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PASSAGE PLANNING: STAGES, PRINCIPLES, RESOURCES

ΤΟΥ ΣΠΟΥΔΑΣΤΗ:

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Α/Α	*Ονοματεπώνυμο*	*Ειδικότητα*	*Αξιολόγηση*	*Υπογραφή*
1				
2				
3				
ΤΕΛΙΚΗ ΑΞΙΟΛΟΓΗΣΗ				

Ο ΔΙΕΥΘΥΝΤΗΣ ΤΗΣ ΣΧΟΛΗΣ: Κ.ΠΛ ΤΣΟΥΛΗΣ ΝΙΚΟΛΑΟΣ

Acknowledgement

I would like to express my sincere gratitude to my supervisor Mrs. Papaleonida Paraskevi for allowing me to undertake this work.

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ABSTRACT

Shipping cargo from one port to another involves coordinated working of several operations of both land and ship staff. One of the most integral parts of shipping operations is the cargo or voyage planning, which is mainly undertaken by a navigational officer of a ship. A passage plan should be a comprehensive, berth to berth guide, developed and used by a vessel's bridge team to determine the most suitable route, to identify potential problems or hazards along the route, and to adopt Bridge Management Practices to ensure the vessel's safe passage. Passage planning includes a complete description of the ship's passage which is assigned and prepared by an experienced deck officer of the ship. This is done to ensure that the ship sticks to the required routes for reaching the port of destination. While making a passage plan, the officer must keep in mind that the ship must reach the destination safe by abiding to both local and international rules and regulations.

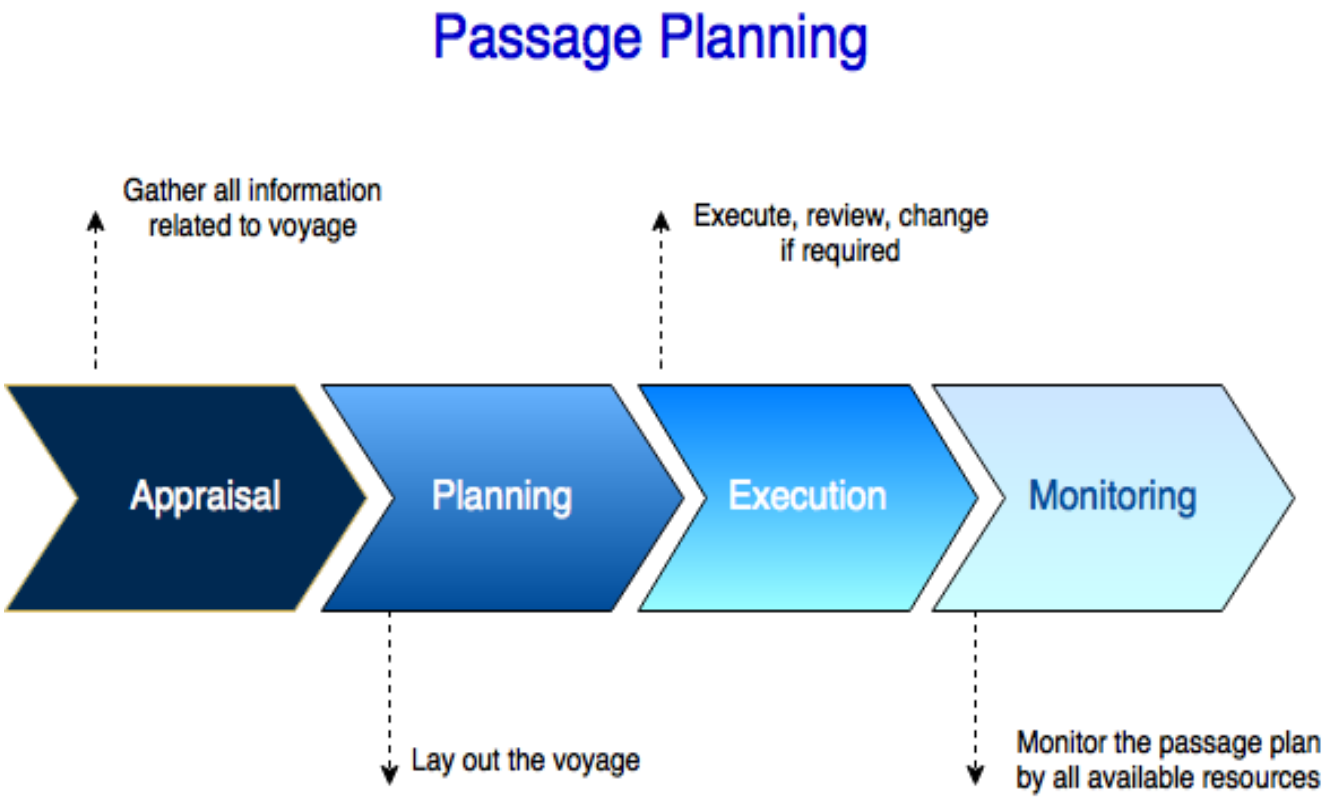
This dissertation presents the stages involved in passage planning, the principles that guide the whole process and the related resources utilized.

CHAPTER 1

Passage Planning Stages

Passage 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 are, in turn, reflected in the local laws of IMO signatory countries.

The Guidelines specify three key items to consider in the practice of voyage planning: having and using a voyage plan is "of essential importance for safety of life at sea, safety and efficiency of navigation and protection of the marine environment, voyage planning is necessary for all types of vessels on all types of voyages, andthe plan's 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 progress.



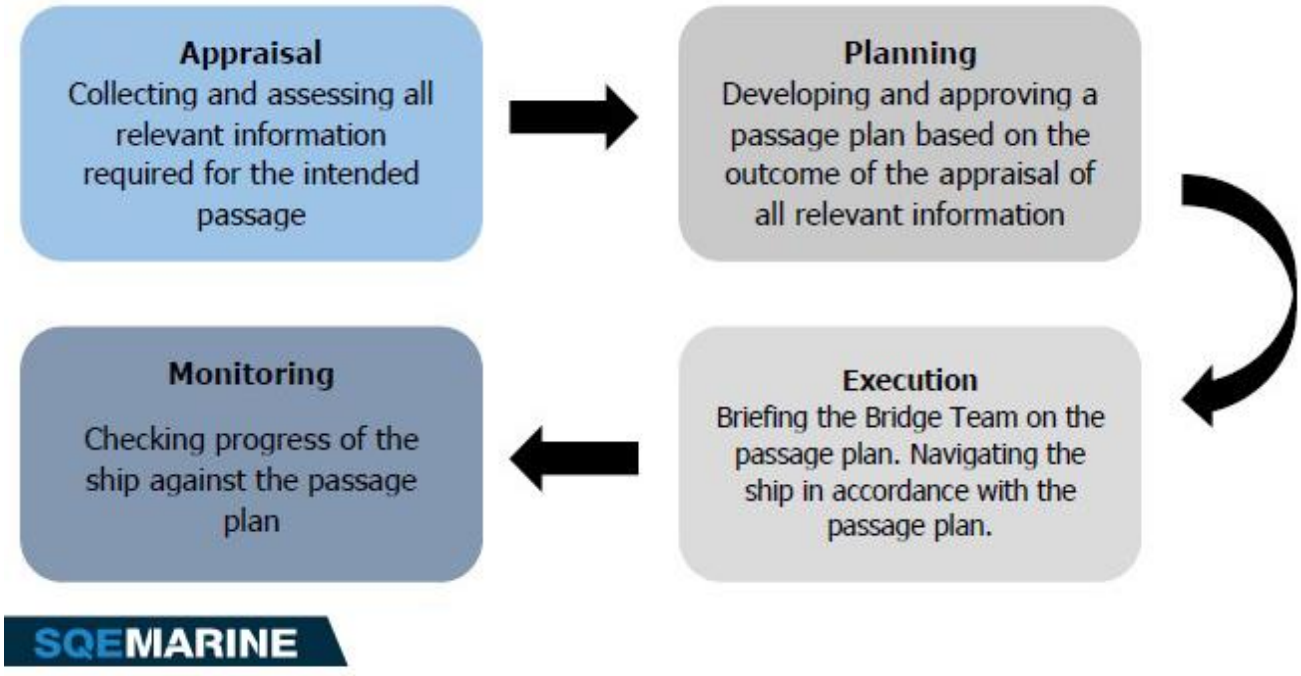
Source:IMO Guidelines for voyage planning

- 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.

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

- The third stage of passage planning is the execution stage. 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 be executed 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.

- 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.



A systematic way of planning, documenting and recording the passage, which is available as reference or guidance to other watch keepers, master and future navigators. A detailed and appropriate passage plan is indication of vigilant & careful attitude of ship's navigation team.

Appraisal, which is one of the component of passage planning, ensures that watch-keepers are aware of all critical & crucial areas, well in advance.

Contingency plans and/or alternate actions may be planned well in advance for possible difficulties, caused by weather, ship’smachinery/ equipment, etc.

Any deviations, stoppages can be easily spotted.

Approaches, crew stations and departures are more organized. This helps in advancement of discipline and lessening the fatigue or incident.

Less chances of grounding.

Less chances of delayed alternations.

Less chances of blunders like insufficient fuel, lube oil, wrong ETA'S, not giving appropriate arrival notice can be avoided with a proper passage planning.

Navigating team is more confident and panic situations are avoided.

