which may be used in radar position fixing.



Figure 5. X Band Radar of Vessel Bouzas – Own Source

- Any transit marks, clearing bearings or clearing ranges (radar) which may be used to advantage. It is sometimes possible to use two conspicuous

clearing marks where a line drawn through them runs clear of natural dangers with the appropriate margin of safety; if the vessel proceeds on the safe side of this transit she will be clear of the danger. If no clearing marks are available, a line or lines of bearing from a single object may be drawn at a desired safe distance from the danger; provided the vessel remains in the safe segment, it will be clear of the danger. Parallel index lines should also be drawn where appropriate.

If an electronic chart system is used to assist voyage planning the plan should also be drawn up on the paper charts. Where official (ENC) vector data is available an ECDIS provided with fully compliant ENC data for the vessel's voyage may be used instead of paper charts. Raster Chart Display Systems (RCDS) using official and up to date Raster charts can be used in conjunction with paper charts to assist voyage planning and route monitoring. Hazards should be marked on the RCDS as well as on the paper chart. Systems that use unofficial chart data should not be used for voyage planning or navigation.



Figure 6. Electronic Chart of vessel Bouzas - Own Source

Depending on circumstances, the main details of the plan should be marked in appropriate and prominent places on the charts to be used during the voyage. They should also be programmed and stored electronically on an ECDIS or RCDS where fitted. The main details of the voyage plan should also be recorded in a bridge notebook used specially for this purpose to allow reference to details of the plan at the conning position without the need to consult the chart. Supporting information relative to the voyage, such as times of high and low water, or of sunrise or sunset, should also be recorded in this notebook.

It is unlikely that every detail of a voyage will have been anticipated, particularly in pilotage waters. Much of what will have been planned may have to be adjusted or changed after embarking the pilot. This in no way detracts from the real value of the plan, which is to mark out in advance,

areas where the vessel must not go and the appropriate precautions which must be taken, and to give initial warning that the vessel is standing into danger.

2.2.3 Execution

The IMO was careful to include execution as part of the process of passage planning. This underscores the fact that the Guidelines list a number of tasks that are to execute during the course of the voyage. It also reiterates the captain's responsibility to treat the plan as a "living document" and to review or change it in case of any special circumstances that should arise:

Factors which should be taken into account when executing the plan, or deciding on any departure therefrom include:

- The reliability and condition of the vessel's navigational equipment
- Estimated times of arrival at critical points for tide heights and flow
- Meteorological conditions, (particularly in areas known to be affected by frequent periods of low visibility) as well as weather routing information
- Daytime versus night-time passing of danger points, and any effect this may have on position fixing accuracy
- Traffic conditions, especially at navigational focal points.

It is important for the master to consider whether any particular circumstance, such as the forecast of restricted visibility in an area where position fixing by visual means at a critical point is an essential feature of the voyage or passage plan, introduces an unacceptable hazard to the safe conduct of the passage; and thus whether that section of the passage should be attempted under the conditions prevailing or likely to prevail. The master should also consider at which specific points of the voyage or passage there might be a need to utilize additional deck or engine room personnel.

2.2.4 Monitoring

The fourth and final stage of voyage planning is the monitoring stage. Once the voyage has begun the progress of the vessel along its planned route must be monitored. This requires that the ship's position be determined, using standard methods bearing in mind the following points:

- Positions obtained by electronic positioning systems must be checked regularly by visual bearings and transits whenever available.
- Visual fixes should, if possible, be based on at least three position lines.

- Transit marks, clearing bearings and clearing ranges (radar) can be of great assistance.
- It is dangerous to rely solely on the output from a single positioning system.
- The echo sounder provides a valuable check of depth at the plotted position.
- Buoys should not be used for position fixing but may be used for guidance when shore marks are difficult to distinguish visually; in these circumstances their positions should first be checked by other means.
- The charted positions of offshore installations should be checked against the most recent navigational notices.
- The functioning and correct reading of the instruments used should be checked.



Figure 7. Autopilot in the bridge of vessel Bouzas - Own Source

- Account must be taken of any system errors and the predicted accuracy of positions displayed by electronic position fixing systems.
- The frequency at which the position is to be fixed should be determined for each section of the voyage.

The officer of the watch, whenever in any doubt as to the position of the vessel or the manner in which the voyage is proceeding, should immediately call the master and, if necessary, take appropriate action for the safety of the vessel.

The performance of navigational equipment should be checked prior to sailing, prior to entering restricted or hazardous waters and at regular and frequent

intervals at other times throughout the voyage.

The plan should be available at all times on the bridge to allow officers of the navigational watch immediate access and reference to the details of the plan.

The progress of the vessel in accordance with the voyage and passage plan should be closely and continuously monitored. Any changes made to the plan should be made consistent with these Guidelines and clearly marked and recorded.

Investigations show that human error contributes to 80% of navigational accidents and that in many cases essential information that could have prevented the accident was available to but not used by those responsible for the navigation of the vessels concerned. Most accidents happen because of simple mistakes in use of navigational equipment and interpretation of the available information, rather than because of any deficiency in basic navigational skills or ability to use equipment.

Masters, skippers and watchkeepers should therefore adhere to the IMO Guidelines taking the following measures to ensure that they appreciate and reduce the risks to which they are exposed:

1. Ensure that all the vessel's navigation is planned in adequate detail with contingency plans where appropriate.
2. Ensure that there is a systematic bridge organization that provides for:
 - a. Comprehensive briefing of all concerned with the navigation of the vessel;
 - b. Close and continuous monitoring of the vessel's position ensuring as far as possible that different methods of determining the position are used to check against error in any one system.
 - c. Cross-checking of individual human decisions so that errors can be detected and corrected as early as possible.
 - d. Information available from plots of other traffic is used carefully to ensure against over-confidence, bearing in mind that other vessels may alter course and/or speed.
 - e. Ensure that optimum and systematic use is made of all appropriate information that becomes available to the navigational staff.
 - f. Ensuring that the intentions of a pilot are fully understood and acceptable to the vessel's navigational staff.

2.3 Pilotage

The Plan covers the voyage from berth to berth and therefore includes the Pilotage stage. The IMO Guidelines do not give specific advice on this important stage therefore the following notes should be taken into consideration when planning and executing the pilotage stages.

Pilots make a significant contribution to the safety of navigation in the confined waters and port approaches of which they have up to date knowledge, but it must be stressed that the responsibilities of the vessel's navigational team and the officer of the watch do not transfer to the pilot. After boarding the vessel, in addition to being advised by the master of the maneuvering characteristics and basic details of the vessel for its present condition, the pilot should be clearly consulted on the voyage plan to be followed. The general aim of the master should be to ensure that the expertise of the pilot is fully supported by the vessel's bridge team.

“Despite the duties and obligations of a pilot, his presence on board does not relieve the officer of the watch from his duties and obligation for the safety of the vessel. He should co-operate closely with the pilot and maintain an accurate check on the vessel's position and movements. If he is in any doubt as to the pilot's actions or intentions, he should seek clarification from the pilot and if doubt still exists he should notify the master immediately and take whatever action is necessary before the master arrives.”⁴

2.4 Navigation in and around small vessels and pleasure craft

2.4.1 Approach plan

There are numerous occasions when commercial deep sea vessels can expect to encounter small craft. Pilot launches, harbor craft, tugs, cargo barges to mention but a few. Apart from the dangers of interaction Masters and bridge Officers should be aware of some basic bridge procedures and precautionary actions prior to engagement with smaller craft, in close proximity.

Any engagement with small vessels should be planned and well thought out prior to commencement of the operation. Full consideration should be given to the geography of the area of intended operation. It should preferably be clear of navigational hazards and in clear water, to allow a suitable course setting to present a favourable aspect to prevailing weather.

The plan should incorporate early timings for standard operations such as: Manual steering change from automatic steering, engine room status prior to reduction of speed, preparation of anchors. Masters requirement on the bridge, lookouts posted etc.

⁴ Extract from IMO Resolution A.285 (VIII)

All tracks and courses should be clearly identified on the chart with both the gyro and compass headings noted. Position monitoring points together with projected ETA's should also be charted.

The use of clearing bearings, transits and sector lights can be particularly useful during small boat engagement and can provide simple checks for monitoring the safe navigation of the vessel. Radar conspicuous targets should be highlighted before the vessel enters the area of engagement.

Special attention being given to racon's and buoys carrying radar reflectors. Course alteration points with wheel over points should be identified and charted in accordance with recommendations of relevant speeds. Special attention should be given to areas where course alterations or speed changes may be adversely effected by strong currents, etc.

2.4.2 Regulations for Small Craft

Regulation 34 applies to all vessels but the degree of voyage planning may sensibly be less for small vessels and pleasure craft. There is still a need for prior planning but the plan need not be written down. The following should particularly be taken into account when planning a boating trip:

Weather: before you go boating, check the weather forecast and get regular updates if you are planning to be out for any length of time.

Tides: check the tidal predictions for your trip and ensure that they fit with what you are planning to do.

Limitations of the vessel: consider whether your boat is up to the proposed trip and that you have sufficient safety equipment and stores with you.

Navigational dangers: make sure that you are familiar with any navigational dangers you may encounter during your boating trip. This generally means checking an up to date chart and a current pilot book or almanac.

Contingency plan: always have contingency plan should anything go wrong. Before you go, consider bolt holes and places where you can take refuge should conditions deteriorate or if you suffer an accident or injury. Bear in mind that your GPS set is vulnerable and could fail at any time. It is sensible and good practice to make sure that you are not over-reliant on your GPS set and that you can navigate yourself to safety without it should it fail you.

Information ashore: make sure that someone ashore knows your plans and knows what to do should they become concerned for your well being. The Coastguard Voluntary Safety Identification Scheme (commonly known as CG66) is also free and easy to join.

Although Regulation 34 only applies when proceeding to sea, small craft users should adhere to the voyage planning principles when also sailing in categorized waters.

Chapter 3. Bridge Preparation

3.1 Bridge Procedures

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.



Figure 8. Bridge of Vessel Bouzas - Own Source

It is recommended to carry a copy of the book Bridge Procedures Guide on board of every ship. The first edition of the Bridge Procedures Guide was published in 1977. Written to encourage good bridge watchkeeping practices, the Guide, quickly made its mark and became acknowledged as the standard manual on the subject.

The Bridge Procedures Guide takes account of good practice with regard to:

- Maintenance of a safe navigational watch at all times
- Safe manning levels and hour regulations

- The requirements of Chapter VIII (Watchkeeping) of the IMO STCW Convention
- The latest changes to the Radio Regulations
- Modern electronic navigation and charting systems
- The use of AIS⁵
- Dynamic Positioning

This book 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.

In particular, this guide has been revised to take into account the amendments to STCW⁶, the ISM⁷ Code and also the provision of modern electronic navigation and charting systems which, on new whips, 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.

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.

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.

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

⁵ Automatic Identification Systems

⁶ Standards of Training, Certification and Watchkeeping

⁷ International Safety Management Code

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 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 VHF 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

3.2 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.

