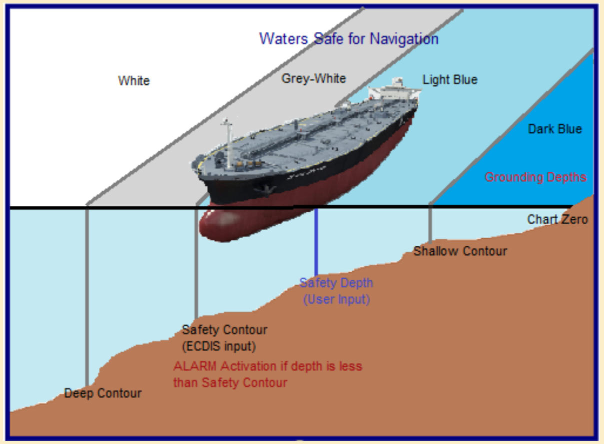
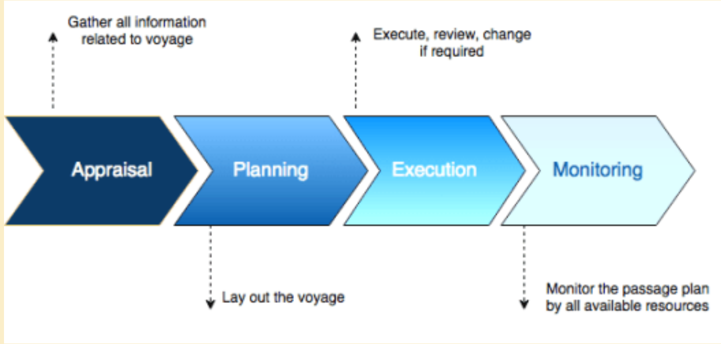
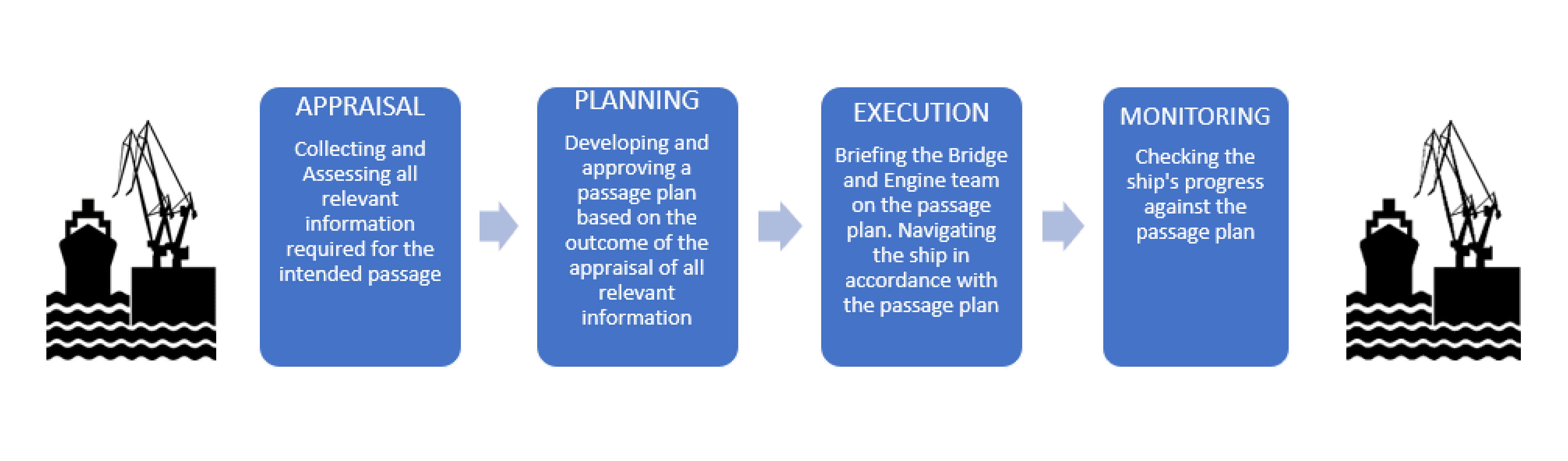
MARN019 Command and manage a voyage on a vessel up to 45 metres





Manage vessel passage planning



Manage vessel passage planning

To define an EXACT position on the Earth's surface, it is necessary to have 2 sets of Coordinates, based on Grid Lines *(similar to street directory)*

The Coordinates used are:

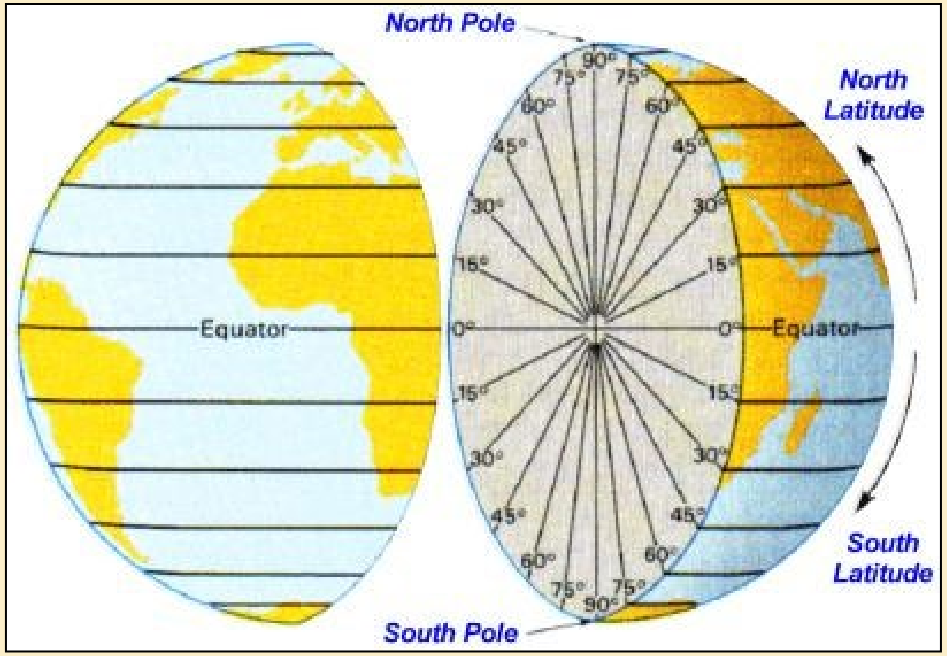
LATITUDE and **LONGITUDE**

Note: Position may also be expressed in relation to a known Geographical Position

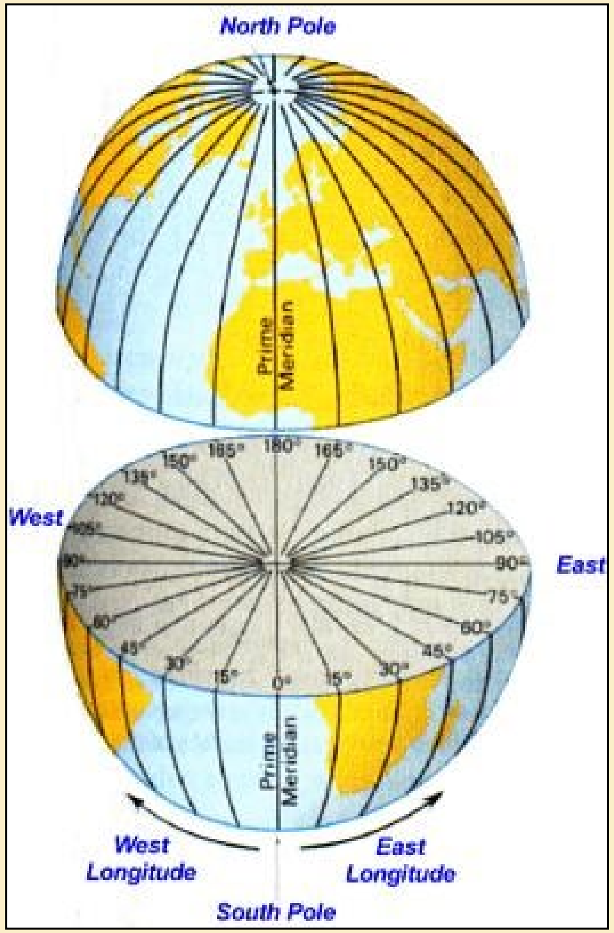
Eg: 15 miles East of Burnett Head Lighthouse

Manage vessel passage planning

LATITUDE & LONGITUDE



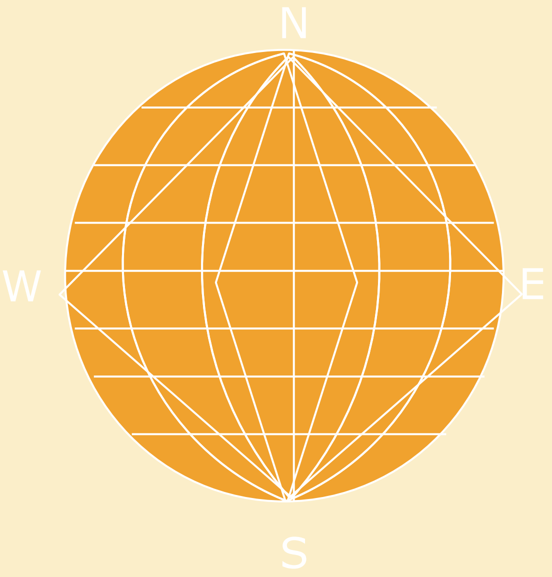
Parallels of Latitude
North south and always stated first

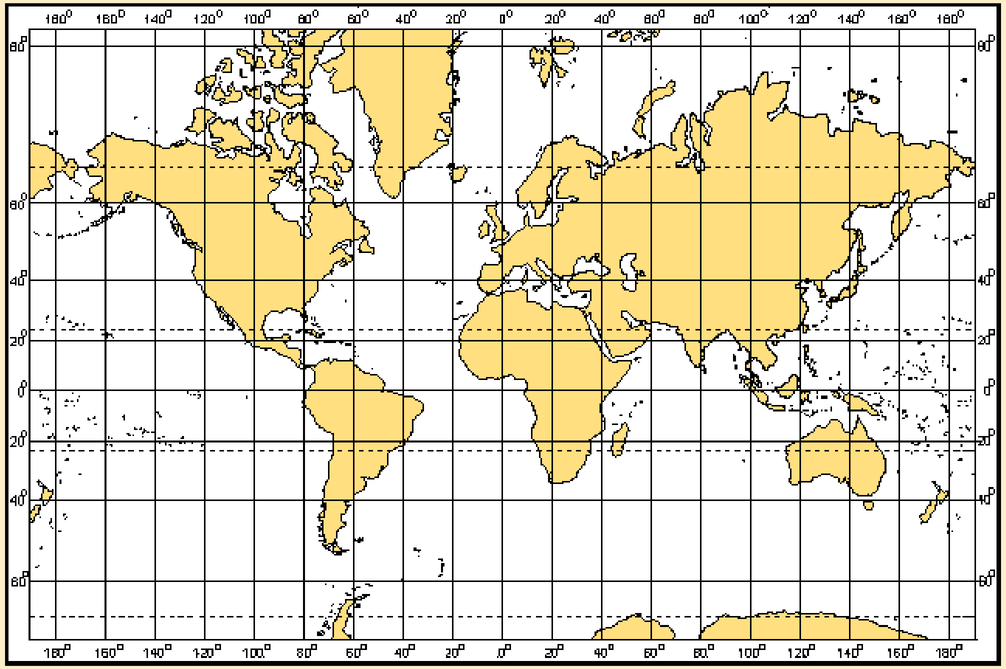


Meridians of Longitude
East West stated second

Manage vessel passage planning

MERCATOR CHART



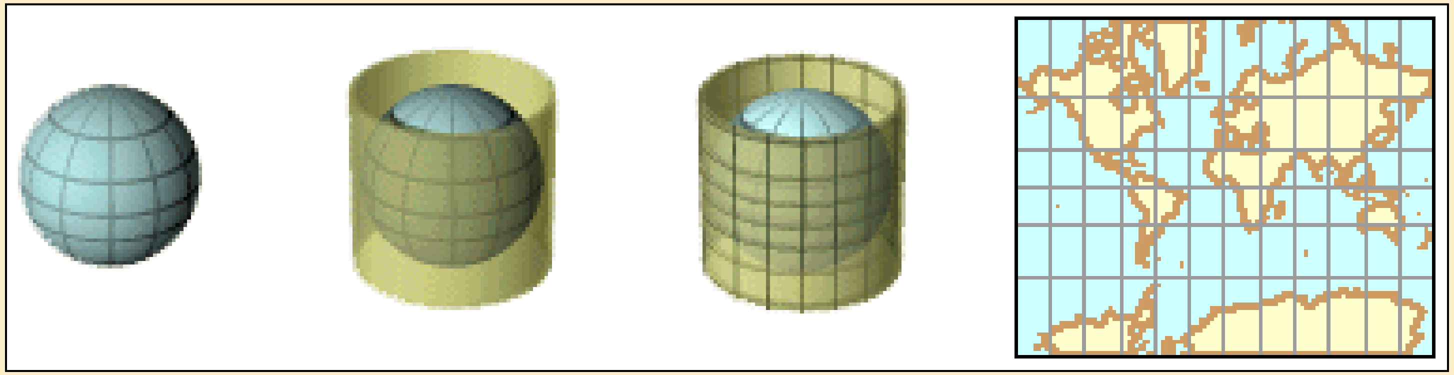


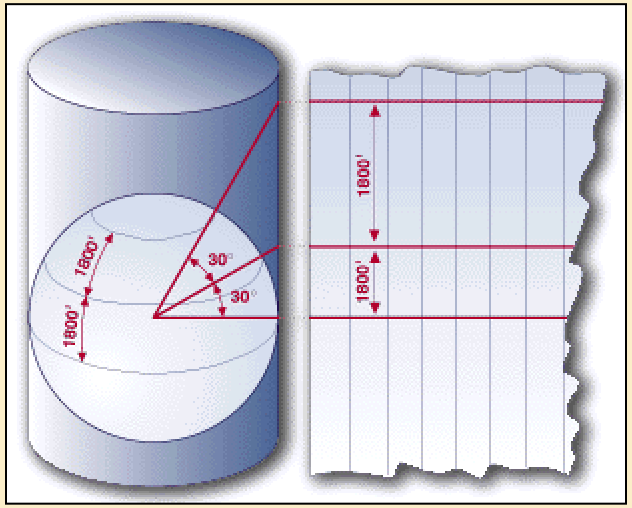
From this....................................to this

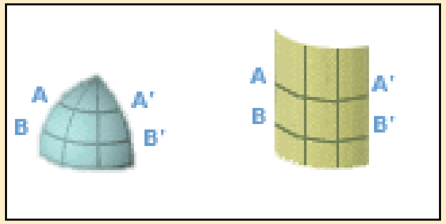
HOW?

Manage vessel passage planning

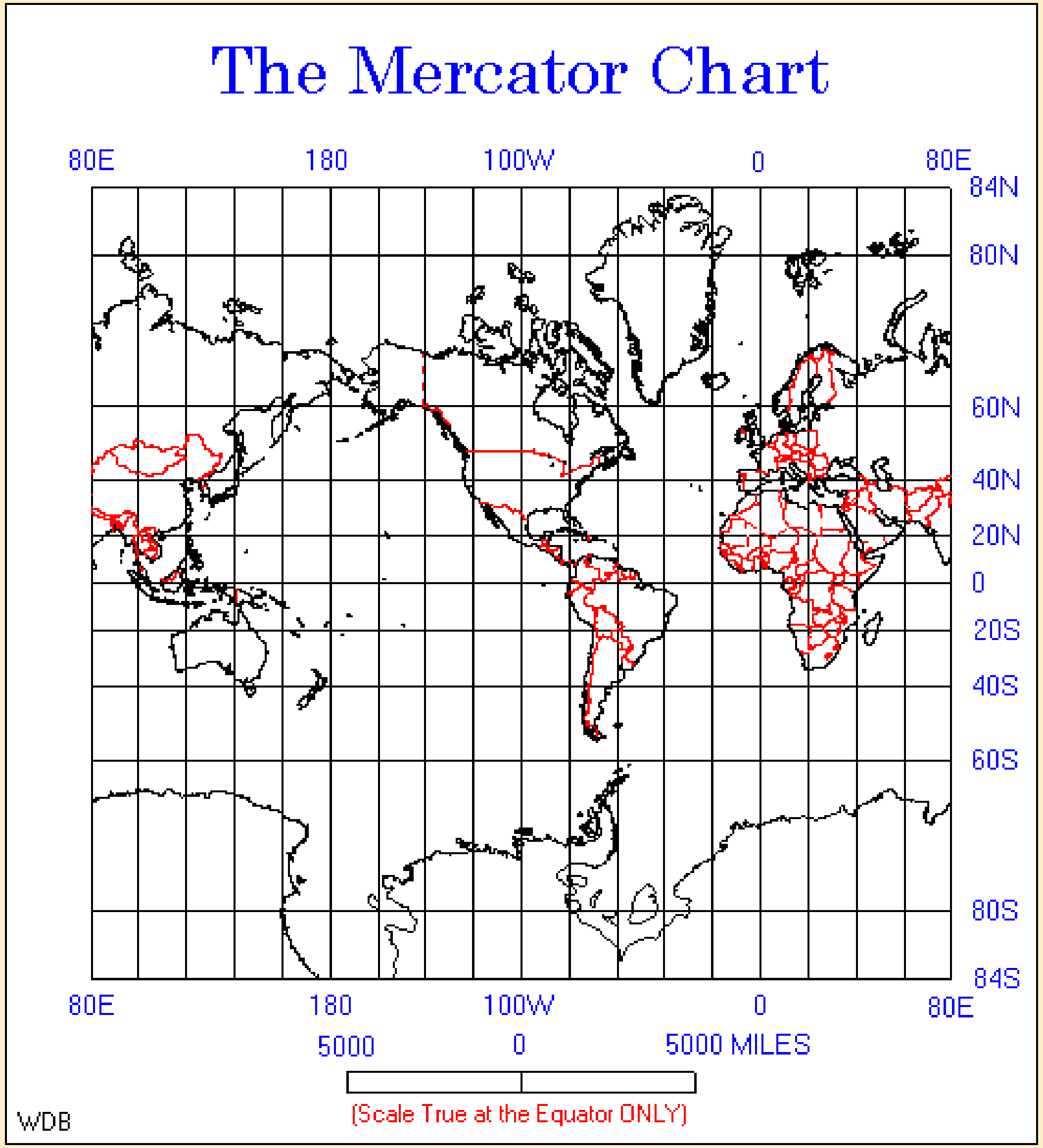
CHARTS







Manage vessel passage planning



Spacings between Parallels of Latitude increase proportionally with distance the further North or South from the Equator

Here the Parallels of Latitude are shown for every 20°

Even though the spacings increase, the number of degrees (20°) stays the same between the Parallels of Latitude

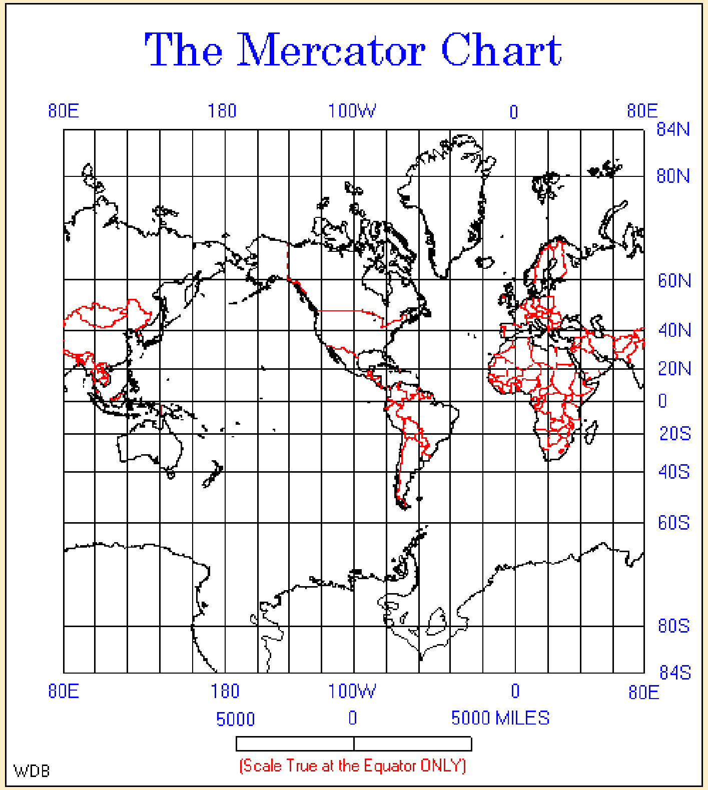
Manage vessel passage planning

On a MERCATOR Chart:

Coastlines retain same shape as on the earth's sphere

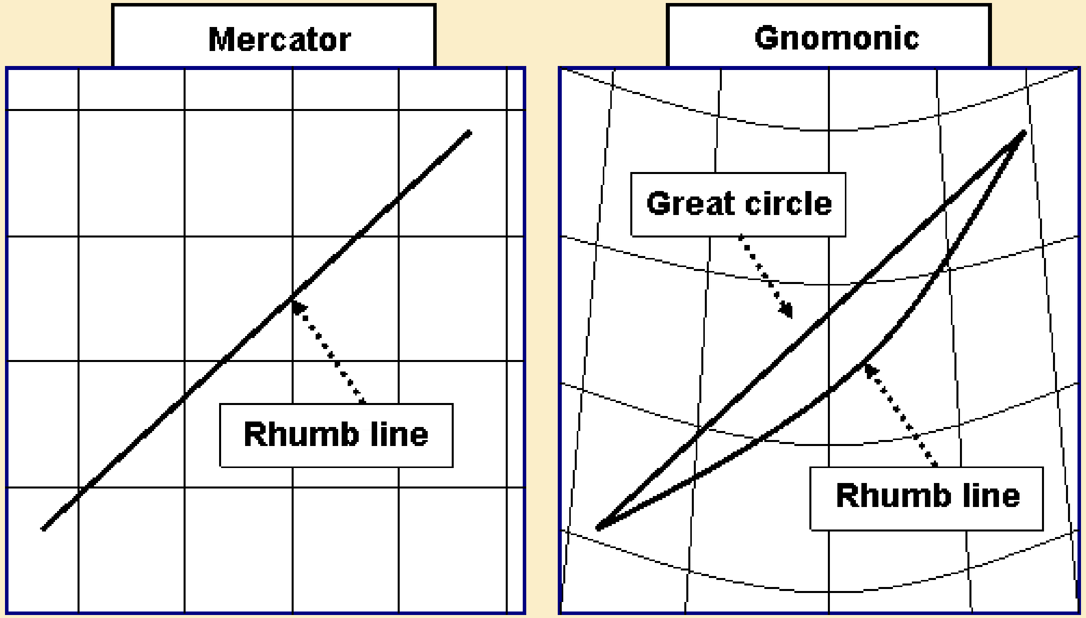
Lines of Latitude & Longitude are North/South and East/West respectively – i.e. cut at right angles

A straight line drawn on a chart between any 2 points gives the distance and direction between them



The straight line is called a **RHUMB Line**, even though the shortest distance is a **GREAT CIRCLE**

(Rhumb lines are used for Coastal Navigation where distances between 2 points are usually less than 600 n.miles)



Manage vessel passage planning

Latitude & Longitude

For navigation, Co-ordinates are described in:

Degrees (°), Minutes (‘), <u>Decimals of a Minute </u>(0.0’)

OR

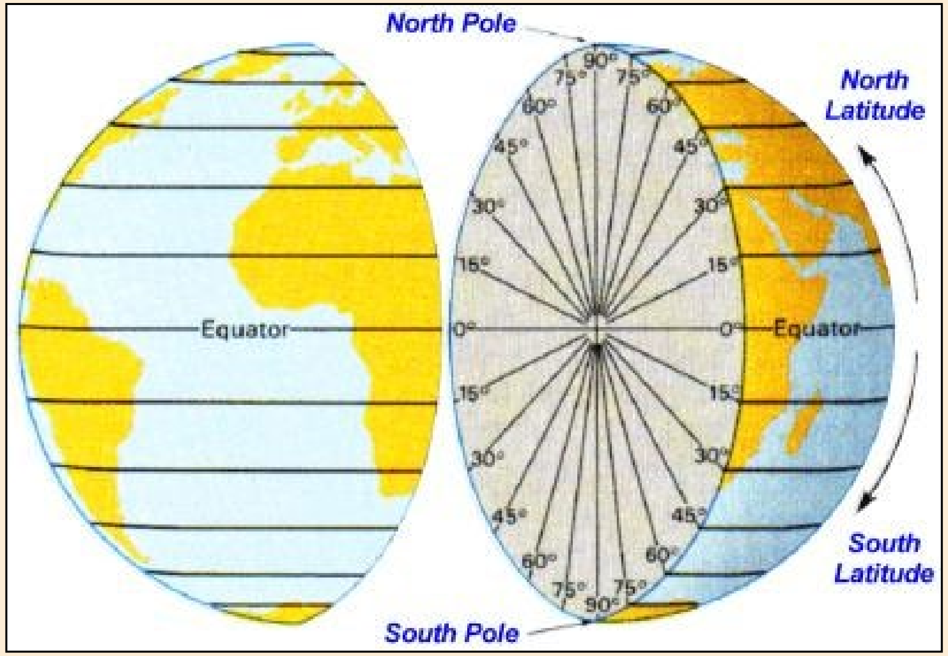
DEGREES (°), MINUTES (’), SECONDS (”)

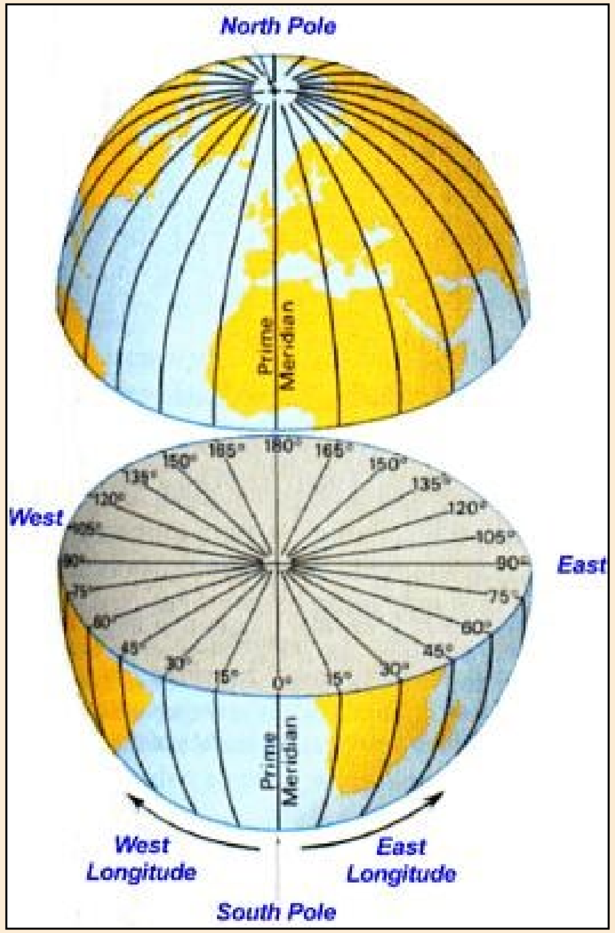
(60’ = 1°)   60” = 1’)

Eg:

Lat: 34°50.697’S D. M. Decimals
Long: 138°29.949’E

Lat: 34° 50’ 42”S D. M. Seconds
Long: 138° 29’ 57”E





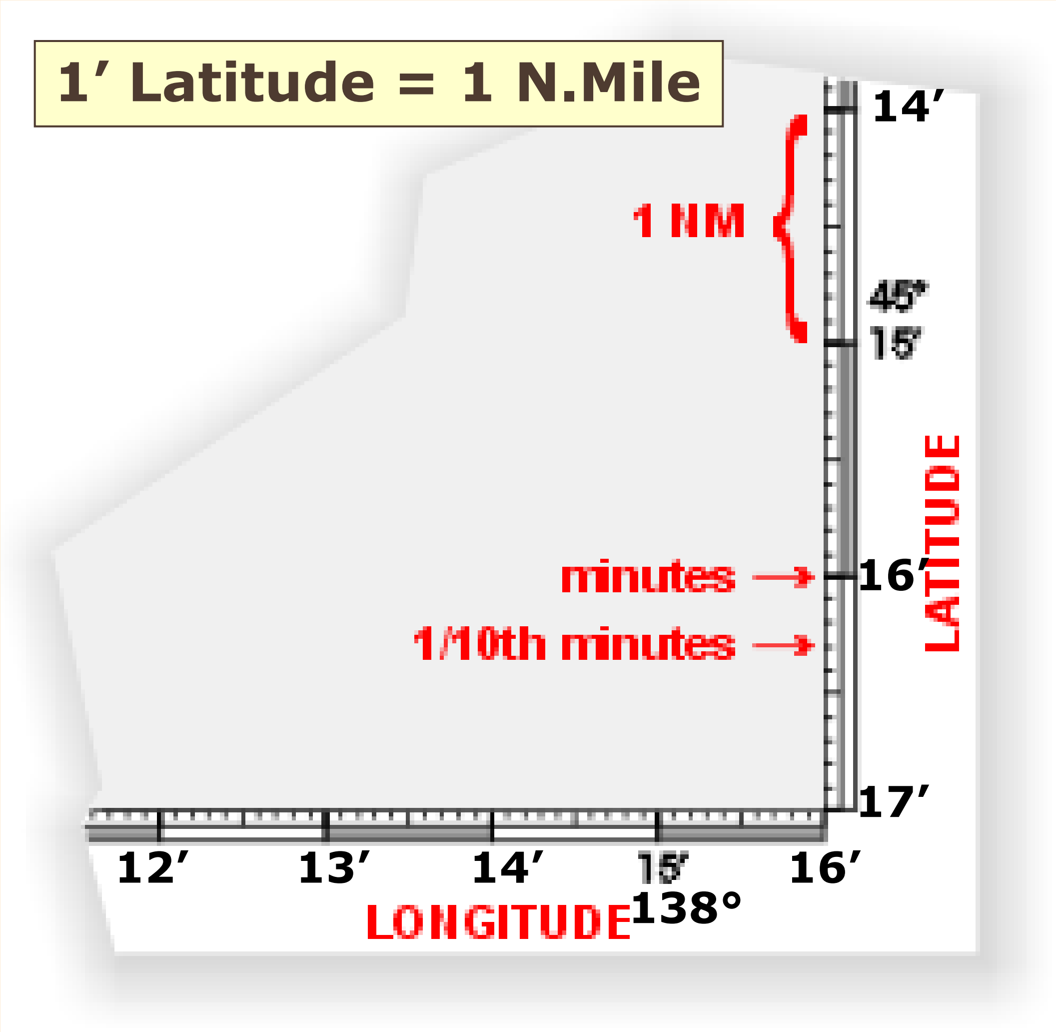
•The distance between any 2 **Parallels of Latitude** is consistent around the globe