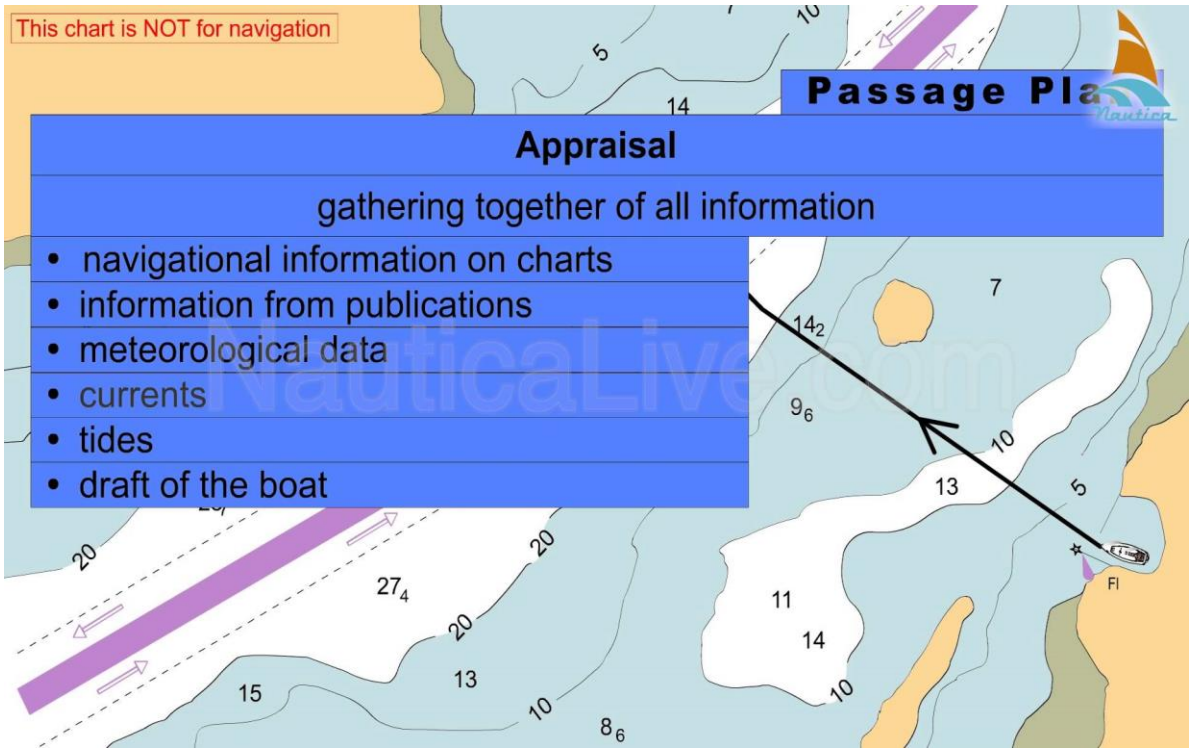
CHAPTER

1.1

Appraisal

Appraisal is the process of gathering all information relevant to the proposed voyage, including ascertaining risks and assessing its critical areas. The Guidelines list the items that should be taken into account.

An overall assessment of the intended voyage should be made by the master, in consultation with the navigating officer and other deck officers who will be involved, after all relevant information has been gathered. 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. Bearing in mind the condition of the vessel, her equipment and any other circumstances, a balanced judgement of the margins of safety which must be allowed in the various sections of the intended voyage can now be made, agreed and understood by all concerned.



All information relevant to the contemplated voyage or passage should be considered. The following items should be taken into account in voyage and passage planning:

1. 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 maneuvering data, including any restrictions.

2. Any special characteristics of the cargo (especially if hazardous), and its distribution, stowage and securing on board the vessel.

3. The provision of a competent and well-rested crew to undertake the voyage or passage.

4. Requirements for up-to-date certificates and documents concerning the vessel, its equipment, crew, passengers or cargo.

5. 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.

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

7. 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.
- 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.

CHAPTER

1.2

Planning

There should be undertaken a planning for any one section of the vessel passage plan using either all electronic or all paper charts rather than a mixture of chart types. Whether planning using paper chats or ECDIS, the plotting of the route should follow established conventions and include the pilotage phase, the ocean phase and coastal phase.

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.

The detailed voyage or passage planning should include the following factors:

1. The plotting of the intended route or track of the voyage or passage on appropriate scale charts: the true direction of the planned route or track should be indicated, as well as all areas of danger, existing ships' routing and reporting systems, vessel traffic services, and any areas where marine environmental protection considerations apply.

2.The main elements to ensure safety of life at sea, safety and efficiency of navigation, and protection of the marine environment during the intended voyage or passage; such elements should include, but not be limited to:

- Safe speed, having regard to the proximity of navigational hazards along the intended route or track, the maneuvering characteristics of the vessel and its draught in relation to the available water depth.
- Necessary speed alterations en route, e.g., where there may be limitations because of night passage, tidal restrictions, or allowance for the increase of draught due to squat and heel effect when turning.
- Minimum clearance required under the keel in critical areas with restricted water depth.
- Positions where a change in machinery status is required.
- Course alteration points, taking into account the vessel's turning circle at the planned speed and any expected effect of tidal streams and currents.
- The method and frequency of position fixing, including primary and secondary options, and the indication of areas where accuracy of position fixing is critical and where maximum reliability must be obtained.
- Use of ships' routing and reporting systems and vessel traffic services.
- Considerations relating to the protection of the marine environment.
- Contingency plans for alternative action to place the vessel in deep water or proceed to a port of refuge or safe anchorage in the event of any emergency necessitating abandonment of the plan, taking into account existing shore-based emergency response arrangements and equipment and the nature of the cargo and of the emergency itself.

Furthermore, following should particularly be taken into account when planning a trip:

- weather: before you leave harbour, 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 vessel and crew are suited to 7 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 mayencounter during your trip.This generally means checking an up to date chart and a current pilot book or almanac.
- contingency plan: always have a contingency plan should anything go wrong.

  Before you sail, 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 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.Each voyage or passage plan as well as the details of the plan, should be approved by the ships' master prior to the commencementof the voyage or passage, and then signed by 2nd Officer (Navigation Officer) Chief Officer & Master.

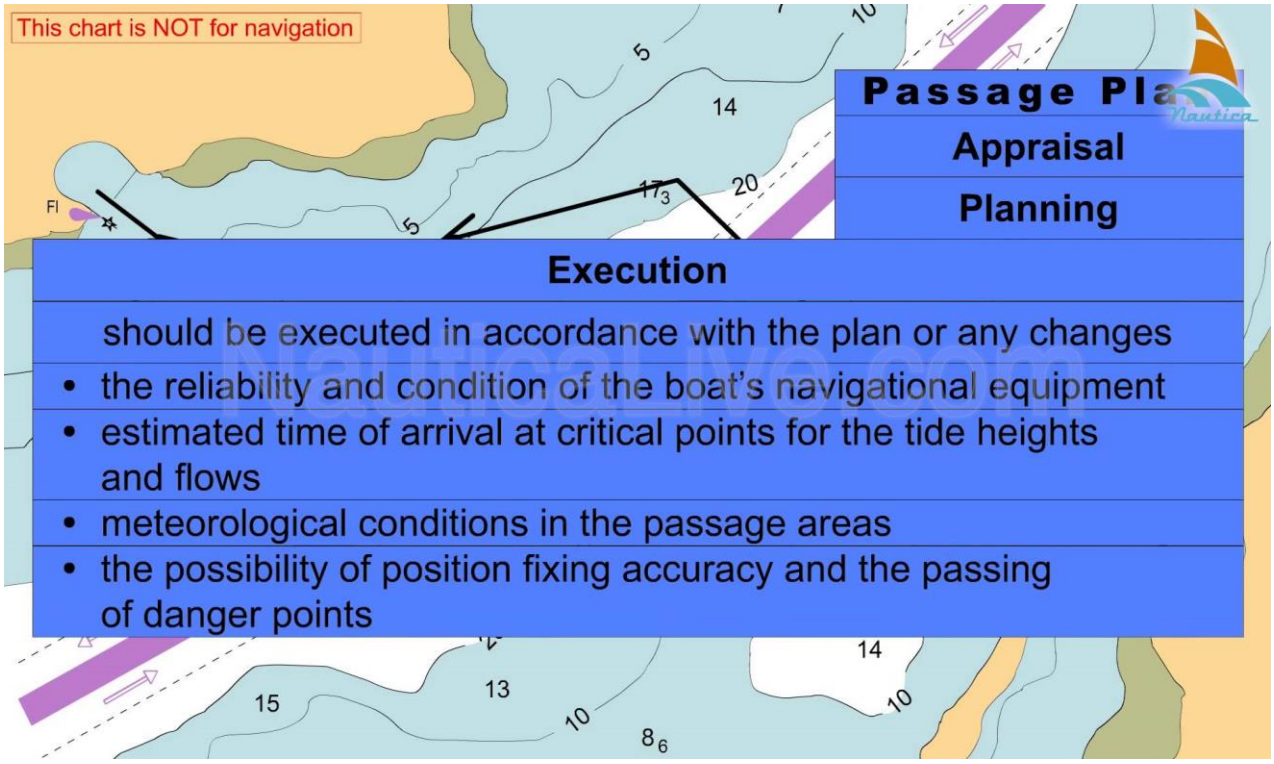
CHAPTER

1.3

Execution

During this stage it is recommended that the Bridge Team get in touch with the passage plan and make sure that the ship would navigate in accordance with the developed plan. Moreover, there should be taken some actions, as long as the ship departs. Firstly, the speed should be adjusted based on the ETA and the expected weather and oceanographic conditions, in order to be on time at its port of destination. Additionally, there must be taken into account the availability of water and fuel on board, for the prevention of any shortage during the voyage. In case the ship uses ECDIS, there must be set the appropriate limits regarding the safety settings.

Having finalized the voyage or passage plan, as soon as time of departure and estimated time of arrival can be determined with reasonable accuracy, the voyage or passage should be executed in accordance with the plan or any changes made thereto.



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

1. The reliability and condition of the vessel's navigational equipment.

2. Estimated times of arrival at critical points for tide heights and flow.

3. Meteorological conditions, (particularly in areas known to be affected by frequent periods of low visibility) as well as weather routing information.