3.3 Delegation of authority

The master has the ultimate responsibility 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 OOW⁸ to carry out the navigation, with the master maintaining a monitoring role.

⁸ Officer on Watch

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.

3.4 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.

3.5 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.

3.6 Bridge Organisation

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 COLREG⁹ 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.

3.7 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 routing 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

⁹ Collision Regulation

- 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.

3.8 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

3.9 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.

3.10 Sole look-out

Under the STCW Code, the OOW may be the sole look-out in daylight conditions.

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 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

3.11 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.

3.12 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.

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

3.13 Working within the bridge team

3.13.1 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.

3.13.2 Co-ordination and communication

The ability of ship's personnel 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.

3.14 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. Self-teaching manuals, videos or computer based training programmes, are examples of other methods that could be used on board ship.

3.15 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 in 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 ISF¹⁰ publication.

¹⁰ 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.

3.16 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 SMNV¹¹ has been published, and SMCP¹² 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 explain his communications to the bridge team, so that the ship is aware of the pilot's intentions at all times.

3.17 The bridge team and the pilot

When the pilot is on board of a ship, he will temporarily join the bridge team and should be supported accordingly.

3.18 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

¹¹ Standard Marine Navigational Vocabulary

¹² Standard Marine Communication Phrases

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

3.18.1 IBS equipment

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

3.18.1.1 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.

3.18.1.2 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

3.18.1.3 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.

3.18.1.4 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
- The details of the plan, and in particular the waypoints, need to be carefully prepared on or transferred to the navigation system

- The position of the ship needs to be safely calculated and quality monitored by the navigation system
- 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

3.18.1.5 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.

Chapter 4. Company Procedures

4.1 Safety Management Policy

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.

4.2 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.

4.3 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.

Chapter 5. Voyage Plan Analysis

5.1 Overview

Now we will analyse the necessary material for developing the voyage plan: The certificates on board, admiralty books, admiralty charts and so on

Besides of the material, what we want to do in this project is to define a methodology to ensure the development of voyage plan and monitoring the possible changes during the voyage.

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.

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.

5.2 Responsibilities

Its modification during the trip as a result of a substantial change in any determinant cause, bad weather, assistance, or other changes which might require modification of the plan. In these cases, the new route should be also planned.¹³

In addition, when in a particular trip pre-exists the possibility of having to alter the route made in the Voyage Plan because of the weather conditions, the vessel must have several alternative voyage plans before taking to sea.

¹³ (STCW-95 Code, ch. A-VIII/2, section 7)

The captain is responsible for the implementation of this procedure in the ship, to check and approve each voyage plan and its updates.

The First Mate is responsible of supervising compliance with this procedure.

The Navigation Officer (Second Mate¹⁴) is responsible of the preparation of each voyage plan in accordance with the instructions received from the captain and the rules described in IMO Guidelines.

Every Officer on duty is responsible for knowing and understanding the voyage plan, and control over his watch in a continuous way, immediately informing the captain, if the ship can not be kept in the planned route or have to deviate substantially from it; and whenever there are any questions about the Plan.

Chief Engineer is responsible according to the Captain to identify the needs of fuel, lubricants, fresh water and so on, according to the voyage plan.¹⁵

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.

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.

5.3 Sources and recompilation of information

5.3.1 Navtex

The Navtex stations transmit information about the waterways and give us service for delivery of navigational and meteorological warnings and forecasts, as well as urgent maritime safety information to ships.

We will use Navtex stations from Tarifa (G), Valencia (X) and Las Palmas (I).

5.3.2 Faximile

Often the print quality of information through this device is usually low due to the systems used for transmission of data (low frequency).

¹⁴ Not in all vessels the Second Mate is the Navigation Officer; but in the case of this Project, the type of vessel which we are analyzing, the 2nd Mate is the Nav. Officer.

¹⁵ ISM Code Application, OMI Resolution – A.741/18

It is important when using this device as a means for information related to consult a publication such as the Admiralty List of Radio Signals.

5.3.3 Internet

Its application as media and vehicle to receive information is relatively recent. This option offers many possibilities to get updated information of different nature and doing it with availability of language (usually English).

Ship-owners, companies and officers are recommended exploring this new medium.

5.3.4 Through agents

The master should ask your agent to provide the latest updated information.

For example, in the case of an underway vessel through Gibraltar Strait, she should receive the latest information and updates before crossing it.

5.3.5 Instructions from company and charterer

Always keep in mind any operation or routine specifically requested by the owner or charterer of the vessel, through internal circulars. ISM¹⁶, SMS Manual fleet or given notice charterers of the vessel.

5.3.6 Instructions for merchant ships and information provided by local authorities

The vessel must have instructions on-board, recommendations and updated information prepared by the institutions / local maritime organizations. This information is usually published in pamphlet form that can be obtained through Internet or by ship-owners.

5.3.7 Celestial Observation

What we make is to measure the angular distance of the sun from us to the horizon, using the sextant to know our position.

The best observations are usually taken at the stars, at sunset. As latitude increases, the decline increases its duration but so long as the sun is located behind the horizon at sunset, delaying the appearance of the stars.

¹⁶ International Safety Management Code. The purpose of this Code is to provide an international standard for the safe management and operation of ships and for pollution prevention.

5.3.8 Nautical Charts

Only official nautical charts 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 needed for the intended voyage should be identified from the chart catalogue and obtained before the ship sails.

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.

The nautical charts are a flat representation of a convex surface (the Earth), it's made through different types of cartographic projections, having each of them a particular use or finality. Basically, the most used are the following:

5.3.8.1 Admiralty charts

The UKHO¹⁷ is responsible of mapping all waters and harbours on a sufficient scale, as an instrument for all vessels, with the objective of contribute in the maritime safety. They are designed to allow vessels go through the oceans and seashores around the world, even the ports and its proximities. Always trying to choose the fittest scale.

It can be classified in:

- **General Charts:** They cover a large amount of coast and sea. They are intended for offshore navigation. Its scale is very small, usually 1 / 30,000,000 and 1 / 3,000,000.
- **Coastal navigation Charts:** Used to navigate near the coast. They usually have scales between 1 / 200,000 and 1 / 50,000.
- **Landfall:** They are made to easy the approach to a port or a geographical accident. Its scale is 1 / 25,000 or very close to it.
- **Fluvial Charts:** The scale usually is 1 / 50,000 or higher, but due to the high accuracy needed for navigate (frequently a few tens of meters), they are used just as a reference, not to determine the position. Generally there are for navigable rivers and pilotage areas.

There are also “lower point” charts, which represent huge extensions, and “higher point” which represent smaller portions. In many charts, usually in coastal navigation, there is a frame representing a part of the chart in bigger scale like a place, port, anchorage area, bay or island.

¹⁷ United Kingdom Hydrographic Office

Charts can also be classified depending on the type of projection:

- **Mercator projection:** They are used for loxodromic navigation. These charts are based on a cylindrical projection, so the meridians are straight and parallel and the same distance from each other. The parallels are also represented as parallel lines, but the distance is greater between them as they move away from Ecuador.
- **Gnomonic projection:** They represent flat surfaces in tangent planes to a point. There are three classes:
 1. **Equatorial:** The plane is tangent to Ecuador. The meridians are parallel but separated between them increasingly separated as the tangent point. The parallels are curves that increase their separation as moving away from the point of tangency and Equator is a line perpendicular to the meridians.
 2. **Horizontal:** The tangent is any point. Meridians are straight lines converging towards the point of projection of the pole and the parallel parabolic curves.
 3. **Polar Charts:** Polar charts have a particular representation. The plane is tangent to the pole. Meridians are as radial straight and parallel and concentric circles.

5.3.8.2 How to correct Nautical Charts

Whenever a new area is to be added to a chart or it has to represent an area different from the previous chart, or the depth units shown on previous charts have to be changed or if the scale on which a previous chart was made has to be renewed, then Admiralty publishes a New Chart.

However if there are major changes in a chart or large amount of data is to be inserted for e.g. Insertion of a New Traffic Separation Scheme not present on the previously used chart, the Admiralty then publishes a New Edition of that chart replacing the existing one.



Figure 9. Admiralty Chart – Own source

The Catalogue of Admiralty Charts and Publications is published every year with current and updated editions of charts, however, if during the year the Weekly Notices to Mariner indicate any new editions or new charts, they are to be inserted in the chart catalogue by the navigating officer.

What do we need to correct the nautical Charts? The essential are: A pen with a very fine point (preferably magenta in colour so that it shows up clearly), a copy of Chart 5011 - Symbols and Abbreviations used on Admiralty Charts and internet access and the free of charge Admiralty Leisure Notices to Mariners website¹⁸.

What Are Notices To Mariners? A Notice to Mariners (NM) is an update or alteration to a chart. Every year the UKHO issues over 5,000 NMs which allow mariners to update their charts to the latest safety-critical information.

Colour Blocks: Notices may also be issued as colour blocks where a lot of changes are to be applied. These are simply cut out and glued on the chart at the coordinates specified. It is important to remember to cut off the enclosing black line around the outer limits of the area of the block. A permanent glue stick is ideal for attaching the block since it allows some movement and readjustment immediately after placement.

5.3.8.3 Applying the Notice to Mariners:

1. Determine if the Notice is applicable to your chart and your vessel.

¹⁸ We will find information in www.ukho.gov.uk/leisure

- You may decide that it isn't relevant to your vessel. For example, changes to a very deep sounding or a new cable in very deep water are not necessarily of interest to the leisure mariner.

2. Apply The Correction

- When replacing a symbol, find the symbol to be replaced on the chart. Then, as close as possible and not over any other information, draw the new symbol. Link the new symbol to the required position with a curved line. Finally draw two diagonal lines through the old symbol to show that it no longer applies.
- When inserting a new symbol, place it on the exact position given in the NM. If there isn't room follow the process above for a 'replacement symbol'

3. Document The Corrections Applied

- Check your work and then, in the bottom left-hand corner of the chart, make a note of the number and year of the NM. Only do this once you have applied the correction and not before.
- If you decide that a correction does not apply to your vessel, making a note of the correction number on the chart will save re-checking at a later date.



Figure 10. Marking a correction – marineinsight.com

5.3.9 Publications

The vessel's crew, especially the Captain and the Officers should know how to use the nautical publications and its information within. Some publications are:

5.3.9.1 Catalogue of Admiralty Charts and Publications

Catalogue of Admiralty Charts (NP 131, 138), gives detailed information of the charts and publications offered by the Hydrographic Office (Hydrographic office).

It's very important to prepare the voyage plan to determine the existing charts and which ones will be needed. If we don't have those charts on board, there is information to order it to the reseller.

Harbour Master will make checks to verify that all necessary charts for the voyage are on board.

When preparing the voyage we will check first of all which charts we have on board and which information should be contained on them. In second place, we will check which charts we will need for the next trip.