•**Distance is always measured on the LATITUDE scale**

•The distance between any 2 **Meridians of Longitude** is **not** consistent around the globe

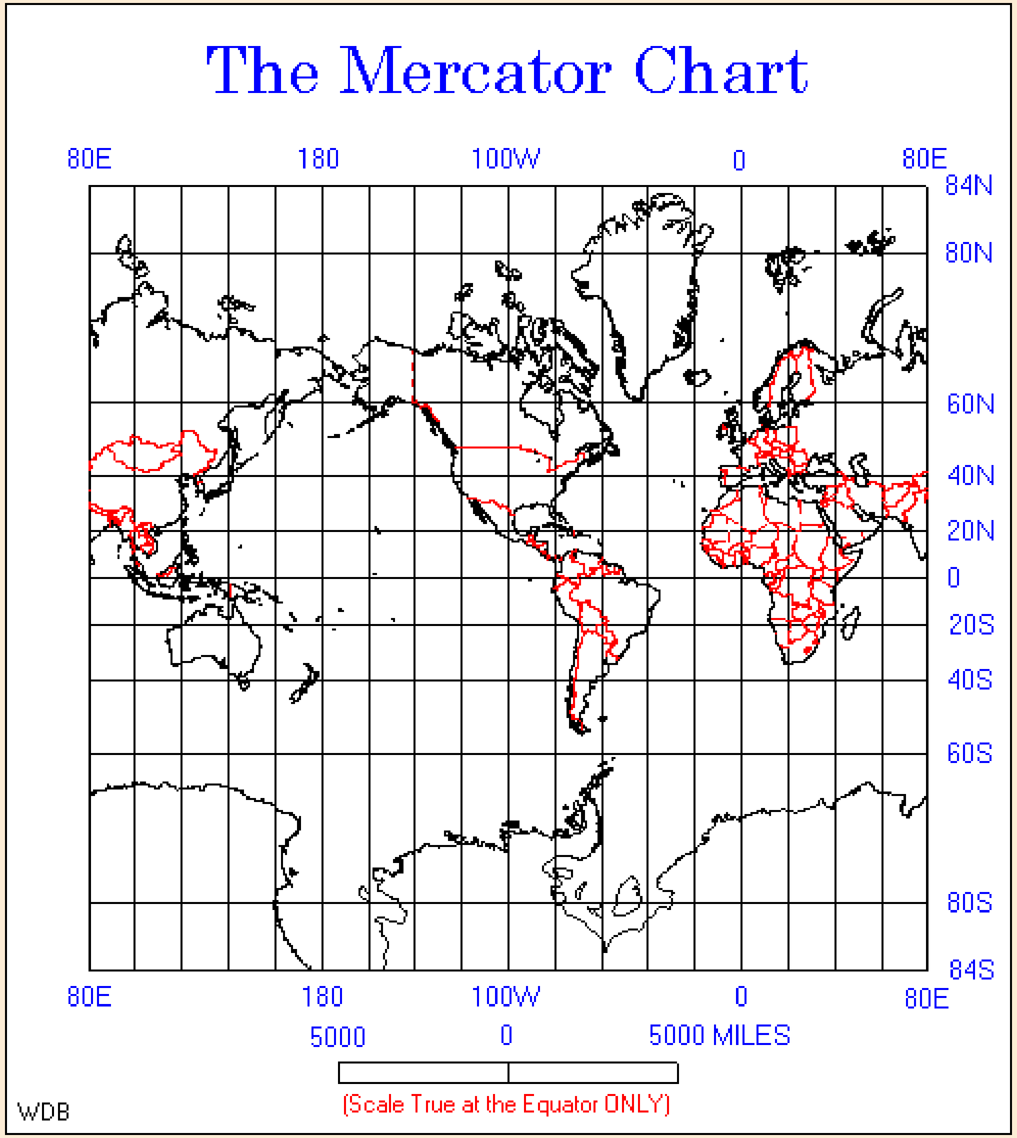
1′ (minute) of Latitude = 1 Nautical Mile

Measuring Distance

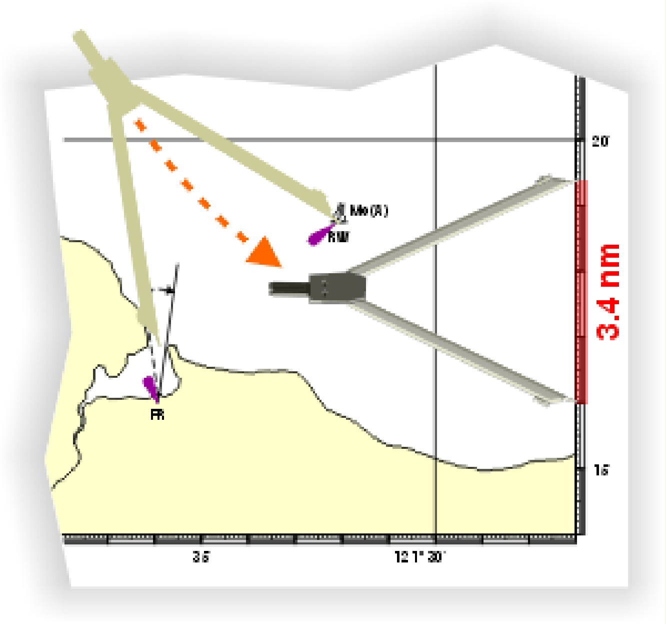


"Minutes" are divided into smaller increments, depending on chart scale size
(e.g., 0.1′, 0.2′ or 0.5′)

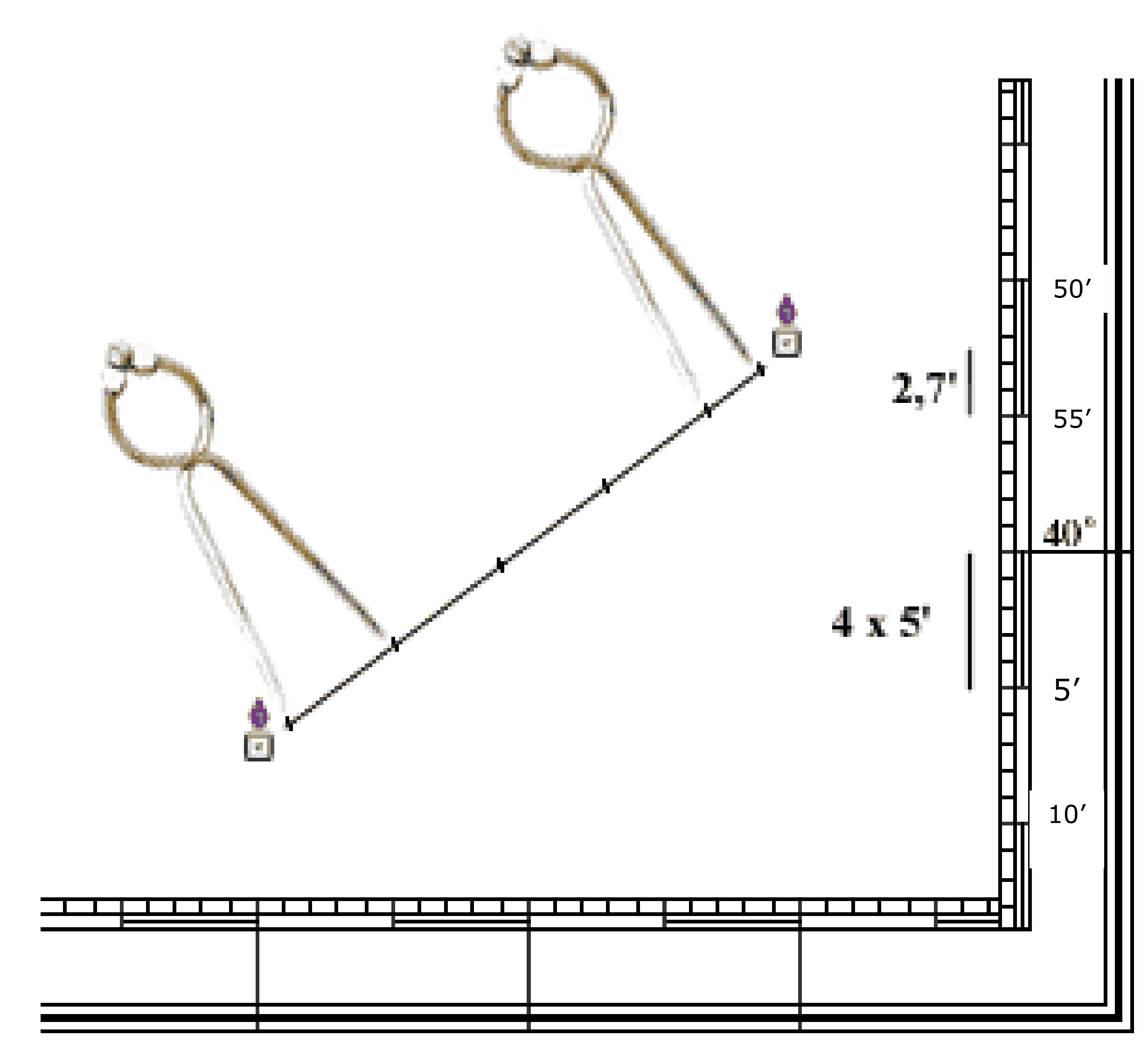
Measuring Distance



Always measure distance on Latitude scale <u>adjacent</u> to area of interest



Measuring Distance



For long distances, set dividers to smaller manageable lengths

Measuring Distance

EXERCISES

(Class based)

Complete exercise 1 in exercise sheet 1 located on page 3 in the student resource/exercise book

CHART CATEGORIES

- ## World Charts

  Smallest scale, used for Ocean Routes, Ocean Currents, and to show Magnetic Variation

- ## Ocean Charts

  Typically 1:10,000,000 covering large areas, with basic detail of shoreline & topography – used for planning & position fixing on long ocean passages

- ## General Charts

  Typically 1:1,000,000 - used for Coastal Navigation Off-shore. Greater detail.

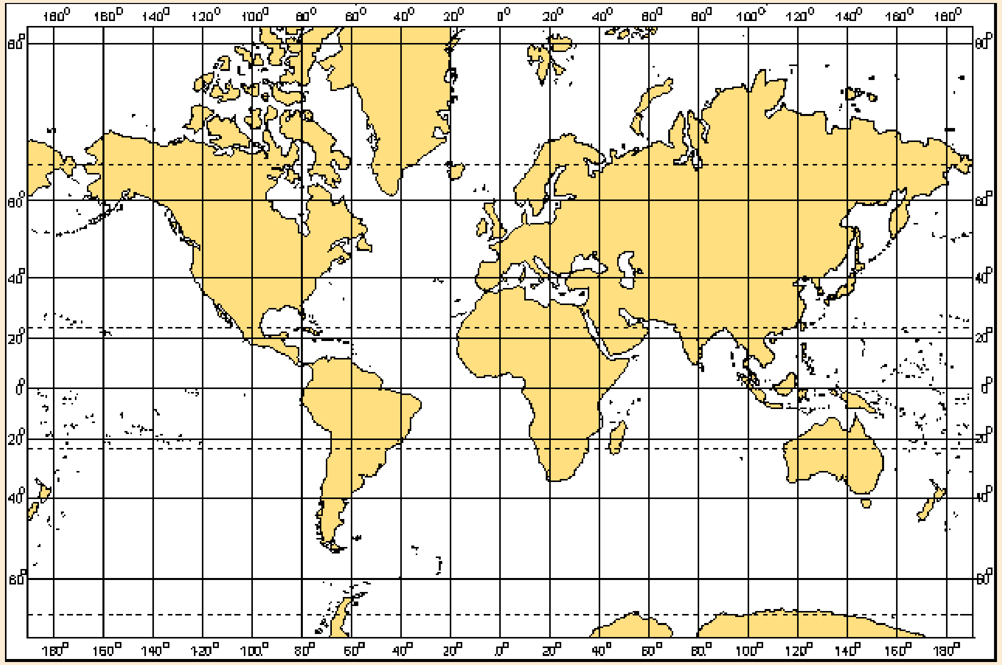
- ## Coastal Charts

  Typically 1:150,000 – used for Inshore Navigation – greater detail.

- ## Plan Charts

  Large scale (1:75,000 or 1:37,500) – great detail.

CHARTS AND FEATURES



N

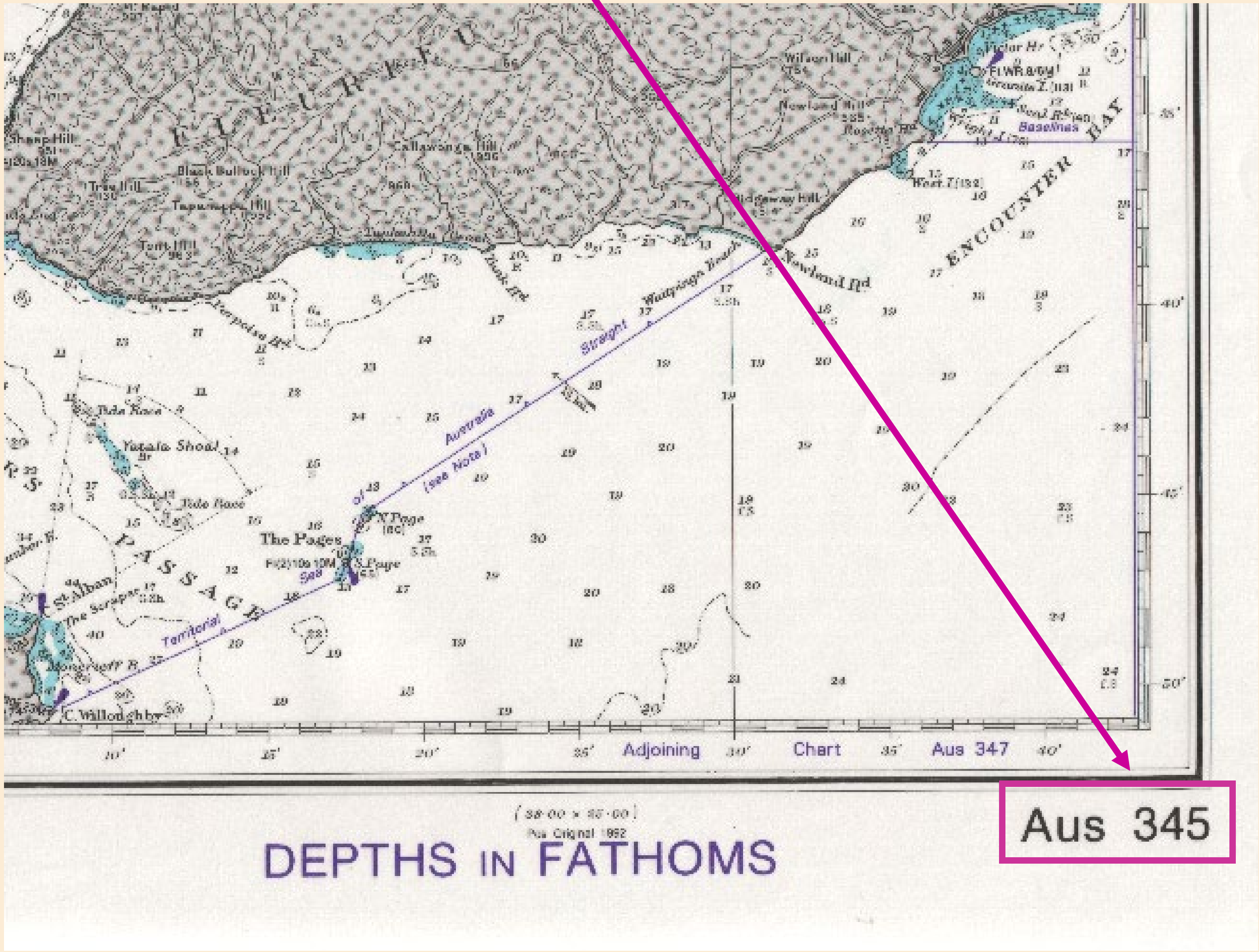
Top of chart is direction of True North

Chart ID Number

Number prefixed by:

AUS 342	Australian
NZ 123	New Zealand
BA 135	British Admiralty
INT 154	International

CHART ID NUMBER



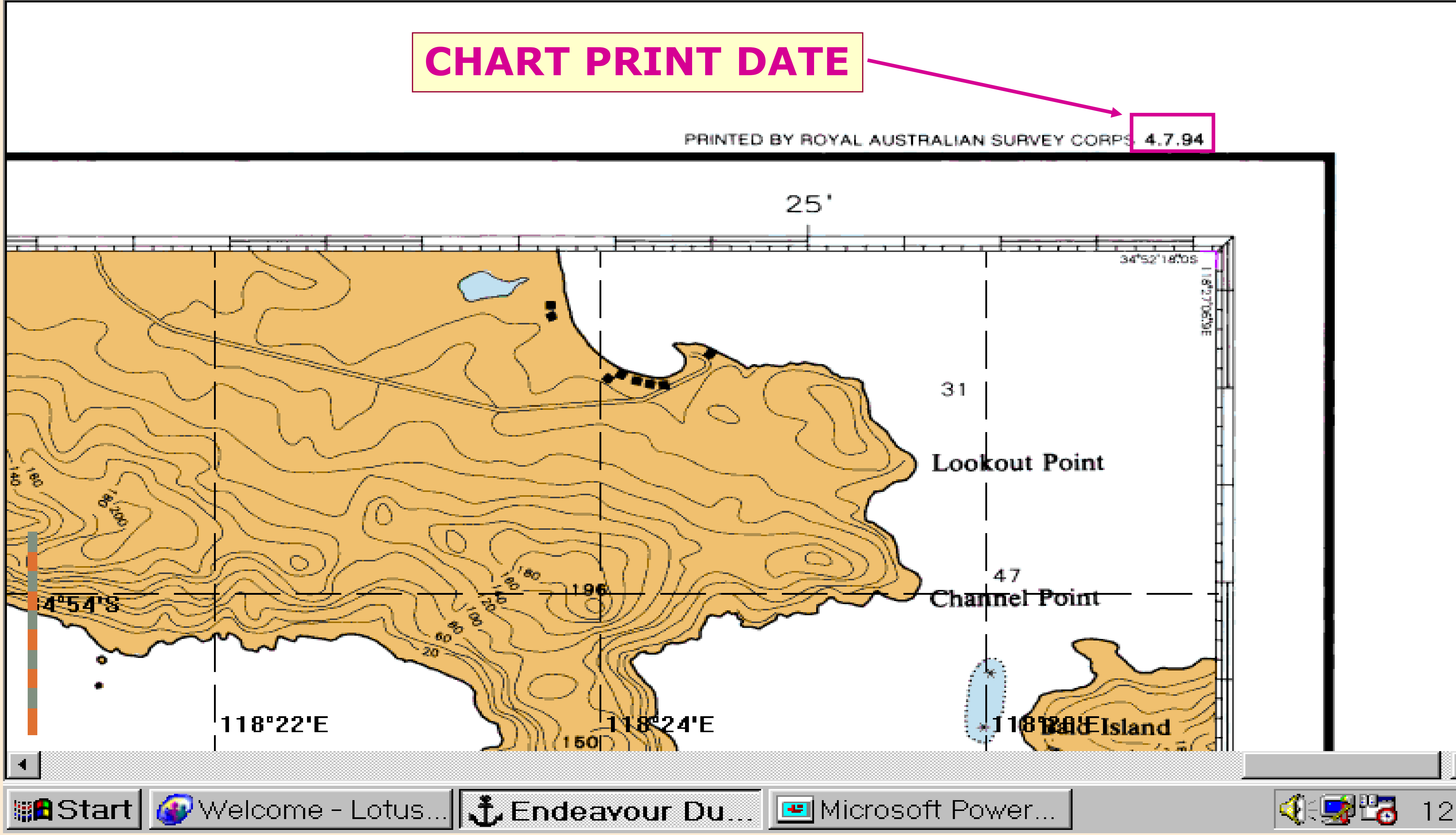
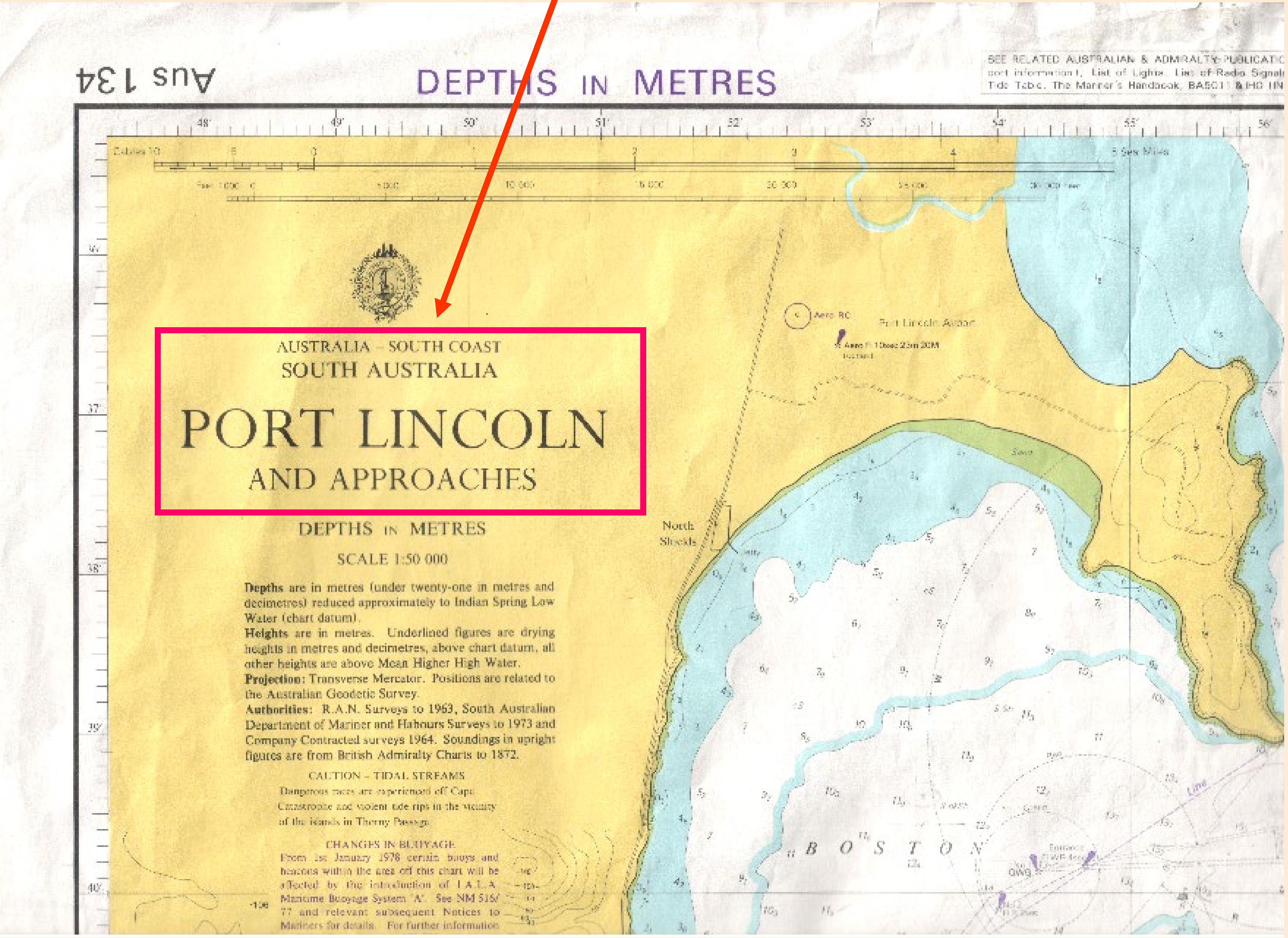
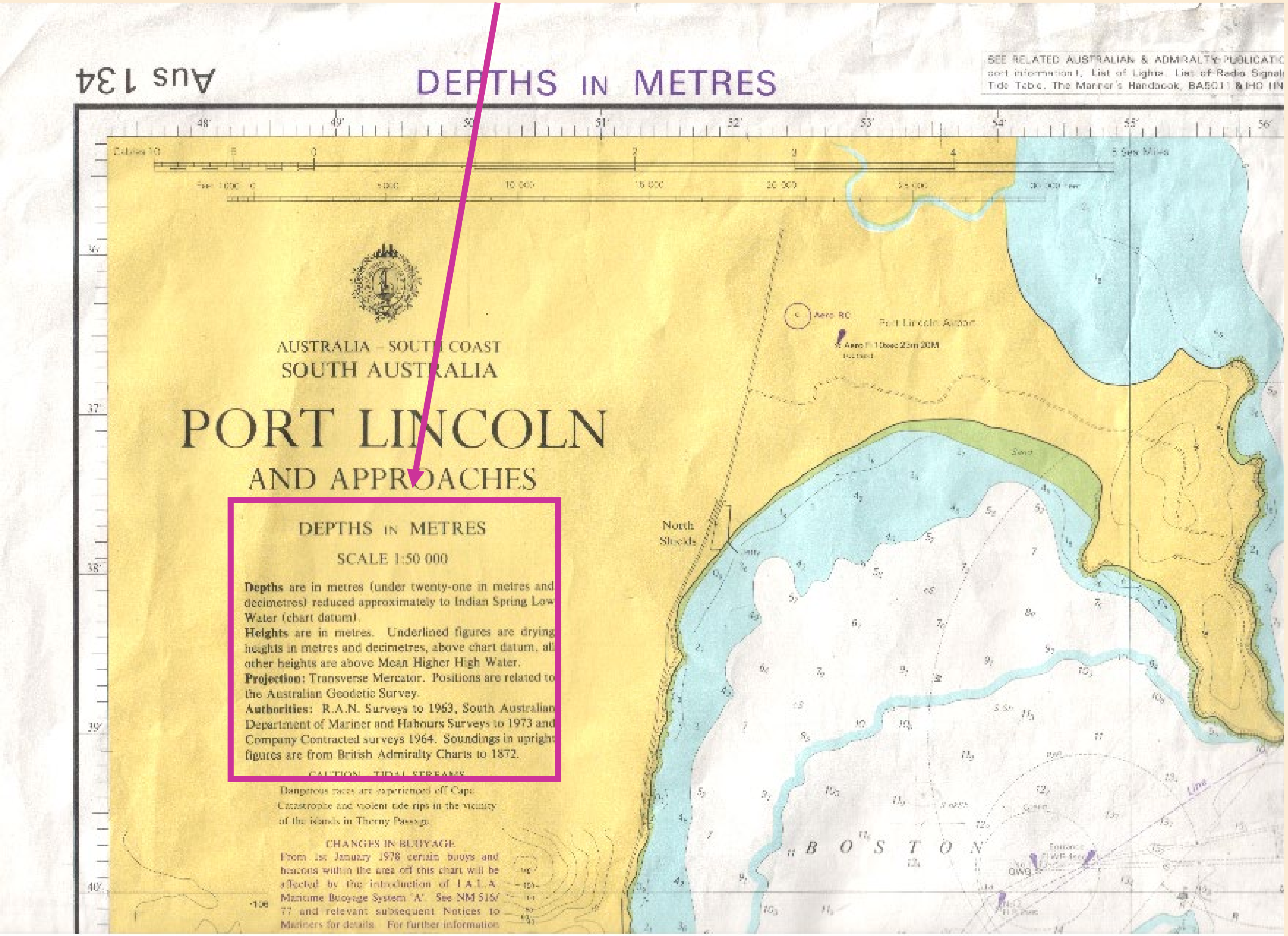


CHART PRINT DATE
PRINTED BY ROYAL AUSTRALIAN SURVEY CORPS 4.7.94
25'
31
Lookout Point
47
Channel Point
196
150
4°54'S
118°22'E
118°24'E
Island
Start
Welcome - Lotus...
Endeavour Du...
Microsoft Power...