4. Daytime versus night-time passing of danger points, and any effect this may have on position fixing accuracy.

5. Traffic conditions, especially at navigational focal points.

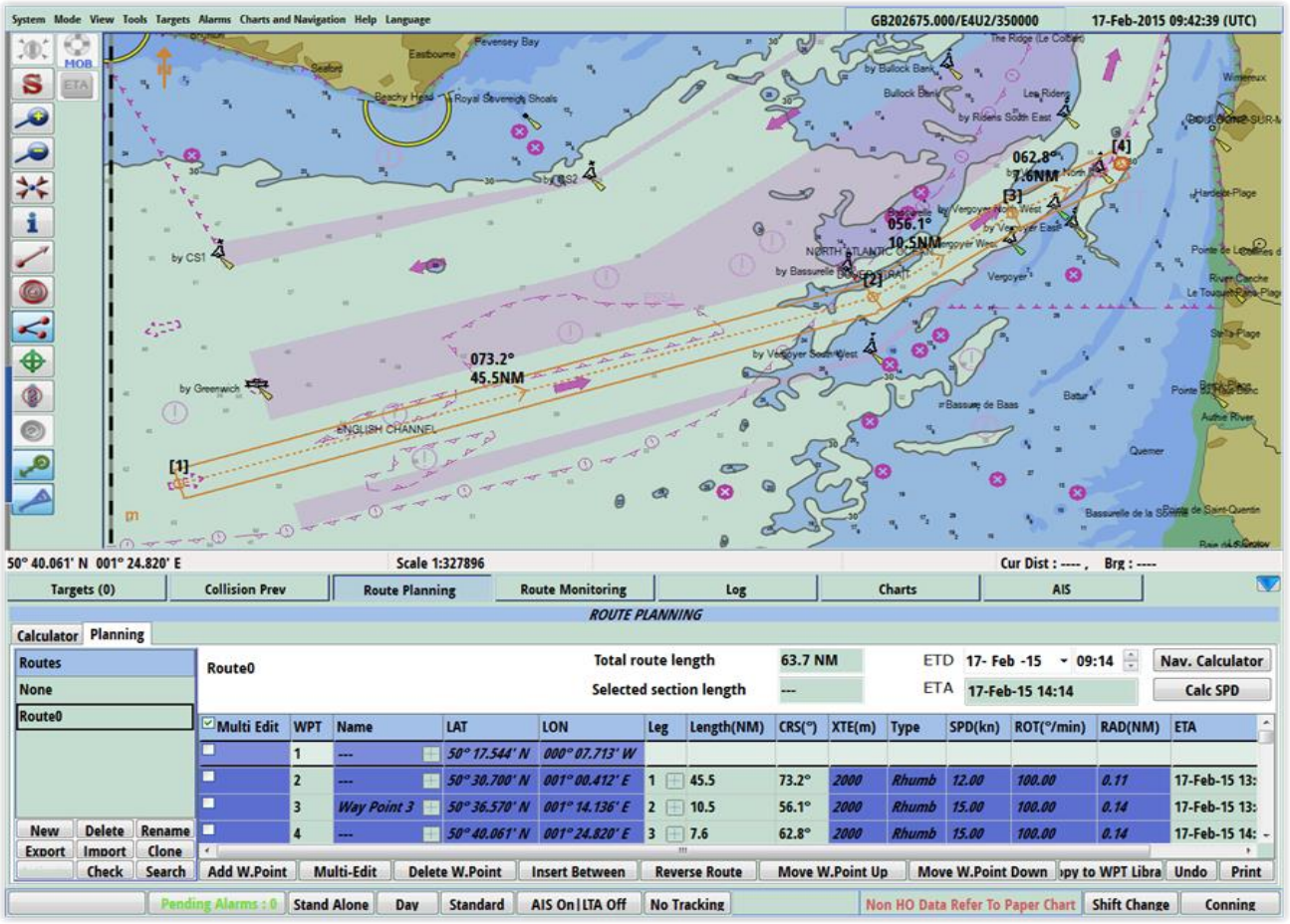
It is important for the master to consider whether any particular circumstance, such as the forecast of restricted visibility in an area where position fixing by visual means at a critical point is an essential feature of the voyage or passage plan, introduces an unacceptable hazard to the safe conduct 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 voyageor passage there may be a need to utilize additional deck or engine room personnel.

CHAPTER

1.4

Monitoring

It is known that, takes part throughout the voyage trying to check the position of the vessel, to ensure that it remains within the safe distance from any dangerous areas. The voyage is always safer when there is conducting a continuous monitoring of the ship's progress along the pre-planned schedule. In case of any emergency situation, if the navigation officer feels it is necessary to deviate from the scheduled plan, he should inform the master prior he takes any action he thinks is better for both of the ship and its crew. As in this stage of vessel passage plan all deck officers contribute their part in the plan, they must indicate personal characteristics such as good seamanship, experience and personal judgment.



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.

CHAPTER

1.5

Bridge Resource Management

Bridge resource management or BRM was adopted in the early 1990s by the maritime industry as a safety and error management tool and has now become an integral part of crew's training. BRM makes use of all available resources including equipment and information and human resources to achieve safe operation. BRM plays an important role in environments where human error can have devastating effects. It has proven to be an important tool for improving safety in the maritime industry and thus prevent the recurrence of incidents. It can thus help to support a safer and more efficient execution of operations by blending technical skills and human skills.

BRM can be termed as the effective management and utilisation of all resources, human and technical, available to the bridge team, to ensure the safe completion of the vessel's voyage.

BRM focuses on bridge officers' skills such as teamwork, teambuilding, communication, leadership, decision-making and resource management and incorporates this into the larger picture of

organizational and regulatory management. BRM addresses the management of operational tasks, as well as stress, attitudes and risk. BRM recognizes there are many elements of job effectiveness and safety, such as individual, organizational, and regulatory factors, and they must be anticipated and planned for. BRM begins before the voyage with the passage plan and continues through the end of the voyage with the passage debrief.

BRM & Passage Planning

A clear understanding of the agreed passage plan and the establishment of a ‘shared mental model’ by the entire bridge team forms the basis of a safe voyage under coastal pilotage conditions. It is essential that the vessel being piloted closely follows the passage plan as agreed with the pilot. Coastal pilots should ensure that every member of the bridge team understands the part they play in ensuring the safe and effective execution of the agreed passage plan. The following considerations should form part of early discussions with the bridge team and the implementation of effective BRM throughout each voyage:

- Navigational and operational tasks responsibilities should be clearly defined and delegated.
- Dangers that may be encountered at any stage of each voyage should be identified as early as possible.
- Appropriate precautions and contingency arrangements necessary to manage identified risks should be implemented.
- Navigational, operational and general safety priorities should be set and constantly reviewed in the context of the prevailing circumstances and conditions.
- The vessel’s position, speed and heading with respect to other vessels and all navigation hazards, should be continuously monitored.
- The vessel’s actual position should be continuously monitored against the agreed passage plan.
- Deviation from the agreed passage plan or standard operating procedures should be noted and addressed immediately.
- All electronic aids, systems and navigational equipment required onboard should function properly and only be used by appropriately trained personnel.

CHAPTER 2

Passage Planning Principles

There are some standard principles Navigation Officers should always take into account, prior to any preparation of a passage plan. Those principles, are applicable for any type of vessel and can prevent many accidents caused by human error. These principles are as follows:

1. Safety first

Passage planning is a fundamental safety-critical function, without it ships could not do what they were designed to do.

2. Controlling risks

Planning ahead identifies risks and allows the navigator to better control the safety of navigation.

3.Stay alert

Many risks can be anticipated; however many cannot. Keeping an alert lookout is always essential.

4. Feel factor

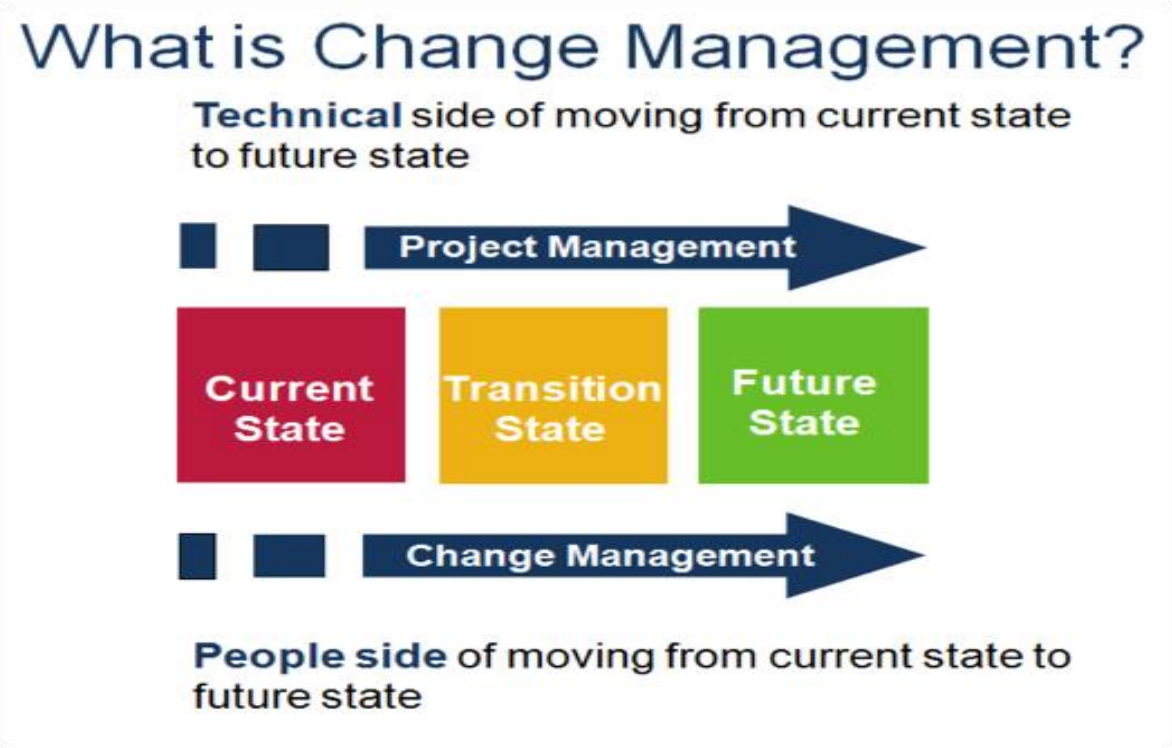
When passage planning or when using a passage plan, it is worth trying to get a feel for the part of the voyage in question, in order to make better decisions.

5. Cover all bases

Local knowledge gained through pilots, sailing directions and marine safety information (MSI), should always be sought at the planning stage.

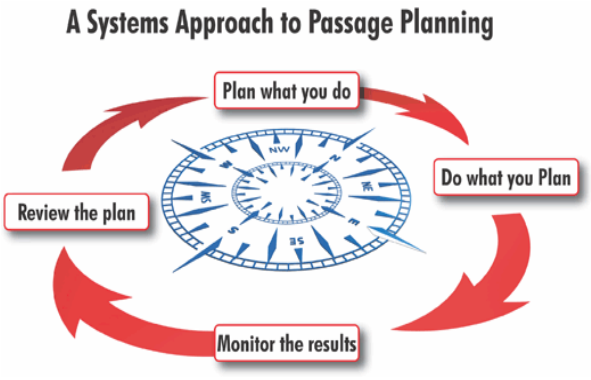
6. Adapting to change

A plan is the basis for change. A good passage plan is essential,but sometimes the plan will need to be adapted, based upon new information e.g. from pilots, Vessel Traffic Services (VTS), weather or commercial changes. Be adaptable and stay safe.



7. Plan your research

There are many good sources of good practice for passage planning, including commercial publications, training courses and company procedures.