5.3.9.2 Admiralty Sailing Directions

Also known as a Pilots Directions, are made to use on board of any type of merchant ship. These publications contain information on all navigation aspects. Sailing Directions is a complementary publication for Admiralty Nautical Charts and provides information of all world waters along its 74 volumes. Each publication contains quality colour pictures and information of the hazards for navigation, beacons and buoys, meteorological data, pilotage, regulations and guidelines for port facilities and port entry.

Regularly new revised editions of the publication introduce innovations, changes and corrections from previous published. They can also be updated through weekly bulletins.

5.3.9.3 Admiralty List of Lights and Fog Signals

This book series offers extensive information of all the lights, floating marks, fog signals and any light that has any meaning or importance for navigation.

This publication also provides information about light and fog signals characteristics, with the equivalent descriptions in the foreign language. Tables can be used to calculate the location of the vessel and the distance at which a light is.

Details of all the lights present in these volumes, including the international number of the light, the location, geographical coordinates, light intensity, elevation (in meters) range (in miles) and description of the structure. Volumes are regularly re-edited with news, reviews and corrections. It's also possible to update a publication on board through the Notice to Mariners weekly published.

5.3.9.4 Admiralty List of Radio Signals

This publication provides information on the aspects of the Maritime Radio Communications. The information is organized and distributed over 6 volumes, to facilitate the marine use. Each of the formats is presented so that it is easy to find information, containing many colour photos and diagrams.

Its content extends from complete listings of radio stations broadcasting over the period, notices to mariners and GMDSS. It also explains the complexity of global positioning systems through Satellite. Publications information is updated through Notice to Mariners. Anyway editions are published regularly with updates and relevant reviews.

The 6 volumes that make up the Admiralty List of Radio Signals are:

- NP281 (Parts 1 & 2) - Maritime Radio Stations
- NP282 - Radio Aids to Navigation, Satellite Navigation Systems, Differential GPS (DGPS) Legal Time, Time Radio Signals and Electronic Position Fixing Systems
- NP 283 (Parts 1 & 2) - Maritime Safety Information Services
- NP 284 - Meteorological Observation Stations
- NP 285 - Global Maritime Distress and Safety System (GMDSS)
- NP 286 (Parts 1-7) - Pilot Services, Vessel Traffic Services and Port Operations

5.3.9.5 Ocean Passages of the World (NP136)

It's the classic volume for the preparation of voyage plan. It contains useful details for both sailing vessels and merchant ships. It is distributed and organized into individual chapters providing information; wind, weather, climate, radio stations, currents, swell, ice hazards and shortest routes between relevant ports.

5.3.9.6 The Mariners Handbook (NP100)

A compilation of essential nautical information, charts, operations, regulations, currents, sea features, basic meteorology, tides, ice navigation, dangers and restrictions to navigation and IALA¹⁹ System Buoyage.

5.3.9.7 Admiralty Tidal Tables (NP 201-204)

The tide tables, provides details about the times and heights of high and low tides of 230 primary ports and 6000 secondary ports in UK, Ireland, Europe, Indian Ocean, China and Pacific Ocean for each day of the year.

¹⁹ The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) is a non-profit organization founded in 1957 to collect and nautical Provide expertise and advice.

5.3.9.8 Distance Tables NP350 1-3

Three volumes, with plenty tables, divided and distributed according to region, offering information about the shortest distance between two ports. They are included diagrams and texts. A three part series of tables, sub-divided by region, the shortest distances giving between ports. There are supporting diagrams and link text as well as tables for places not in the same or adjacent table.

5.3.10 Electronic Navigation Chart (ENC)

An electronic navigational chart is an official database created by a national hydrographic office for use with an Electronic Chart Display and Information System (ECDIS). An electronic chart must conform to standards stated in the International Hydrographic Organization (IHO) Publication S-57 before it can be certified as an ENC. Only ENCs can be used within ECDIS to meet the International Maritime Organisation (IMO) performance standard for ECDIS.

ENCs are available for wholesale distribution to chart agents and resellers from Regional Electronic Navigational Chart Centres (RENCs). The RENCs are not-for-profit organizations made up of ENC-producer countries. RENCs independently check each ENC submitted by the contributing countries to ensure that they conform to the relevant IHO standards. The RENCs also act collectively as one-stop wholesalers of most of the world's ENCs.

IHO Publication S-63 developed by the IHO Data Protection Scheme Working Group is used to encrypt and digitally sign ENC data. Chart data is captured based on standards stated in IHO Publication S-57, and is displayed according to a display standard set out in IHO Publication S-52 to ensure consistency of data rendering between different systems.

IMO adopted compulsory carriage of ECDIS and ENCs on new high speed craft from 1 July 2010 and progressively for other craft from 2012 to 2018.

5.4 The navigation officer

Usually the Second Mate is the Navigation Officer and he is responsible for preparing the voyage plan. Always need the approval of the Captain.

The main tasks of the navigation officer are:

- Communications on board.
- Diary, weekly, monthly and quarterly tests of the bridge equipment: Specifically navigation equipment and radio communication.
- Maintenance and organization of the hospital / medicine kit.

- Planning of the trip. He is responsible for preparing the voyage plan prior approval of the captain. This includes plotting courses, depth calculations under keel (Under Keel Clearance Water) and stations to report. Many of the subjects on board of this project are responsibility of the second mate.
- Maintenance, registration and updating of publications and charts.
- Arrange navigational warnings and parts received through communication equipment on board (NAVAREA, METEARA, NAVTEX ...)

5.5 Elaboration procedures

1. Prior to start the trip, the captain instructs the second mate to prepare the appropriate voyage plan unless that plan was already previously planned, and will continue to be appropriate for that voyage.
2. Second Mate collects all relevant information to the trip (Checklist²⁰).
3. The Second Mate, according with the captain instructions and taking into account the applicable information, will plan the trip on the paper charts to be used.
4. Captain supervises the Second Mate planning. Then approves or requires him to change it prior approval.
5. Once approved the plan, the Second Mate gives a copy the First Mate. Also leave a few copies in the bridge, to control voyage plan by the OOW²¹.
6. Once started the trip, the Captain follows and controls the trip. The OOW records the appropriate data in the logbook and filling the checklist.
7. If for any reason during the voyage is necessary to deviate substantially from the planned route, the OOW will inform the Captain who will order to update the Plan or make a new one.

5.6 Records

1. The second mate, keeps the completed voyage plan papers on a folder as security logs.

²⁰ In each vessel there is a checklist to prepare the voyage plan defined in the ISM Code. We will see it later.

²¹ Officer On Watch

2. It's must to make annotations in the vessel logbook, engine's logbook and ship's log.
3. In the case of an accident at sea, the used navigation charts in that moment, constitute a record, which will be maintained without change, with the notices to mariners received, the weather information available and any other important fact, as a basis for the reports to be written.

5.7 Checklist to prepare the voyage plan

5.7.1 First Part: Data Collection and Evaluation.

The Second Mate should collect and dispose in the navigation room, all necessary information for the provided voyage:

1. The necessary Navigation and Port Charts, available, corrected and arranged from Barcelona to Las Palmas including Barcelona Port, Cabo de la Nao, Cabo de Palos, Cabo de Gata, Estrecho de Gibraltar, Atlantic Ocean and Las Palmas.



Figure 11. Admiralty chart of Canary Islands - Own Source

2. Pilot Volumes and Lists of Lights, corrected and marked the pages which will be used. We will use Mediterranean Pilot and A

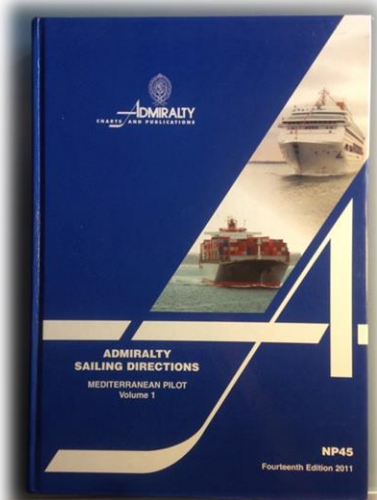


Figure 12. Admiralty Sailing Directions. Mediterranean Pilot Volume 1 - Own Source

3. Pilot Charts: It is a nautical chart published monthly by the US Hydrographic Office containing information about winds, currents, floating ice, recommended routes, etc.

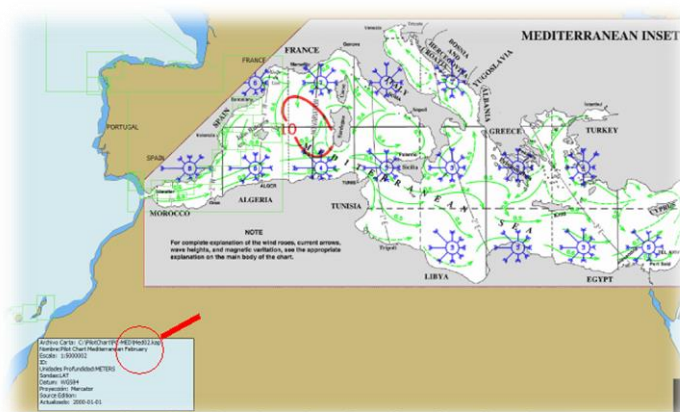


Figure 13. Pilot Chart - www.google.com

4. Currents determination: It's important to know the change in the speed and route. For example, in Alboran sea it uses to be an East current in the northern part and a West current in the southern part so, it's better to go through the northern part when going to canaries, and through the southern when we are coming back to Barcelona.

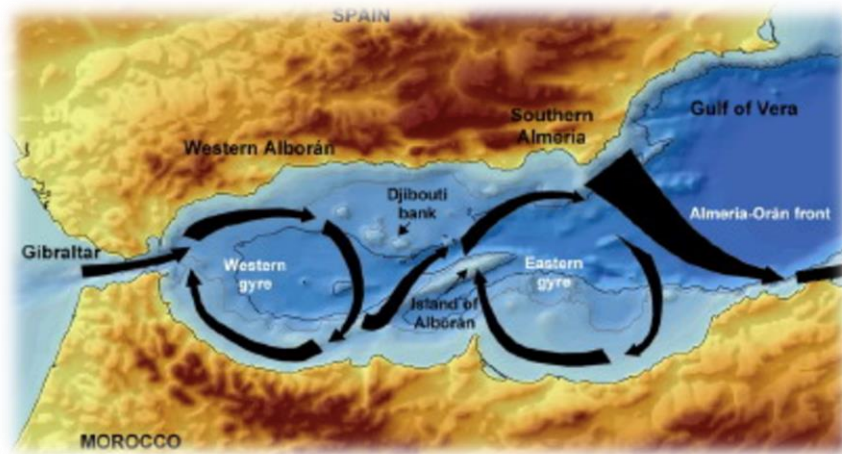


Figure 14. Alboran Sea Currents - www.alnilam.com.es

5. Meteorological data affecting the area: It's always better to avoid storms, big waves and bad weather because it will decrease the speed of the vessel and it's important in this type of routes to be on time. This is why it goes always in 85% of the engine output, on a speed of 18.5 knots approximately.
6. Tides calculation (heights, times and tidal currents): There is no tides in the Mediterranean sea so, we don't have to calculate it for the "Port de Barcelona" but, we will have to calculate it for the Canaries ports, "Puerto de la Luz" in Las Palmas. It is important for the UKC.