TITLE


Aus 134
DEPTHS IN METRES
AUSTRALIA – SOUTH COAST
SOUTH AUSTRALIA
PORT LINCOLN
AND APPROACHES
DEPTHS IN METRES
SCALE 1:50 000
Depths are in metres (under twenty-one in metres and decimetres) reduced approximately to Indian Spring Low Water (chart datum).
Heights are in metres. Underlined figures are drying heights in metres and decimetres, above chart datum, all other heights are above Mean Higher High Water.
Projection: Transverse Mercator. Positions are related to the Australian Geodetic Survey.
Authorities: R.A.N. Surveys to 1963, South Australian Department of Mariner and Habours Surveys to 1973 and Company Contracted surveys 1964. Soundings in upright figures are from British Admiralty Charts to 1872.
CAUTION – TIDAL STREAMS
CHANGES IN BUOYAGE
North Shields
Port Lincoln Airport
B O S T O N

TITLE INFO



Aus 134
DEPTHS IN METRES
AUSTRALIA – SOUTH COAST
SOUTH AUSTRALIA
PORT LINCOLN
AND APPROACHES
DEPTHS IN METRES
SCALE 1:50 000
Depths are in metres (under twenty-one in metres and decimetres) reduced approximately to Indian Spring Low Water (chart datum).
Heights are in metres. Underlined figures are drying heights in metres and decimetres, above chart datum, all other heights are above Mean Higher High Water.
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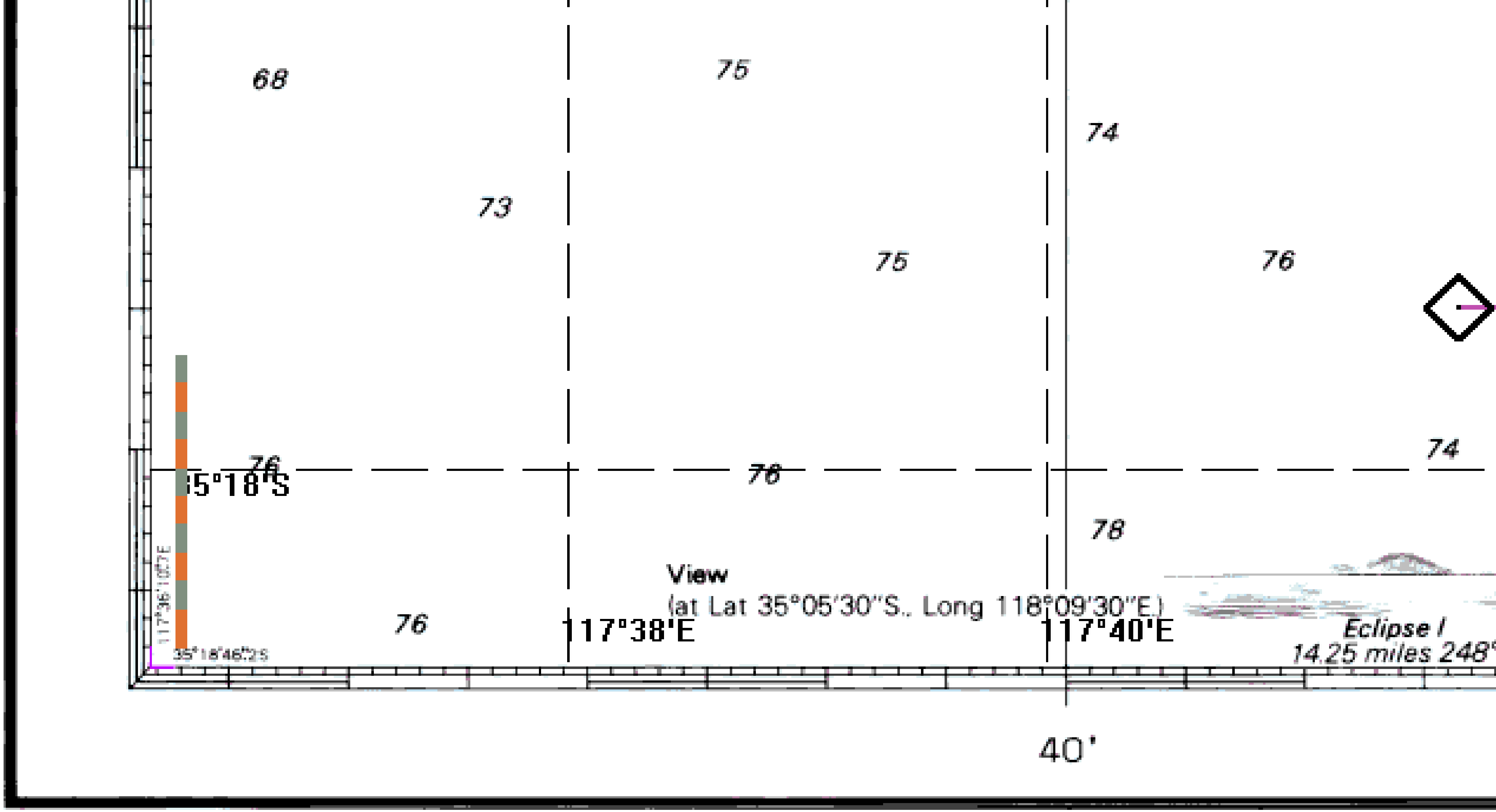
CAUTION – TIDAL STREAMS
CHANGES IN BUOYAGE
North Shields
B O S T O N



Notices to Mariners inclusive to 1994-158-234-270-[1.7] –1996– 323

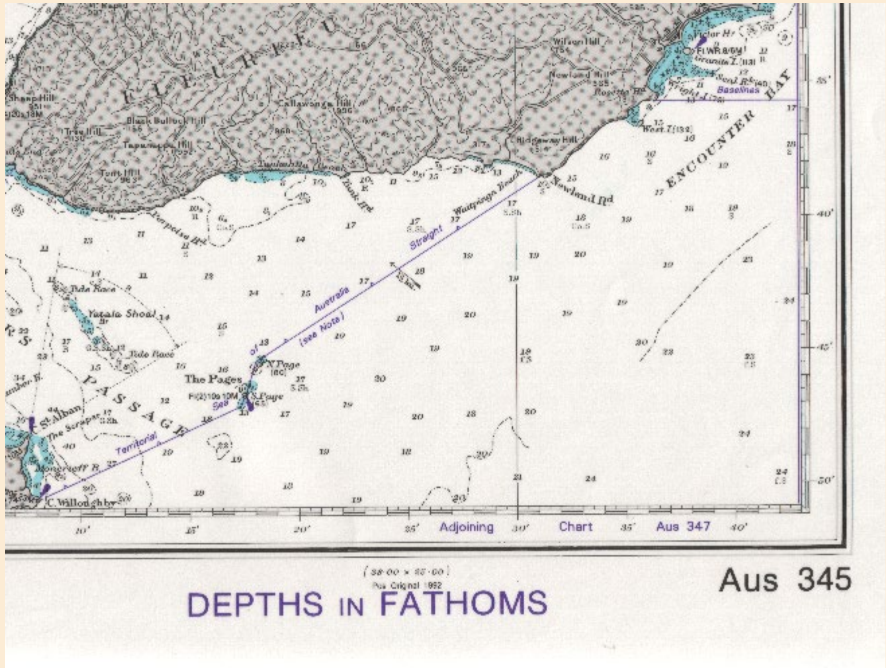
CORRECTIONS must be do
with magenta ink

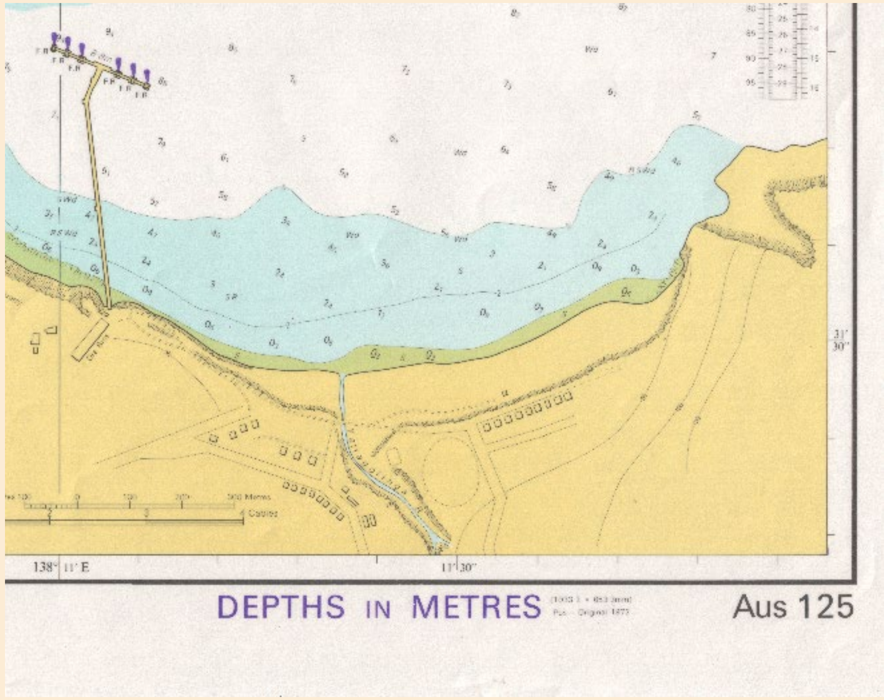
DEPTHS

METRIC CHART

Under 21 Metres, depths shown in Metres and Decimetres

e.g. **10_7 = *10.7 Metres***





FATHOMS CHART

Under 11 Fathoms, depths shown in Fathoms and Feet

e.g. **8_5** = ***8 Fathoms 5 feet***

(1 Fathom = 6 feet)

SATELLITE DERIVED POSITIONS

SATELLITE – DERIVED POSITIONS

Positions obtained from satellite navigation systems are normally referred to WGS 72 Datum; such positions should be moved 0.09 minutes SOUTHWARD and 0.07 minutes WESTWARD to agree with this chart.

To accompany Australian Notice to Mariners 123/2002

SATELLITE DERIVED POSITIONS

Positions obtained from the Global Positioning System (GPS) in the WGS 1984 Datum must be moved 0.09 minutes SOUTHWARD and 0.06 minutes WESTWARD to agree with this chart.

Note for chart Aus 836

To accompany Australian Notice to Mariners 36/2002

SATELLITE DERIVED POSITIONS

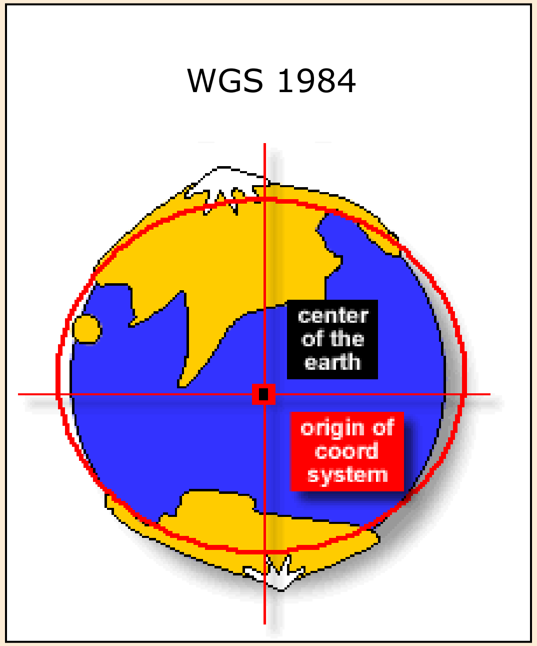
Positions obtained from the Global Positioning System (GPS) in the WGS 1984 Datum can be plotted directly onto this chart.

Note for chart Aus 342

A little about CHART DATUMS

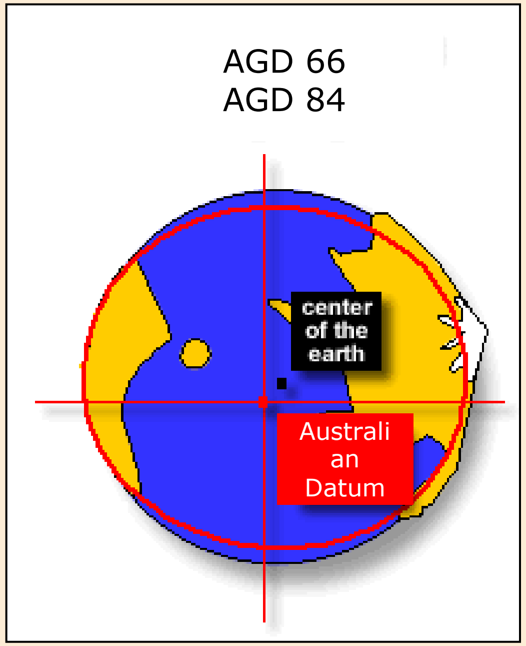
GPS positions relate to the American **WGS 1984** system

WGS 1984 *is based on a particular mathematical shape which represents the centre of the Earth. GPS satellites relate positions to this* ***DATUM***



American Chart Datum (GPS System)

Australian Chart Datum (red)



Example – Using the wrong Datum

Your Australian Datum Chart (AGD66) will show your WGS84 GPS position at "X", and safely heading West into harbour.

However, the corrected WGS position (which agrees with the Australian Datum) places you at "X1", HEADING FOR THE ROCKS!

Make sure the GPS datum agrees with your chart

(Gradually, all the world's charts are being converted to WGS 1984)

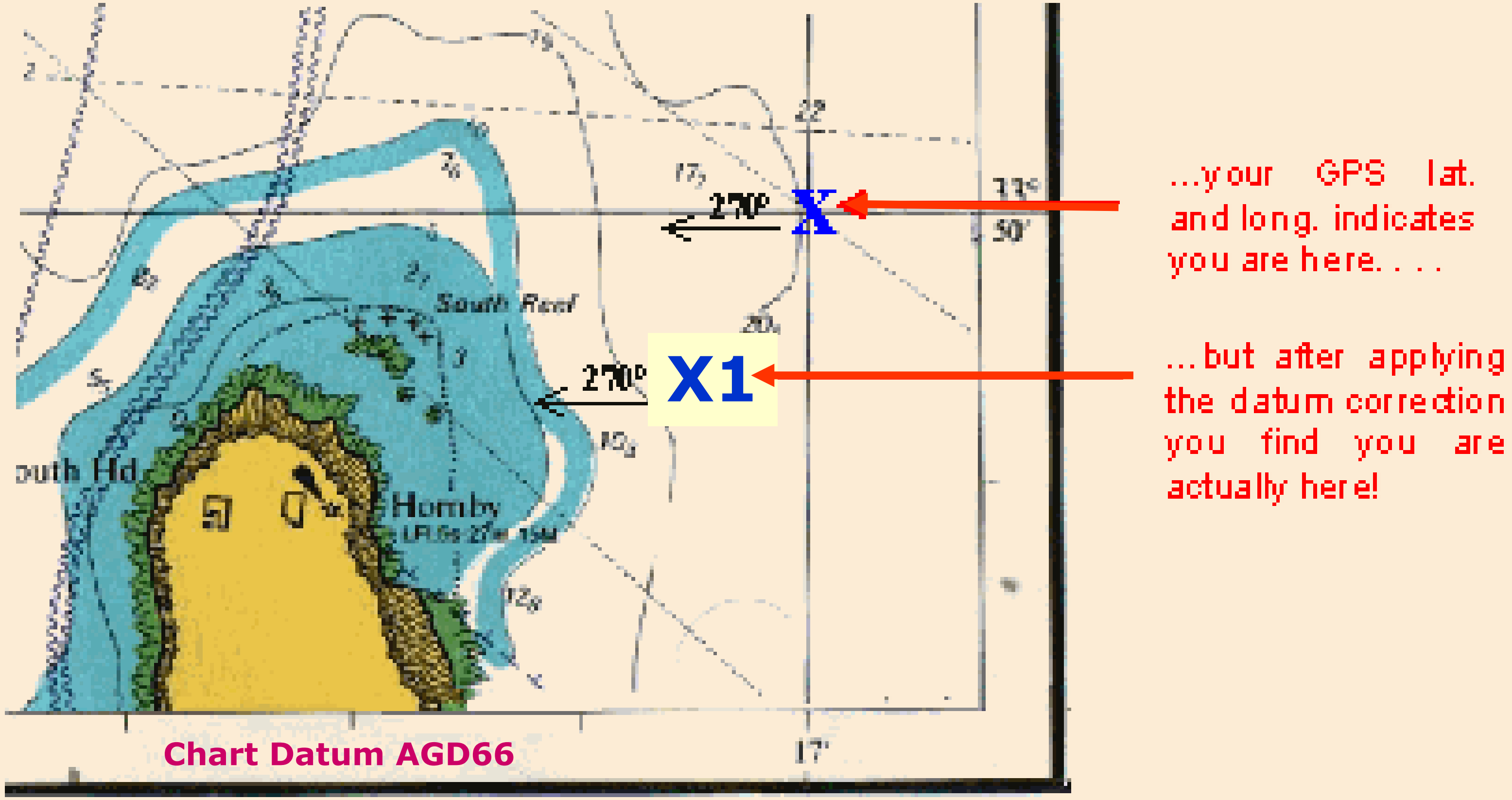
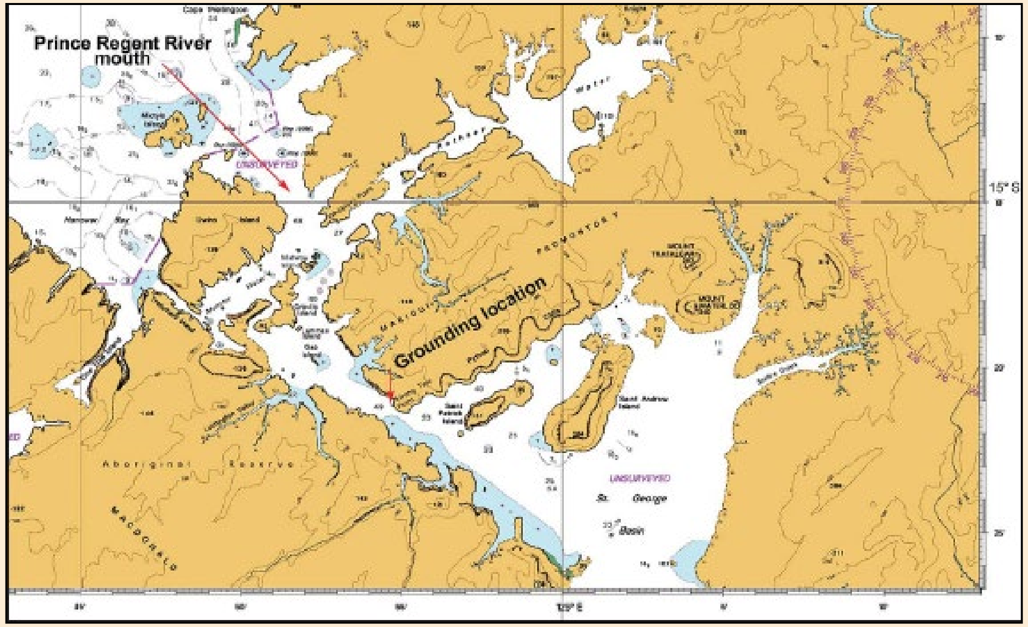


Chart Datum AGD66

What happens when you get it wrong

CASE STUDY

Grounding of "True North" in the approach passage to St George Basin, Western Australia on 7th August, 2004.



Vessel Particulars

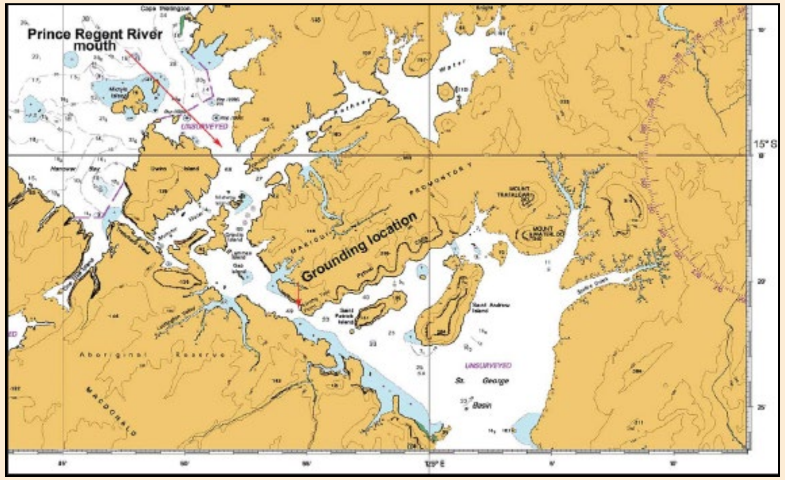
Vessel Length: 34.56 metres
Vessel Class: Passenger
Persons on Board: 38
Persons on Watch: 1 (Master)
Navigation Mode: Automatic, Electronic Chart with GPS interface

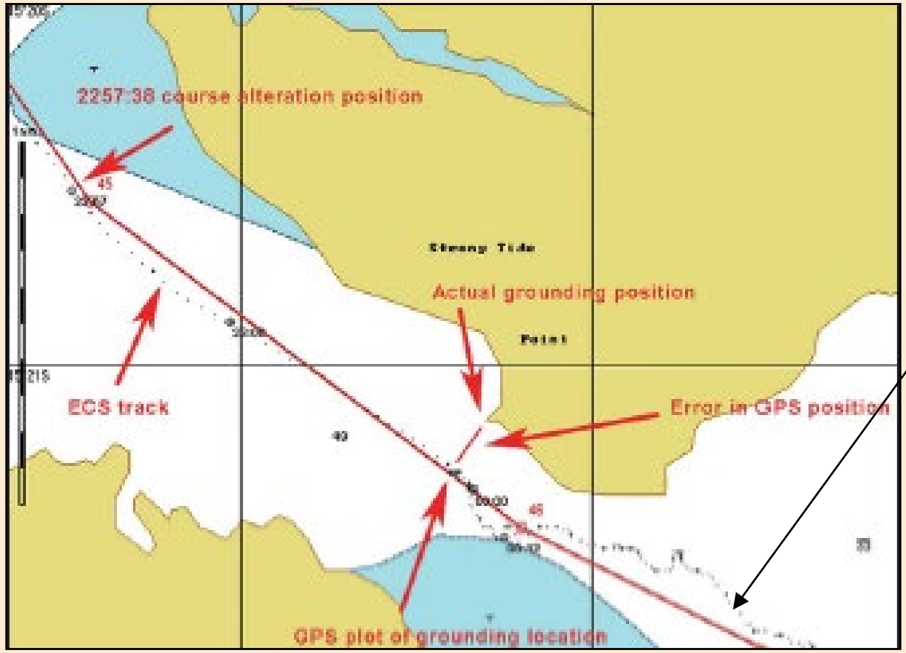
Incident Particulars

Date of Grounding: 7th August,2004
Time of Grounding: 2304 hours
Speed at Grounding: 14.5 knots

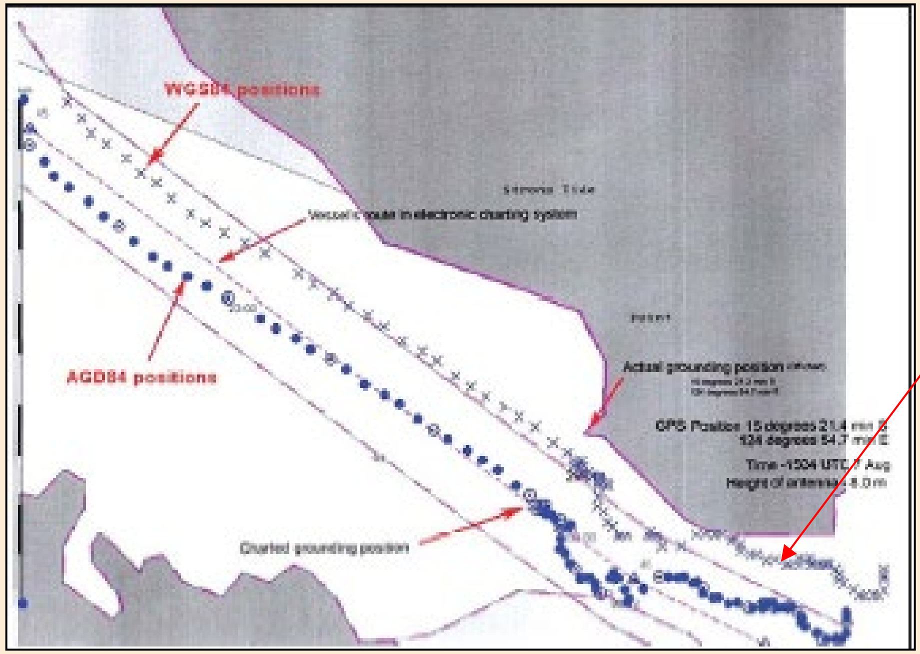
Navigational Equipment

Radar: On
GPS: On
ECS: On
E/Sounder: Off
Sonar: Off





Master of "True North" thought he was on this track (according to GPS Plotter)



This was the actual track of "True North" prior to grounding

FINDINGS OF MARINE SAFETY INVESTIGATION

- **Too much reliance was placed on the accuracy of GPS positions, and the GPS positions plotted on the vessel's Electronic Chart System were not adequately checked by other navigational means**

- **A proper lookout was not maintained by visual, radar and other means to ensure the vessel remained in safe water**

- **At the time of the grounding, it is probable that the master was suffering from some effects of fatigue as a result of his work routine………**

FINDINGS OF MARINE SAFETY INVESTIGATION *(cont)*

GPS derived positions plotted on the ECS differed from the vessel’s true position, possibly caused by:

- **GPS system inaccuracy;**
- **Geodetic datum ambiguity;**
- **The ECS operating on a common user personal computer which allowed possible corruption of the ECS operating system;**
- **A change in the GPS receiver parameters;**
- **Loose wiring or connection in the on-board systems;**
- **A combination of the above**

Sources: R.A.N. surveys to 1980 and Public Works Department W.A. plans to 1982. Soundings shown in upright figures are from early Admiralty surveys.

SATELLITE-DERIVED POSITIONS

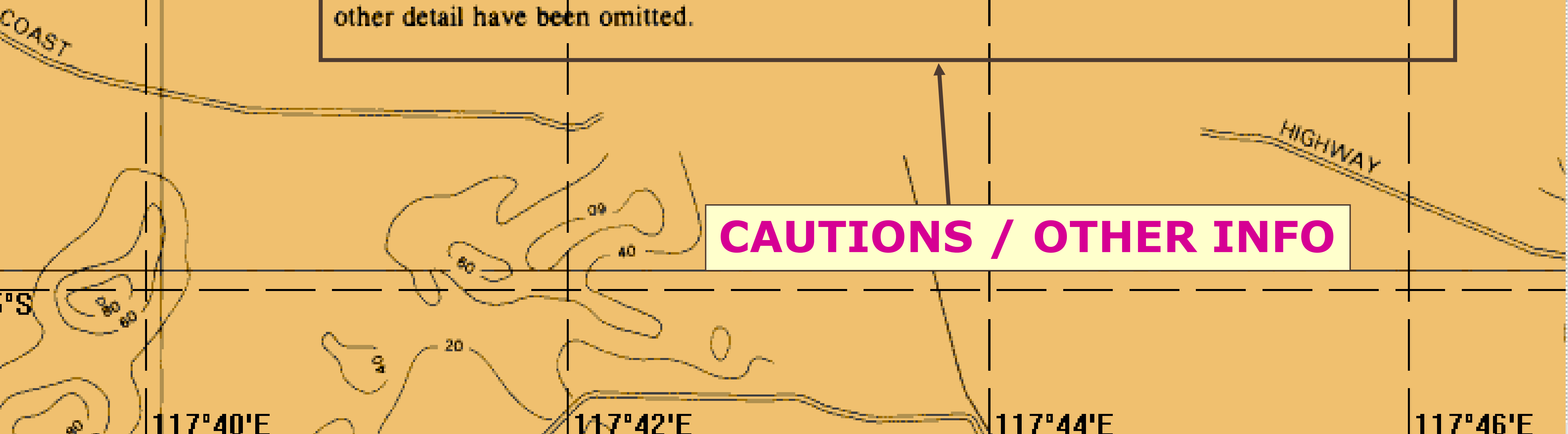
Positions obtained from satellite navigation systems are normally referred to the WGS Datum; such positions should be moved 0.07 minutes SOUTHWARD and 0.08 minutes WESTWARD to agree with this chart.

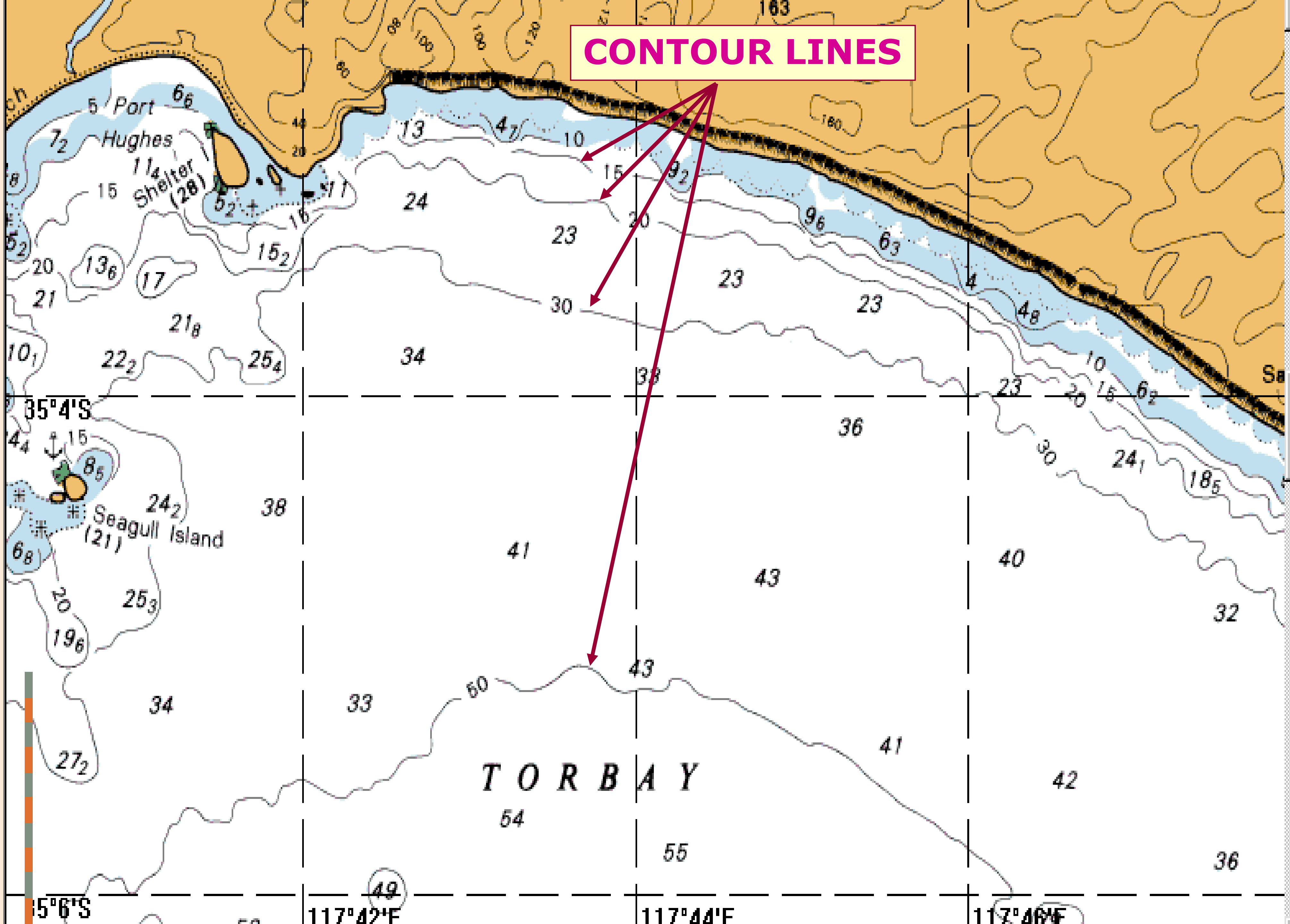
OMISSIONS FROM CHART

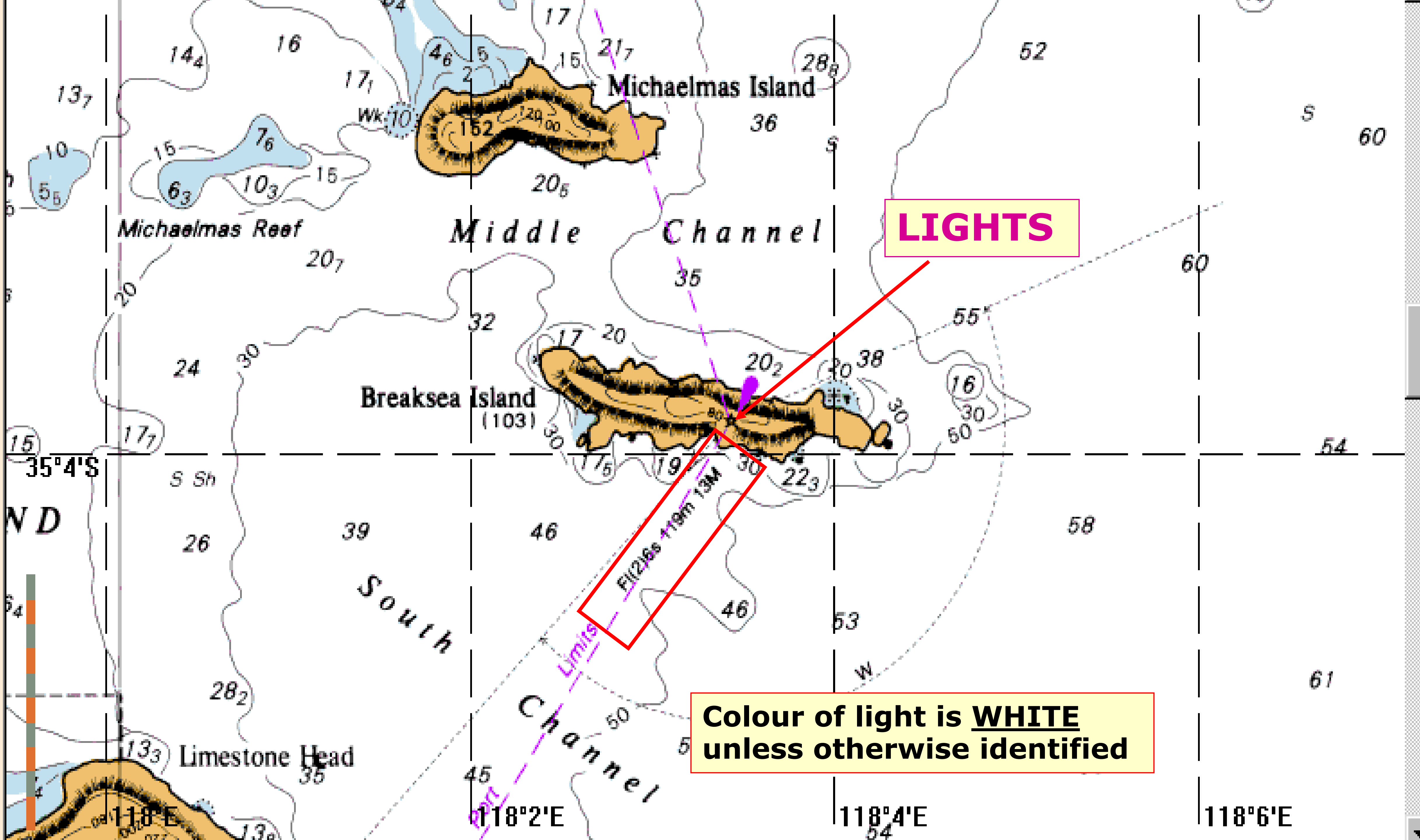
In areas covered by larger scale charts Aus 109 and Aus 110 certain navigational aids and other detail have been omitted.