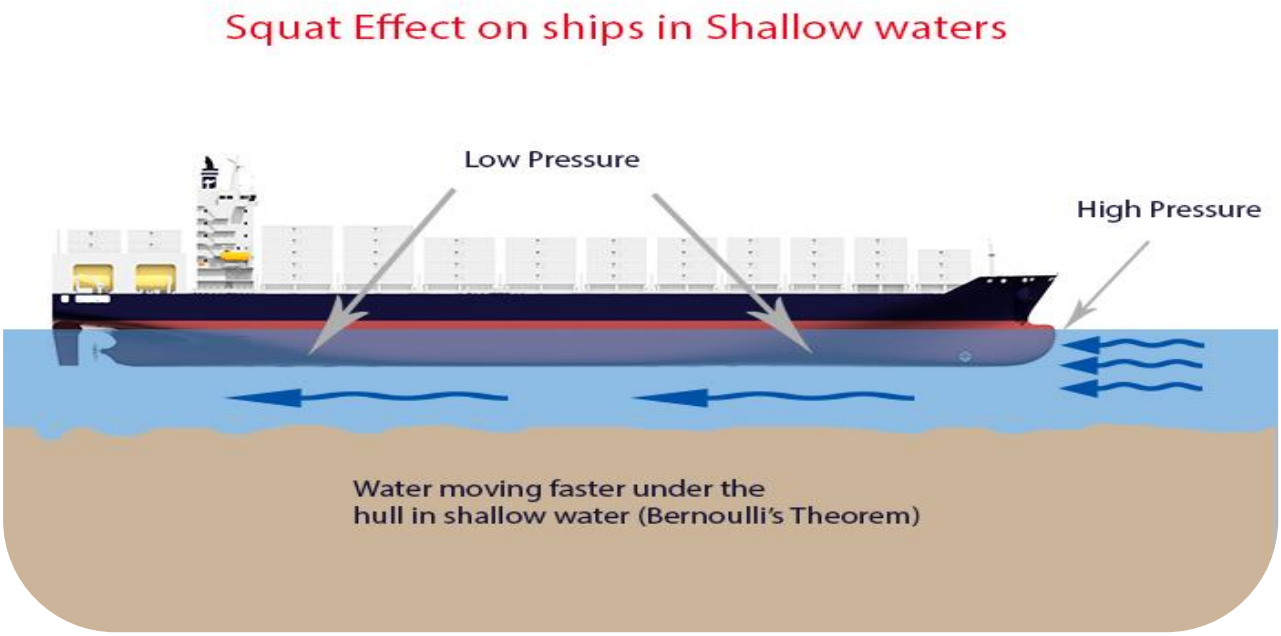


8. Mentoring matters

Onboard mentoring is essential for developing good passage planning and monitoring skills, take just ten minutes and give it a go.

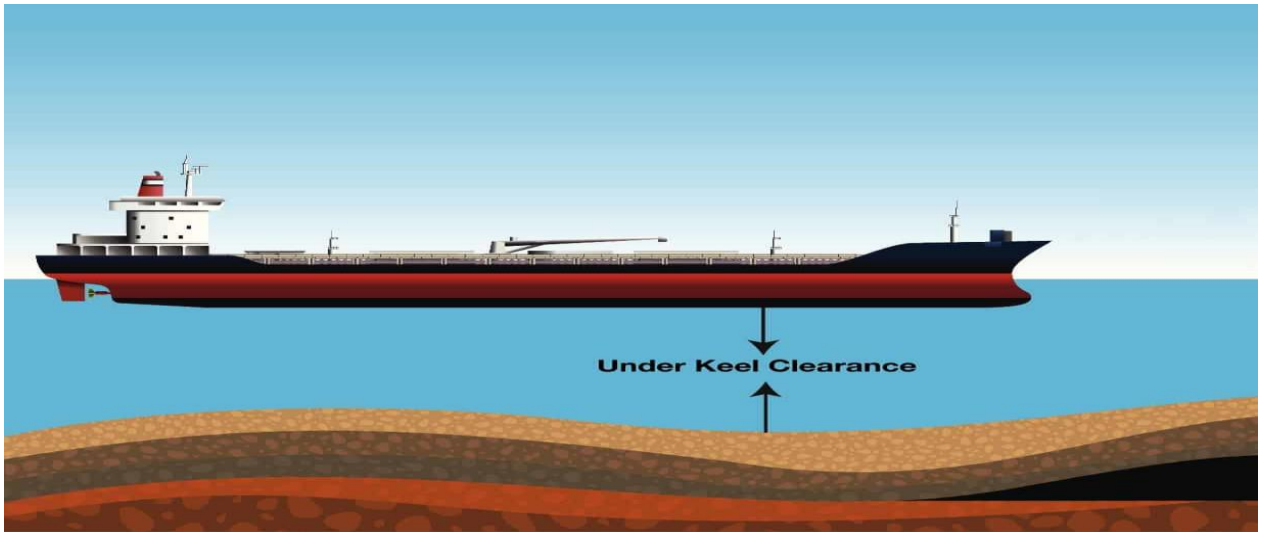
9. Shipshape

Passage plans should take into account the special characteristics of the vessel itself, including draft,maneuverability, squat, mechanical risks and manning levels.



10. Trust your data?

Always question the integrity of information used in passage planning and navigation, particularly with regards to calculating position and under keel clearance (UKC).
Apply the concepts of validity, plausibility, comparison and latency to help ensure risks are minimized.



CHAPTER

2.1

Voyage Planning Considerations

In preparation for voyage planning, a wide array of information must be reviewed and considered.
The following is a list of some items the officer in charge of voyage planning might consult and take into consideration:

- Appropriately-scaled charts, navigational publications such as notices to mariners, and nautical publications
- M – Quality Objects (Zones of Confidence) of the ENCs which will be used for the voyage should be taken into account for the voyage planning and execution.
- Adjust Turn radius in order to conform with vessel's characteristics
- Adjust Cross Track Distance (XTD) according to navigational waters and the desired off-track limitation
- Validate your route using Check Route functionality.
- Area within your XTD corridor will be checked toward obstacles and safety contours
- For Areas where alarm is activated in Safety Alarm configurationwill be highlighted
- Note that all charts within the Safety Scale (equal or larger scale is checked
- Apply planned speed and/or ETA/ETD in order to create a Schedule
- Create Ref Points to Specific as required.
- Apply estimated Draught along the route in order to calculate Under KeelClearance along each leg
- Take tide and current data into consideration
-

Additional voyage related data can be prepared by using ADD INFO drawing tools in ADD INFO Task menu.

More specifically the first thing to do is to harvest as much relevant information as you can. This will include estimates and assumptions of course, but some things are factual. This means taking into consideration the following:

- Proposed destination port and estimated date and time of arrival.
- Proposed port of departure.
- Type of vessel and basic data including size and type, draft length overall (LOA) and seaworthiness (this should include knowledge of her displacement and stability curve if you intend a longer offshore passage). Check what sail plans are available (e.g. how many reefs do you have? Do you carry a trisail and storm gib? How do you rig the storm sails). Check the engine type and fuel capacity, cruising speed under sail and engine, safety equipment and critical spares and tools on board, communications equipment (radio check), battery capacity and water capacity.

Then when all standard info is gathered we continue as follows:

- We check tides and currents and the weather forecast (both area specific and further afield). A large scale synopsis will help us to understand what to expect if the reality differs from the forecast.
- We check the charts and by reference to the information listed above, we start to plan voyage by setting out specific waypoints on the chart. The waypoints should be chosen to keep us away from dangers and also with careful consideration of the wind direction and speed as well as tidal flows.
- Once we have an approximate route we can plan how long the passage is likely to take by referring to the likely sea state (from tidal and weather predictions) and cruising speed.
- At this point, we work back down the route referring to the chart and the tides / weather forecast to make sure that we do not arrive at known tidal gates (such as narrow channels and headlands) at the wrong time. By adjusting our plan we will eventually decide the best time to leave to allow us to make best advantage of the tide and make the journey as pleasant as possible.
- If everything comes ideal, we will leave on the tide and sweep effortlessly through every tidal gate, arriving at our planned destination in good light, ideally a couple of hours after sunrise, thus allowing us to refer to shore lights and lighthouses on your distant approach whilst being able to identify landmarks and marina entrances on arrival. If we manage this we'll make our passage much easier and less stressful - especially when entering a port that's new to us.

❖ If things go wrong along the way we should have made alternate plans for ports of refuge. These ports should be noted in our plan and ideally we will have a choice of ports that are accessible in the prevailing conditions and hopefully at most states of tide. Remember, strong onshore winds can quickly make a port entrance hazardous, so we should think about alternatives when planning our passage. Making sure we have pilotage plans for each port entry and you've noted particular rules for entry and communication. We check the Almanac before we leave - that way we won't be surprised when the port you've been beating to in that unforeseen gale is closed!

- Last, but not least, we should take a good look at our crew. An exhilarating and rewarding passage for a fit, sea-hardened crew of experienced sailors can quickly become, at best an horrendous and frightening experience and, at worst, a dangerous one, for less capable sailors. When considering crew and crew numbers the type of passage, type of boat, the length of the passage, weather forecast and tidal streams should be carefully considered.

CHAPTER

2.2

Reporting Requirements

1. Ship reporting systems contribute to safety of life at sea, safety and efficiency of navigation and/or protection of the marine environment. A ship reporting system, when adopted and implemented in accordance with the guidelines and criteria developed by the Organizationpursuant to this regulation, shall be used by all ships, or certain categories of ships or ships carrying certain cargoes in accordance with the provisions of each system so adopted.

2. The Organization is recognized as the only international body for developing guidelines, criteria and regulations on an international level for ship reporting systems. Contracting Governments shall refer proposals for the adoption of ship reporting systems to the Organization. The Organization will collate and disseminate to Contracting Governments all relevant information with regard to any adopted ship reporting system.

3. The initiation of action for establishing a ship reporting system is the responsibility of the Government or Governments concerned. In developing such systems provision of the guidelines and criteria developed by the Organization shall be taken into account.

4. The master of a ship shall comply with the requirements of adopted ship reporting systems and report to the appropriate authority all information required in accordance with the provisions of each such system.

5.All adopted ship reporting systems and actions taken to enforce compliance with those systems shall be consistent with international law, including the relevant provisions of the United Nations Convention on the Law of the Sea.

Communication between a VTS centre and a participating vessel or between participating vessels should be limited to information essential to achieve the objectives of the VTS. Communication should be clear, unambiguous and easily understood by as many as possible of all participants. Standard reports and phrases should be used when necessary. Where language difficulties exist, use should be made of a common language as determined by the VTS authority.

Before ships are crossing the reporting lines, a mandatory SOUNDREP report must be communicated to Sound VTS online or by VHF, e-mail or telephone. The use of correct and updated AIS information accomplish the main part of the reporting requirements. The report must contain the following information:

A. Name of ship, call sign, IMO number and MMSI number.

B. Date and time.

C. Position expressed in latitude and longitude.

E. True course.

F. Speed.

I. Destination and ETA.

L. Route information and intended route through the Sound.

O. Maximum present draught.

P. Cargo details. For IMO; quantity for each class of dangerous goods.

Q. Defects and deficiencies or other limitations.

T. Contact details for the communication of cargo information (If unknown, name and telephone number to the DPA).

U. Air draught (especially important if exceeding 35 meters).

W. Total number of persons on board.

X. Type and estimated quantity of bunker (only ships of 1000 gross tonnage and above).

Vessels navigating in an area where vessel traffic services are provided should make use of these services. Depending upon governing rules and regulations, participation in a VTS may be either voluntary or mandatory. All types of vessels should be permitted and encouraged to use a VTS where mandatory participation is not required.

Communication with the VTS and other vessels should be conducted in accordance with established procedures, in particular where a communication concerns intended manoeuvres. VTS procedures should stipulate what communications are required and which communication systems should be monitored.