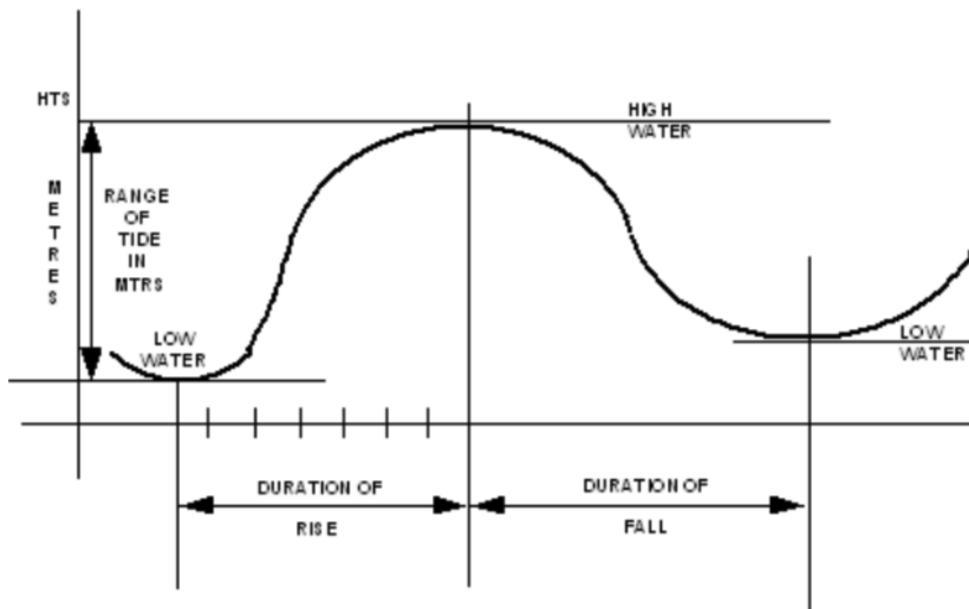


Figure 15. Tides Calculation - www.splashmaritime.com.au

7. Draft information: The second mate has to collect information about the draft in the port to know if the vessel can go through it and have a safety mooring.
8. Stations broadcasting weather information: Check the Inmarsat C and the Navtex Stations. For this voyage plan, we will use three stations: Tarifa (G), Valencia (X) and Las Palmas (I).



Figure 16. Navtex of vessel Bouzas - Own Source

9. Information about the symbols on the charts: Ensure that there is not any danger in the middle of the route that we want to make.
10. Navigational warnings affecting the area: Check the necessary Navarea warnings received through the Inmarsat and Navtex.
11. Pilots information, traffic controls and traffic separation schemes: We can check all this information in the Sailing Directions books in the Chart room of vessel Bouzas.
12. Ship manoeuvring data: We will check this information in the role of the vessel specifications in the chart room.

5.7.2 Second Part: Voyage Plan Documents

13. Trace the course on the right charts, berth to berth: The term berth to berth is important because the new IMO regulations tells that voyage plan must be traced from dock to dock. Previously was only from pilot point to pilot point.

14. Mark on the charts the closest course hazards: Hazards can be received through Inmarsat or Navtex. Also via Internet, corrections and radio VHF or MF.
15. Draw error margins where appropriate.
16. Indicate minimal safeguard to the coast and the closest hazards.
17. Consider the possible black out: failure of government or propulsion. Know which is the procedure in this case, where are the auxiliary batteries and how to restore the electricity.
18. Indicate the courses in circular notation²².
19. Indicate the distances for each section of the course: Write in the table the distances between the different waypoints.
20. Mark significant points to plot by radar or visually: For example, in coastal navigation (Cabo de la Nao, Cabo de Palos, Cabo de Gata and Estrecho de Gibraltar) take bearing and distance from shore to know the position and change the course.

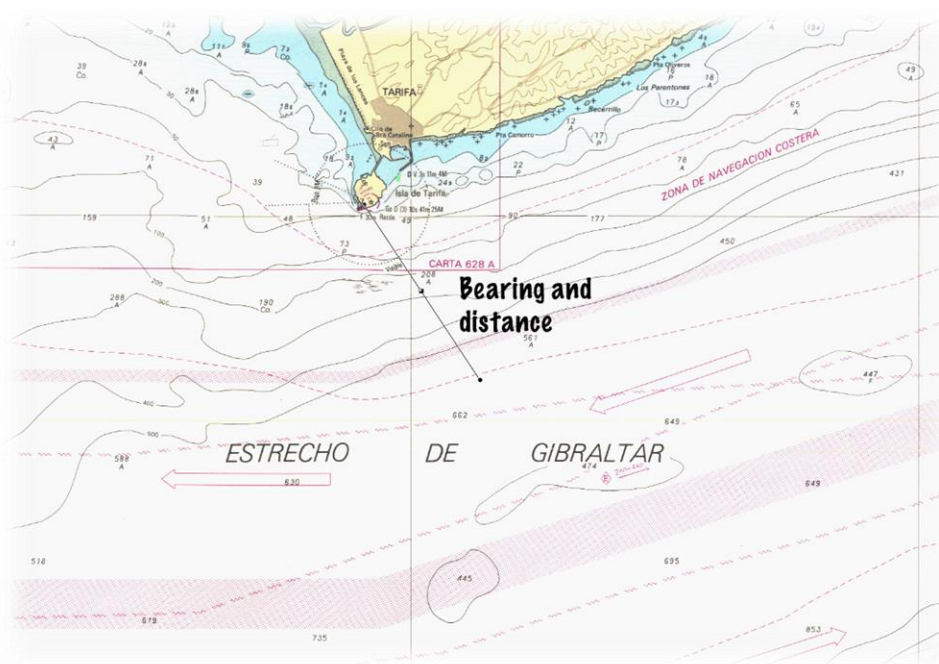


Figure 17. Bearing and distance from Tarifa – www.mdnautical.com

²² Directions (*course to steer, course, heading and route course*) are typically measured clockwise from north, either true or magnetic, in degrees from 0° to 359°, following compass convention (0° being north, 90° being east, etc.).

21. Trace leading lines²³ or distances to determine the bypass of a hazard.

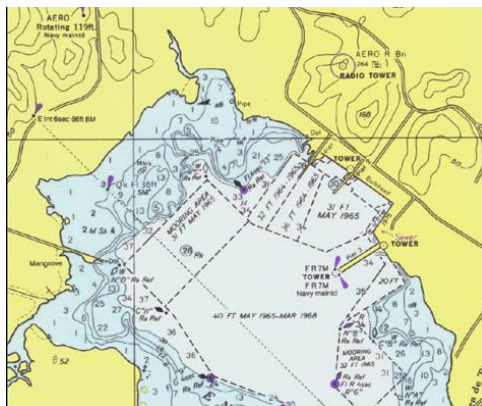


Figure 18. Leading lines on a chart - www.google.com

22. Determine the minimum UKC²⁴: The under keel clearance should be noted for all stages of the engagement and any areas of limiting water depth should be clearly marked on the chart. Areas where the under keel clearance may give cause for concern should be identified in relation to the early use of echo sounder and with relevant position fixing methods.

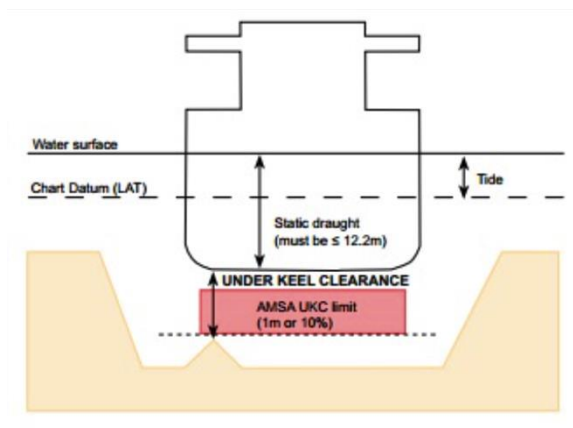


Figure 19. UKC scheme - www.safety4sea.com

23. Indicate the areas where determine the situation has a critical precision.

24. Determine and mark safety speed in restricted water areas.

²³ Leading line corresponds to the position created by the alignment of two recognizable objects on a nautical chart.

²⁴ Under keel clearance, or UKC, is the vertical distance between the lowest part of the ship's hull and the seabed. Maintaining a UKC margin in Torres Strait is important because it ensures a ship's keel is kept clear of the seabed and minimises the chance of the vessel running aground in that area.

25. Determine and mark the course changes and the Waypoints²⁵.
26. Determine actions for steering the vessel to open waters, or in emergency case, to an anchorage.
27. Fill the First part of the Voyage Plan.

²⁵ Waypoints are sets of coordinates that identify a point in physical space.

Chapter 6. Voyage Plan Research: Barcelona – Las Palmas de Gran Canarias

6.1 The Vessel

- **Name:** Bouzas
- **Type of vessel:** Roll on – Roll off
- **Length over all:** 142 m
- **Beam:** 21 m
- **Summer Draft:** 5,4 m

Tonnages

- **Net Tonnage:** 13.873
- **Gross Tonnage:** 15.224

Cargo Lines

- **Summer draft:** 5.4 m
- **Winter draft:** 5.1 m

Equipment

- **“S” band Radar:** No
- **“X” band Radar:** Yes
- **Inmarsat B:** Yes
- **Inmarsat C:** Yes
- **Satellite telephone:** Yes
- **AIS:** Yes



Figure 20. Vessel Bouzas, Barcelona Port – Own Source

6.2 Publications

Some publications that the vessel should carry on board by requirements of the regulation or just because they are recommended will be:

- Admiralty List of Radio Signals
- Bridge Team Management
- List of Lights and Fog Signals
- Sailing Directions (Mediterranean Pilot Volume I and Africa Pilot Volume I).
- Admiralty Pilots (areas of Mediterranean and Atlantic Africa West Coast)
- Ocean Passages of The World
- The Mariner's Handbook
- Admiralty Tide Tables
- Admiralty Distance Tables
- Ship Routing

- SOLAS
- MARPOL

6.3 The Voyage between Barcelona – Las Palmas de Gran Canarias

- **Distance:** 1.234,7'
- **Cargo:** Vehicles, Trailers and general ro-ro cargo
- **Time of voyage:** 3 days
- **Medium speed:** 18.7 kn

6.4 Starting: Port de Barcelona and Approaches

6.4.1 Topography

The East Coast of Spain is less indented and rugged than the S coast, and a number of rivers enter the sea, with the R o Ebro being one of the largest rivers in Spain.

Most of the coast is low, although mountains of considerable elevation rise inland, especially in the S part and N of Cabo San Sebasti n.

The coast is thickly populated but possesses no natural harbours for vessels of deep draught, although there are several artificial harbours, the most important of which is **Barcelona**.

Large sections of this coastline have been transformed into built-up areas with numerous prominent hotels and large blocks of flats.