MARINE FARM

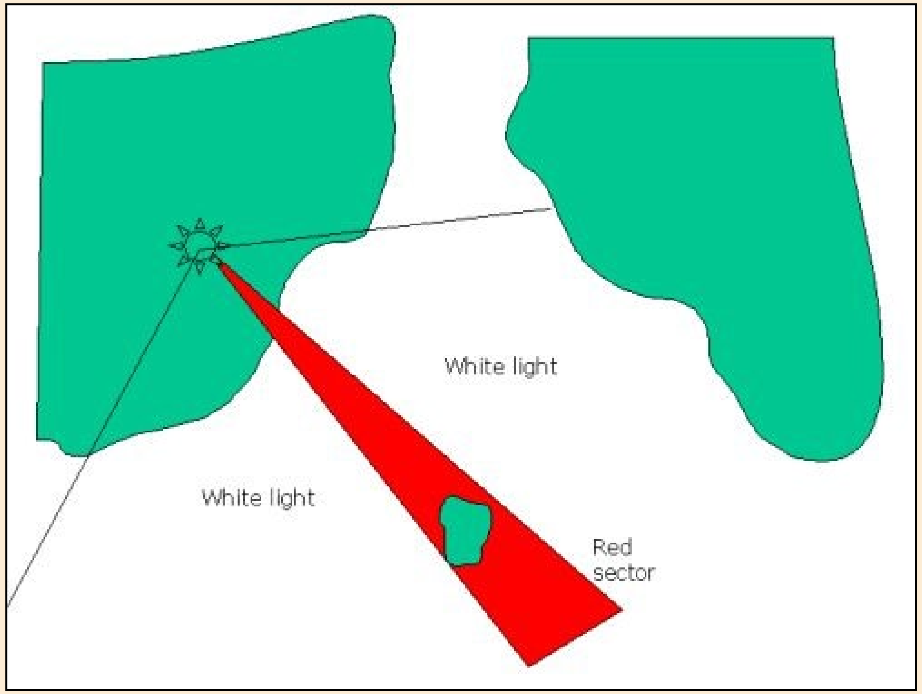
Fish cages exist within the marine farm area and the extremities of these underwater obstructions will be marked by special can light buoys, Fl.Y.3s.



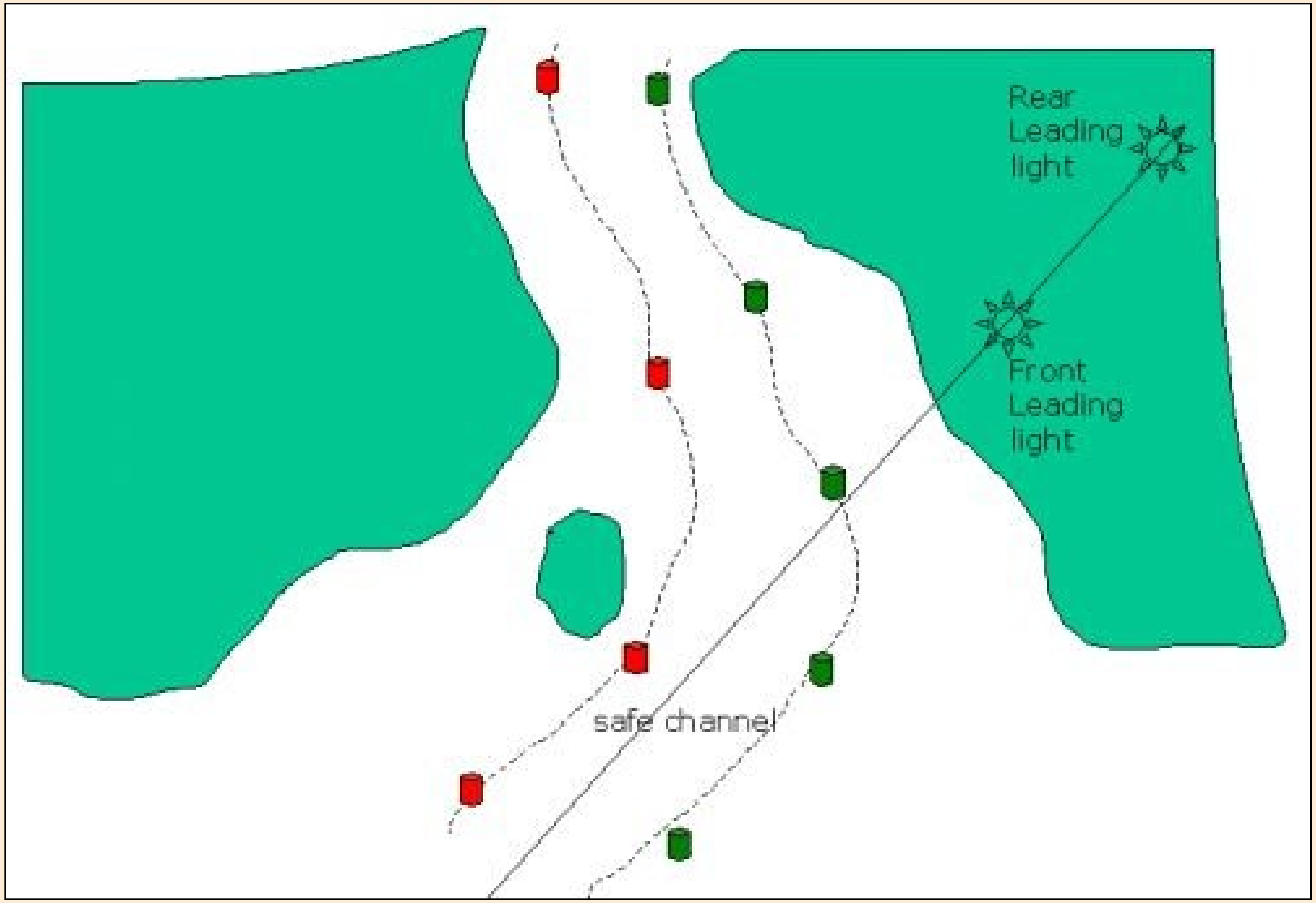

CONTOUR LINES
Port Hughes
Shelter
Seagull Island
TORBAY
35°4'S
117°42'E
117°44'E

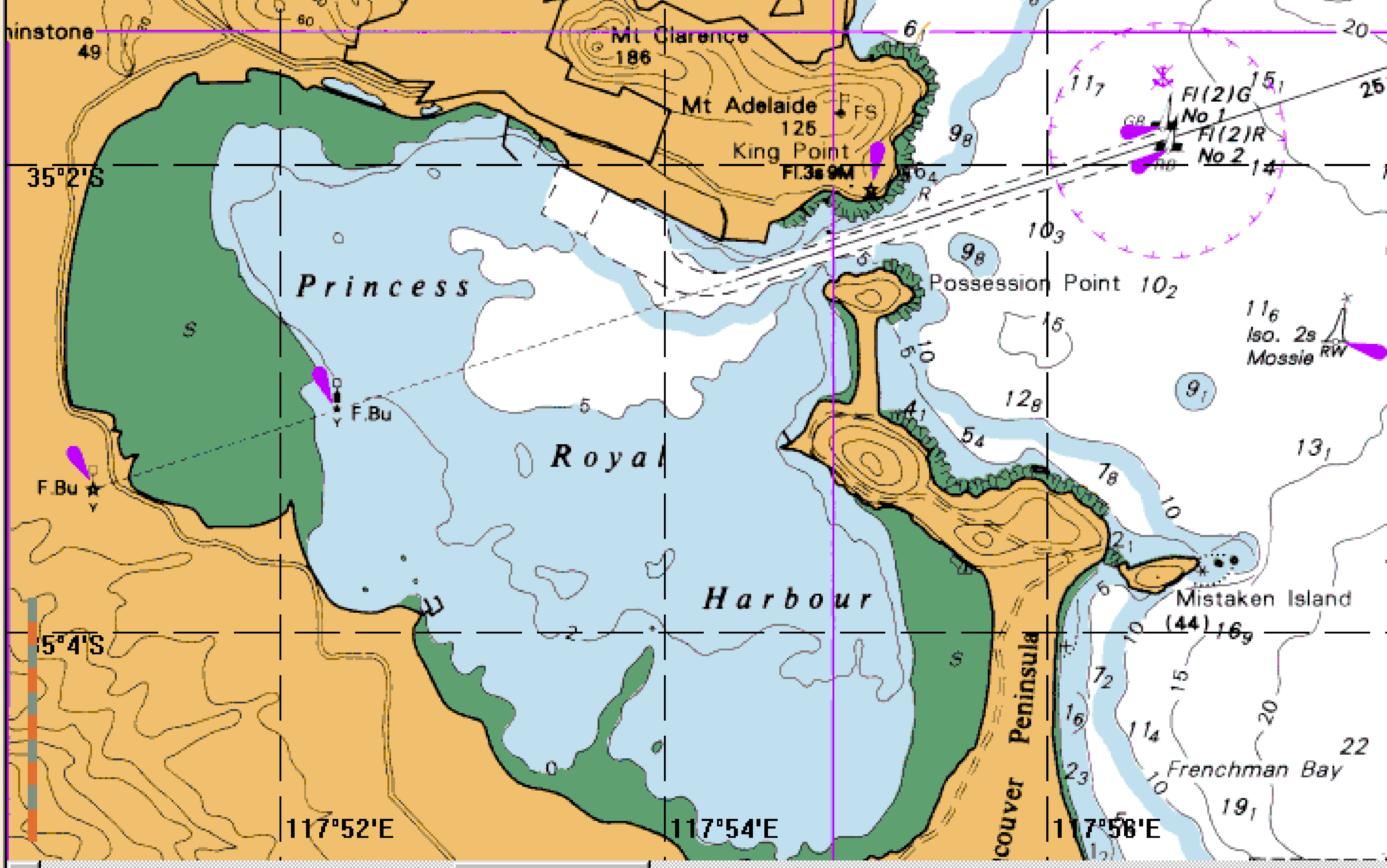

LIGHTS
Colour of light is WHITE unless otherwise identified
Michaelmas Island
Michaelmas Reef
Middle Channel
Breaksea Island
(103)
Fl(2)6s 119m 13M
South Channel
Limestone Head
Limits
35°4'S
118°E
118°2'E
118°4'E
118°6'E

LIGHTS - Sectors



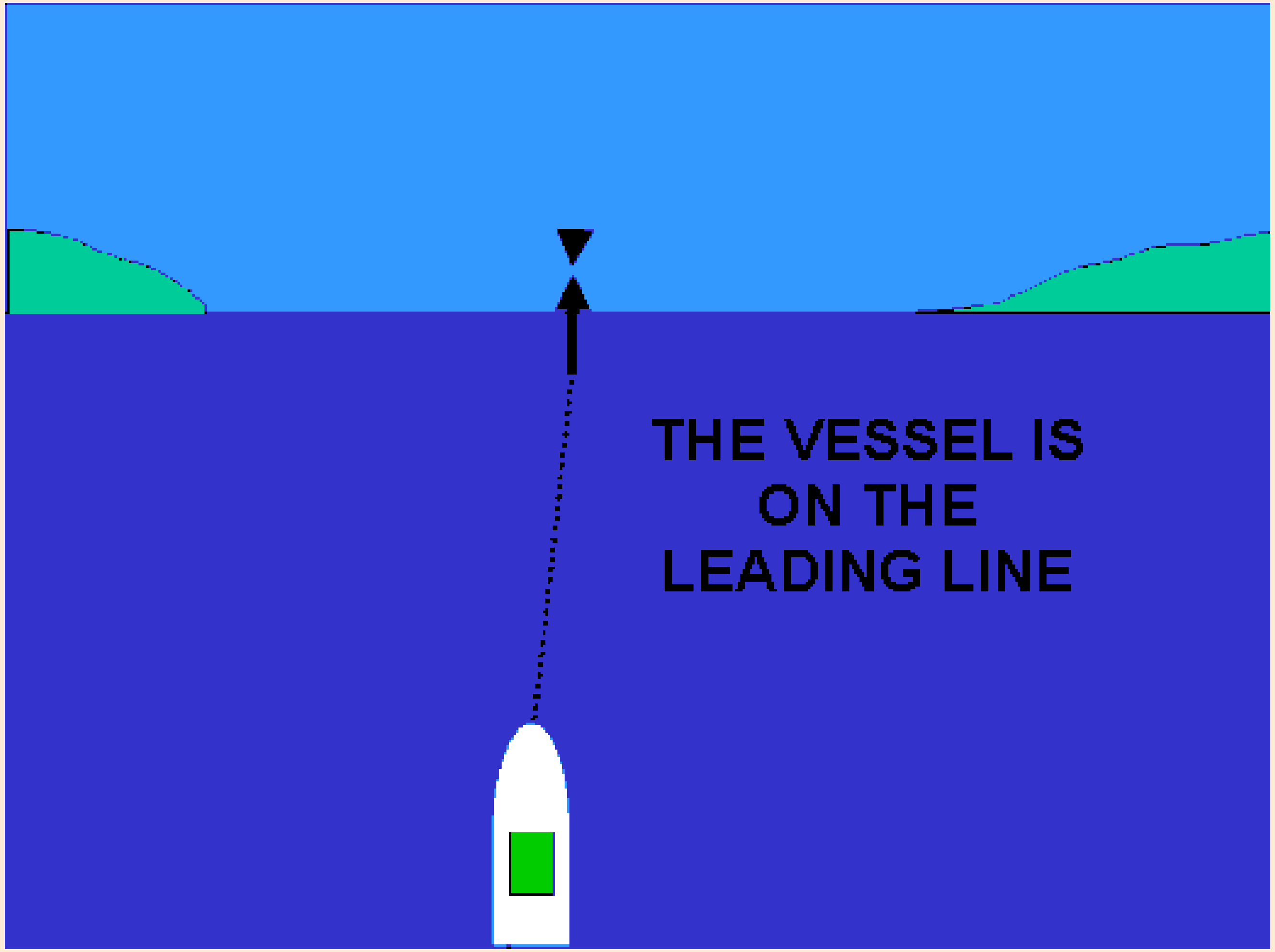
LEADING LIGHTS



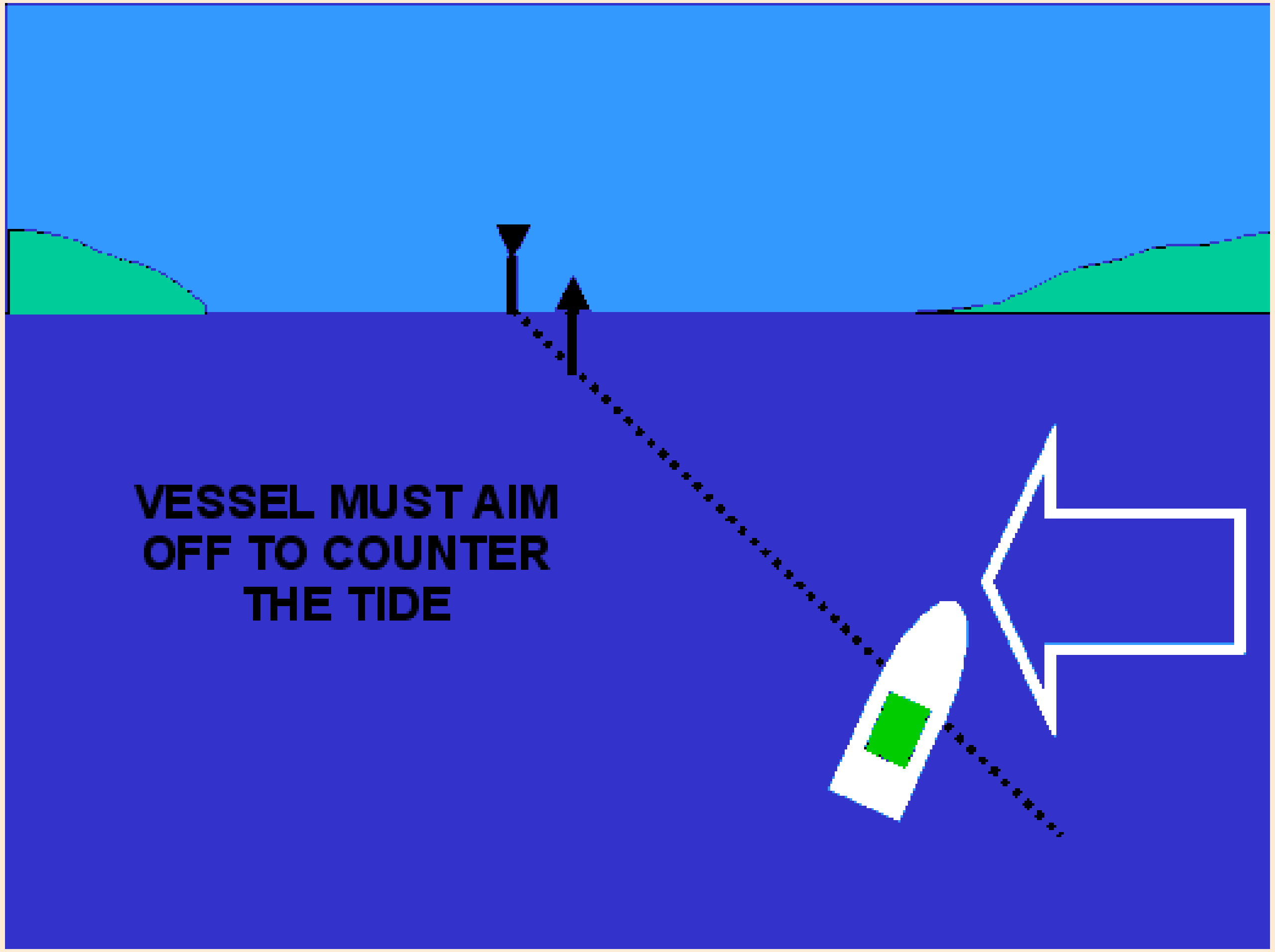


Princess Royal Harbour
Mt Clarence
186
Mt Adelaide
125
FS
King Point
Fl.3s 9M
Possession Point
Mistaken Island
(44)
Frenchman Bay
Vancouver Peninsula
Fl(2)G
No 1
Fl(2)R
No 2
Iso. 2s
Mossie
F.Bu
F.Bu
35°2'S
35°4'S
117°52'E
117°54'E
117°56'E

LEADING MARKS



LEADING MARKS



TIDAL STREAMS

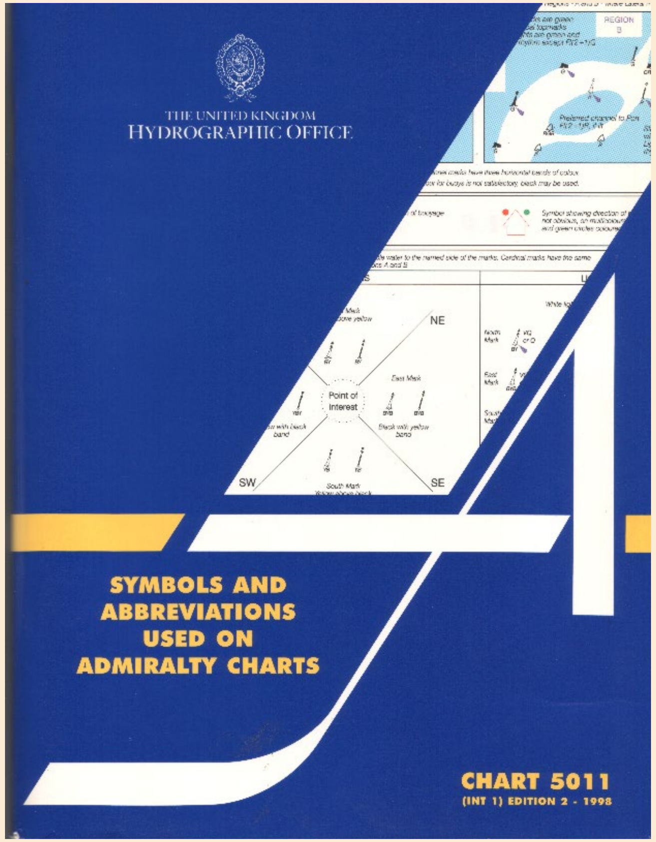
Aus 345

Aus 345

Direction and Rate shown on Chart

SYMBOLS & ABBREVIATIONS

Chart 5011



A reference to Symbols and Abbreviations found on British Admiralty and International Charts

Chart 5011 – information on:

- **Topography**
  - Landmarks, Ports
  - Natural/Cultural features
  - Topographic Terms
- **Hydrography**
  - Tides,Currents
  - Depths
  - Nature of seabed
  - Rocks, Wrecks, Obstructions
  - Offshore installations
  - Tracks, Routes
  - Areas, Limits
  - Hydrographic Terms
- **Aids & Services**
  - Lights
  - Buoys, Beacons
  - Fog Signals
  - Radar, Radio, Electronic Position Fixing systems
  - Services
  - Small Craft facilities
- **Alphabetical Indexes**
  - Index of Abbreviations
- **General**
  - Chart Number, Title Marginal notes
  - Positions, Distances, Directions, Compass

Chart 5011

General information in "INTRODUCTION":

Depths: – The position of a sounding is the centre of the area covered by the figures

Drying Heights: – Underlined figures on rocks and banks which uncover due to tidal movement, indicate heights **above chart datum**

Heights: – including overhead clearances, are given **above Mean High Water Springs**

Bearings: – given from seaward, referred to the True Compass

PUBLICATIONS USED FOR NAVIGATION

- **Sailing Directions (Pilots)**
- **Admiralty List of Lights**
- **Tide Tables** (Australian National Tide Tables, or locally published Tide Tables)
- **Australian Notices to Mariners**
- **Australian Seafarers Handbook**
- **Reef Vessel Traffic Services**

Australian Notices to Mariners

Published Fortnightly by

Australian Hydrographic Office

(www.hydro.gov.au)

Contain corrections for:

- *Charts*
- *Sailing Directions (Pilots)*
- *List of Lights*
- *Admiralty List of Radio Signals*
- *Navigational Warnings*

Australian Notices to Mariners are the authority for correcting Australian Charts

AUSTRALIAN NOTICES TO MARINERS

Notices 358 - 387

Published fortnightly by the Australian Hydrographic Service

B. J. KAFER,
Hydrographer of Australia

The substance of these notices should be inserted on the charts affected.

Bearings are referred to the true compass and are reckoned clockwise from 000° (North) to 359°; those relating to lights are given as seen by an observer from seaward. Positions quoted in permanent notices relate to the horizontal datum for the chart(s). When preliminary or temporary notices affect multiple charts, positions will be provided in relation to only one horizontal datum and that datum will be specified. When the multiple charts do not have a common horizontal datum, mariners will be required to adjust the position(s) for those charts not on the specified datum. The range quoted for a light is its nominal range. Depths are with reference to the chart datum of each chart. Heights are above mean high water springs or mean higher high water, as appropriate.

The capital letter (P) or (T) after the number of any notice denotes a preliminary or temporary notice respectively, which are contained separately at the end of the permanent notices. A star (*) adjacent to the number of a notice indicates that the notice is based on original information.

Mariners are particularly requested to notify the AUSTRALIAN HYDROGRAPHIC SERVICE, Locked Bag 8801 South Coast Mail Centre, NSW 2521 (Fax 02-4221 8599, e-mail Hydro.NTM@defence.gov.au or, alternatively by filling in and submitting the Hydrographic Notes forms located on the web site – www.hydro.gov.au), immediately on the discovery of new dangers or suspected dangers to navigation. For changes or defects in aids to navigation notify AusSAR (Fax 02-6230 6868 or email rccaus@amsa.gov.au).

Copies of these notices can be obtained from the AUSTRALIAN HYDROGRAPHIC OFFICE, 8 Station Street, Wollongong, and Agents for the sale of charts and hydrographic publications.

Australian Notices to Mariners

Notice number

195* SOUTH AUSTRALIA - Middle Bank - Racon established.
Former Notice - 715(P)/2001 is cancelled
List of Lights Vol K/2002 -- 1930.00
AMSA ATH 2002/08 (02/1299), Auscoast 068/02 (02/1357).
(AH99/37)
Aus 344 [*80/2002*]
Insert *Racon (M),* at light 33° 43'.9 S 137° 29'.7 E
Aus 444 [*166/2002*]
Insert *Racon (M),* at light 33° 43'.9 S 137° 29'.7 E
Aus 777 [*531/2001*]
Insert *Racon (M),* at light beacon 33° 43'.9 S 137° 29'.6 E
Aus 778 [*80/2002*]
Insert *Racon (M),* at light beacon 33° 44'.0 S 137° 29'.7 E

"*" = *based on original information*
"P" = *Preliminary notice*
"T" = *Temporary notice*

To accompany Australian Notice to Mariners 768/2002

MARINE FARMS

Marine farms, which may be floating or fixed structures, and their associated moorings should be avoided. The farms are generally marked by buoys or beacons, which may be lit.

Note for chart Aus 777

To accompany Australian Notice to Mariners 54/2002

ROCK LOBSTER AND
GIANT CRAB FISHERY

During the period 1 October to 31 May, extensive lobster and giant crab fishing takes place inshore of the 500m isobath off the coast of South Australia. Mariners are cautioned that surface floats associated with the activity may be encountered.

Note for chart Aus 345

Accessing and Checking Currency of ECDIS overview:

Electronic Chart Display and Information Systems (ECDIS) utilize Electronic Navigational Charts (ENCs) for navigation.

Accessing and checking for currency involves using a permit tied to a specific navigation system and accessing the appropriate service provider.

Regularly updating these charts through either cumulative or individual updates ensures they are up-to-date with the latest information.

Accessing and Checking Currency of ECDIS overview:

1. Permit and Subscription:

A permit, unique to a navigation system, grants access to the desired ENC cells. This permit is associated with a subscription, which covers the duration of access and includes updates.

2. Service Provider:

You'll need to access the ENC service provider, which could be either the AusENC Service for Australian waters or commercial services like IC-ENC Value Added Resellers (VARs) or PRIMAR.

3. Updates:

Updates are usually provided as either a cumulative update (recommended) or individual updates. New permits for newly published ENCs are automatically sent for the remaining subscription period, ensuring access to the most current charts.

Accessing and Checking Currency of ECDIS overview:

4. Validation Checks:

Tools like dKart Inspector and 7CS Analyzer are used to validate ENCs and ensure data quality, consistency, and compliance with standards.

5. Checking for Over-scaling:

Over-scaling an ENC can be dangerous, so proper use of the display is crucial.

Accessing and Checking Currency of ECDIS overview:

Currency in Australia:

- **AusENC:**

  All ENCs published by the Australian Hydrographic Office (AHO) are part of the AusENC service and can be accessed through AusENC distribution agents or IC-ENC VARs.

- **Use of RNCs:**

  Raster Navigational Charts (RNCs) are not permitted in Australian waters when ENCs are available.

- **Marine Orders and Notices:**

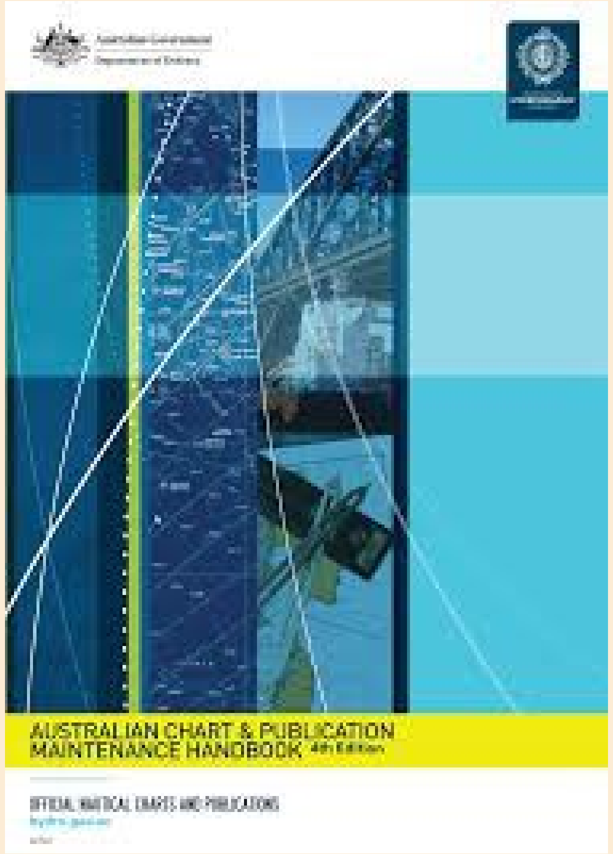
SOLAS vessels in Australian waters should consult AMSA Marine Orders and Notices for electronic chart carriage requirements, according to the Australian Hydrographic Office.