CHAPTER

2.3

Guide to Port Entry

The most accurate and comprehensive port information resource, Guide to Port Entry, assists us in planning port calls to over 11,400 global commercial ports and terminals.

A complete port overview with over 83 port information sections at their disposal, including, pre-arrival information, details of the documentation required by the port, maximum size of vessel permissible and cargo facilities, as well as Reports of Actual Conditions Experienced by other seafarers visiting that port.

Over 23,700 port service providers, together with their contact details, are also given for quick access to the facilities you need. Plus, when using this port information guide in conjunction with navigational information, we will have a clear understanding of the location of the facilities available by using its port plans, of which over 5,000 are available.

Included within this edition is access to the latest port information updates via unique port QR codes, which can be scanned using a smartphone or tablet. As such, we can be safe in the knowledge that when planning a port call your vessel/s have all the essential information they need.

Over 11,400 commercial ports and terminals in over 190 counties, all reviewed and revised since the last edition 109 new ports and terminals are included 83 port information headings Unique QR codes for each port entry providing access to updated port information via Findaport.com 5,049 port plans and mooring diagrams, designed and reviewed by its in-house cartographers

Over 23,700 port service providers Over 1,700 Reports of Actual Conditions Experienced provided by fellow seafarers following port visits 2,979 cross references ensuring no duplicated information is listed All data is sourced directly from port authorities, agents or operators Four hardback volumes - two of text, two of plans.

Volumes 1 and 2 consist of detailed port information laid out in logical sequence across 70 headings including: Pre-arrival Arrival Communications Berthing Operations Cargo Pollution Facilities Security Local Information Shore Crew General Volumes 3 and 4 provide usable and detailed port plans and mooring diagrams, invaluable to shipmasters approaching unfamiliar ports and berths.

Plans are available in six categories for easy reference:

Country Plans: showing the location of ports Port Location: location of, and approaches to, ports, harbours and terminals
Berth Locations: berth numbers and locations
Berthing Diagrams: individual berth and mooring arrangements
Berth Equipment: including cranes, manifolds, chiksans, fire-fighting equipment, fendering and much more
Shipmasters' Plans: drawings/plans as supplied by shipmasters, officers, superintendents and other authoritative sources

CHAPTER 3

Passage Planning Resources in general

Why do we plan our voyages? Because we want to get from A to B safely. This fulfils our three main responsibilities as seafarers:

- Preserving the safety of life at sea
- Preserving the safety of the ship
- Protecting the marine environment from pollution.

In order to carry out our passage successfully taking into consideration the above three rules, we need to ensure we included all the necessary information we collected from different resources and apply them to our plan.

You will need books to guide you through this instruction to be able to clearly visualize what I'm trying to say.
These books are available onboard the ship's library, located on the Navigation Bridge.
As officers and aspiring officers I encourage you to read a lot, and know what you read, and start asking questions.
That is how you will learn it onboard the ship. The books are as follows:

- Bridge Team Management
- Bridge Procedures and Guide 4
- Guides to Port Entry
- Nautical Publications
- Charts and Chart Catalogue
- Navarea navigational warnings
- Weather routing

CHAPTER

3.1

Navigation Officer's Equipment and Information System

Gone are the days when a ship navigation officer had to take help of unconventional ways to planand navigate a voyage at sea. Today, a ship officer has myriad of marine navigation equipment which makes his life a lot simpler, thanks to the advancement in technology.Moreover, present-day seafarers are trained so as to know the functioning and operation of all modern day navigational equipment that has made the journey at sea smoother and safer.
With modern day facilities and automation, a ship today has several advanced navigation equipment systems which give accurate data for the voyage.

1. Gyro Compass

It is used for finding the right direction. Unlike magnetic compass, gyro compass is not hampered by externalmagnetic field. It is used to find correct North Position,which is also the earth's rotational axis.Its repeater system must be present in the steeringplatform for emergency steering.

2. Radar

It is used to determine the distance of the ship from land, other ships, or any floating object out at sea. Also obtains data including speed, CPA, TCPA, BCR etc.

3. Magnetic Compass

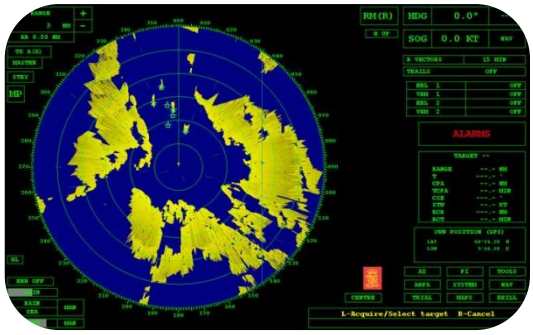
The magnetic compass work in conjunction with the magnetic field of the earth.
It is used to get planned direction for the voyage.

4. Auto Pilot

It is a combination of hydraulic, mechanical, and electrical system and is used to control the ship's steering system from a remote location (Navigation bridge).

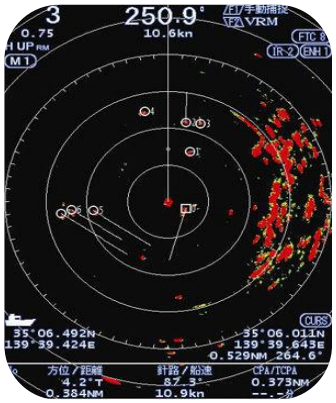
5. ARPA

Automatic Radar Plotting Aid displays the position of a ship and other vessels nearby.
The radar displays the position of the ships in the vicinityand selects the course for the vessel by avoidingany kind of collision.



6. Automatic Tracking Aid

Just like ARPA, automatic tracking aid displays the information on tracked targets in graphic and numeric to generate a planned layout for a safer and collision-free course.



7. Speed & Distance Log Device

The device is used to measure the speed and the distance traveled by a ship from a set point.
By calculating the same, ETA of the ship is adjusted or given to the port authority and agent.

8. Echo Sounder

This instrument is used to measure the depth of the water below the ship's bottom using sound waves.

9. Electronic Chart Display Information System

ECDIS is a development in the navigational chart Systemused in naval vessels and ships.
With the use of the electronic chart system, it has become easier for a ship's navigating crew to pinpoint locations, and attaining directions are easier than before.

10. Automatic Identification system

AIS is a system which helps to pinpoint the location and other navigational statistics of ships.

AIS uses VHF radio channels as transmittersand receivers to send and receive messages betweenships which endeavors to fulfill a lot of responsibilities.

11. Long Range Tracking and Identification System

LRIT is an international tracking and identification system incorporated by the IMO under its SOLAS convention to ensure a thorough tracking system for ships across the world.

12. Rudder Angle Indicator

Rudder angle indicator, as the name indicates, provide the angle of the rudder.

The display is provided on bridge to control the rate of turn and rudder angle of the ship.

13. Voyage Data Recorder

A VDR or voyage data recorder is an instrument safely installed on a ship to continuously record vital information related to the operation of a vessel.

It contains a voice recording system for a period of at least last 12 hours. This recording is recovered and made use of for investigation in events of accidents.

14. Rate of turn indicator

It indicates how fast the ship is turning at steady rate, normally shown as number of degree turned.

15. GPS Receiver

A Global Positioning System (GPS) receiver is a display system used to show the ship's location with the help of Global positioning satellite in the earth's orbit.

16. Sound Reception System

This system is required for a ship with fully enclosed type bridge. It enables the navigating officer inside the cabin to listen to the sound signals and fog horn from other ships.

17. Navigational Lights

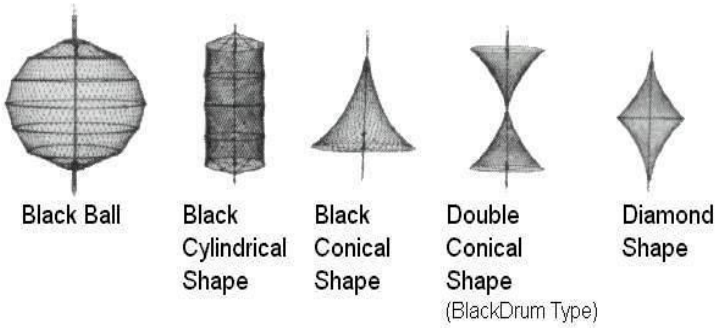
All boats – whether big or small are required to have night lights as a part of the navigation systems.

18. Ship Whistle

A ship's horn is known as a whistle and it is generally provided in duplicate.
One is driven by air and the other is electrically operated.

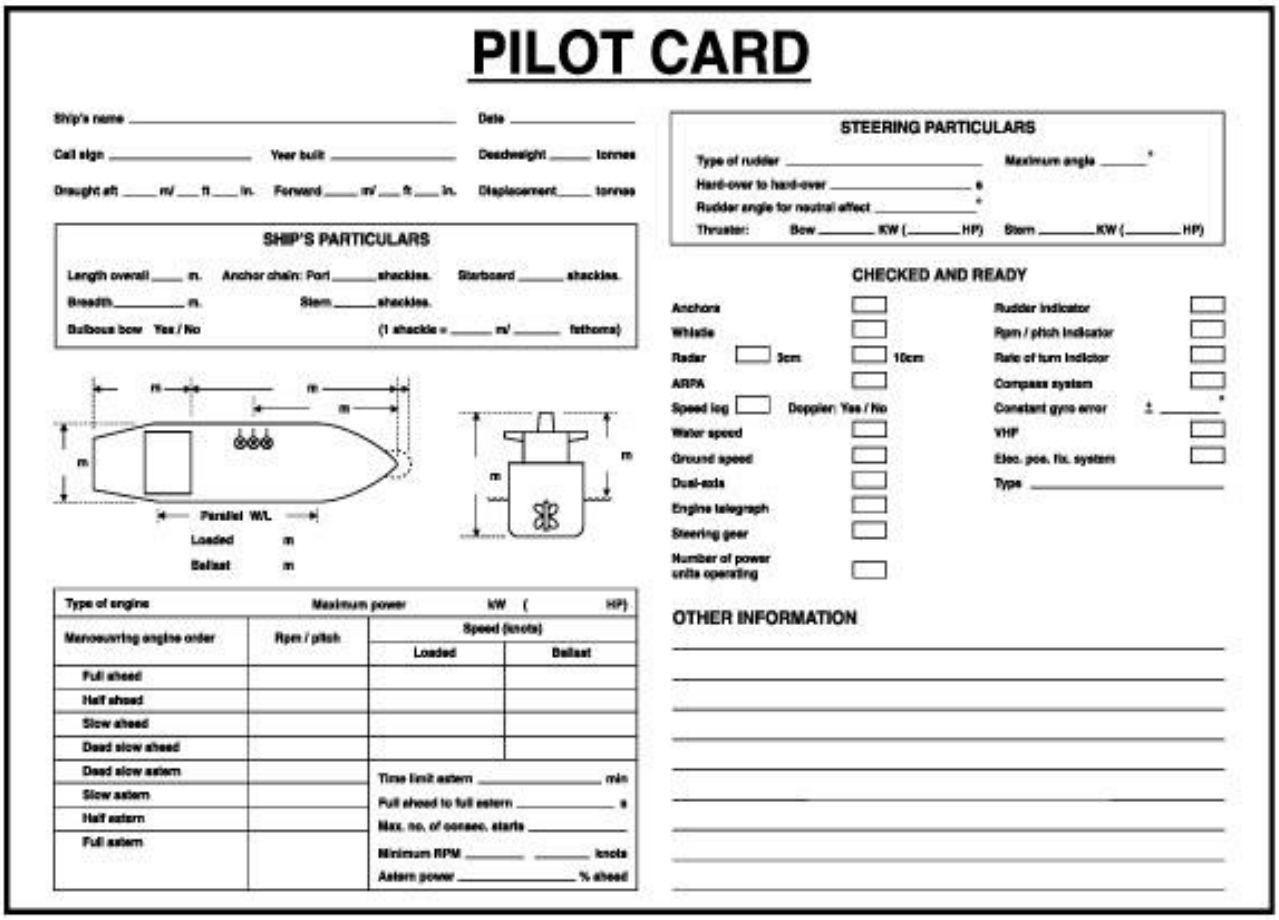
19. Daylight Signaling Lamp

They are light signaling devices used for emergency signaling in the day time.