Barcelona can be recognised from a great distance, not only by the city's large extent, but also by El Tibidabo, San Pedro Martir and San Just, which are the highest summits of a range of mountains rising some 3 miles NW of the city. El Tibidabo has a tall tower on its seaward slopes the bright grey hemispherical cupola of an observatory can be seen. In the pass between El Tibidabo and San Pedro Martir is the town of Vallvidrera and on the summit of San Pedro Martir are some ruins. All this high ground gives a good radar response.

On the skyline behing the city immediately below the summit of El Tibidabo, a conspicuous, white, needle-shaped tower has been constructed.

6.4.2 Approach and entry to Barcelona

The port is approached either from S, entering at the S end of the N end of the E mole. Both approaches are by a recommended two-way traffic route.

The speed limit is 4 kn.

In summer, variable currents can be experienced in the harbour which not only hamper a vessel when berthing but can also produce considerable alterations in depths both within the harbour and alongside the wharfs. When berthing in strong winds caution is necessary because manoeuvring space is limited.

A current, which is much influenced by the wind, sets parallel to the shore in the vicinity of the harbour. The predominant set is SW with a rate of 0.5 kn; an onshore set of up to 1 kn is possible.

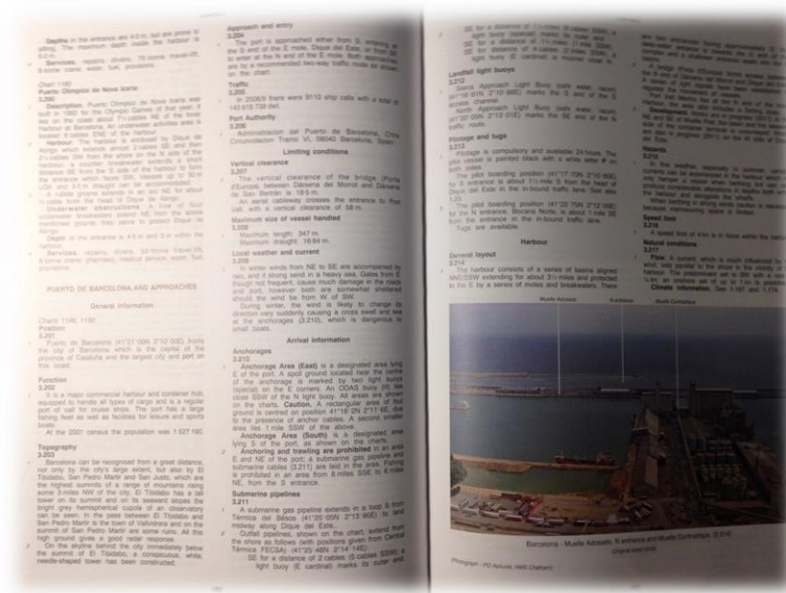


Figure 21. Mediterranean Pilot Volume I

6.4.3 Harbour

The harbour consists of a series of basins aligned NNE/SSW extending for about 3.5 miles and protected to the E by a series of moles and breakwaters. There are two entrances facing approximately S; the deep-water entrance is towards the S end of the complex and a shallower entrance leads into the N basins.

A bridge (Porta d'Europa) forms access between the N end of Dársena del Morrot and Dique del Este. A series of light signals have been established to regulate the movement of vessels.

Port Vell Marina lies at the N end of the Inner Harbour, the area also includes a fishing quay.

Works are in progress to the NE and SE of Muelle Prat; the basin and the seaward are also in progress on the W side of Dique del Este.



Figure 22. Barcelona N entrance – Own source

6.4.4 Limiting Conditions

The vertical clearance of the bridge (Porta d'Europa) between Dársena del Morrot and Dársena de San Bertrán is 18.5 m. An aerial cableway crosses the entrance to Port Vell, with a vertical clearance of 58 m.

Maximum length: 347 m

Maximum draught: 16.84 m

In winter winds from NE to SE are accompanied by rain, and if strong send in a heavy sea. Gales from S, though not frequent, cause much damage in the roads and port, however both are somewhat sheltered should the wind be from W of SW.

During winter, the wind is likely to change its directions very suddenly causing a cross swell and sea at the anchorages, which is dangerous to small boats.

6.4.5 Pilotage and tugs

Pilotage is compulsory and available 24 hours. The pilot vessel is painted black with a white letter P on both sides.

The pilot boarding position (41°17.70N 2°10.80E) for S entrance is about 0.25 mile S from the head of Dique del Este in the in-bound traffic lane.

The pilot boarding position (41°20.75N 2°12.00E) for the N entrance, Bocana Norte, is about 1 mile SE from the entrance in the in-bound traffic lane. Tugs are available.

6.4.6 Exercise areas

Diving, mine counter measures and naval air exercises occur frequently in the Mediterranean East Spain waters.

6.5 Cabo de la Nao

6.5.1 Description

Charts 1701 and 1704

From a position NE of Cabo de la Nao (38°48.11N 0°11.94E), the route leads generally NW for about 45 miles to the approaches to Valencia, passing Dique Norte Light.

NE of Punta del Sardo (17 miles SE). Torre del Jarro (Torre del Agua Dulce) stands on a hill at an elevation of 149 m, 1 mile SE. Caution. This stretch of the coast should be given a wide berth during onshore winds, as the sea breaks heavily squalls come off the high land. Thence:

NE of Escollos de San Nicolás (16.25 miles SE), a reef lying 7.5 cables WNW of Punta del Sardo and close NNW of Punta de San Nicolás, 1.5 cables SE of the reef, is partly rocky and sandy, and decreases in elevation. Thence:

NE of Puerto de Denia (15 miles SE) marked by lights

6.5.2 Principal Landmarks

1. Cabo de San Antonio Lighthouse (38°48.19N 0°11.84E).
2. Monte Mongó (38°48.37N 0°7.77E)
3. Castillo de Denia at Denia (38°50.56N 0°06.44E)
4. Monte de las Zorras (39°10.56N 0°15.06W), 233m in height, at the S end of Sierra de Cullera, which rises steeply from the plains and at a distance might be mistaken for an island.
5. Cabo Cullero Lighthouse (white round tower on round dwelling, 16m in height) (39°11.19N 0°13.02W) standing on the cape.
6. Ermita de los Santos de Sueca standing on a hillock 38m in height in the middle of the coastal plain about 2.5 miles inland, 5.75 miles NW of Cabo Cullera.
7. Valencia, Dique Norte Lighthouse (octagonal tower, 22m in height) (39°26.95N 0°18.13W).

6.5.3 Major lights

1. Cabo de la Nao Light
2. Cabo de San Antonio Light
3. Cabo Cullera Light
4. Valencia, Dique Norte
5. Manises Airfield Aero Light (tower on control tower, 15 m in height) (39°29.58N 0°28.44W), exhibited occasionally.

6.5.4 Currents

Vessels crossing the bay in E winds, especially when moving from N to S, should exercise great caution to avoid being set inshore by the current, which sometimes attains a rate of 2 or 3 kn. This current may also be experienced in settled weather when it is frequently associated with the development of a NE or SE wind.

When the rivers entering the gulf are in spate, the current may attain rates of 4 or 5 kn.

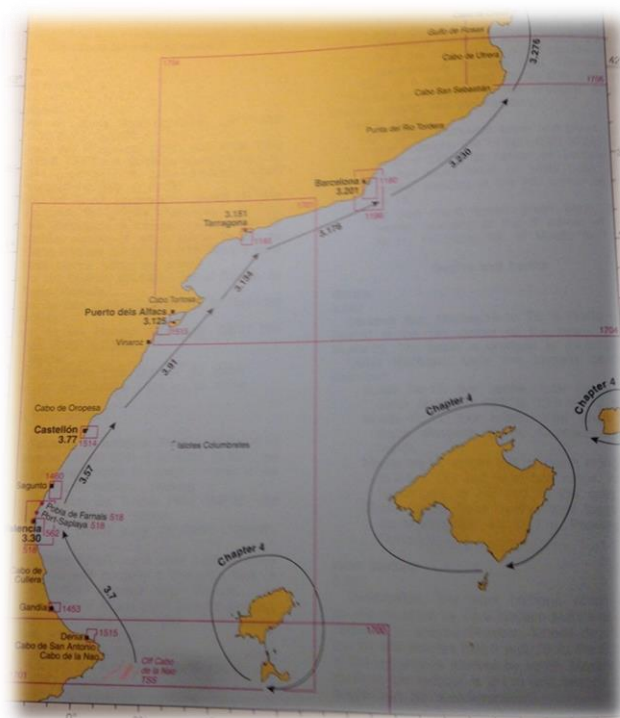


Figure 23. Cabo de la Nao to Cap Cerbère – Mediterranean Pilot Volume I

6.6 Cabo de Palos

Chart 1700

6.6.1 Description

From the N side of Cabo de Palos peninsula the coast consists of a low sandy barrier, 1 to 5 cables wide, extending 11.5 miles N to Puerto de San Pedro del Pinatar. The barrier encloses Mar Menor, a large salt water lagoon.

Cerro del Cabezo Gordo, a hill which rises to a height of 312 m and stands 4.5 miles W of San Javier (37°48.30N 0°48.20W), may be mistaken for Isla Grosa (37°43.65N 0°42.45W) to which it has some resemblance when viewed from the NE.

The coast between Punta de la Escaleta (38°31.41N 0°05.86W) and Punta del Albir, 3 miles NE, rises in precipitous, reddish cliffs to Sierra Helada. This range, when viewed from SW or NE presents a steep slope on its seaward side with a gradual decline inland.

Caution must be exercised, especially in misty weather, to avoid mistaking the hill for the island

6.6.2 Prohibited anchorage and fishing area

A prohibited anchorage and fishing area has been established to protect a submarine water pipeline which is laid between the mainland and Isla de Tabarca.

6.6.3 Major landmarks and lights

1. Cabo de Palos Light
2. Aero light (38°04.30N 0°39.90W), exhibited from the top of Guardamar de Segura Mast. Seven vertically disposed red obstruction lights are displayed on the mast.
3. Isla Tabarca Light (square tower on white dwelling, 14 m in height) (38°09.85N 0°28.28W).
4. Cabo de Santa Pola Light (white square tower on white dwelling, 15 m in height) (38°12.58N 0°30.82W), exhibited from the cape.
5. Punta del Albir Light (white round tower and dwelling, 8 m in height) (38°33.80N 0°03.00W)
6. Cabo de la Nao Light
7. Cabo de San Antonio Light

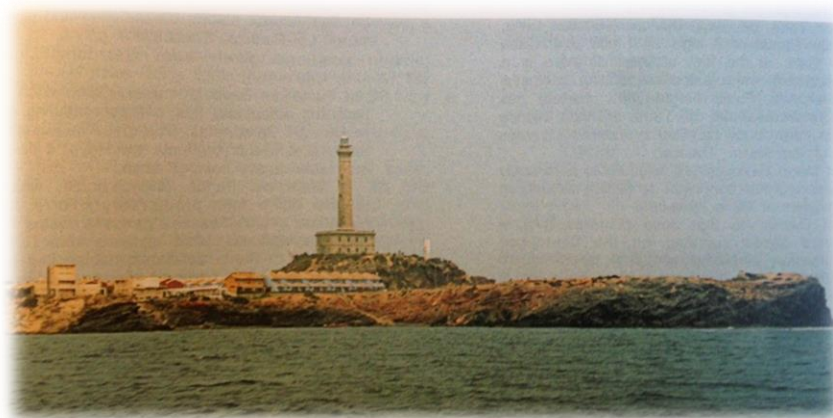


Figure 24. Cabo de Palos Lighthouse – Mediterranean Pilot Volume I

6.7 Cabo de Gata

Charts 773 and 774

6.7.1 Description

The coastal route between Cabo de Palos and Cabo de Gata is 93 miles SW.