Accessing and Checking Currency of Nautical publications and related documentation overview:

Nautical publications and related documentation, including navigational charts, Notice to Mariners, and other safety-related information, are crucial for safe navigation and must be regularly checked for currency to ensure accuracy and avoid potential hazards.

Importance of Checking for Currency:

- **Navigational Safety:** Outdated charts and publications can lead to inaccurate positioning, misidentification of hazards, and ultimately, unsafe navigation.
- **Compliance with Regulations:** Many regulations require vessels to maintain up-to-date navigational charts and publications.
- **Identifying Hazards:** Currency ensures that the latest changes, like new buoys, navigational aids, or depths, are reflected, allowing for informed decision-making during navigation.



Accessing and Checking Currency of Nautical publications and related documentation overview:

Types of Nautical Publications and Documentation:

- **Navigational Charts:**

  Essential for plotting a route and identifying features, hazards, and depths.
- **Notice to Mariners (NTM):**

  Provides updates and corrections to charts and other publications, including changes to aids to navigation, depths, and other relevant information.
- **Electronic Chart Display and Information Systems (ECDIS):**

  Digital systems that incorporate and display navigational information, including charts and updates.
- **Tide Tables:**

  Provide information about tidal levels, which are crucial for planning and navigating coastal areas.
- **Weather Reports and Warnings:**

  Provide information about weather conditions, which can impact navigation.
- **Admiralty Sailing Directions and their supplements:**

  Provide detailed information on navigation, including aids to navigation, coastal features, and potential hazards.
- **Other related publications:**

Include lists of lights and fog signals, radio signals, and tidal publications.

Accessing and Checking Currency of Nautical publications and related documentation overview:

How to Check for Currency:

- **Regularly review Notice to Mariners (NTM):**

  NTMs are a primary source of updates and corrections to charts and other publications.

- **Ensure charts are up-to-date:**

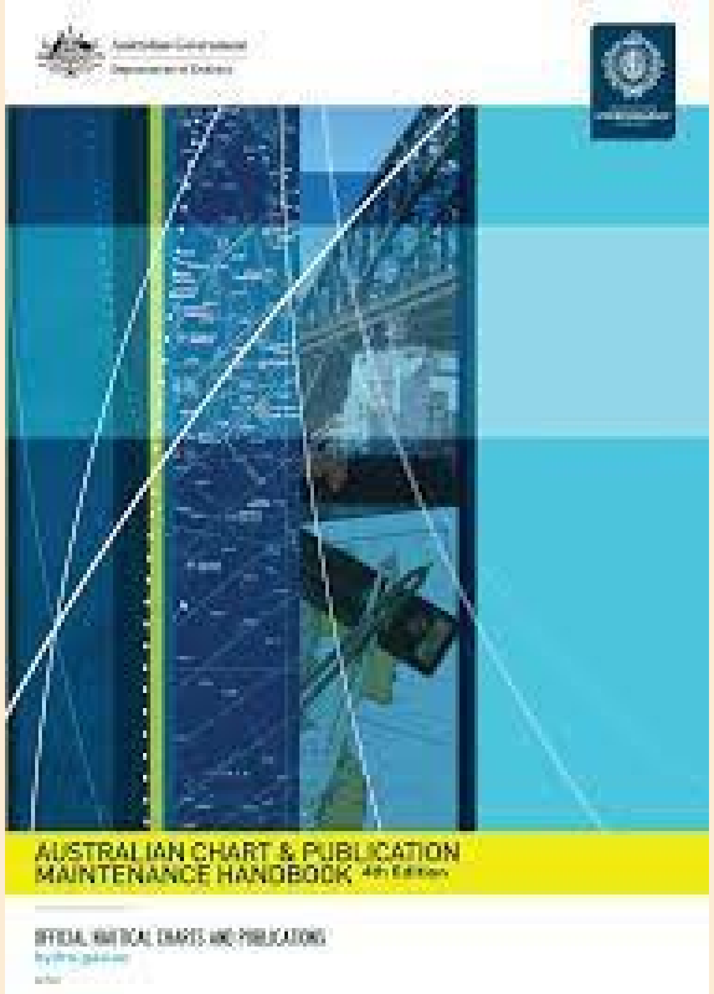
  Look for the date of the chart edition and check for any updates or corrections.

- **Utilize electronic resources:**

  ECDIS systems often provide real-time updates and alerts.

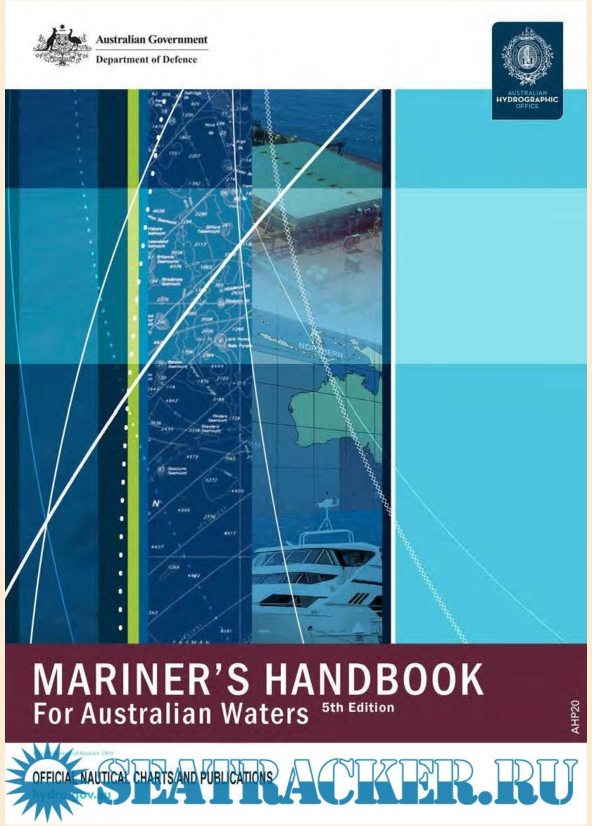
- **Consult relevant authorities:**

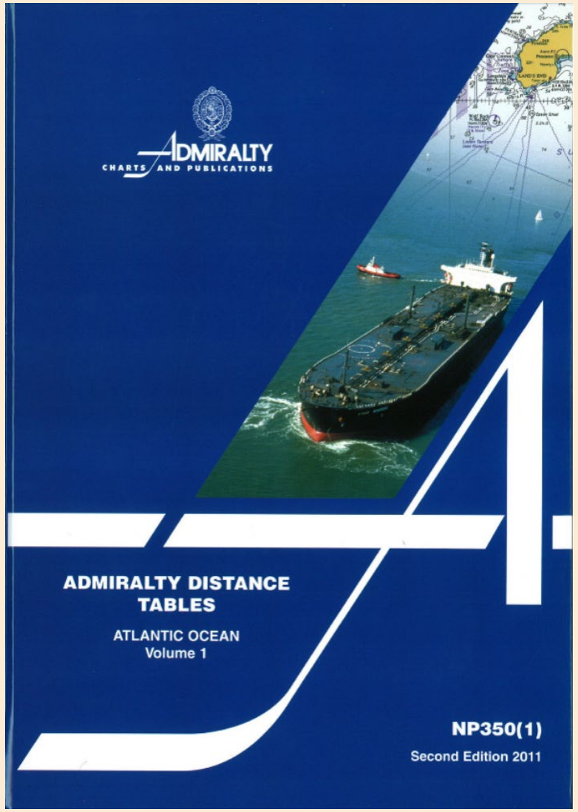
Hydrographic offices and other maritime authorities provide information on currency and availability of publications.

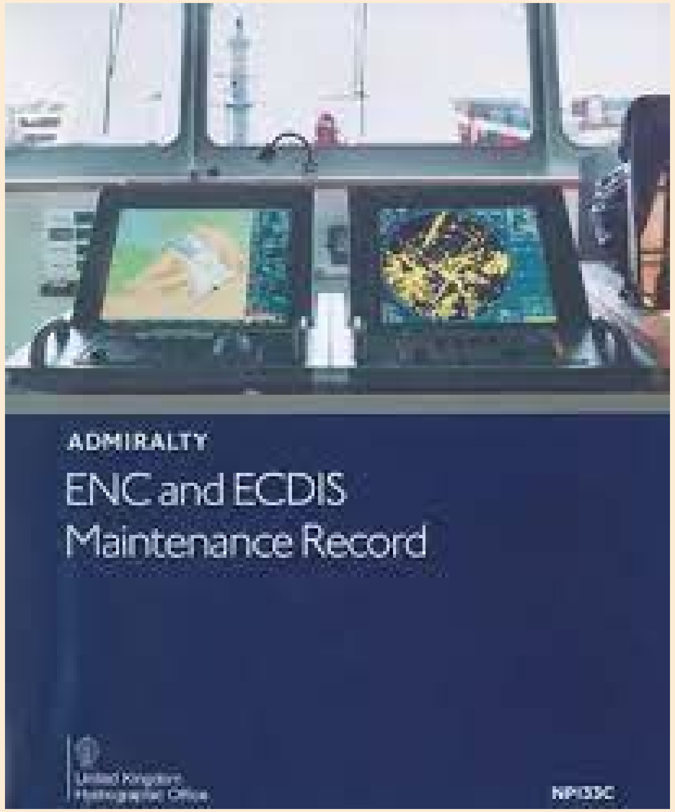


Accessing and Checking Currency of Nautical publications and related documentation overview:

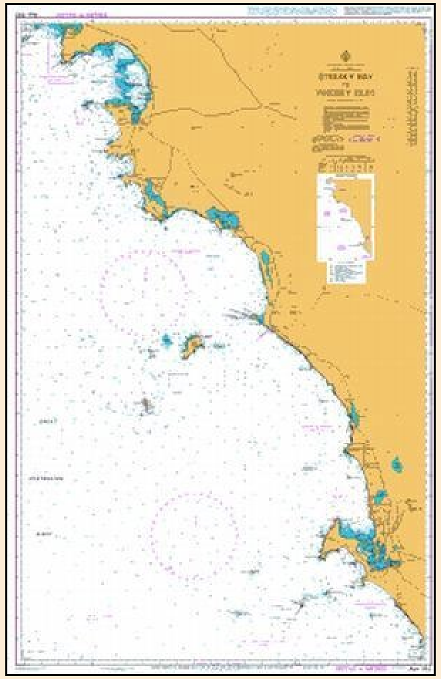
By checking for currency, mariners can ensure that they are using the most accurate and up-to-date information available, contributing to safer and more efficient navigation.

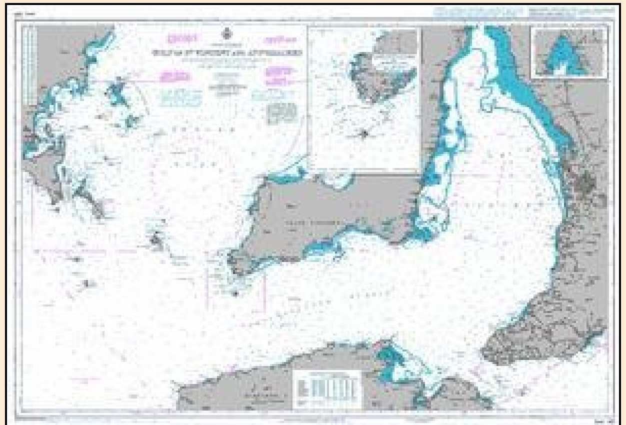






Passage Planning





Checklist:

Charts – to cover all areas/intended areas of operation
Notice for mariners for area of passage
Update the charts to be used
Books and publications
Calculate distance of passage
Calculate passage time
Calculate fuel requirement and reserves
Calculate food and victuals required for passage
Identify safe havens along route and emergency ports
Navigational Dangers – check depth and safe distance to pass

- **Eg, During Day safe distance = 1nm**
- **During Night, safe distance = 2nm**

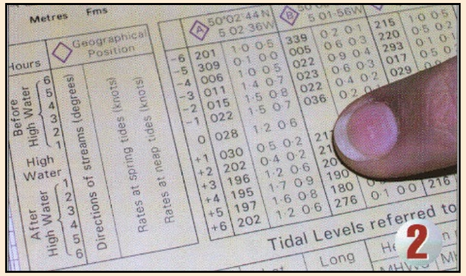
Note which part of your track will be covered in Daylight, and which part in Darkness.
Work out how you will cover the watches and account for fatigue management and crew experience to do watches

Passage Planning

Checklist:

Weather - obtain forecast for area of operation
- identify sources where weather information may be obtained from
- set maximum weather parameters (wind speed/sea conditions) for voyage

Passage Planning



<u>Checklist:</u>

Tidal Streams – ascertain from chart

- **consider best approach (state of tide) with impending weather**

Do not rely on Light Buoys alone – they may not be lit

- **Buoys may also have shifted**
- **When passing between islands, use features of one island only for position fixing (may have been separately surveyed)**
- **Use clearly defined points for Bearings (i.e., avoid low points of land)**

Passage Planning

<u>Checklist:</u>

Take account of traffic density and maneuverability of larger vessels

Consult chart Zone of Confidence Diagram

Transfer positions from one chart to another by Bearing and Distance, then verify by checking Latitude and Longitude (in case chart scales are different)

Where possible, select Waypoints that are easily conspicuous

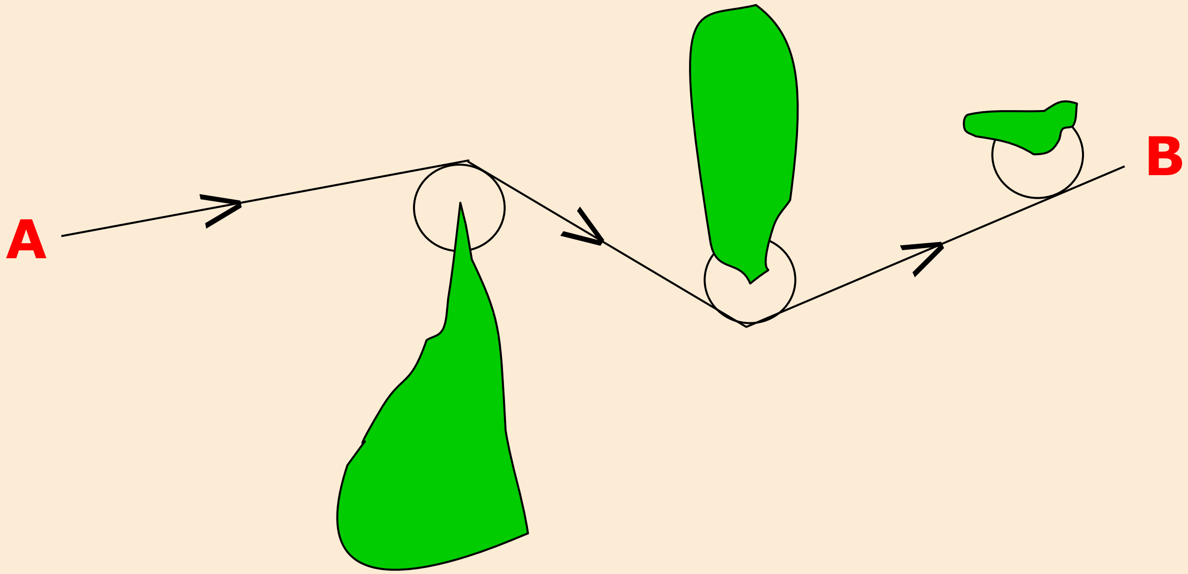
For position fixing, always select objects close to your vessel in preference to distant objects

- **In narrow waters, allow plenty of room rounding points of land, shoals, buoys etc.**
- **Check state (strength) of tidal stream before passing objects**

Plotting Safe Courses

1 Select a safe distance, and draw arcs around all the hazards adjacent to your intended track

2 Join the circles, around the dangers, to make your safe course



Don’t cut it to fine allow some sea room for errors

Obtaining current weather information

VHF and HF

Weather reports on VHF and HF radio are sent out at regular intervals. On both the systems the Coast radio station makes an "all ships" call on a calling/watchkeeping frequency informing you of the appropriate channel to tune to in order to receive the latest weather bulletin for that area

Weather information available in other regions

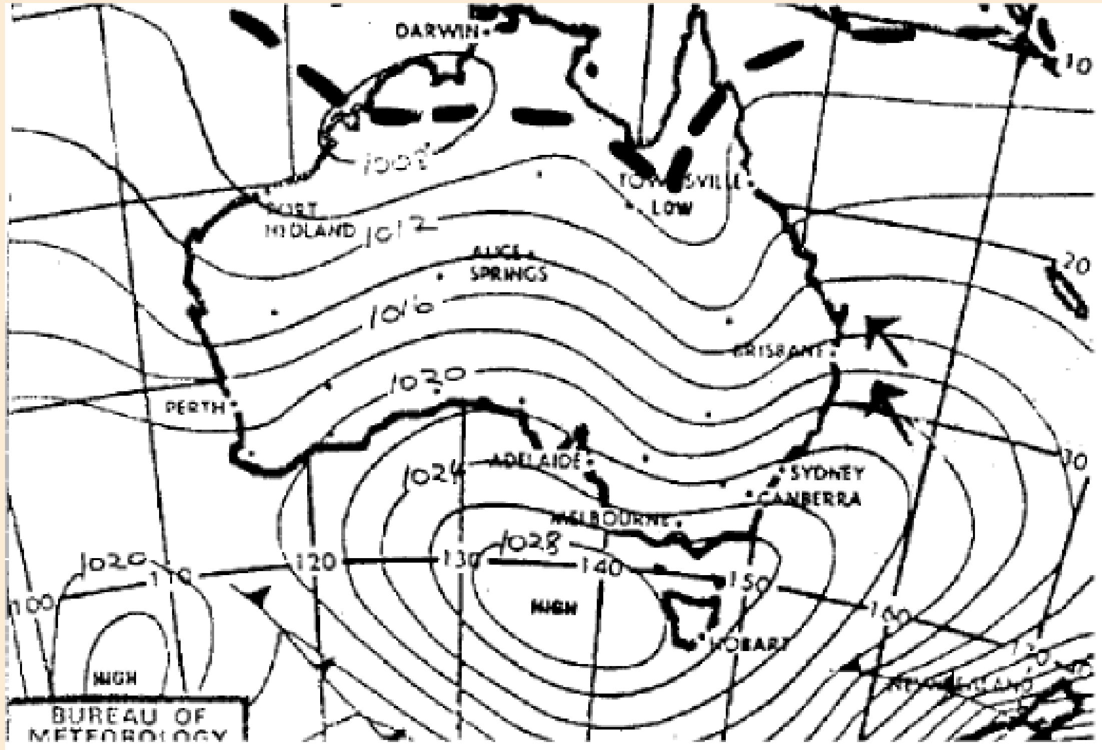
There is a worldwide system of radio weather services, and details are contained in Volume 3 of the Admiralty List of Radio Signals. The broadcast information comprises strong wind, gale and storm warnings, statements of the weather situation, and forecasts.

Most long distance weather messages are sent on single side band radio, but short-range forecasts, including those broadcast by public or commercial radio, are on double sideband, amplitude modulation. Again, the List of Radio Signals contains these details, as well as the times of all broadcasts.
Note that all times given here and in the List, are in GMT, or Universal Time.

Interpreting weather reports

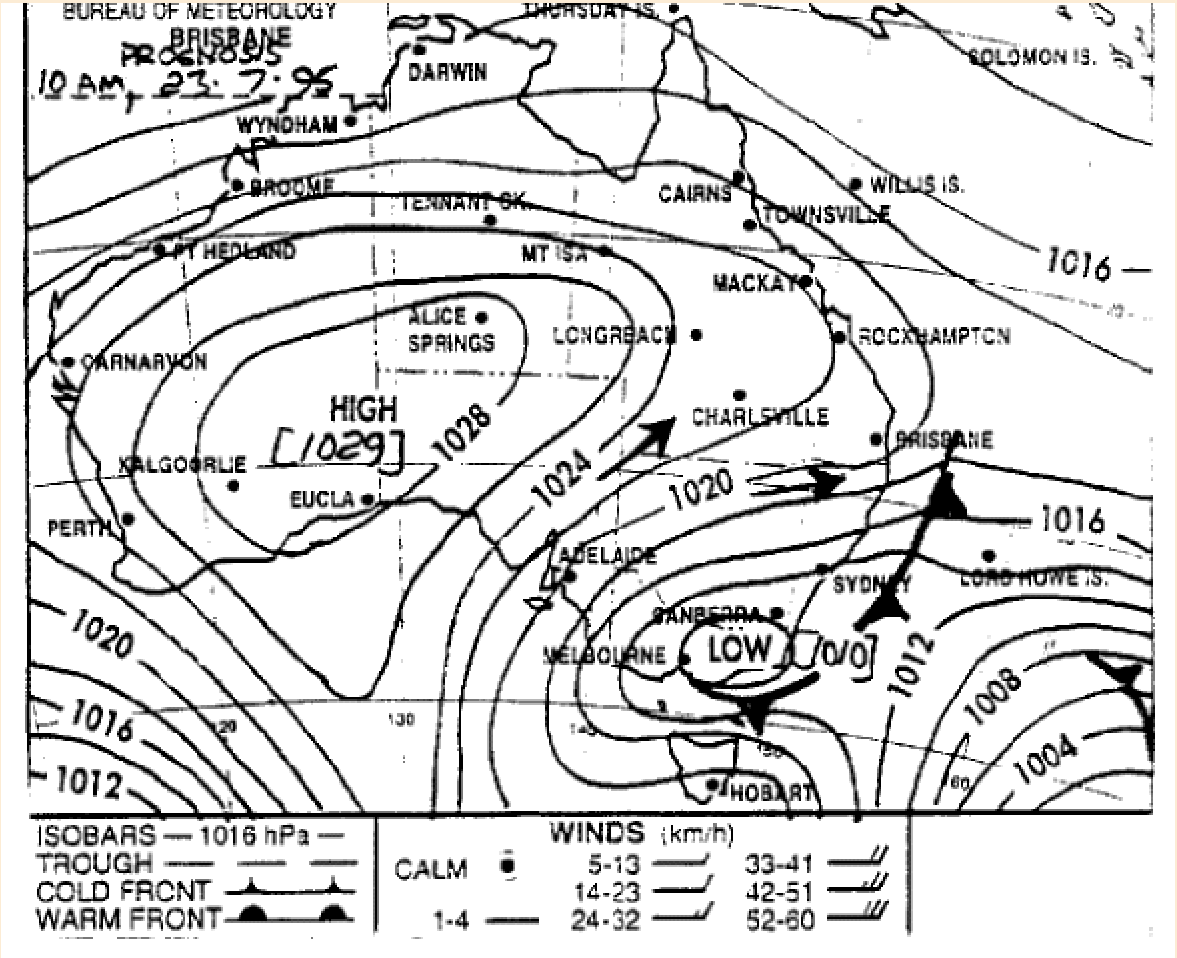
The Australian Picture

The sun drives the major pressure systems and as the sun apparently moves north and south throughout the seasons the pressure systems go with it. The figure shown is a typical summer map. Note the anticlockwise airflow around the high in the Bight giving southeast trade winds along the east coast. Also note the equatorial trough present across northern Australia. The pressure gradient along the equatorial trough is notoriously weak giving rise to light wind conditions known as the doldrums.



The Australian Picture

The figure shown is a typical winter map. Note the absence of the monsoon trough, which has moved into the Northern Hemisphere. The high-pressure systems now take a line through central Australia taking the southeast trade winds into northern Australia. South of the line of the high-pressure systems the wind driven by the pressure systems (gradient) is predominantly west to southwest. Southern Australia wind is also affected by intense low-pressure systems and cold fronts associated with the Polar Front. These cold fronts extend as far north as southeast Queensland through winter.



ECA Maritime COLLEGE

Interpreting weather reports

Synoptic surface weather charts

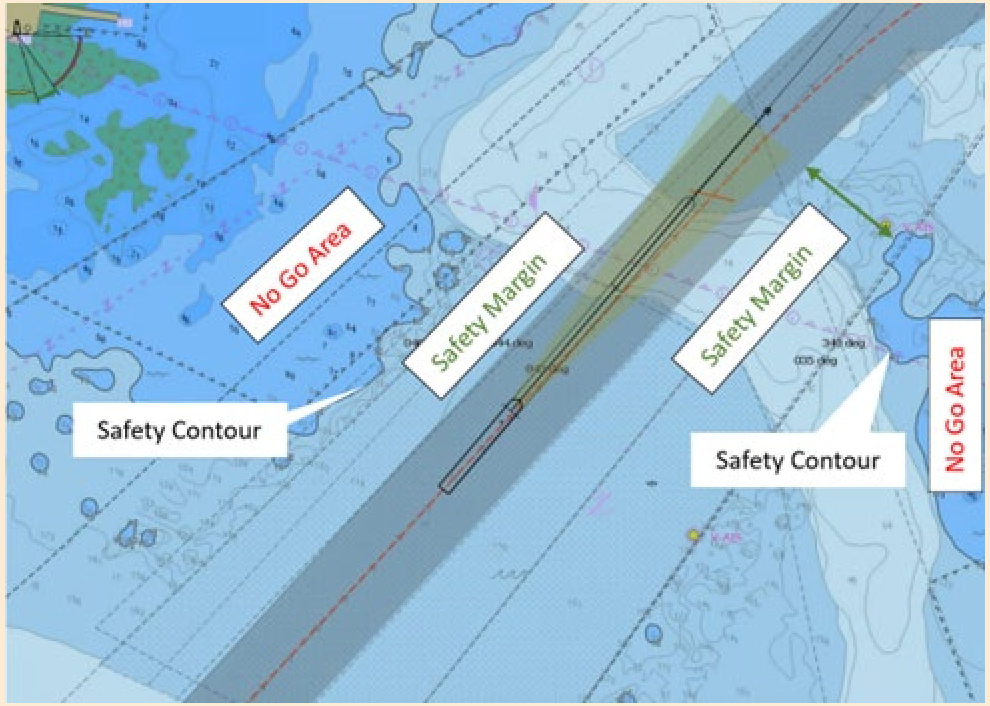
Everybody will be familiar with the simplified weather map, which appears in the daily newspapers around the nation and is commented upon, with varying degrees of success, during the evening television news sessions. These maps are more correctly called Synoptic Surface Weather Charts (the word "synoptic" being derived from the word synopsis, meaning a summer or outline. Synoptic: separately defined as "having the same view point" or. in the weather sense, "... a weather analysis at a given moment in time.")

To achieve this a large number of observations need to be made simultaneously over a wide area. The internationally agreed hours are: 0000, 0600, 1200 and 1800 UTC.

These observations come from weather ships, meteorological-stations, automatic weather recording stations, port meteorological officers, airport meteorology officers, co-operating marine observing vessels and aircraft. These observations are compiled by a computer, which then generates a synoptic chart. The forecaster examines this chart, interprets the latest satellite image, upper air observations, radar observations, previous synoptic and upper air charts and then the forecasting process begins.

Safe Havens

Safe havens, also known as places of refuge, are identified and plotted as part of voyage planning to provide alternative routes or locations to avoid potential hazards or emergencies. These havens are typically incorporated into the voyage plan and may include harbors, anchorages, or even specific areas within a designated navigation corridor.



Here's a more detailed look at how safe havens are used in voyage planning:

Safe Havens

1. Purpose and Importance:

- **Emergency Situations:**

  Safe havens allow vessels to deviate from their planned route and seek refuge in cases of distress, navigational errors, or mechanical failures.

- **Hazard Avoidance:**

  They provide alternative locations or routes to avoid areas with strong currents, hazardous weather conditions, or other potential dangers.

- **Navigational Errors:**

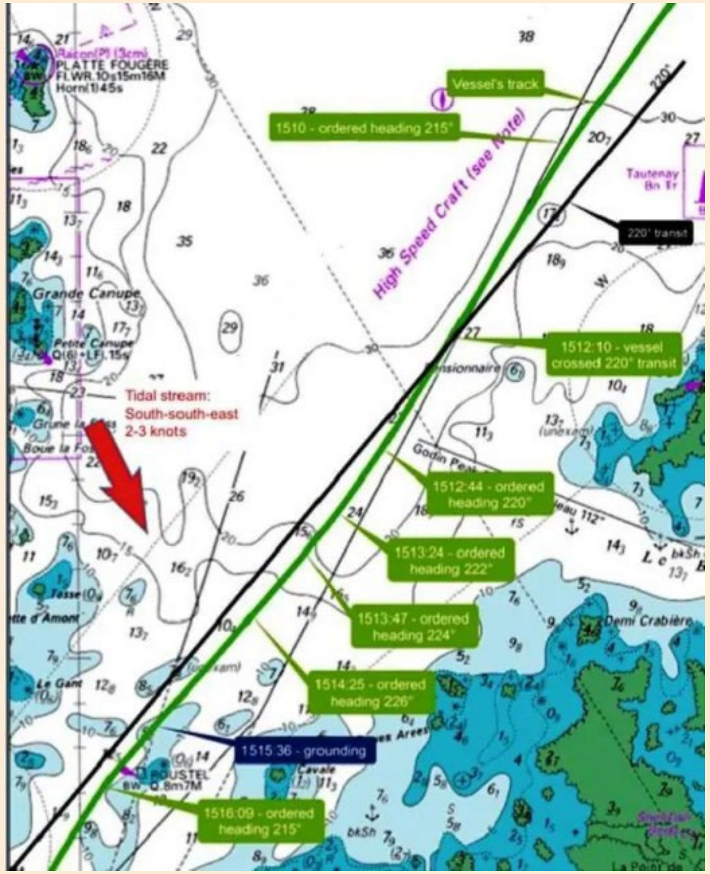
  Safe havens can be used as a temporary anchorage to correct course, troubleshoot equipment, or make necessary preparations before continuing the voyage.

- **Compliance with Regulations:**

  In some cases, regulations may require vessels to identify and plot safe havens as part of their voyage plan.

Safe Havens

2. Identification and Plotting:



- **Vessel-Specific Needs:**

  The selection of safe havens depends on the vessel's type, size, draft, and cargo.