20. Pilot Card

It is an informative booklet provided to the ship's pilot.
It consists of the dimension, draught, turning circle,maneuvering, propulsion equipment etc. of the vessel for safe maneuvering.



PILOT CARD

Ship's name _____ Date _____

Call sign _____ Year built _____ Deadweight _____ tonnes

Draught aft ____ m/ ____ ft ____ in. Forward ____ m/ ____ ft ____ in. Displacement ____ tonnes

SHIP'S PARTICULARS

Length overall ____ m. Anchor chain: Port _____ shackles. Starboard _____ shackles.

Breadth _____ m. Stern _____ shackles.

Bulbous bow Yes / No (1 shackle = _____ m/ _____ fathoms)

m m m m m

Parallel W/L

Loaded m

Ballast m

m m

Type of engine	Maximum power	kW (	HP)
Manoeuvring engine order	Rpm / pitch	Speed (knots) Loaded	Ballast
Full ahead			
Half ahead			
Slow ahead			
Dead slow ahead			
Dead slow astern			
Slow astern			
Half astern			
Full astern			

Time limit astern _____ min

Full ahead to full astern _____ s

Max. no. of consec. starts _____

Minimum RPM _____ _____ knots

Astern power _____ % ahead

STEERING PARTICULARS

Type of rudder _____ Maximum angle _____°

Hard-over to hard-over _____ s

Rudder angle for neutral effect _____°

Thruster: Bow _____ KW (_____ HP) Stern _____ KW (_____ HP)

CHECKED AND READY

Anchors	☐	Rudder indicator	☐
Whistle	☐	Rpm / pitch indicator	☐
Radar ☐ 3cm	☐ 10cm	Rate of turn indicator	☐
ARPA	☐	Compass system	☐
Speed log ☐ Doppler: Yes / No		Constant gyro error ± _____°	
Water speed	☐	VHF	☐
Ground speed	☐	Elec. pos. fix. system	☐
Dual-axis	☐	Type _____	
Engine telegraph	☐		
Steering gear	☐		
Number of power units operating	☐		

OTHER INFORMATION

_____

_____

_____

_____

_____

_____

_____

_____

_____

21. Voyage Plan

A voyage Plan must be present onboard for referringpast voyage plans or planning a future voyage.

22. Forecastle Bell

It is used to mark the presence of the ship in fogor bad weather and sound the alarm in case of any emergency.

23. Maneuvering Booklet

In this booklet the performance of the propulsion plant and the ship during manoeuvring in different weathers and situations is recorded for quick reference.

24. Black Ball Shape

It is a day time signaling shape used to determinethe characteristics of vessel with different arrangement of ball shapes.For e.g. a vessel at anchor will show a blackball at foremost end of the forecastle.

25. Record of Navigation Activities

All the navigational activities must be recorded and kept on board for ready reference.
This is a mandatory and the most important log book.

26. Record of Maintenance of Navigational Equipment

Hard copy of the record must be present onboard shipsfor ready reference of port and regulatory authorities and must be signed by master and duty officers of the ship.

27. Wheelhouse Posters

Present in the Navigation bridge, it displays a detailed Informationof manoeuvring characteristics of the ship.

28. Transmitting Heading Devise

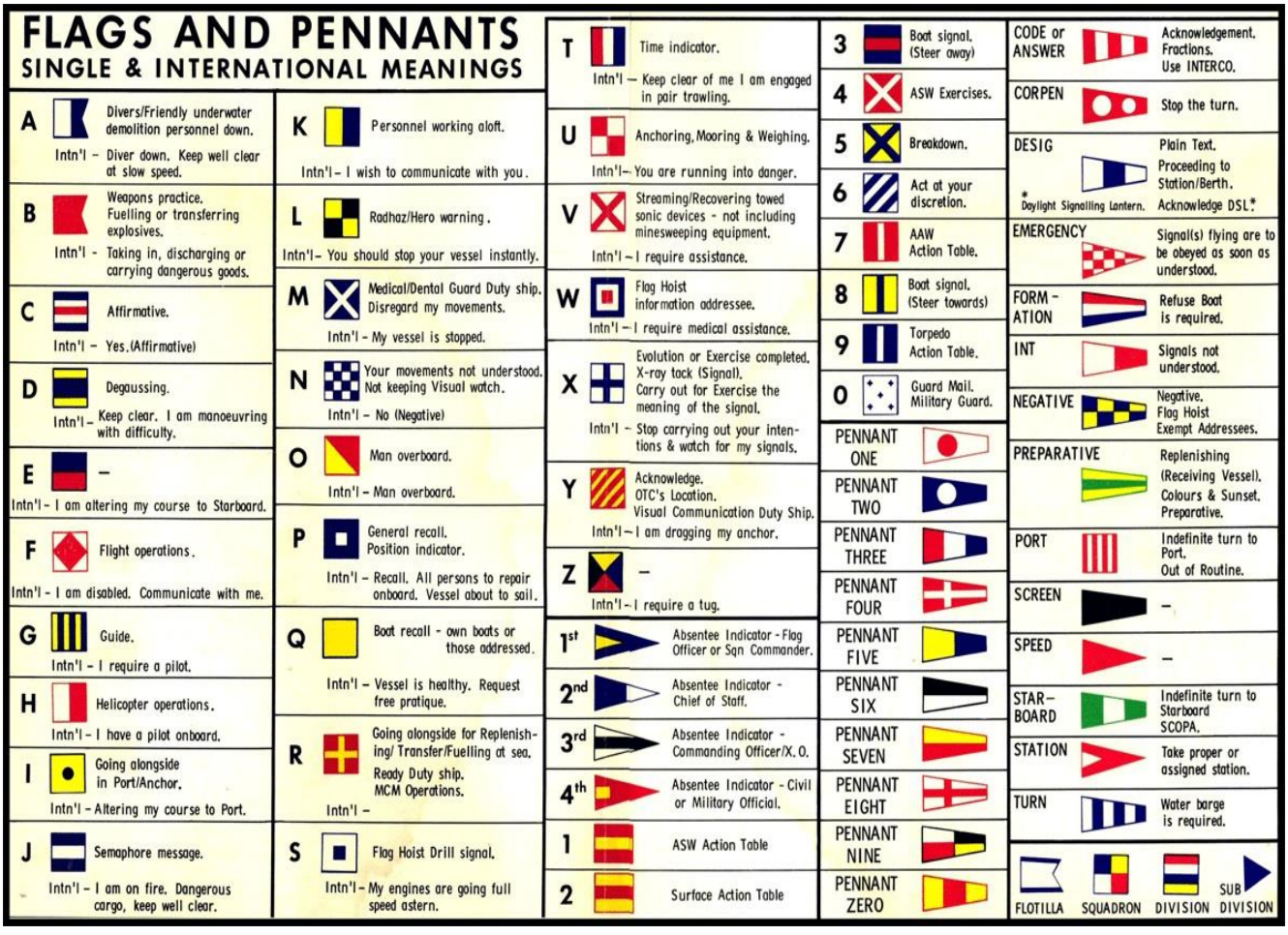
They are used to display the informationof the vessel's true heading.

29. Black Diamond Shape

When the ship is being towed or when a vessel is unable to maneuvers on itself, a black diamond shape is shown during the day time.

30. Ship Flags

Various types of ship flags with different colors and signs are used to indicate a ship's position. Signal flags are they are commonly known, have been used since the ancient times and are still used on all vessels.



CHAPTER 3.2

Admiralty Notices To Mariners

This ADMIRALTY Notices to Mariners Bulletin (ANMB) is published by the UK Hydrographic Office (UKHO). The UK Maritime and Coastguard Agency accepts that both the paper and digital forms of the ANMB comply with carriage requirement for Notices to Mariners within Regulation 19.2.1.4 of the revised Chapter V of the Safety of Life at Sea Convention, and the Merchant Shipping (Safety of Navigation) Regulations, both of which came into force 1 July 2002.

While every effort is made to ensure that the data provided through the Notices to Mariners service is accurate, the user needs to be aware of the risks of corruption to data. It is important that the user should only use the data on suitable equipment and that other applications should not be running on the user's machine at the same time. Users should exercise their professional judgement in the use of data and also consult the Mariners' Handbook (NP100) for further details.

The user needs to be aware that there is a possibility that data could be corrupted during transmission, or in the process of display or printing on the user's equipment, or if converted to other software formats, and is accordingly advised that the UKHO cannot accept responsibility for any such change, or any modifications or unauthorised changes, made by licensees, or other parties.

Admiralty Digital Publications

The Admiralty Digital Publication (ADP) functionality permits the following data to be ordered and displayedby using Navi-Planner 4000:

- Admiralty Digital Radio Signals volume 1,3,4,5 [ADRSv1345]
- Admiralty Digital Radio Signals volume 2 [ADRSv2];
- Admiralty Digital Radio Signals volume 6 [ADRSv6];
- Admiralty Digital List of Lights [ADLL];
- Admiralty Total Tide.

Admiralty Digital Radio Signals volume 1,3,4,5 (ADRS 1,3,4,5) assists the mariner in routine radio communications, receiving and providing weather reports and safety information, pollution and quarantinereporting, seeking for Telemedical Assistance Services (TMAS) and provides detailed procedures in the eventof a distress or SAR incident.

Admiralty Digital Radio Signals volume 2 (ADRS 2) provides a range of regularly updated and compliant, digitalpositional and timekeeping references:

- Listing of VHF radio-direction-finding stations;
- Worldwide listing of radar beacons (Racons and Remarks);
- Identification System (AIS) Aids to Navigation (AtoN);
- Worldwide listing of radio beacons transmitting DGPS corrections;
- International radio time signal broadcast details.