The coast between Cabo de Palos and Cabo de Gata is high and broken and presents a mass of scarped summits of medium elevation, interrupted by ravines which open onto the sea in the form of coves and bays. These generally contain sandy shores and offer shelter from NW.

6.7.2 Principal landmarks

1. Cabo de Gata Lighthouse (36°43.30N 2°11.58W).
2. Two prominent pyramid peaks, Los Frailes de Cabo de Gata, lie 1 mile WNW of Punta de Loma Pelada (37°46.68N 2°03.62W). The higher of the two attains an elevation 489m.
3. Punta de la Polacra Lighthouse (truncated conical masonry tower, 14 m in height) (36°50.53N 2°00.17W), standing on a rounded hill above the point.
4. Mesa de Roldán Lighthouse (white octagonal tower and white hut, yellow corners, 18 m in height) (36°56.50N 1°54.40W), standing on the summit of La Mesa de Roldán, a high tableland. A ruined conical brown masonry tower stands about 1.5 cables W.

5. A chimney (grey with red and white bands near the top, red obstruction lights, 205 m in height) ($36^{\circ}58.70N$ $1^{\circ}54.30W$), stands at a power station close to Carboneras.
6. Sierra de Moreras ($37^{\circ}34.50N$ $1^{\circ}20.60W$), the three peaks of which are conspicuous.
7. Cabo Tiñoso Lighthouse (white round tower, 10 m in height) ($37^{\circ}32.13N$ $1^{\circ}06.51W$), standing on the cape. Cabo Tiñoso is high, precipitous and reddish in colour.

6.7.3 Major lights

1. Cabo de Gata Light
2. Mesa de Roldán Light
3. Mazarrón Light (white round tower and dwelling, 11 m in height) ($37^{\circ}33.62N$ $1^{\circ}15.28W$), exhibited 2 cables NNE of Punta Negra.
4. Cabo Tiñoso Light
5. Islote Escombreras Light
6. Cabo de Palos light

6.7.4 Currents

Strong E-going and SE-going currents are experienced in the vicinity of Isla de Alborán, and caution should be exercised in poor visibility.



Figure 25. Cabo de Gata Lighthouse – Mediterranean Pilot Volume I

6.8 Gibraltar Strait

Charts 2717, 142

6.8.1 Description

The coast of Spain, from the isthmus of Gibraltar, extends 180 miles from Cabo de Gata, thence 170 NE to Cado de la Nao. It presents a series of fertile areas, arid plains, gently sloping beaches, rugged coasts, salient headlands and bays. In the most parts the coast can be closed to a shore distance and there are few off-lying dangers.

The coastal hills are of moderate elevation backed by high mountains. Most rivers on this coast are swollen by rains or melting snow from the inland mountains, and in summer they diminish to small streams or, in some instances, completely dry up; no large rivers enter the sea along this coast.

The coastline is also the site of numerous holiday resorts, all of which contain tall prominent buildings and in view of continued development the mariner should be prepared to see towns where small villages or even open country are charted.

Apart from Isla de Alborán (35°56.35N 3°02.11W), about 18 miles S of the track of vessels bound E through the Mediterranean, the only other islands are small and lie within 3 miles of the coast.

6.8.2 Major lights

1. Europa Point Light
2. Gibraltar Aeromarine Light (elevation 405 m) (36°08.55N 5°20.58W).
3. Punta de la Doncella Light
4. Marbella Light
5. Punta Calaburras Aeromarine Light
6. Málaga Light

6.8.3 Use of Traffic Separation Schemes (TSS)

The IMO published routing guide, “Ships Routing”, details adopted schemes around the worlds marine coastlines. Such routing operations are often monitored by ‘Radar Surveillance’ operated by various Coastguard Organisations. It should be realised that heavy penalties exist for traffic observed to be in contravention of these operations. As such, Masters should ensure that their respective Passage Plans comply with the TSS recommendations and that the movement of the vessel conforms to Regulation 10, of the Anti-Collision Regulations.

In areas where the TSS forms an essential element of a traffic focal point, like the English Channel and in particular the Dover Strait or Malacca Straits, the importance of adequate watchkeeping facilities must be in place, alongside any passage through the scheme. Passage plans should provide positive indication where manual steering, double lookouts, speed changes, Masters presence required, contingencies etc. are likely to form a critical factor of the vessels continued safe movement.

6.8.4 Anchorage in Gibraltar

Large vessels, many awaiting orders, anchor off the E side of Gibraltar up to 5 miles offshore.

6.8.5 Prohibited areas

For areas where anchoring and fishing are prohibited, and for the extent of fish havens see charts.

A prohibited area of width approximately $\frac{3}{4}$ cable, extends 2.5 cables E from the E extremity of Gibraltar airport runway (36°09.08N 5°20.80W).



Figure 26. Faro de Tarifa – Mediterranean Pilot Volume I

6.9 Cap Spartel to Canaries

Chart 4104

6.9.1 Description

The Atlantic coast of Morocco from Cap Spartel is low and dangerous; it is bordered by low sandhills and the land is mostly barren.

The highest part is in the vicinity of Cap Bedouzza, 260 miles SW of Cap Spartel. The uniform sandy beach S of Essaouira (31°30.40N 9°46.47W) is backed by dunes and continues thus as far as the vicinity of Cap Rhir (30°37.93N 9°52.95W) which lies at the W end of Atlas Mountains.

6.9.2 Natural Conditions

6.9.2.1 Weather

The coast of Morocco offers little shelter being totally exposed to the sea with onshore winds. Between Cap Spartel and Cap Bedouzza allowance should be made for a heavy W swell which usually sets directly onto the coast.

6.9.2.2 Piracy

Acts of piracy have taken place in these waters. Generally, these acts have taken place at anchorages or in the approaches to the ports. Mariners are advised to keep a constant watch and not to permit any unauthorised craft to come alongside.

6.9.3 Traffic regulations

6.9.3.1 Traffic separation scheme

Exists in the W approaches to Strait of Gibraltar, about 14 miles NW of Cap Spartel. This traffic scheme is IMO-adopted and Rule 10 of *International Regulations for preventing Collisions at Sea (1972)* applies.

6.9.3.2 Prohibited area

Maghreb-Europe Gas pipeline. A safety and protection zone has been established 1 mile either side of the pipeline for a distance of three miles.

6.9.4 Landmarks and Major lights

1. Cap Spartel Light (yellow square tower, 24 m in height) (35°47.47N 5°55.43W).
2. Tanger Boukhalf Aero Light (control tower, 12 m in height) (35°43.43N 5°54.74W).
3. Port Larache Light (N breakwater head) (35°12.17N 6°09.35W).
4. Pointe Nador (Punta Nador) Light (white 8-sided tower and building, 44 m in height) (35°11.56N 6°03.16W).
5. Al Awambra Aero Light (tower, 16 m in height) (35°02.61N 6°03.03W).

6. Mehdiya Entrance Rear Leading Light (red octagonal tower, white cupola, 9 m in height) (34°15.54N 6°39.63W).
7. Kentira Aero Light (yellow tower, bulbous top) (34°17.48N 6°36.07W).

6.10 Arrival to Canaries, Las Palmas

6.10.1 Description

Canaries Islands, contained between the parallels of 27°30N and 29°30N and the meridians of 13°25W and 18°10W, consist of seven major islands and several smaller ones.

The total area of the islands is 7492 sq km.

6.10.2 Port of Las Palmas

Ubication: 28°09N 15°25W

The Port of Las Palmas, belongs to the network of existing ports of general interest in Spain, managed by the Port Authority of Las Palmas, is located on the island of Gran Canaria, part of the archipelago of the Canary Islands, 210 kilometers from the African coast and 1,250 of Europe.

It is located in the city of Las Palmas, in the northeast of the island of Gran Canaria, main economic and commercial center of the island [citation needed]. Its strategic location, excellent conditions of their bay and the quality of its services make the Puerto de La Luz a maritime crossroads between Europe, Africa and America. So much so that from the port of Las Palmas can be reached about 380 ports worldwide thanks to some thirty shipping lines passenger and cargo that will connect them.

Port of Las Palmas (also called La Luz Port) (Spanish: Puerto de Las Palmas or Puerto de La Luz) is port for fishing, commercial, passenger and sports boats in the north-west of Las Palmas, Spain, European Union. For five centuries, the Port of Las Palmas (La Luz Port) has been the traditional base for scale and supplying ships on their way through the Middle Atlantic.

La Luz Port is not only the first port of the Canary Islands, but also the first port in the Mid-Atlantic, and handles the most traffic at the crossroads between Europe, Africa and America. In turn, it constitutes one of the main ports of Spain and the first of the geographical area of West Africa. The port in 2007 handled a total of 907,782 passengers, 16.26% more than in 2006, and the growing cruise passenger traffic rose 21.23%. In 2007, it processed some 11,262 ships. La Luz Port] has the 5th position of Spain in TEUs, 1,449,773 in 2007, which places it among the first 15 ports of Europe.

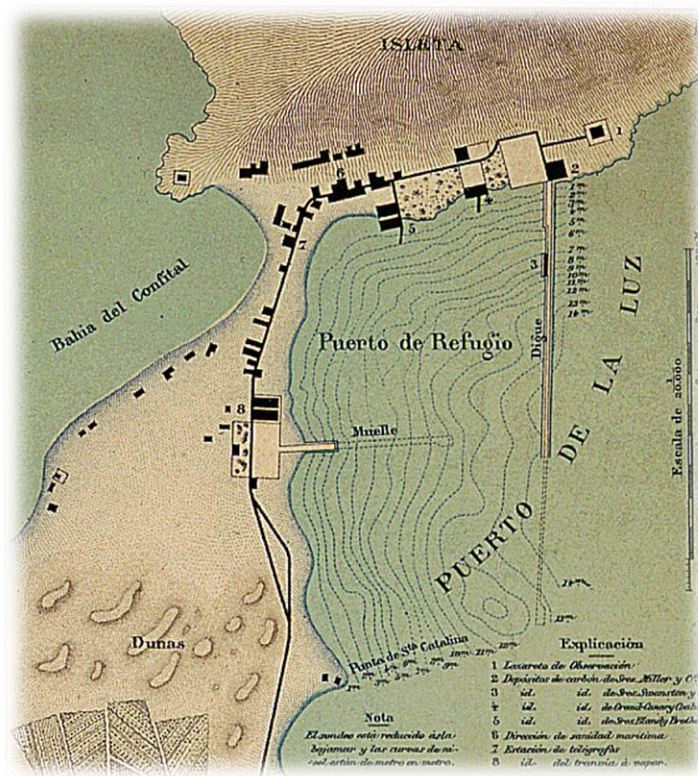


Figure 27. Puerto de la Luz, Las Palmas – www.wikipedia.com

In this section of the project I will proceed to expose and emphasize considerations related to developing Voyage Plans in general, and also the specific considerations that the navigation officer, who is in charge of its preparation should think about.