- **Chart Consultation:**

  Navigational charts and electronic chart display systems (ECDIS) are used to identify potential safe havens based on depth, seabed conditions, and other relevant factors.

- **Consideration of Potential Hazards:**

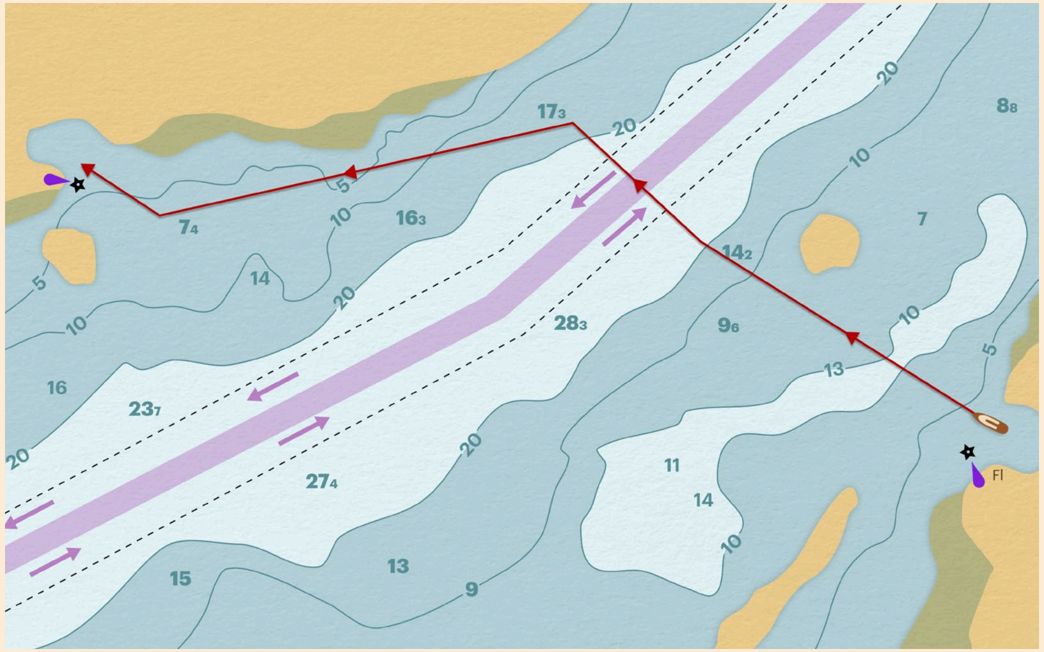
  The chosen havens should be assessed for potential hazards such as strong winds, currents, shoals, or areas with limited access.

- **Documentation:**

  Safe havens are typically documented in the voyage plan, including their location, depth, and any other relevant information.

Safe Havens

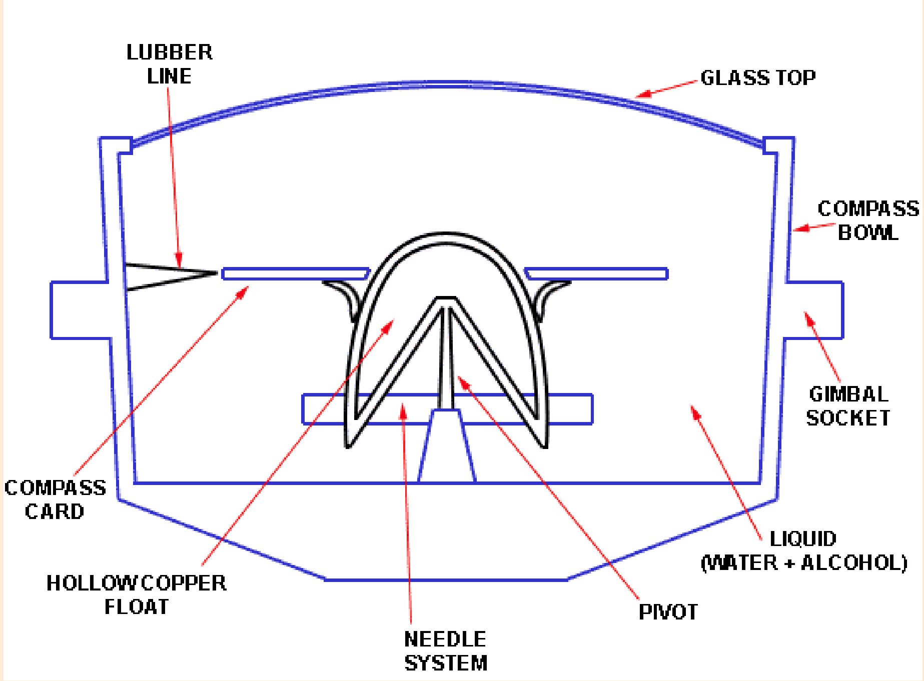
3. Use in Voyage Execution:



- **Deviations:** When necessary, vessels may deviate from their planned route and proceed to a designated safe haven.
- **Temporary Anchoring:** Safe havens may be used as temporary anchorages for a set period, allowing the vessel to address any problems or wait for favourable conditions.
- **Return to Route:** Once the situation has been resolved, the vessel will return to its planned route as soon as possible.

Command a watch on a vessel whilst undertaking a voyage

MAGNETIC COMPASS



- Simple and reliable
- Filled with liquid – to dampen card’s movement
- Liquid is mixture of Distilled Water & Alcohol
- Magnets attached to underside of compass card
- Lubber line at forward end – indicates vessel’s head
- Compass bowl suspended in gimbals

MAGNETIC COMPASS

FITTING

On fore & aft line of vessel
Visible from helm

Care & Maintenance

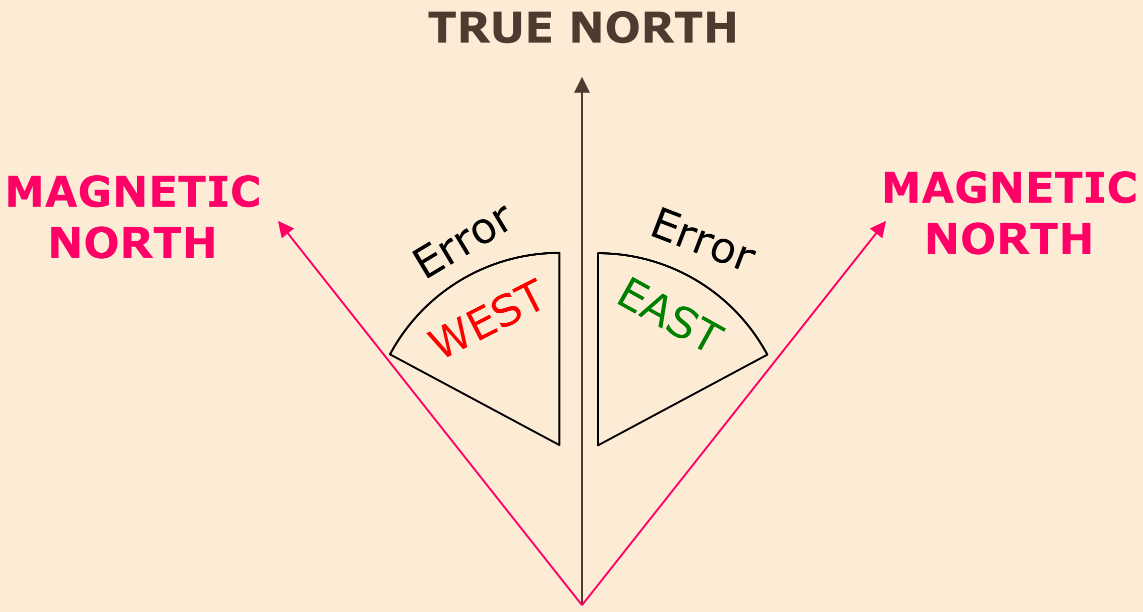
Clean & free from salt/grease
Gimbals lightly oiled
Away from direct sunlight
Remove air bubbles
Detect pivot wear
Maintain deviation card, swing

DO NOT PLACE

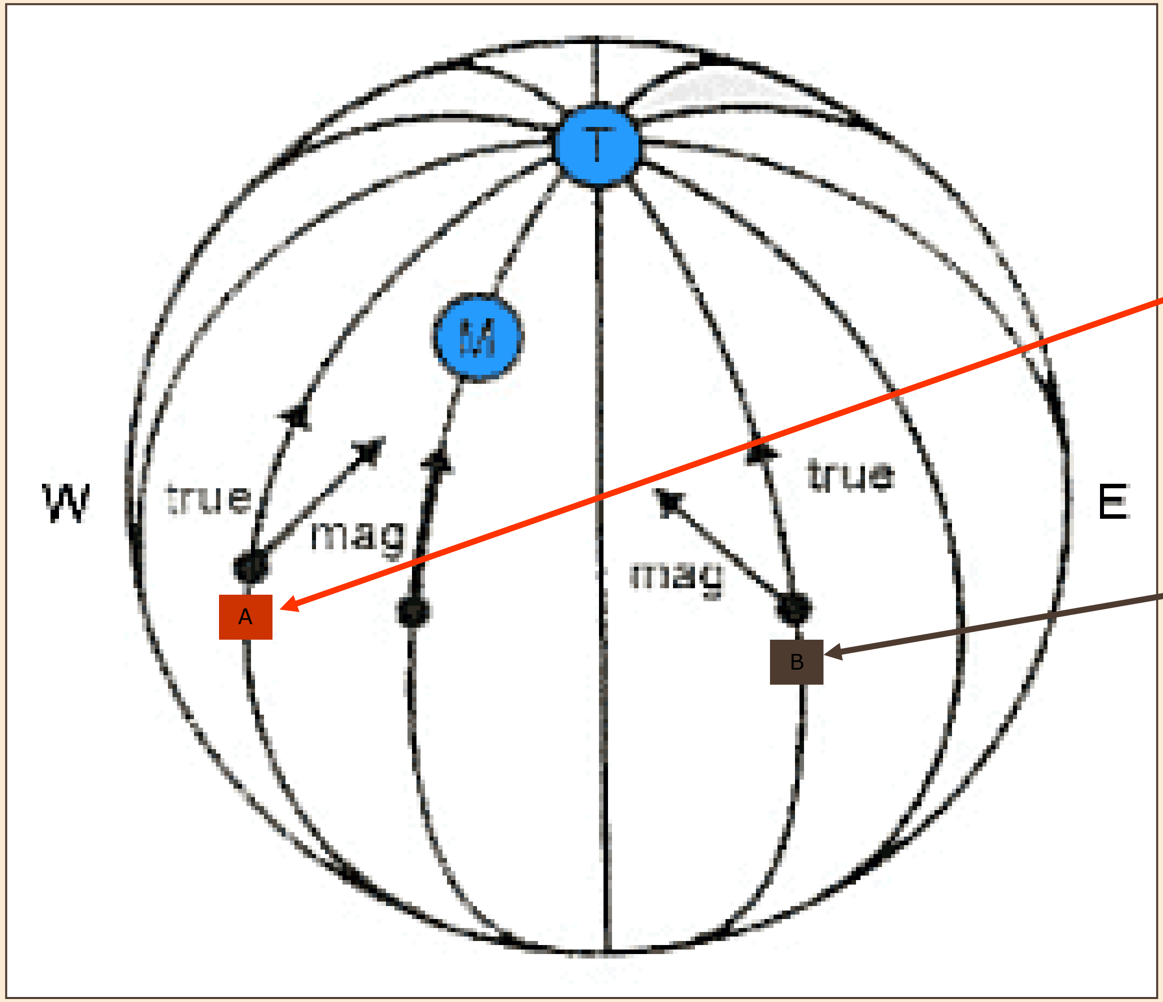
Metal objects near compass
Electrical appliances (radio) near compass
Electronic equipment near compass – check safe distance
Any new electrical wiring near compass

MAGNETIC VARIATION

- Angular difference between **Magnetic North** and **True North**
- Variation can be West or East found on chart



Magnetic Variation



Variation at 'A' = East

Variation at 'B' = West?

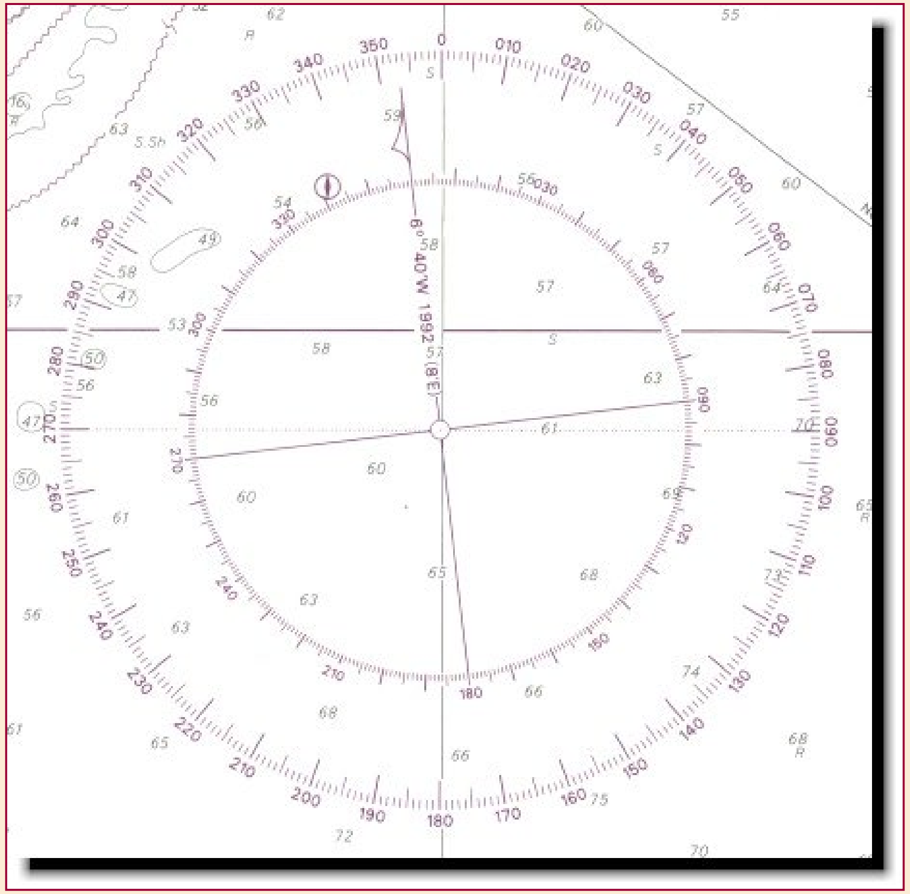
Magnetic Variation

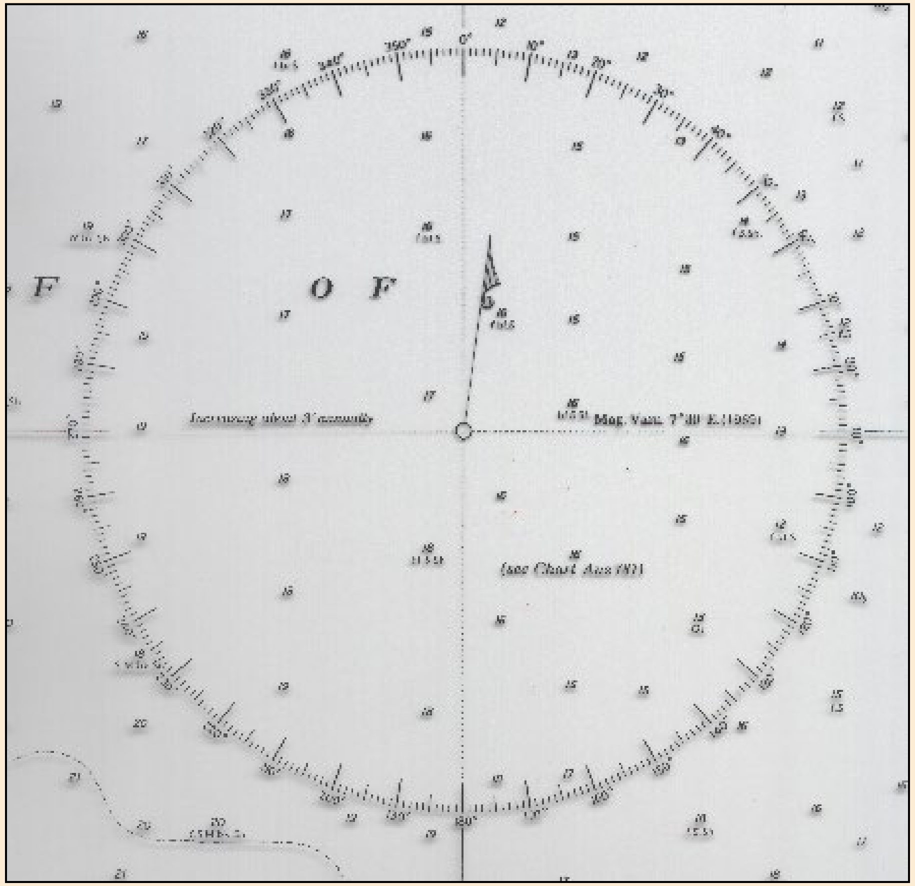
EXERCISE

- Look at the Chart in front of you and calculate the Magnetic Variation from any Compass Rose for this current year

- Is there any difference in Variation between different Compass Roses on the same chart?

Magnetic Variation



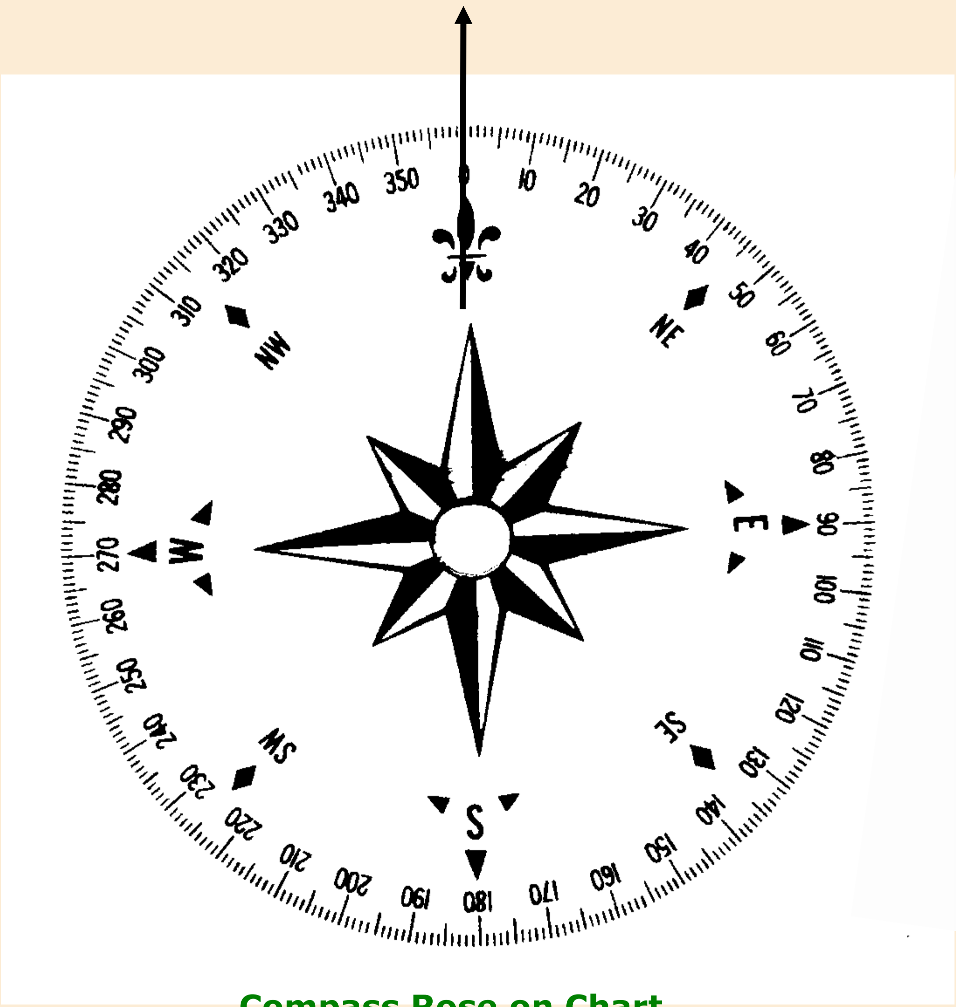


Variation WEST

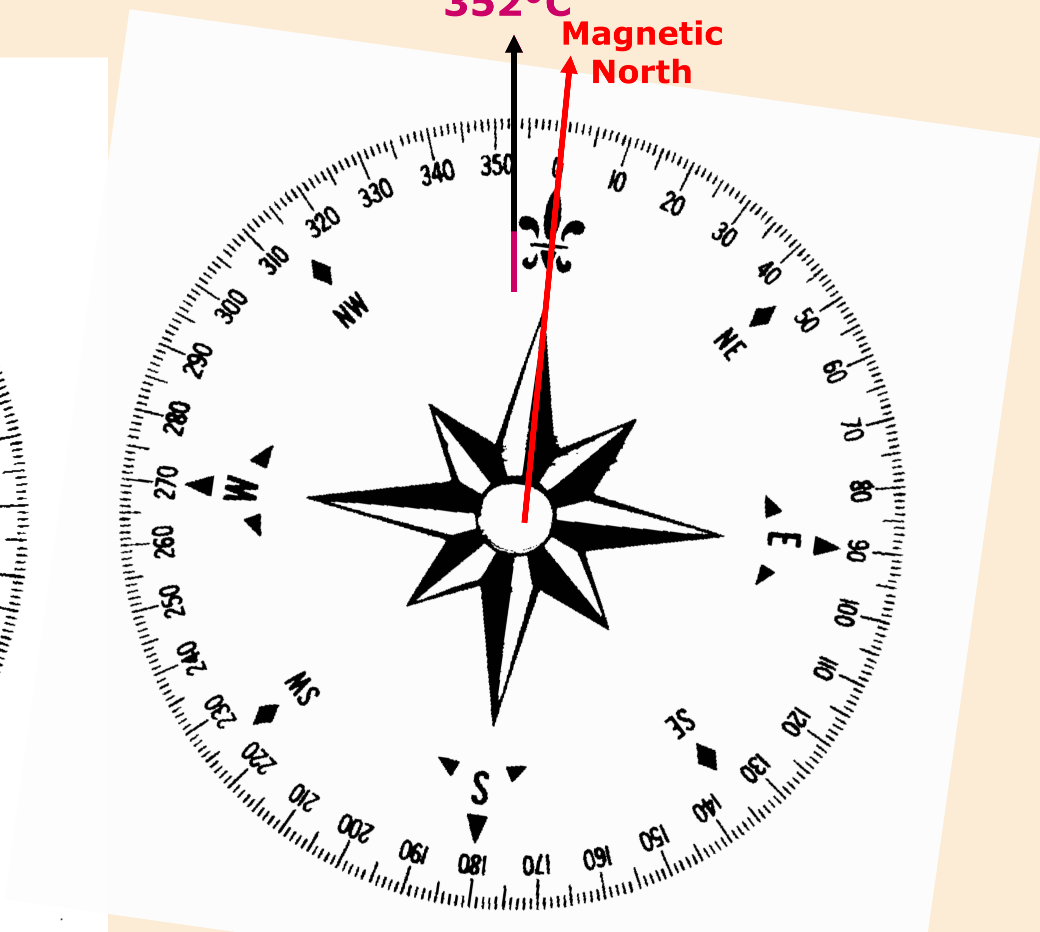
Variation EAST

Compass Rose indicates direction and value of Variation for a particular year

EXERCISE
MAGNETIC VARIATION



Compass Rose on Chart



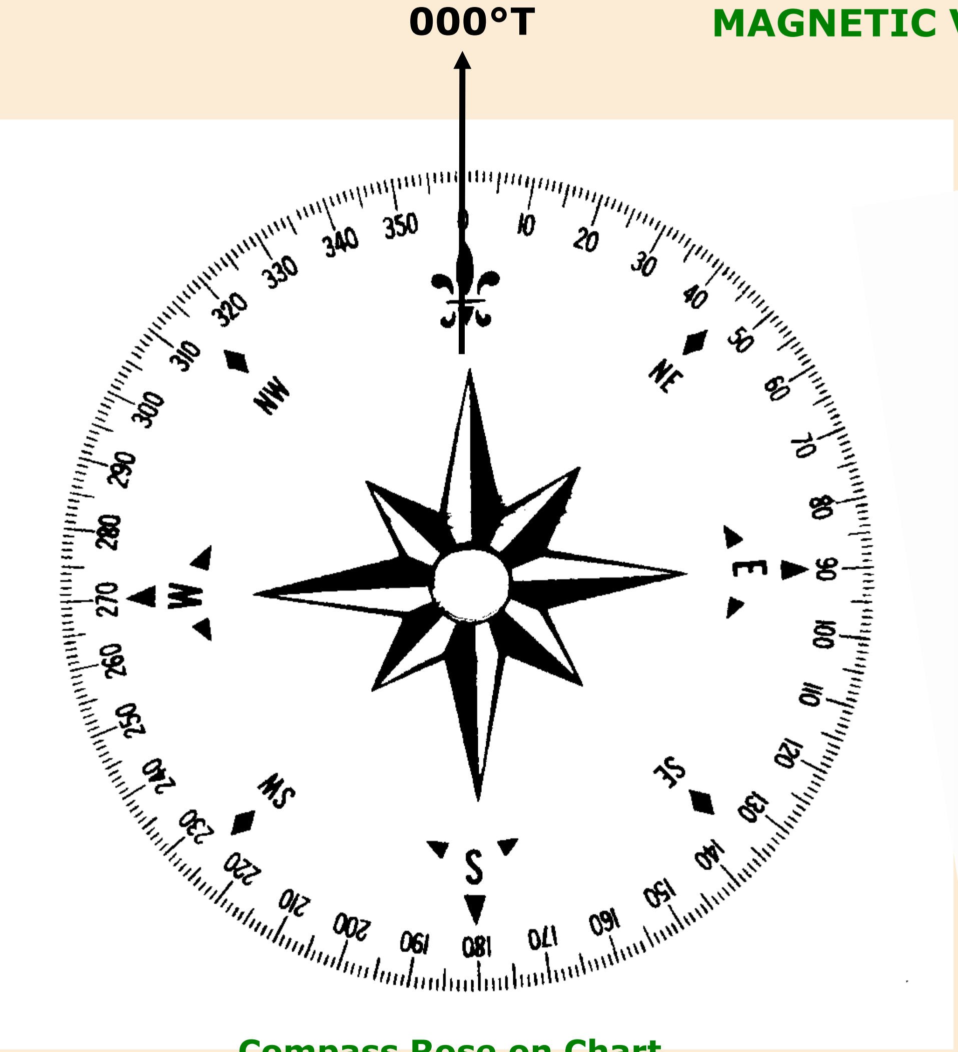
Magnetic Variation is **8°E** (Ship's Magnetic Compass)

Course required to be steered is **000°T (360°T)**

What <u>**Compass Course**</u> should be steered to maintain **000°T**?

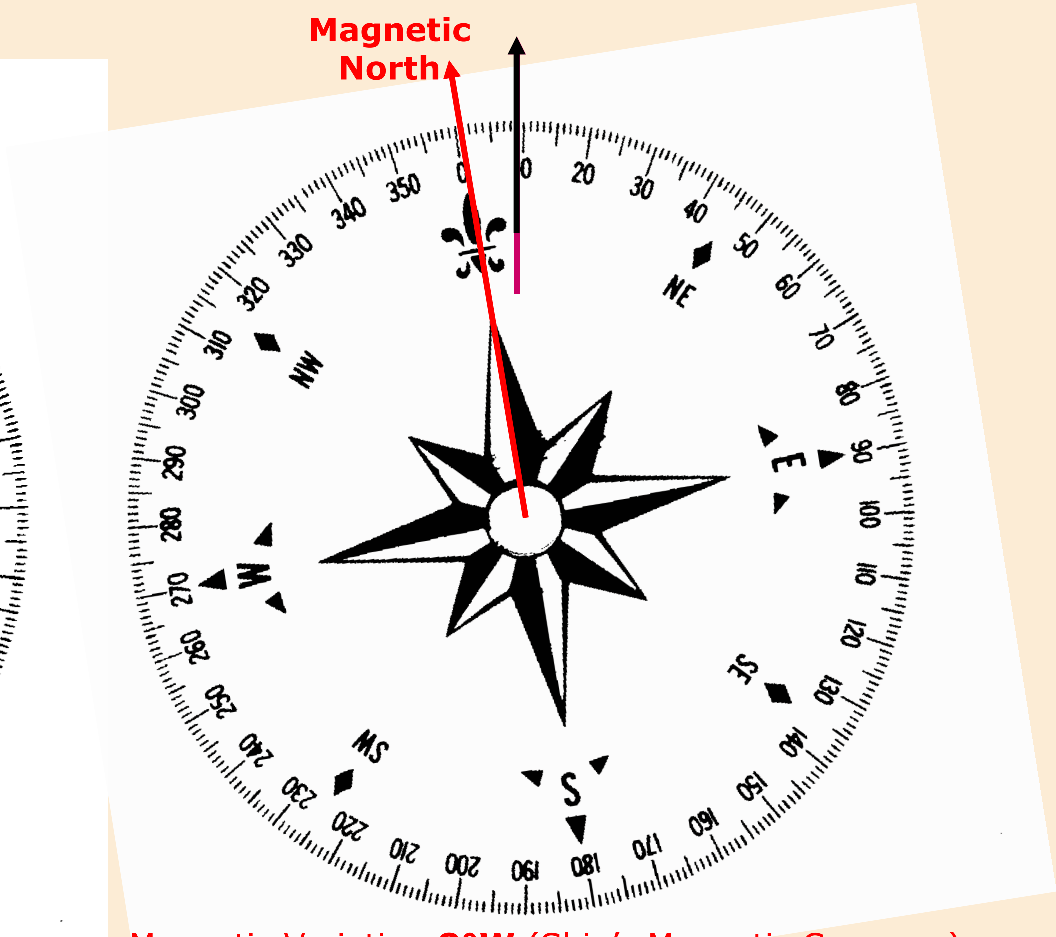
Ans. = 352°C

EXERCISE
MAGNETIC VARIATION



Compass Rose on Chart

Course required to be steered is **000°T (360°T)**

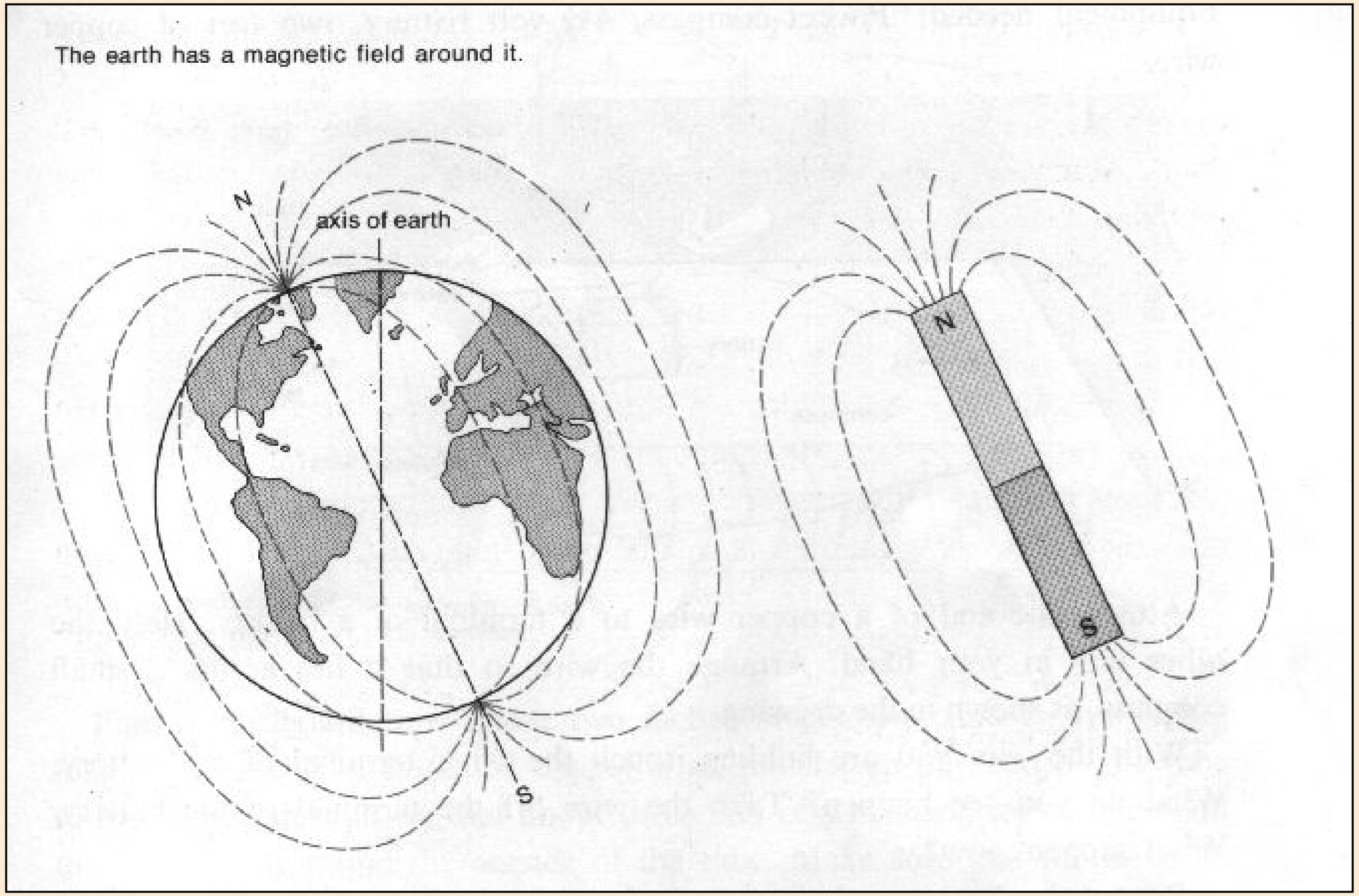


Magnetic Variation **8°W** (Ship's Magnetic Compass)

What **Compass Course** should be steered to maintain **000°T**?