Admiralty Digital Radio Signals Volume 6 provides maritime radio communications information for pilotservices, vessel traffic services and port operations worldwide. More than 3000 service locations are updatedquickly and efficiently online every week.

The Admiralty Digital List of Lights provides light and fog signal information for more than 70,000 unique lightstructures worldwide. Users can get weekly updates by email or access the information online as soon as itbecomes available.

The Admiralty Total Tide is the world's most comprehensive tidal prediction program, which provides fast,accurate tidal height and tidal stream predictions. It contains tidal information for over 7,000 ports and morethan 3,000 tidal stream stations worldwide.

For this functionality to operate, the Admiralty Digital Publication software is required to be installed on theWS. The software can be found in the appropriate TPT (Transas Planning Tools) media.

CHAPTER 3.3

ENC Charts

An electronic navigational chart or ENC 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 Centers (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.
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.

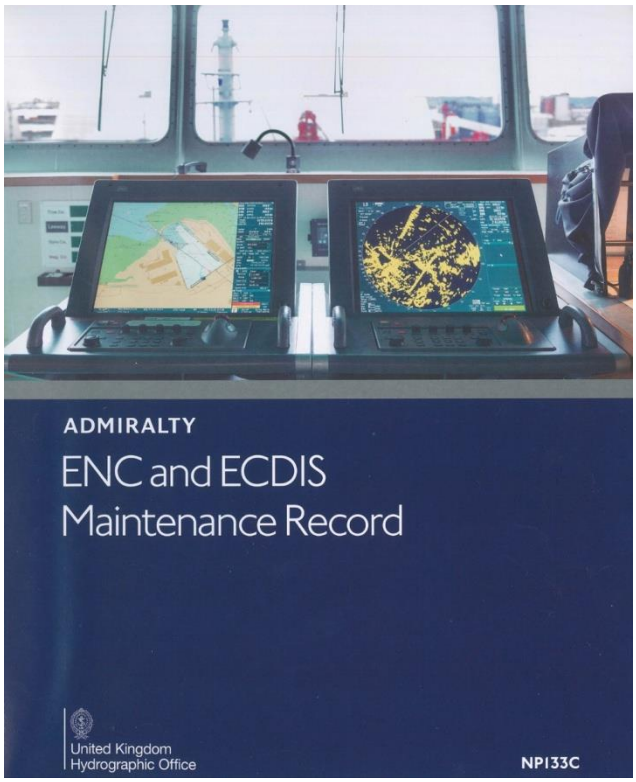
Maintenance of Charts

Official charts – ENCs – are to be used in the ECDIS, and should cover the entirety of the voyage and to be up to date.ENCs can normally be ordered for 3, 6, 9 or 12 months. ENCs from any provider can be used in the NS4000 ECDIS.

Company has opted for Transas provided ENCs via our Chart Service (TADS) for easy chart handling onboard.These charts are distributed in a SENC format. Transas normally issue a new BASE DVD quarterly, while weekly update DVDs are issued upon customer requirements.

A default license period of 3 months has been agreed between company andTransas in order to allow direct chart ordering from Transas Chart Server.The ENCs loaded on the ECDIS should be of the appropriate scale for theplanning and perform of the voyage plan.

A record of all loaded ENCs and all updates should be maintained along with NM and Navigational warnings received onboard should be logged in the ADMIRALTY ENC Maintenance Record Book.



Manual updates for NM and Navigational warnings which not included in the ENCS should be entered and highlighted if affect the safety. All Masters and Bridge Officers should be fully aware on how to update and maintain the onboard ECDIS and ENCs.

Chart updates are released on a weekly basis, and the vessel should implement routines to update their chart portfolio according to that interval.At least the latest Base DVD should be kept onboard, together with latestUpdate DVD if service chosen by company.

When new licenses are received, always install charts from latest Base DVDbefore updating the portfolio.Depending on both trading pattern and number of charts installed, you canchoose between updating by route/selection or “All installed charts” when updating online or via e-mail.ENC/ ECDIS Data presentation and performance check should be done as perIHO procedures.

After weekly updates, check of ECDIS status and all ENCs to be carried out. These checks must include NTMs and Navigational warnings.Vessels navigating in areas which not covered by ENCs, normal paper charts should be used.

T&P Corrections on ECDIS

T & P corrections to ENC are supplied via Transas weekly update by CD orsending them by e-mail downloading and displayed as AIO Charts.

Notice To Mariners and T&P corrections which are received weekly via email
from Transas are transferred to the ECDIS with the dedicated USBthat is to be used for that sole purpose only, so that it is free of any virus in orderto protect the ECDIS software.

Some producing hydrographic offices do not include T&P corrections in their
Weekly updates to ENCs. The relevant corrections are entered into ECDIS via the MANUAL CORRECTION Task.

The SW Admiralty Information Overlay (AIO) layer open up for displaying AIOs
from UKHO. These data include T&P corrections from UKHO Notice to Mariners
and are displayed for the charts have been licensed.

Use AIO CHARTS Task and “show AIO” when performing final route planning inorder to see any T&P Corrections or other information are interfering the routeplan.

Navigational warnings received via NAVTEX should be plotted in the ECDISusing the MANUAL CORRECTION Task.

CHAPTER 3.4

Advantages of ENCs

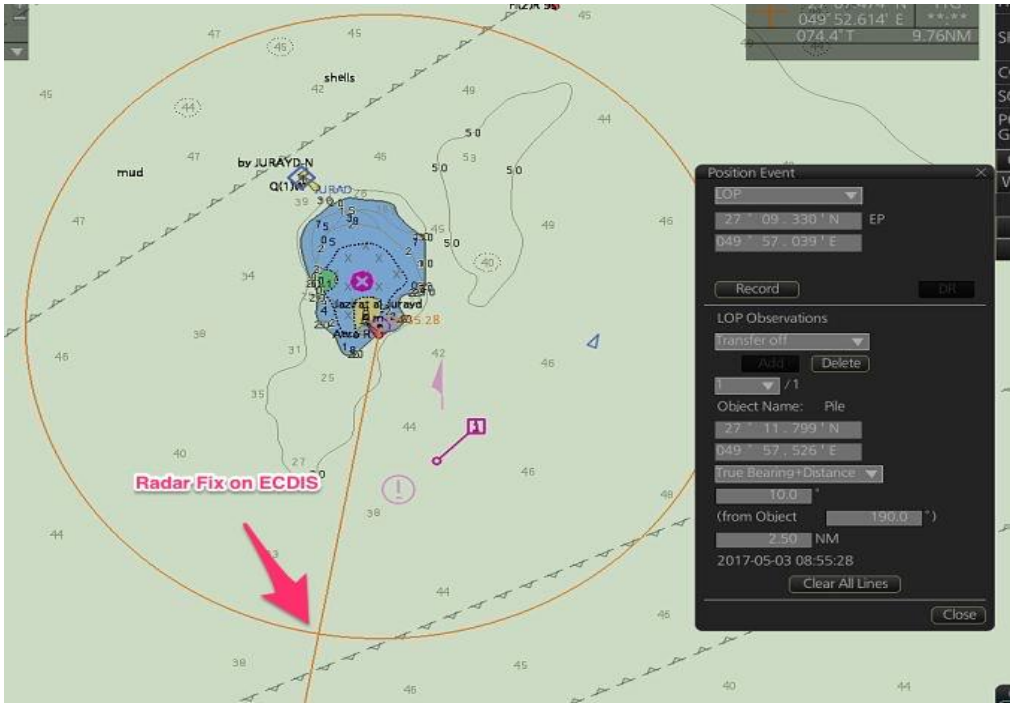
1. Availability: One of the great advantages of ECDIS over paper charts is the availability of electronic charts – especially when voyage orders are received at the last minute. Gone are the days when Second Mates huddled over the good old NP 131 (chart catalogue) to determine what charts they require for the voyage. This was followed by the arduous task of ordering these charts and hoping thatthey arrive in time. More often than not, this proved a major challenge especially on tramper trades which tend to get last minute voyage orders.
With vessels going chartless, all that the Second Mate needs to do now is plot a rough course in the voyage planner and a list of all the required paper charts is populated. The Master then emails this list to the chart supplier, who will then send the activation codesfor those charts. A task that with skill and practice required hours now takes a few minutes.

2. Speed and Accuracy: With ECDIS as the primary source of navigation, the Navigating Officer can plan and summarize the passage much faster than on Paper Charts. Most ECDIS units have a facility where the waypoints can be imported into an excel format which reduces the effort to manually input the waypoints when compiling the Voyage Plan. Daily reporting data such as Distance to Go, Distance Covered, Average Speed, etc. can be done quickly with hardly any effort.

3. Corrections: Before the advent of paperless navigation, the largest chunk of the Navigating Officer's work time was consumed inCorrecting Charts. Correcting charts with speed and accuracy was a skill that took a long time to master. Even then there was a possibility of the occasional erroneous correction.
The Temporary and Preliminary (T&P) Notices were especially tedious since these came without tracings and required a thick file to be maintained. Keeping the world folio updated was a matter of pride which came with a lot of bragging rights. All that has changed with paperless navigation.
The Navigating Officer now receives weekly updates to the Electronic Charts via Email which he has to download onto a zip drive and upload them to the ECDIS.
Even the dreaded T&P notices are now shown electronically on the ECDIS.

4. Continuous Monitoring of Vessel's Position: One of the single biggest advantages of the ECDIS over paper charts is its ability to enable the user to see the vessel's position in real time without user action. The ECDIS is interfaced with both the vessel's independent GPStransceivers, thereby making the system work even if one fails. However, we all know that GPS signals can be unreliable and are prone to errorsoccasionally. This problem can be overcome by using the Radar Overlay and Echo Referencing facility in the ECDIS and Radar.
The Radars need to be interfaced with the ECDIS for this. Once this is done, the user will have to activate the overlay tab of the ECDIS which will super impose the Radar Screen on the ECDIS.

By checking that the Radar Echo is matching with the ECDIS display, one can be assured that the positions can be relied upon.
Another feature enabling continuous position monitoring, especially during coastal navigation is ARPA Echo Referencing. This is done by acquiring a fixed / stationary target such as a small island, lighthouse, rock etc. on the Radar (ARPA) and then activating the ARPA tab on the ECDIS.
Next step is to deselect the Secondary Position Source on the ECDIS as GPS and select Echo Reference in its place. Once enabled, this gives the user visual indication of the past tracks of both the Primary (GPS) and Secondary (Echo Reference) position fixing modes.
Finally, one can also use the Radar Range and Bearings to plot positions on the ECDIS display, just like on paper charts. All types of ECDIS these days come with an option of manually plotting the position using the Range / Bearing method. One simply has to take the range and bearing from a suitable radar object and plot this on the ECDIS by using the Range / Bearing function of the ECDIS itself. In ECDIS terminology, this is referred to as a Line of Position (LOP).
A time stamp is printed on the ECDIS screen (see figure below) with both the GPS positions and the LOP. This serves as a ready indication of any offset present between the GPS and Radar fixes.