By developing the Voyage Plan, this will be the last part before implementing everything discussed in this work.

6.11 The Tabular Presentation

The use of a 'table' related directly to the 'passage plan' can be the ideal check for the navigator. It can provide a running update on the distance and subsequently deliver a continually revised ETA. The basic table entries would be comparable with the 'charted legs' of the passage and this in itself ensures an additional check against the measured distance.

Table presentations can be as detailed as the conditions of the passage dictate but should include the following examples entries:

All 'alter course', positions, with the specified courses and distances between them. Courses being in degrees 'true'. Distances 'to go' and the respective steaming time for each 'leg' of the passage is useful in providing an update to the ETA as the passage proceeds.

Additionally, some presentations may show 'primary' and 'secondary' position fixing methods and frequency of their use. Engine status may also be shown for appropriate periods in the passage together with under keel clearances when necessary.

This table shows information about the passage from Barcelona to Las Palmas. It contains information about position of the waypoints, courses, distances and other additional information.

Voyage Plan

VOYAGE PLAN – Barcelona to Las Palmas								
WPT.	WP. NAME	LATITUDE LONGITUDE	COURSE DIST.	DISTANCES		VEL.	ETA	MASTER ORDERS
				ADD.	DEST.		DATE & TIME	
1	BCN START	41° 20,0' N 002° 13,0' E	122,9° 1,8'		1.234,7'	18,7'	Friday 14:49	Report to Barcelona Pilots on Ch. 14 and Barcelona Traffic on Ch. 10 when passing November buoy
2	BCN N	41° 19,0' N 002° 15,0' E	208,8° 181,7'	1,8'	1.232,9'	18,7'	Friday 14:54	
3	LA NAO DOWN	38° 40,0' N 000° 21,0' E	213,0° 78,2'	183,5'	1.051,1'	18,7'	Saturday 00:37	
4	PALOS DOWN	37° 34,5' N 000° 33,0' W	228,7° 104,8'	261,7'	972,9'	18,7'	Saturday 04:48	
5	GATA DOWN	36° 25,5' N 002° 11,5' W	284,0° 43,6'	366,6'	868,1'	18,7'	Saturday 10:25	Report to Gata Traffic on Ch. 11
6	SW PUNTA DE LOS BAÑOS	36° 36,0' N 003° 04,0' W	270,0° 41,8'	410,1'	824,5'	18,7'	Saturday 12:44	
7	TORROX	36° 36,0' N 003° 56,0' W	243,5° 80,9'	451,9'	782,7'	18,7'	Saturday 14:59	
8	PUNTA CARNERO	36° 00,0' N 005° 25,7' W	252,4° 9,3'	532,8'	701,8'	18,7'	Saturday 19:18	Report to Tarifa Traffic on Ch. 10
9	TARIFA 2	35° 57,2' N	270,0°	542,1'	692,6'	18,7'	Saturday	

Analysis of a Voyage Plan from Barcelona to Las Palmas

		005° 36,6' W	28,9'				19:48	
10	HOYOS NORTE	35° 57,2' N 006° 12,2' W	224,8° 663,7'	571,0'	663,7'	18,7'	Saturday 21:21	
11	LAS PALMAS	28° 07,0' N 015° 23,5' W		1.234,7'			Monday 08:50	Las Palmas Traffic on Ch. 10 and Control Center Las Palmas on Ch. 12 (1 hour before)

Table 1. Voyage Plan Table

Chapter 7. Navigation in Port

Vessel Bouzas owns to Suardiaz Shipping and she is transporting Roll on – Roll off cargo as cars, trucks and industrial machinery.

Suardiaz is oriented to Shipping, Logistics, Warehousing, Customs, Railway, Stowage, Project Freight Forwarding and company.

Suardiaz fleet is a leading European capital. “Grupo Suardiaz”, one of the strongest companies with long tradition in the maritime Spanish and international market, has been dedicated to this activity for more than one century, but it was in 1944 when vapores Suardiaz was created under the auspices of the brothers Rafael and Jose Riva Suardiaz.

Currently as ship-owners operate with a total of 25 ships, on fixed routes, specialized in the transport of vehicles, trailers and general cargo, between Europeans, Africans and Asians ports for the leading manufacturers of the automotive and industrial sector. Suardiaz also participate actively in various military and humanitarian transportation behalf of the United Nations and NATO.

7.1 Shipboard preparations

All flags and/or navigational day/night signals should be clearly indicated prior to the approach. It should be normal practice for early communications to be established by VHF either channel 16 or if known, the most suitable working channel. Barcelona Traffic is channel 10 and Barcelona Pilots is channel 14. Las Palmas Traffic is channel 10 and Las Palmas Pilots is channel 12.



Figure 28. Barcelona Pilots – www.barcelonapilots.com

A listening watch on the working channel would then be maintained with relevant ETA's being passed to the target vessel.

Information regarding new navigational dangers in the area, together with weather updates should be sought from the approaching craft as appropriate. In the case of pilots, ladders should be rigged in ample time and in a position to suit the weather and the needs of pilot launches.

Instrument checks should be made and safe speed established prior to engagement. Ships progress and all relevant operations should be noted in the log book especially the monitoring of the ships position at appropriate stages of the approach.

7.2 Operations

An early sighting of the target is always beneficial, but it should always be borne in mind that the most direct route to the rendezvous is not always the safest or most prudent. Echo sounder should be running and the position monitored as often traffic while at the same time maintaining visual contact with the target vessel once this has been established.

The direction of the wind should be ascertained immediately prior to engagement, with the view to adjusting the vessels head so as to provide a 'lee' for the smaller craft. Speed should be continually adjusted to allow the two vessels to close and maintain station on each other.

Officers of the watch and/or Masters should ensure that reductions of speed do not result in the vessel losing steerage way. Clear instructions to the bridge team, especially to the helmsman and lookouts to report anything untoward, should be clearly expressed.

Internal and external communications, will without doubt play a major role in any operation of this nature. If precise records are maintained in the form of old log books, they can form a valuable directive for future operations and help to inform in similar activities at a later date.

7.3 Navigation and Manoeuvring with Tugs

Usually with vessel Bouzas we don't need Tugs because we are always touching the same ports. Besides she is equipped with a bow thruster and 142 m length. Anyway, it's important to know the procedure of taking tugs because it may be necessary sometimes in bad weather conditions:

The employment of tugs is always generally accepted as being a welcome addition by the majority of Masters/Pilots when engaged in manoeuvring. However, this welcome addition will only remain so while the tug and the Tug Master continue to respond to the navigational needs of the parent vessel. It is not unusual to see six

or more tugs engaged in the berthing or undocking of a large ULCC or VLCC, but not in our case, Ro-Ro one or two will be enough. Provided each tug responds as part of an overall team then full control of the operation becomes the accepted norm. To this end a clear and understandable communication system must be known and practised by all Tug Masters and the bridge team of the parent vessel. Clear and identified VHF channels together with recognised whistle signals must be familiar to all operators.

7.3.1 Approaching tugs

Early communication with Tug Masters to ascertain position of rendezvous and projected ETA must be considered essential information. Prudent Masters would also obtain such practical details as to whether the ships towing springs are to be used or the tugs lines. The relative position that the tug will secure to the vessel and how the lines are to be secured. (Some tugs will secure by employing the eye only, other will require the wires on the bitts. Other tugs may be engaged to push as opposed to securing). When approaching tugs a continuous lookout should be maintained and the operation of securing tugs should not be allowed to distract from essential watchkeeping duties. The vessel should be in manual steering and all flags and/or respective navigation signals displayed.

The Master/Navigator should make an early chart assessment of the area of rendezvous. It should be clear of obstructions and without heavy traffic density. The prevailing direction of anticipated weather could be usefully displayed on the chart to provide indication for ships head and visually present the overall ship handling scenario to the bridge team. Current and tide conditions must be considered prior to engagement of tugs.



Figure 29. Salvador Dalí, Barcelona Tug, 'Grupo Reyser' – Own Source

7.4 Pilots and Pilotage

7.4.1 Introduction

With few exceptions the presence of a Pilot on board never relieves the Master or members of his crew of their duties and obligations regarding the safe navigation of the vessel. The 'bridge team' principle, where all relevant parties are inter-linked within a communication loop must include the marine pilot as a key member. Full exchange of information from the onset of picking up the pilot and a continuous flow of positive assistance between and towards all bridge team contributors, should be the order of the day.

7.4.2 Master/Pilot Relationship

With the arrival of the marine pilot aboard the vessel, the Master would normally be expected to receive documentation reflecting the Pilot's licence and/or the pilotage authority. The recognition and acceptance of the Pilot's credentials and the respect and reputation of the pilotage authority is assessed initially at this time. On regular liner trades, where Pilots are often known personally to the Master the task of Pilot assessment is obviously made with increased peace of mind.

As with any relationship, mutual respect is two ways. The Pilot will require an equal level of respect from the Master as well as the ship's criteria. In the majority of cases the Pilot is a professional mariner and his competency is attested to by the pilotage authority that issues the licence to practice. In the case of the Master his competency lies within the possession of his master's certificate, so both meet on equal terms.

Open and frank discussion between Master/Pilot regarding manoeuvres of berthing or other navigational aspects would be expected. There is however, a danger of excessive fraternisation and it must be remembered fully that final decisions and the necessary 'power of command' remain with the Master. In the past shipping companies retained 'Company Pilots' but this practice is not as prevalent as it used to be. This Master/Company Pilot relationship was one that could, if allowed to, easily develop to a point of distraction for the pilot and the Master, away from the task in hand.

Masters who are engaged on world wide trades can expect to experience varying degrees of competence in the Pilots who board their vessels. It must therefore be assumed that at some time in the inadequate for maintaining the safety of the vessel. In this case the level of competence may well not be revealed until the pilotage is underway. The options at this stage for the Master would appear to be as follows:

1. Master relieves the Pilot and takes on the pilotage duty.
2. Master relieves the Pilot and requests another Pilot

3. Master relieves the Pilot and holds the ship's position, either stopped or at anchor, until a relief Pilot is available.

Should this unlikely situation develop a statement should be entered into the ship's log book and evidence and witness statements obtained where relevant.