Ans. = 008°C

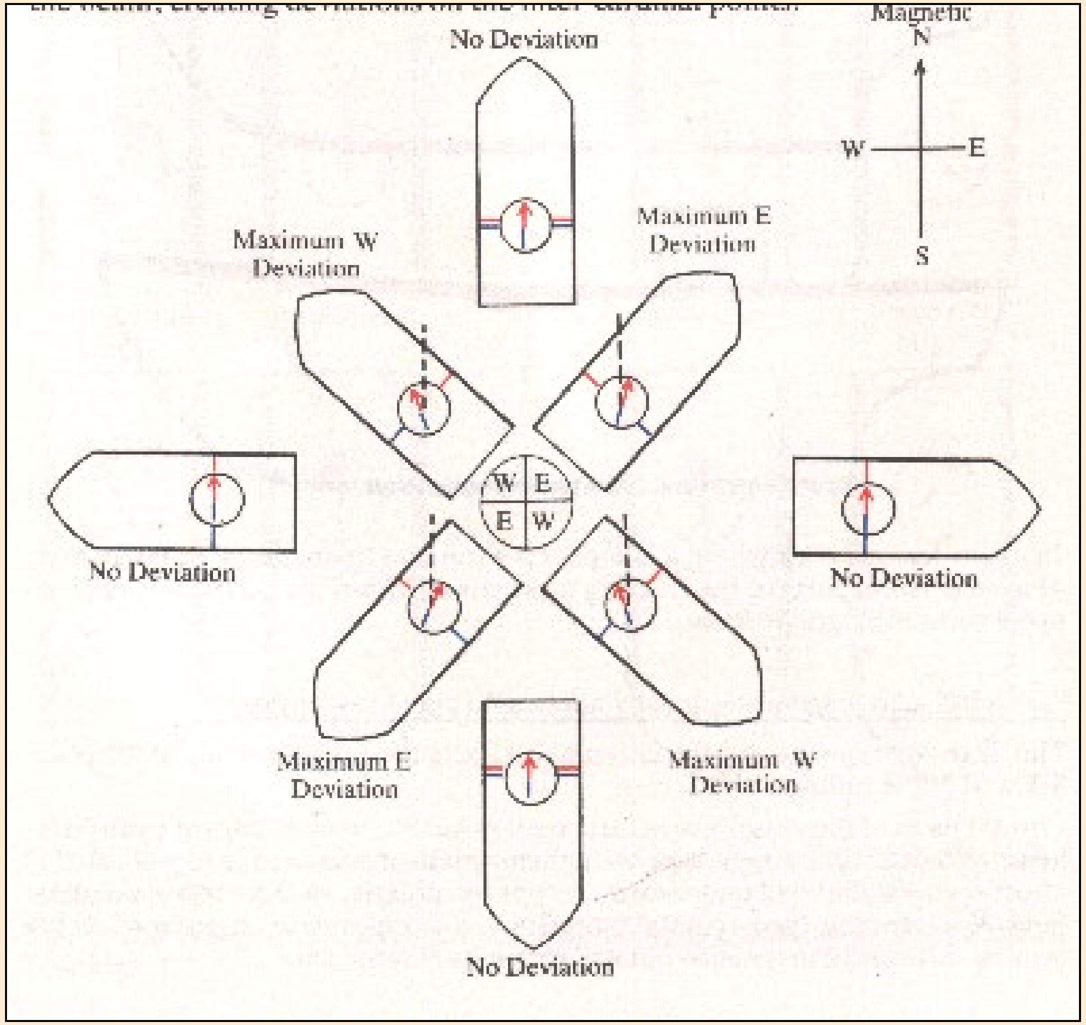
MAGNETIC DEVIATION



Affect on Ship's magnetic compass due to Ship's own magnetic fields

MAGNETIC DEVIATION

Affect on Ship's magnetic compass due to Ship's own magnetic fields



(Note: Deviation changes as vessel alters heading)

MAGNETIC DEVIATION

Amount of Deviation is reduced by a Compass Adjuster

Deviation for any heading is obtained from the Deviation Card

DO NOT place any magnetic objects near compass

DEVIATION CARD

COMPASS DEVIATION CARD 1A

Ship's head by compass	Deviation	Ship's head by compass	Deviation
000°	2°W	180°	2°E
010°	3°W	190°	2°E
020°	3°W	200°	1°E
030°	4°W	210°	1°E
040°	4°W	220°	1°E
050°	4°W	230°	2°E
060°	3°W	240°	2°E
070°	3°W	250°	2°E
080°	2°W	260°	3°E
090°	1°W	270°	2°E
100°	0	280°	2°E
110°	1°E	290°	1°E
120°	2°E	300°	0
130°	3°E	310°	1°W
140°	3°E	320°	1°W
150°	3°E	330°	2°W
160°	2°E	340°	2°W
170°	2°E	350°	2°W

Compass Error

Combination of:

VARIATION *(from Chart)*

DEVIATION (from Deviation Card)

Compass Error

- the combined difference between TRUE and Compass course/bearing

- **When VARIATION & DEVIATION are the same (i.e., EAST or WEST), add the values together.**

Variation	7°E
Deviation	2°E
C/E =	9°E

Variation	4°W
Deviation	3°W
C/E =	7°W

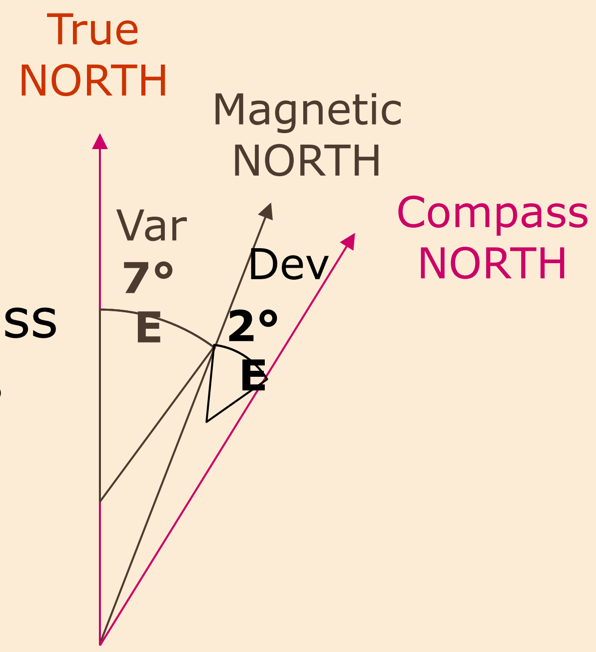
Compass Error

Variation 7°E

Deviation <u>2°E</u>

C/E = <u>9°E</u>

In this case the vessel's Compass will indicate COMPASS North as being 9° to the East of TRUE North



Compass Error

- **When VARIATION & DEVIATION are opposite values, (E and W):**
- **Subtract the Lower number from the Higher number**
- **Use the VALUE of the Higher number**

Variation 7°E
Deviation 2°W
C/E = 5°E

Variation 3°E
Deviation 4°W
C/E = 1°W

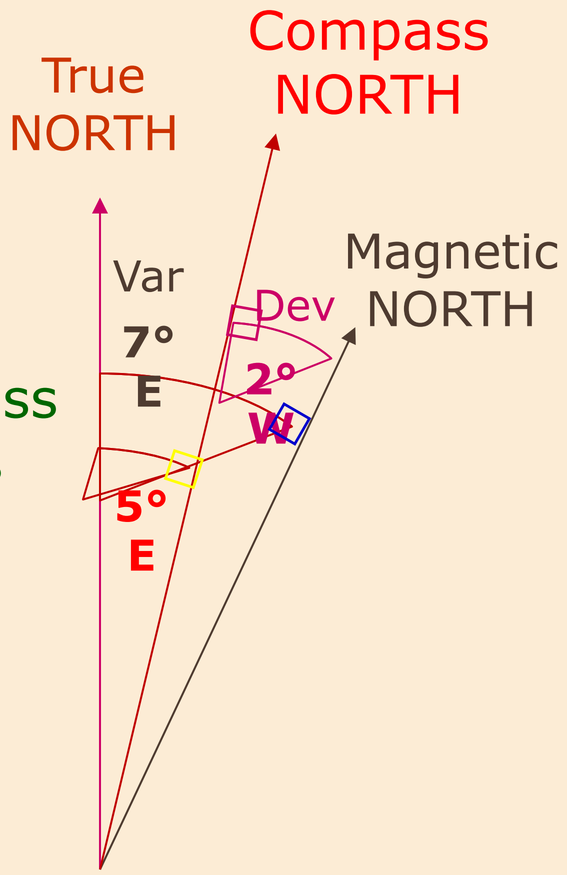
Compass Error

Variation 7°E

Deviation 2°W

C/E = 5°E

In this case the vessel's Compass will indicate COMPASS North as being 5° to the East of TRUE North



Applying Compass Error

To convert a **True course** to a **Compass course**:
East least -
West best +

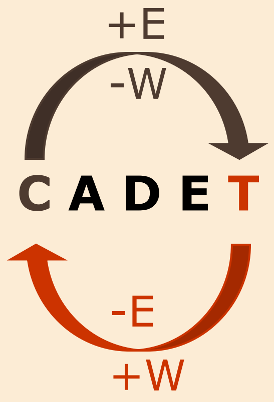
+E
-W
C A D E T
-E
+W

T	**True**	**067°T**	
V	**Variation**	**-7°E**	(Refer to Chart Compass Rose, e.g. 7°E)
M	**Magnetic**	**060°M**	
D	**Deviation**	**+3°W**	(Refer to Deviation Card)
C	**Compass**	**063°C**	

Applying Compass Error

To convert a **Compass course** to a **True course**:

Error **EAST**, Compass **LEAST**
Error **WEST**, Compass **BEST**



C	**Compass**	**063°C**
D	**Deviation**	**- 3°W**
M	**Magnetic**	**060°M**
V	**Variation**	**+ 7°E**
T	**True**	**067°T**

(Refer to Deviation Card)

Error = 4°E

(Refer to chart Compass Rose, e.g. **7°E**)

Remember

When converting a **Compass bearing** to a **True bearing**:

Apply **Deviation** for the **SHIP'S HEAD** when taking each bearing

Exercises
(Use Deviation Card 1A, Variation 8°E)

(1) Ship heading **080° C**
Bearing of Lighthouse is **145° C.**
What is True Bearing of Lighthouse?

Ans: 151° T

V = 8°E
D = 2°W
C/E = 6°E

(2) Ship heading **260° C**
Bearing of Mt Lofty is **355° C.**
What is True Bearing of Mt Lofty?

Ans: 006° T

V = 8°E
D = 3°E
C/E = 11°E

(3) Ship heading **100° C**
Bearing of Snapper Point is **000° C.**
What is true Bearing of Snapper Point?

Ans: 008° T

V = 8°E
D = 0°
C/E = 8°E

DEVIATION CARD

COMPASS DEVIATION CARD 1A

Ship's head by compass	Deviation	Ship's head by compass	Deviation
000°	2°W	180°	2°E
010°	3°W	190°	2°E
020°	3°W	200°	1°E
030°	4°W	210°	1°E
040°	4°W	220°	1°E
050°	4°W	230°	2°E
060°	3°W	240°	2°E
070°	3°W	250°	2°E
080°	2°W	260°	3°E
090°	1°W	270°	2°E
100°	0	280°	2°E
110°	1°E	290°	1°E
120°	2°E	300°	0
130°	3°E	310°	1°W
140°	3°E	320°	1°W
150°	3°E	330°	2°W
160°	2°E	340°	2°W
170°	2°E	350°	2°W

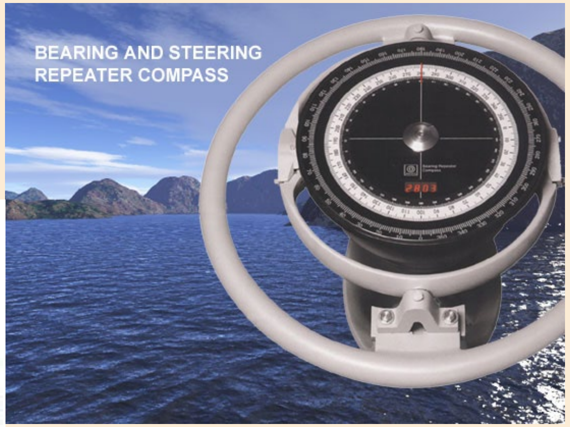
EXERCISES

1. Compass to True
2. True to Compass

Complete exercise 5 in exercise sheets 3, 4 & 5 located on pages 5 to 14 in the student resource/exercise book

Gyro Compass Error

GYRO COMPASS



- Minimal Error
- Seeks True North
- Repeaters placed anywhere on vessel
- Excellent for taking True Bearings

Gyro Compass Error

- Although minimal, Gyro Error is subject to Course, Speed and Latitude errors

- **Gyro Error** is named **HIGH** or **LOW**

- Error is **HIGH** when course/bearing shown is **Higher than True course/bearing**

- Error is **LOW** when course/bearing shown is **Lower than True course/bearing**

Gyro Compass Error

Example:

True Course to be steered is **076°T.**
Gyro Error is **2° High**
What course should be steered by Gyro?

Answer:

True Course	076°T
Gyro Error	2°H
Gyro Course	078°G

Example:

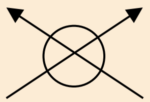
A bearing taken with the same Gyro gives 246°G.
What is the True Bearing?

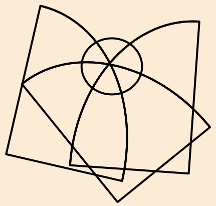
Answer:

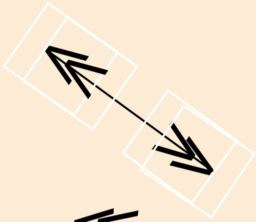
Gyro bearing	246°G
Gyro error	2°H
True bearing	244°T

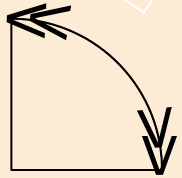
CHARTWORK CONVENTIONS AND SYMBOLS

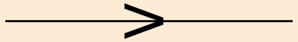
Position Line 

Bearings 

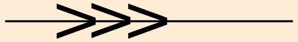
Ranges 

Transferred Position Line  (Bearing)

 (Ranges)

Course 

Track 

Set & Drift 

POSITIONING

DR (Dead Reckoning Position) + (*time*)

Found by using **True Course steered** and **Distance Travelled** through the water.

Takes no account of current or tidal movement, nor the effect of wind on the vessel's track.

EP (Estimated Position) ◬ (*time*)

Found by adjusting the **DR** position after taking into account the effects of **Wind (Leeway)** and **Current/Tidal stream (Set & Drift)**

FIX (Positive Position) ⊕ (*time*)

A **KNOWN** position obtained by the intersection of 2 or more position lines

FIXING POSITION AT SEA

- Cross Bearings (Compass)
- Ranges (Radar)
- Bearing/Range
- GPS
- Bearing and Depth Contour
- Running Fix

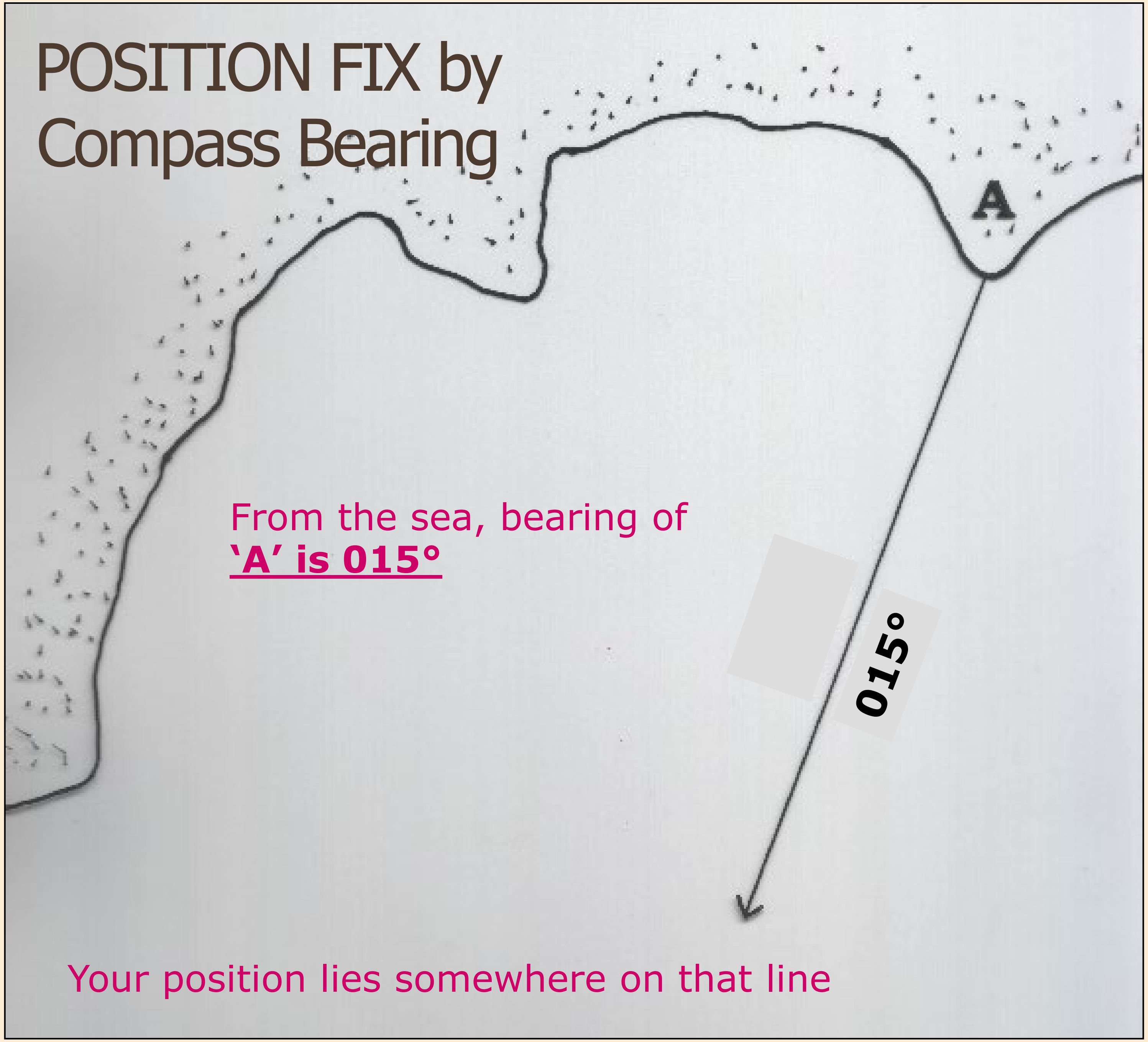
TAKING A COMPASS BEARING

Don't use deviation card on hand bearing compass

TAKING A COMPASS BEARING USING AN AZIMUTH RING Use deviation card

Be aware of prism errors (arrow UP reading should agree with arrow DOWN reading) – otherwise make allowance.

POSITION FIX by Compass Bearing

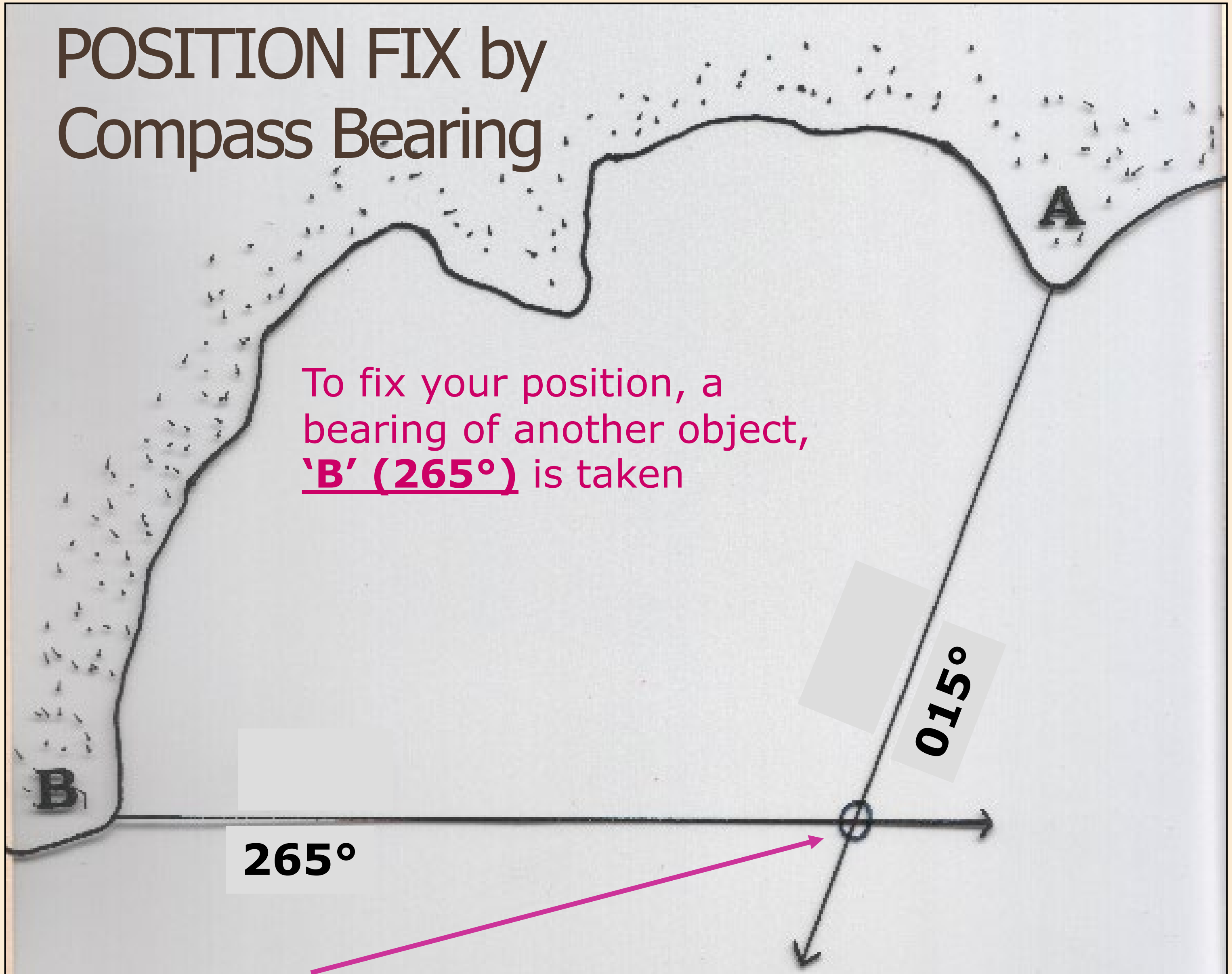


From the sea, bearing of **<u>'A' is 015°</u>**

Your position lies somewhere on that line

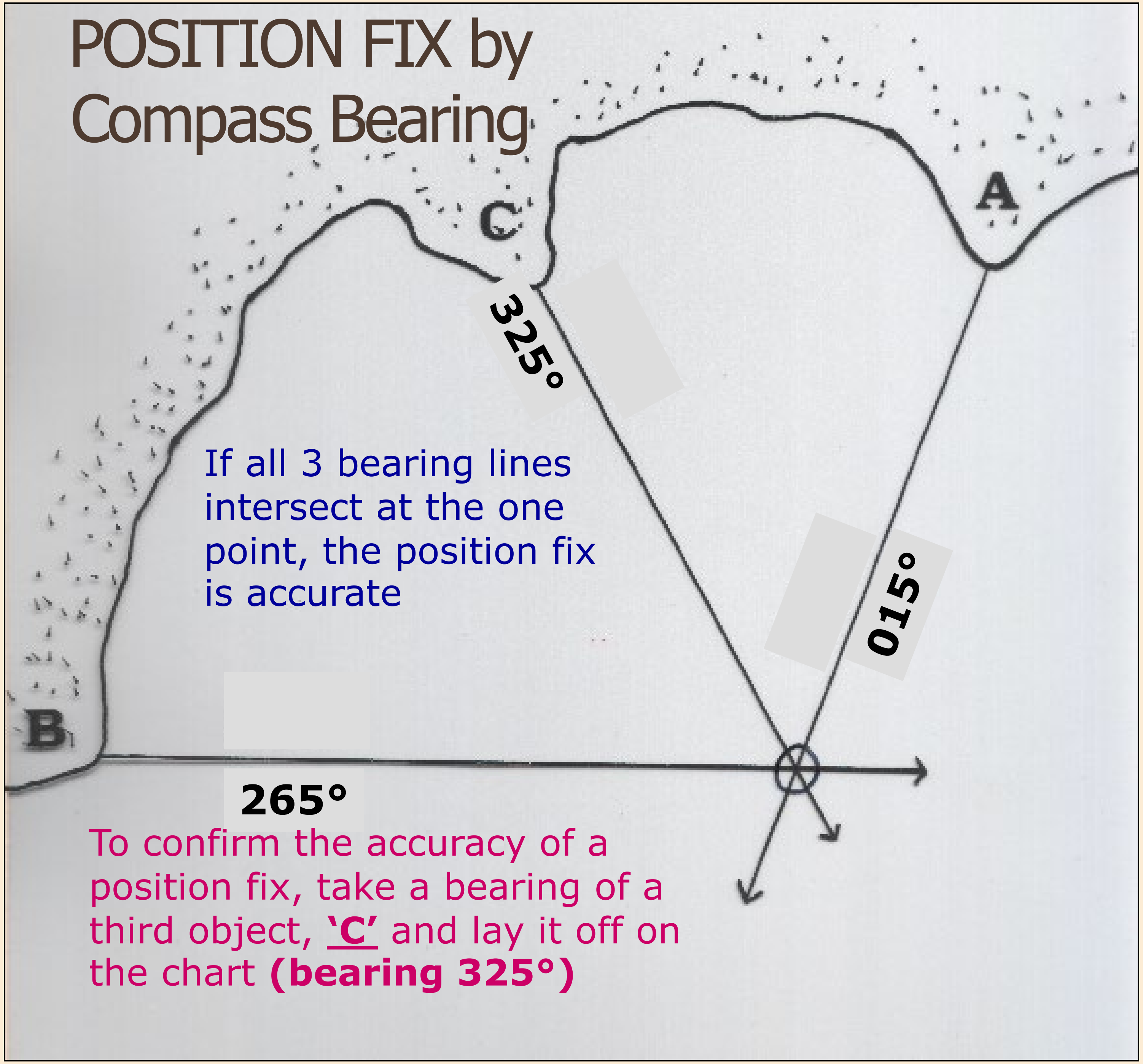
POSITION FIX by Compass Bearing

To fix your position, a bearing of another object, **<u>'B' (265°)</u>** is taken