5. <u>Anti-Grounding Alarms and Settings</u>: Though ECDIS has now evolved into a full-fledged primary source of navigation, it was born as an Anti-Grounding aid to Navigation. Even to this day, the ability of the ECDIS to warn the user of approaching shallow waters make it one of the most useful equipment on the bridge. The user has complete flexibility to determine these safety settings on the ECDIS. Most companies' will have strict guidelines on the minimum safety parameter settings.
As a minimum, the following serves as a general guideline.

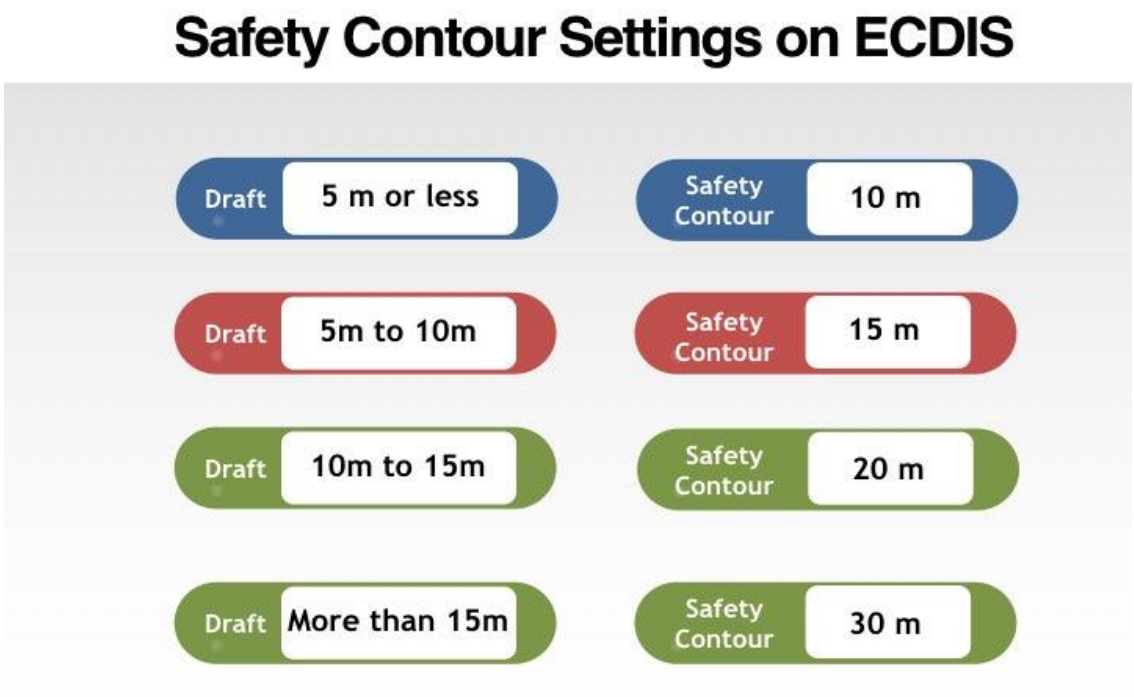
CHAPTER 3.5

Safety parameters on Ecdis

Safety settings sets the safety parameters according to the ship's static as well as dynamic particulars. That is a change ECDIS brought from the traditional paper charts.
The colors on the paper chart may not represent the shallow waters for all the ships.
But on the ECDIS these can be set by the user according to their draft and other parameters.
There are 4 safety settings:

- Safety contour Setting
- Shallow contour settings
- Deep contour setting
- Safety Depth setting

Appropriate safety settings are of paramount importance for ECDIS display. Failings in appropriate settings have recently resulted a few grounding incidents (e.g. CSL Thames and LT Cortesia). The navigators must understand the values for the safety depth, safety contour and set them properly to achieve a sensible and well thought-out implication.



The safety contour marks the division between 'safe' and 'unsafe' water. If the navigator does not specify a safety contour, this will default to 30m. When the safety contour is not displayed to the specified value set by the navigator, then the safety contour is shown to the next deeper contour as per the default layers in the electronic charts. Moreover, the contours may also differ between electronic charts produced by different hydrographic offices. During route planning, an indication

will be made if the route is planned to cross the ship's safety contour. At the time of route monitoring, ECDIS should give an alarm if, within a specified time set by the navigator, own ship is likely to cross the safety contour.

The division between 'safe' and 'unsafe' water is highlighted by chart colouring, with blue colour used to indicate unsafe area and white or grey for safe area. The unsafe area may be further defined with the selection of a shallow contour, showing dark blue in the shallow water and light blue between the shallow water and the safety contour. The navigator must remember that displayed underwater obstruction or isolated danger symbols can change according to the settings of the safety contour. Furthermore, the safe water may also be sub-divided with the selection of a deep contour, in which case the area between the safe contour and the deep contour will be coloured grey.

The shallow contour should be used to highlight the gradient of the seabed adjacent to the safety contour and the deep contour to highlight the depth of water in which own ship may experience squat.

It is acknowledged that not all ECDIS manufacturers provide separate controls for safety contour and safety depth value, some have a common or a linked control. Some flexibility of the system is lost when there is only one common control for 'Safety Depth' for both the 'safety depth' and the 'safety contour'. In such cases, the navigator must decide the value to be given for safety depth i.e. draught or draught plus an allowance for UKC (Under Keel Clearance)? Author recommends that the safety contour value should be used for the safety depth on ECDIS with such feature.

CHAPTER 3.6

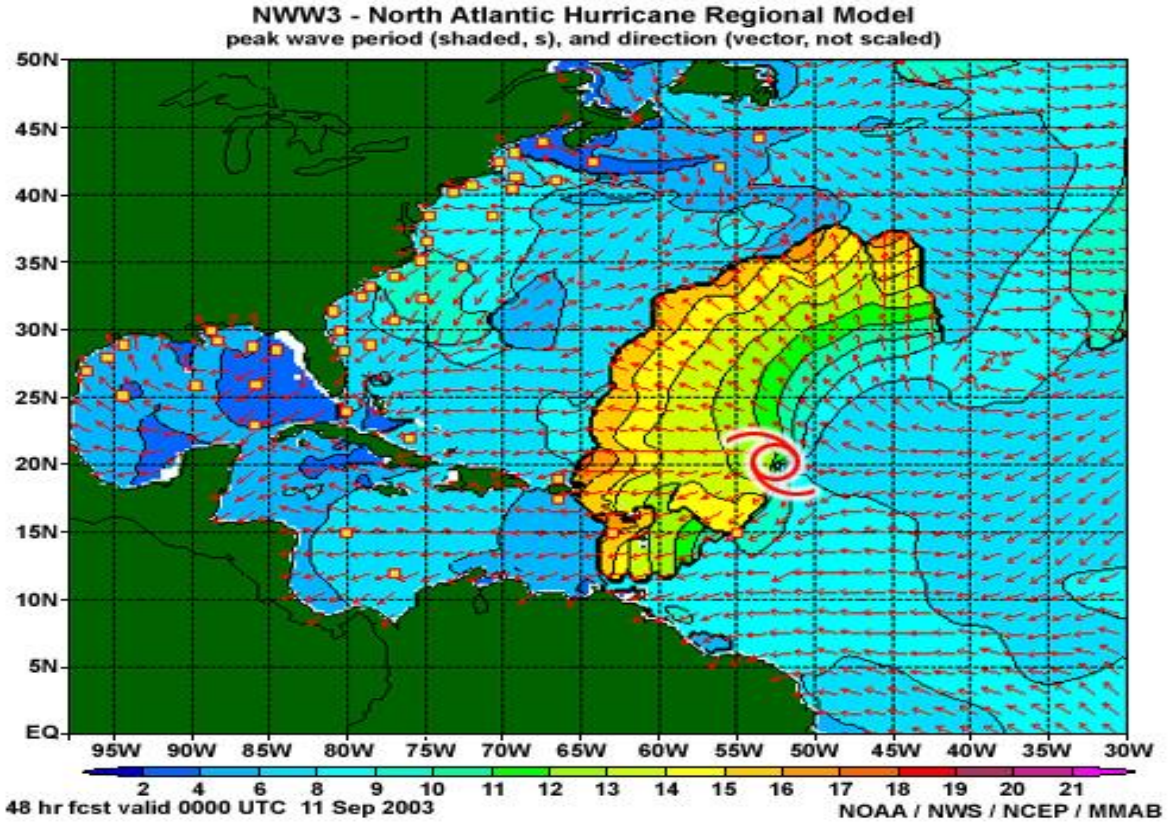
Meteorological Resources

Weather information has always been vital for the safety and efficient operation of marine industries, particularly transport and fishing. Early in the twentieth century, wireless telegraphy allowed regular communication between ship and shore, and weather broadcasts to shipping began. The first International Convention for the Safety of Life at Sea (SOLAS Convention) called for all shipping lanes and fishing grounds to be covered with weather information broadcast by radio; governments agreed to share responsibilities for these broadcasts.

The International Maritime Organization (IMO)/WMO Worldwide Met-Ocean Information and Warning Service (WWMIWS) provides uniform coverage of forecasts and warnings to ships traversing the oceans. The IMO Polar Code provides additional guidance on the provision of suitable marine meteorological and sea-ice services to support safe shipping in polar waters.

The availability of marine forecasts and warnings to mariners in coastal waters is vitally important to the ability of National Meteorological and Hydrological Services (NMHSs) to meet the principles of the SOLAS Convention.

A marine meteorological program embraces a wide range of activities. In the preparation of analyses, synopses, forecasts and warnings, knowledge is required of the present state of the atmosphere and the ocean surface, as well as the climate of the region. In addition, other types of forecasts that refer to special elements and phenomena, such as waves, storm surges, sea ice and ice accretion may be based on relevant observational data.



Abbreviations

AIS – Automatic Identification System

COLREG - International Regulations for Preventing Collisions at Sea (“Rules of the Road”)

CPA – Closest Point of Approach

EBL – Electronic Bearing Line

ECDIS – Electronic Chart Display and Information System

ENC – Electronic Navigational Chart

GPS – Global Positioning System

IMO – International Maritime Organization

STM – Sea Traffic Management

SA – Situation Awareness

WP – Way Point

PSC - Port State Control

GMDSS - Global Maritime Distress Safety System

LR - Large Range

LW - Low Water

P & I - Protection & Indemnity

VSL – Vessel

AMSA - Australian Maritime Safety Authority

APS - Arrival Pilot Station

BNWS - Bridge Navigational Watch Alarm System

ETA – Estimated Time of Arrival

ETD - Estimated Time of Departure

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