7.4.3 Embarking/Disembarking of Pilots

In any operation which involves the embarkation or the disembarkation of a Pilot, it is essential that early and effective communications are established from the onset. If the inbound vessel requires the services of a Marine Pilot ample notices should be given to the pilotage station/authority, by the ship's agents or direct from the Master of the vessel. Relevant call signs and frequencies being found for respective stations in the Admiralty List of Radio Signals.

A provisional ETA, once passed to the pilot station, can always be revised up or down as the ships progress can more accurately be projected with the closing range. Once contact is established by radio, additional information will be sought by the Pilot stations, to enable the planning of an appropriate coastal route.

Such information could include:

1. Draught of vessel when at Pilot roads.
2. Manoeuvring speed of vessel.
3. Size of vessel, with respect to:
 - a. Length overall (for berthing)
 - b. Beam width (for locks)
 - c. Navigation equipment
 - d. Manoeuvring aids
4. Requirements for tugs, linesmen, docking Pilot, mooring boats, etc.
5. Nature of cargo (For Bouzas: cars and trucks)

7.4.4 Shore-to-Ship Pilot/Master Exchange and Communications

Prior to approaching a Pilotage Station it would be normal procedure to request pilotage details. These would expect to include the Name of the Pilotage Authority, a contact name, together with an operational VHF communication channel, often obtainable from Sailing Directions.

On establishing communications 'Pilot boarding Instructions', including the Rendezvous Position, time and method of boarding should be clarified. The pilot

himself may provide relevant information regarding the use of anchors, tugs, moorings, gangways, etc. failing this, such information can usually be obtained from the harbour authority via the VHF.

Inspection of the Passage Plan would be of mutual concern to both Pilot and Master. It is also pointed out that many authorities now engage pilots who board with computer lap top facilities bearing an authority approved passage plan for use with the particular vessel at its specific draught. Masters are however, advised that such facilities do not render the ships charted Passage Plan, obsolete. Clearly in the event of malfunction of the pilot's equipment or a power loss, the ships plan becomes only too relevant.

Bearing in mind that Passage Plans are devised berth to berth and that many pilotage regions are enhanced by VTS operations, all communication positions would be considered a formal element of the plan during execution. As such, these positions should be clearly identified on charted or computerised passage plans.

It is highly unlikely that a Pilot's lap top computerised plan will contain the same contingency elements as the ships own charted plan. Hence, a further reason that Masters would be ill advised to reduce the value placed on ships own charted plans.

Chapter 8. Conclusions

In brief, one of the most important aspects to make a correct voyage plan is the organisation of the Bridge Team. 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.

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

To ensure a correct Voyage Plan is important a proper look-out in the bridge considering the state of weather and sea, the density of the traffic and other activities while the ship is navigating, the special attention in TSS²⁶, to anticipate other's ships manoeuvres, take appropriate radiocommunication activities and the availability of assistance to be summoned immediately to the bridge when necessary, check the alarm systems of the bridge, check the propeller and the ship manoeuvring characteristics and any other relevant standard, procedure or guidance relating to watchkeeping arrangements and fitness for duty.

²⁶ Traffic Separatin Schemes

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Annex 1. Bridge Emergencies – OOW Actions according to ISM Code

In the event of a main engine failure emergency services will be activated, although a short delay must be anticipated in the majority of ships before these become operational. The Master should be informed at the earliest possible time of the reason and kept up-to-date with regard to the state of repairs.

With regard to the ship handling possibilities following loss of power, immediate actions by the Officer of the Watch could be extremely beneficial, depending on the ships position, geography and of course the prevailing weather at the time. It may be possible to maximise the use of 'Headreach'²⁷ that the vessel will carry prior to the ship stopping in the water. Alternatively the use of anchors, if navigating in appropriate depths, may also be a prudent action. Deep water anchoring may become a viable option to prevent drift towards a lee shore for instance.

In any event 'not under command' signals/lights should be displayed and depending on circumstances an 'emergency signal' may also be a necessity. Without doubt the Master will call for an assessment of the situation regarding state of repairs and future actions will depend greatly on what can and cannot be carried out by way of repairs. The use of a 'tug' may become a consideration.

A position should be placed on the chart and the rate of drift established. This may not be an easy task for watch officers who could well be left without instruments and out of sight of visual targets.²⁸

A1.1 Steering Gear Failure

In steering gear fails, the OOW should immediately engage alternative emergency steering gear. The engine room should be informed and the Master informed of the situation. The watch officer should exhibit 'Not Under Command' signals/lights and if appropriate sound signals "D" or "U" to warn other shipping of the vessels predicament.

In the event of emergency and auxiliary steering systems being lost, the vessel would most certainly be stopped. In this situation a navigation warning and/or report may become necessary, depending on ships position, e.g. TSS, Tarifa Tráfico.

²⁷ Headreach is the distance made to windward while tacking.

²⁸ D.J. House – Navigation for Masters

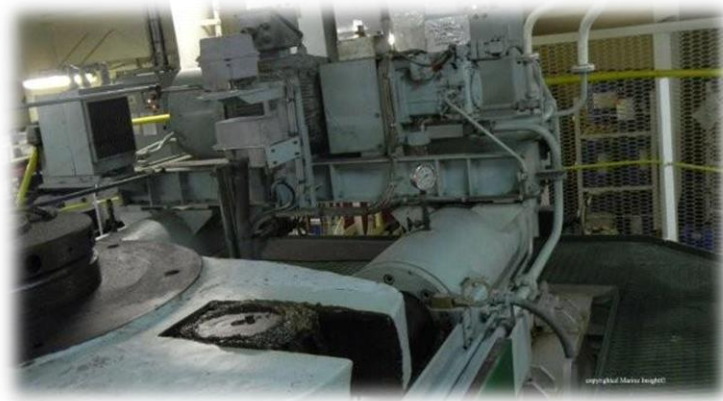


Figure A 1. Steering Gear of Bouzas – Own Source

A1.2 Compass Failure

If the ship's gyroscopic compass became unreliable this would normally be noticed instantly by the 'off course alarm' being activated. The Officer of the Watch would then engage manual steering and adopt steering by use of the magnetic compass.

The Master would be informed and an inspection of the gyro compass by either the navigation officer or the electrical officer would be an expected line of action.

The loss of the gyroscopic compass could well have a detrimental effect on other navigational instruments, such as radars which may be 'gyro-stabilised' and automatic steering, off course alarms etc.



Figure A 2. Compass of Bouzas – Own Source

A1.3 Associated Shipboard Emergencies – Bridge Reactions

A1.3.1 Bridge Informed of Fire

The Officer of the Watch will immediately raise the fire alarm and expect emergency stations to be manned. The engine room would be placed on 'stand-by' status and the Master would be informed of all known details including the location of the fire.

The OOW would be expected to carry out specific duties, dependent on the type of vessel involved:

1. Automatic closure of all fire doors. This can often be activated from the bridge and if this can be done it should be.
2. Ventilation and/or cargo fans are also sometimes controlled from the bridge or from a localised station. These should be shut down as soon as possible.
3. In all cases the course of the ship should be altered in conjunction with the wind, assuming adequate sea room to reduce forced draft within the wind, assuming adequate sea room to reduce forced draft within the confines of the vessel. (Unless the draft is required to clear smoke).
4. The ship's position should be plotted and made available to the communications officer prior to transmission of an 'urgency signal'.
5. The bridge watch and the monitoring of other traffic should be continued throughout and if appropriate, 'deck lighting' may be switched on.
6. N.U.C. lights/shapes would be displayed.



Figure A 3. Fire Alarm of a vessel - www.academyfire.com

A1.3.2 Bridge Informed of Flooding

Although unusual in its own right, the possibility of underwater damage and subsequent flooding is always present in the marine environment. However, it is more common following a collision incident. In many cases the emergency alarm may have already been sounded for an associated incident, but in the event no

alarm has been activated, watch officers should immediately activate the 'general alarm signal'

Additional actions will include:

1. Closing of all watertight doors.
2. Inform the Master and give update on the situation.
3. Engine room informed and respective pumps activated.
4. Position of vessel charted and made available for radio dispatch by the communications officer.
5. Following damage assessment an 'urgency' or 'distress' signal may become necessary.
6. N.U.C. signals may be appropriate



Figure A 4. Example of vessel flooding – Carnival Cruise (www.youtube.com)

A1.3.3 Man Overboard

In any incident where a man is overboard the immediate tendency is for the ship to return to the datum position by one of the several manoeuvres considered appropriate, i.e. Williamson turn, single delayed turn, elliptical turn or short round. Usually initiated when man is seen to fall and the subsequent alarm raised simultaneously.

With any situation where the vessel is turned through 180° whilst at full sea speed, there is bound to be a subsequent decrease in the overall speed. In some cases the watch officer could expect a reduction of up to around 30% depending on sea state

and weather conditions. The time factor to complete the turn will vary but it could be assumed that the OOW, would place main engines on a stand-by status and subsequently reduce approach speed to suit rescue boat launch and/or recovery, during the interim period.

In the event that the casualty is not found the IAMSAR manual²⁹ recommends that a sector search pattern is employed. However, the time factor for the main in the water is critical and any search pattern should reflect a small track space “leg length”. If the speed of the vessel is also considered while the search is ongoing (probably about 3 knots) then the reason for short leg lengths is directly related to the wellbeing of the casualty. When conducting a sector search, Masters may well consider track space in time as opposed to distance, e.g. 10 minutes away from datum at any one time.



Figure A 5. Man Overboard – www.cruiselawnews.com

A1.3.4 Bridge Procedure

From the onset of the incident Masters should ensure that the bridge is placed on an alert operational status and the following actions take place:

²⁹ SOLAS chapter V Safety of Navigation requires ships to carry an up-to-date copy of Volume III of the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual.

Jointly published by IMO and the International Civil Aviation Organization (ICAO), the three-volume IAMSAR Manual provides guidelines for a common aviation and maritime approach to organizing and providing search and rescue (SAR) services. Each volume (available separately in loose-leaf form, binder included) can be used as a standalone document or, in conjunction with the other two volumes, as a means to attain a full view of the SAR system.

Assuming the alarm has been sounded, the helm has been applied to clear the propeller from the casualty, that the engine room has been placed on stand-by and the bridge wing lifebuoy has been released.

1. Con of ship to be maintained and manoeuvre completed.
2. Manual steering to be engaged.
3. Datum position plotted and relevant search pattern laid on the chart.
4. Ship's position plotted to be monitored continually.
5. Lookouts strategically posted high and forward.
6. Lookouts strategically posted high and forward.
7. Communications established with coast radio station. Urgency message and/or distress, if required.
8. Local signals made to inform other shipping in the area: 'O' flag displayed and sounded on whistle.
9. Rescue boat turned out and made ready for immediate launch.
10. Hospital made ready to treat for shock and hypothermia.
11. Obtain updated weather report.

A1.4 Figures

Figure A 1. Steering Gear of Bouzas – Own Source

Figure A 2. Compass of Bouzas – Own Source

Figure A 3. Fire Alarm of a vessel – www.academyfire.com

Figure A 4. Example of vessel flooding – Carnival Cruise (www.youtube.com)

Figure A 5. Man Overboard – www.cruiselawnews.com