Your position must be where both bearing lines intersect

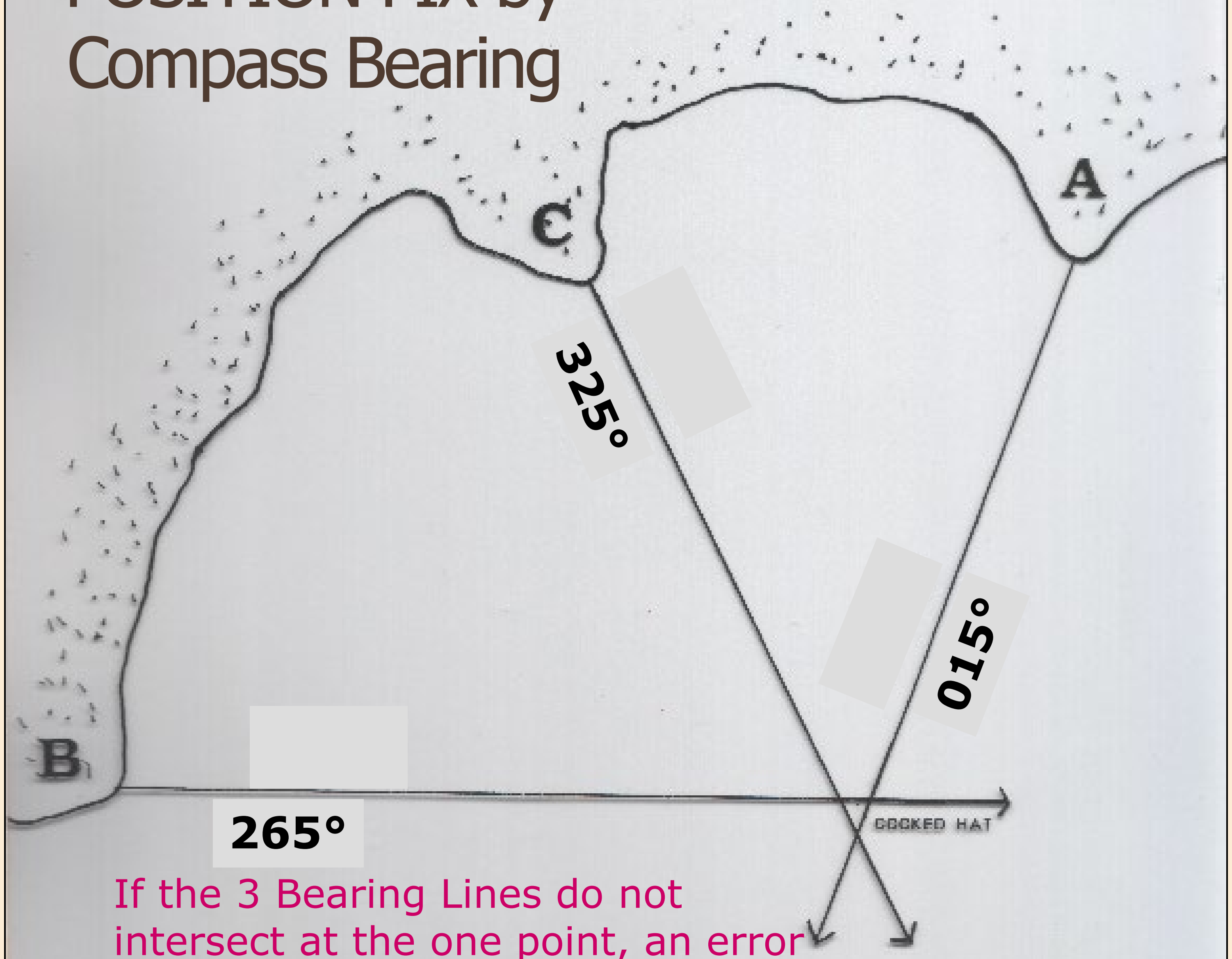
POSITION FIX by Compass Bearing



If all 3 bearing lines intersect at the one point, the position fix is accurate

To confirm the accuracy of a position fix, take a bearing of a third object, **<u>‘C’</u>** and lay it off on the chart **(bearing 325°)**

POSITION FIX by Compass Bearing



If the 3 Bearing Lines do not intersect at the one point, an error has occurred – a 'cocked hat' is formed – redo the bearings again

POSITION FIX by Compass Bearing

EXERCISES

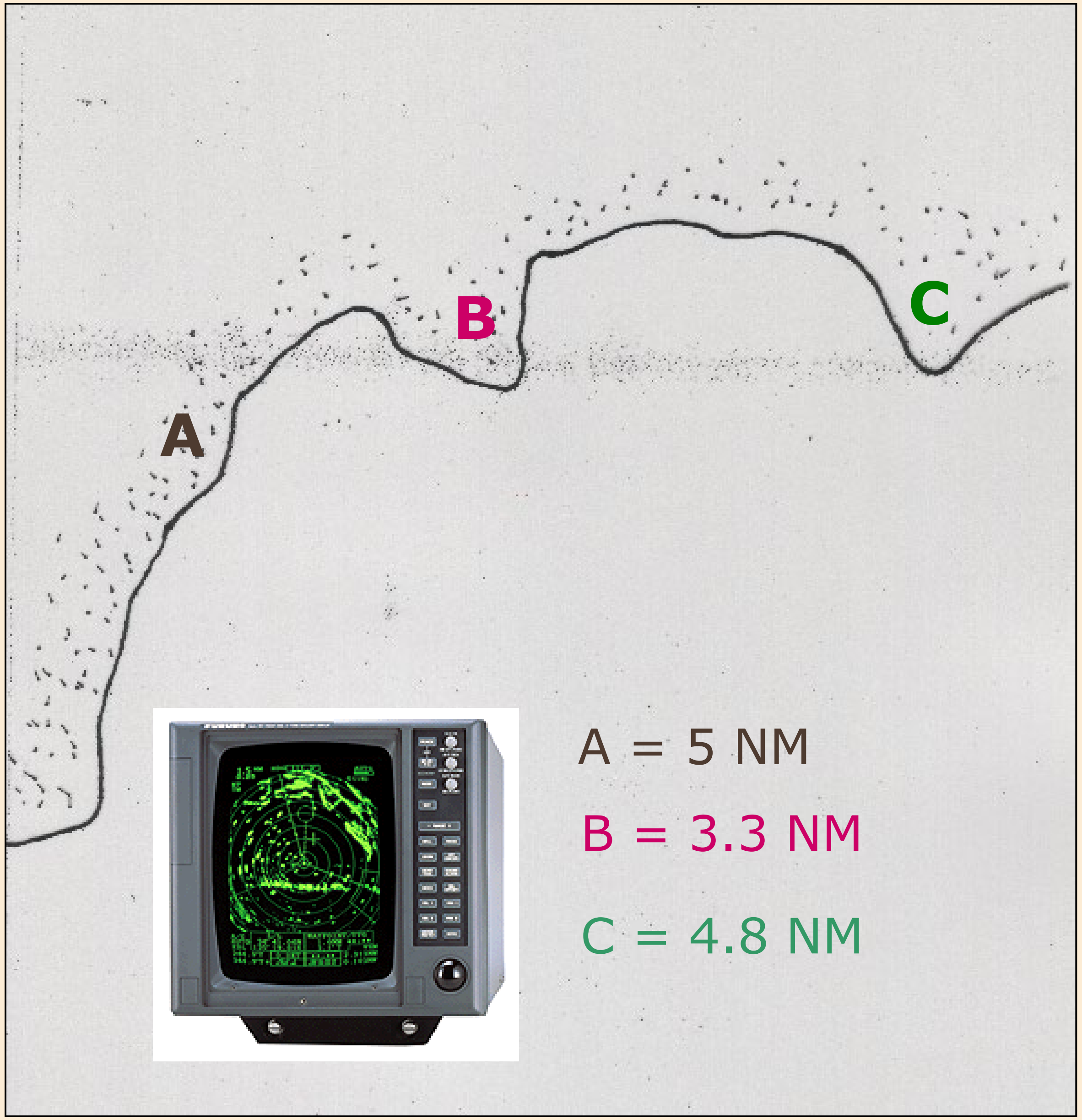
(Class based)

Complete exercise 6 in exercise sheet 6 located on page 15 in the student resource/exercise book

POSITION FIX by Radar Range

- Identify features on chart

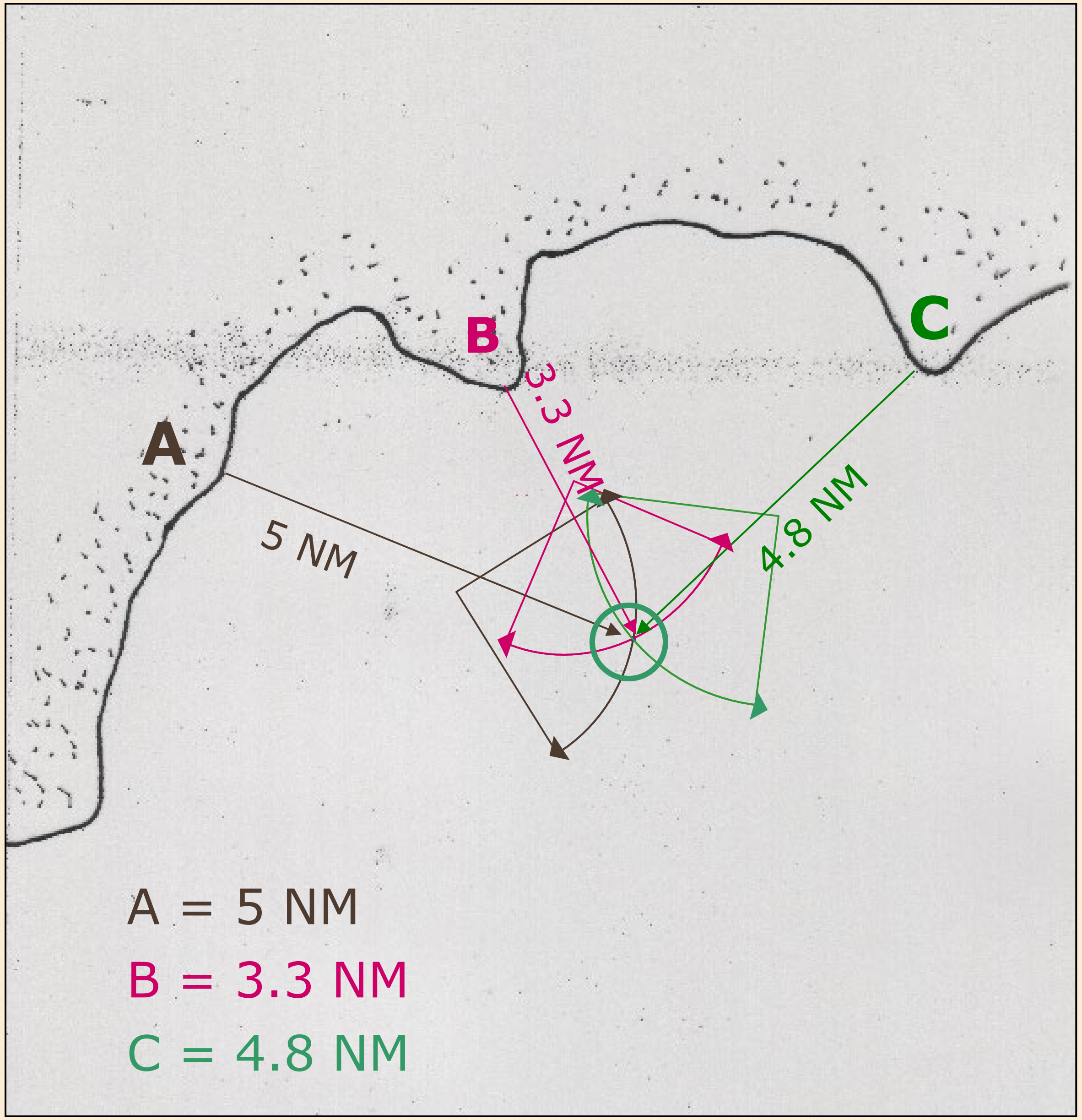
- Measure distance to each feature by Radar



To fix position on Chart, lay off Radar Ranges obtained from features observed

- If arcs drawn from each feature intersect in the one spot, a good fix has been obtained

- If result is a cocked hat, re-check ranges obtained and re-plot



POSITION FIX by Compass Bearing and Range

- Identify feature on chart (B)
- Take Compass Bearing of (B) and measure distance by Radar
- From (B) draw line in direction of reciprocal bearing
- From (B) draw arc at radar distance to 'cut' Bearing line

- Your position is where the measured radar distance 'cuts' the line of bearing

POSITION FIX by Bearing and Range

EXERCISES

(Class based)

Complete exercises 7 in exercise sheets 6 & 7 located on pages 15 to 21 in the student resource/exercise book

Position by Bearing and Depth Contour

This method may be used providing:

- **Allowance is made to reduce the sounding to Chart Datum**
- **The Depth contours are well defined**
- **The contour in question only crosses the Bearing Line in one place**
- **The Depth contour crosses the Bearing Line at a Wide Angle**

TRANSIT BEARING

When 2 charted objects are seen to be **in line**, they are said to be **IN TRANSIT**

Transit Bearing - Most accurate of all bearings

- No compass required

- Can be used in conjunction with Radar Ranges, Sounding Contours

RISING AND DIPPING RANGE OF LIGHTS

- Lighthouses on charts have notation of their Height & Range
- Heights are given above MHWS
- The range is the Nominal Range (i.e. visibility 10n.miles)
- Height above sea level dictates the <u>Light's Geographical Range</u>
- Your Eye Height above sea level dictates <u>Your Geographical Range</u>
- Reference to Tables enables us to find Maximum Range (dependant on <u>Height of Object</u> and <u>Height of Eye</u>)

RISING AND DIPPING RANGE OF LIGHTS

For further Information and exercises on calculating rising and dipping ranges of lights see exercise 8 on exercise sheet 8 pages 22 to 31

RUNNING FIX

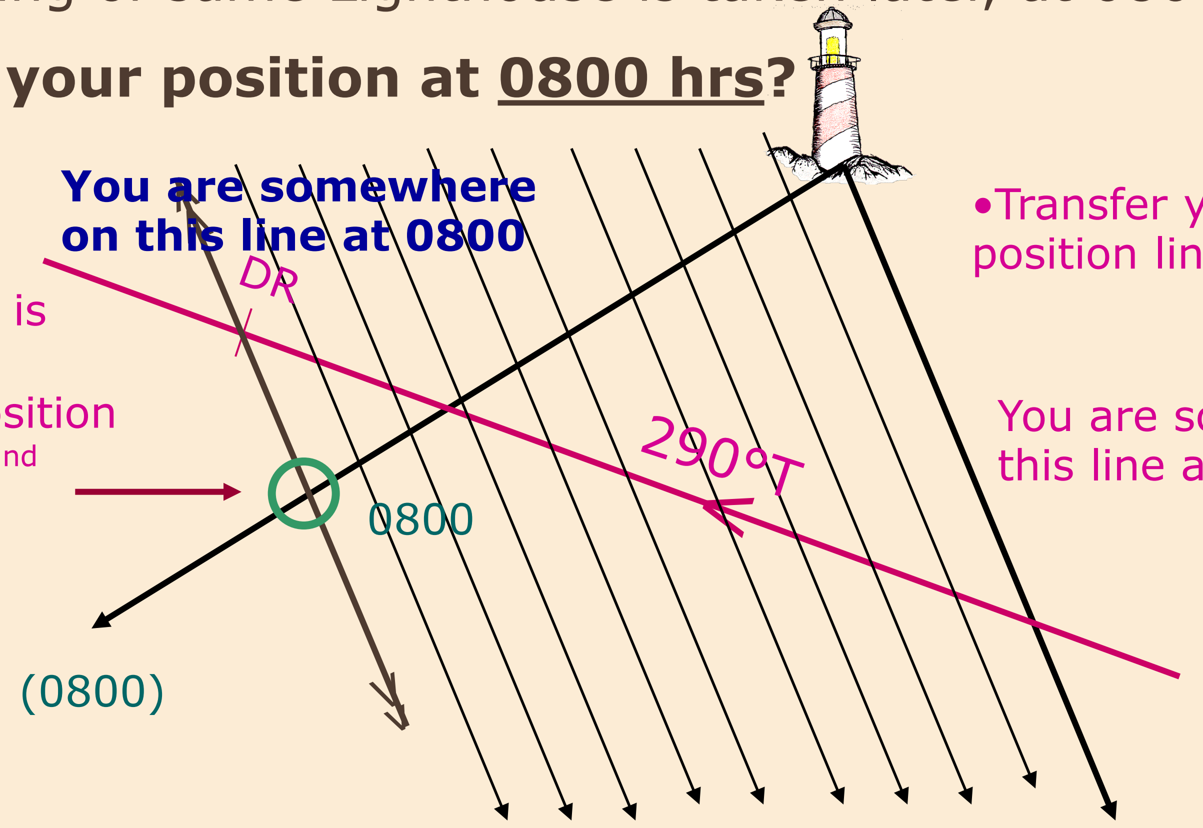
(Transferred Position Line)

This method is used when only **<u>ONE</u>** suitable object is visible at any one time from which to take a bearing

*(May be separate bearings of the **SAME object**, or separate bearings of 2 **DIFFERENT objects**)*

POSITION BY RUNNING FIX METHOD

- You are steering a Course 290°T, Speed 9 Knots
- Bearing of Lighthouse is taken at 0700 hrs
- 2nd bearing of same Lighthouse is taken later, at 0800 hrs
- **What is your position at <u>0800 hrs</u>?**



- Transfer your first position line to your 'DR'

You are somewhere on this line at 0700 hrs

- Your position is where the transferred position line cuts the 2nd bearing line

- Draw course line in direction of travel – make sure it cuts both bearing lines
- From the 1st bearing line, measure off the distance you have covered between the times when both bearings were taken – this becomes your 'DR'

RUNNING FIX

RUNNING FIX EXERCISES

Complete exercise 9 in exercise sheet 9 located on page 32 in the student resource/exercise book

For further information on running fixes see the student handout on running fixes in the course materials

How to check DEVIATION at Sea

How to check DEVIATION at Sea

1. Position your vessel where 2 objects are seen in "transit" *(i.e., in line with one another)*, and identify these on a chart

2. Draw a line on the chart joining these "transits" – this is the **True Bearing** of the transits from your position, which lies somewhere on this line

3. At the same time, take a **Compass bearing** of the objects in "transit"

4. The difference between the Compass Bearing and the True Bearing on the chart is the **Compass Error**

5. **Compass Error** is a combination of **Variation** and **Deviation** – find the Variation from the chart, and the Deviation can then be calculated

How to check DEVIATION at Sea

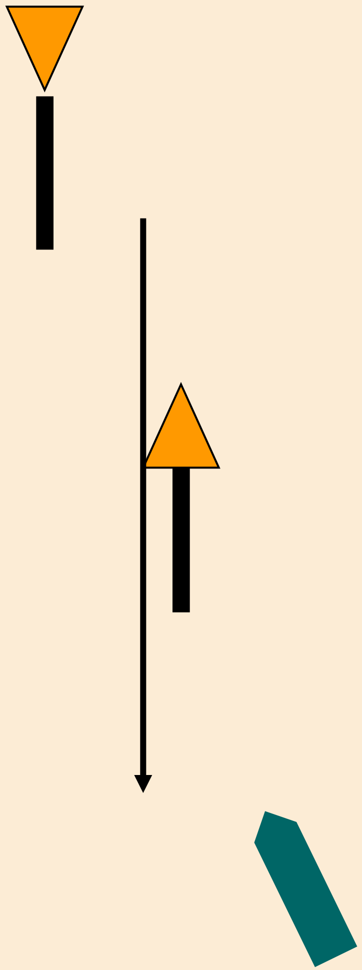
Example:

True Bearing of Transits	=	173°T
Compass Brg of Transits	=	169°C
C/E=		**4°E**

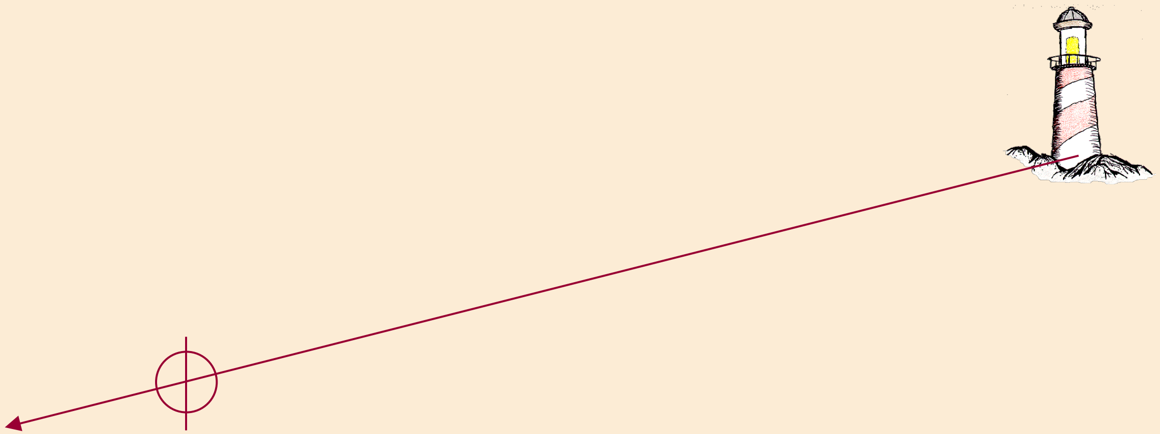
C/Error is a combination of Variation and Deviation

Variation	=	7°E *(from Chart)*
Deviation	=	**3°W**
C/E	=	4°E

Checking Deviation
-Other Methods



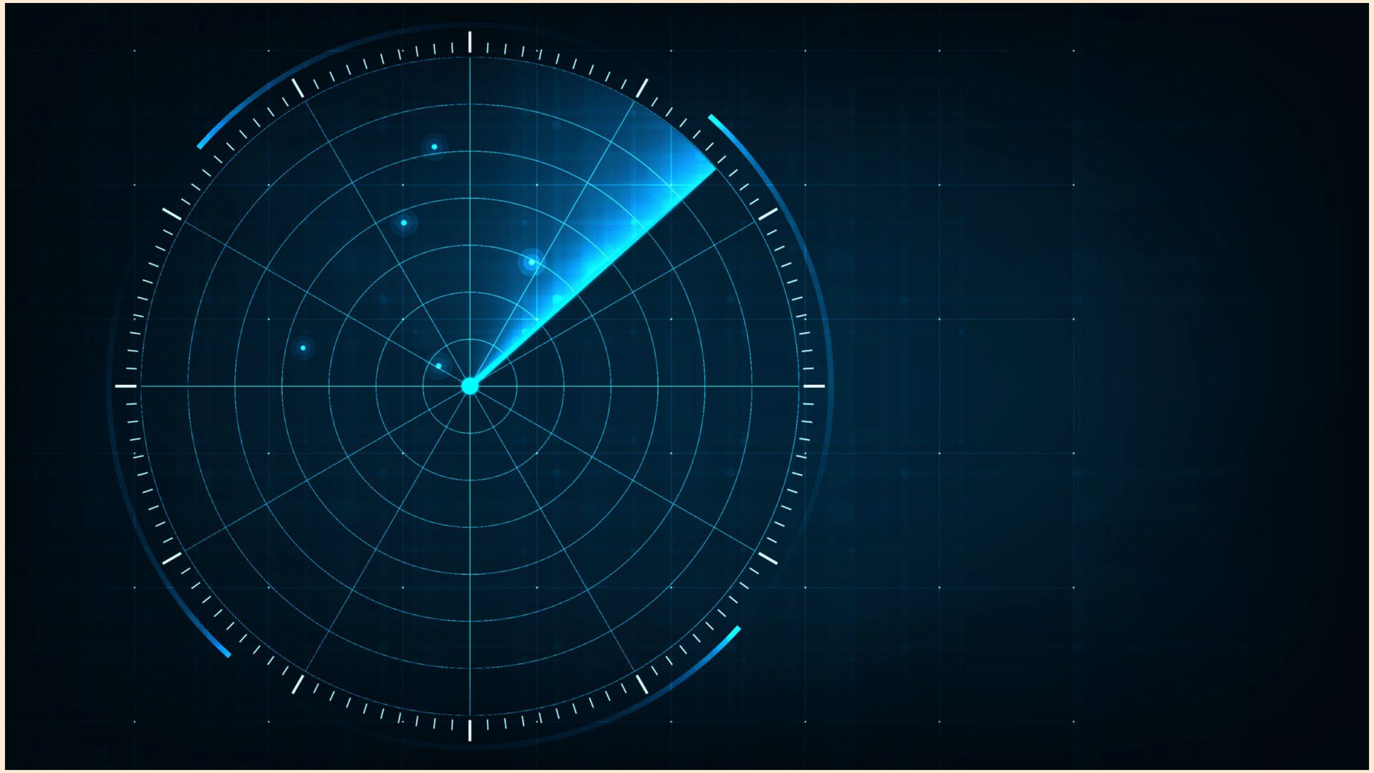
•Apart from a Bearing of objects in transit (e.g. beacons),



•Bearing of any object from an accurate Position Fix

RADAR

Characteristics and Performance



Fundamental Principles

Electromagnetic Energy transmitted in form of Radio Waves

Transmitted in PULSES

Radio Waves returning from object produce Echo on display screen

2 MAIN COMPONENTS

Scanner

Display

- Distance to any target is determined by ‘echoing’

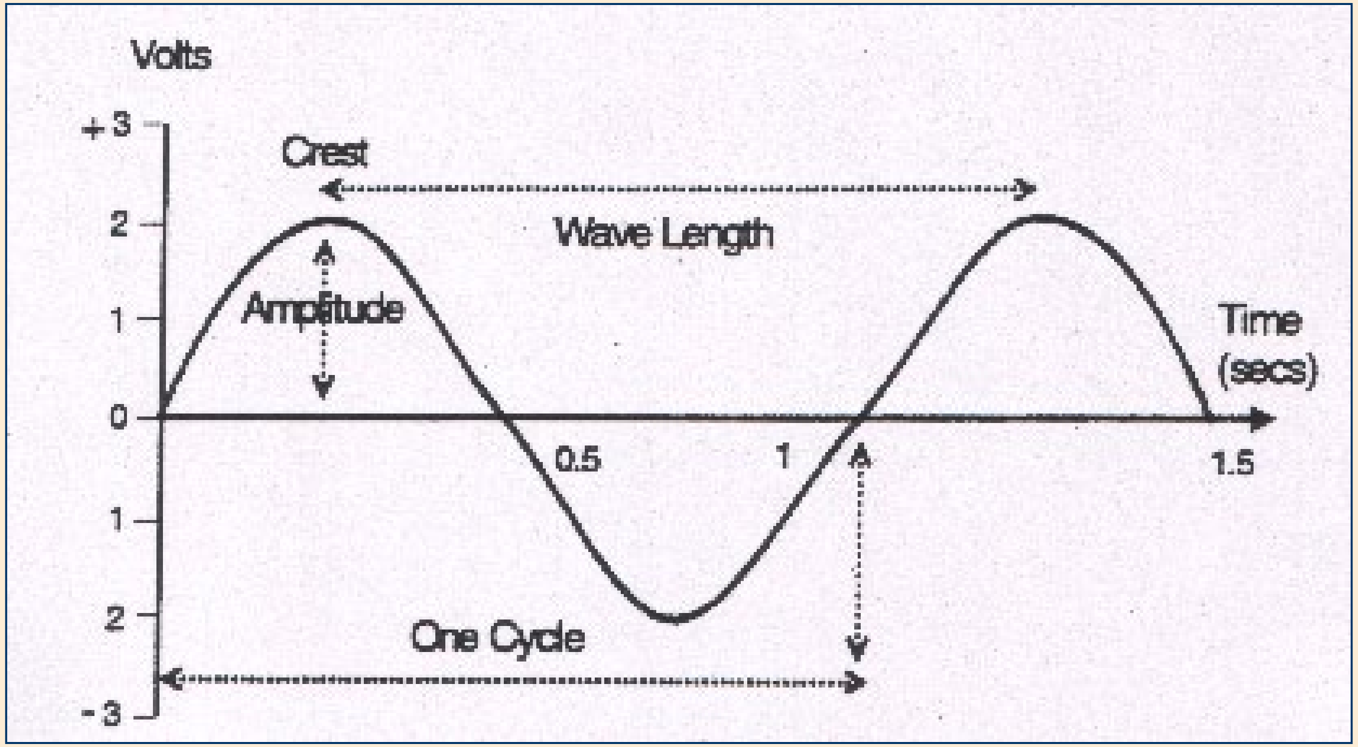
FURUNO

Electromagnetic Radio Waves travel at the speed of Light= 162,000 NM/second

(or 300 metres/1 millionth of a second)

- $\text{Range} = \dfrac{\text{Distance travelled by Radio Waves}}{2}$

RADIO WAVE CHARACTERISTICS

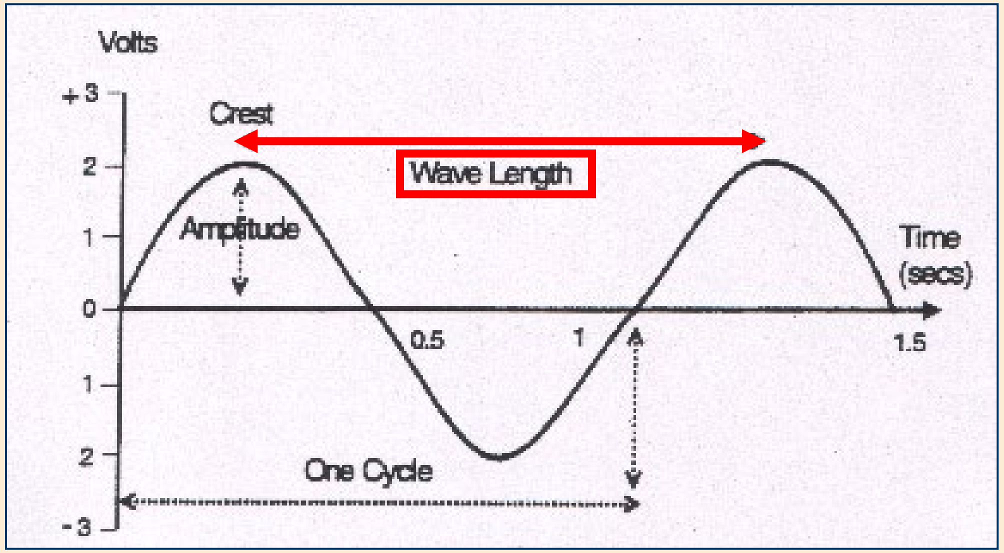


WAVELENGTH = Distance between successive crests

CYCLE = one complete oscillation

FREQUENCY = Number of cycles passing a given point per second (Hz)

FREQUENCY = **Number of cycles passing a given point per second (Hz)**



- **Radar wavelengths are either 10cm or 3cm in length**
- **10cm wavelengths are transmitted on a Frequency of 3,000 MHz**
- **3cm wavelengths are transmitted on a Frequency of 10,000 MHz**

"X" Band & "S" Band Radar

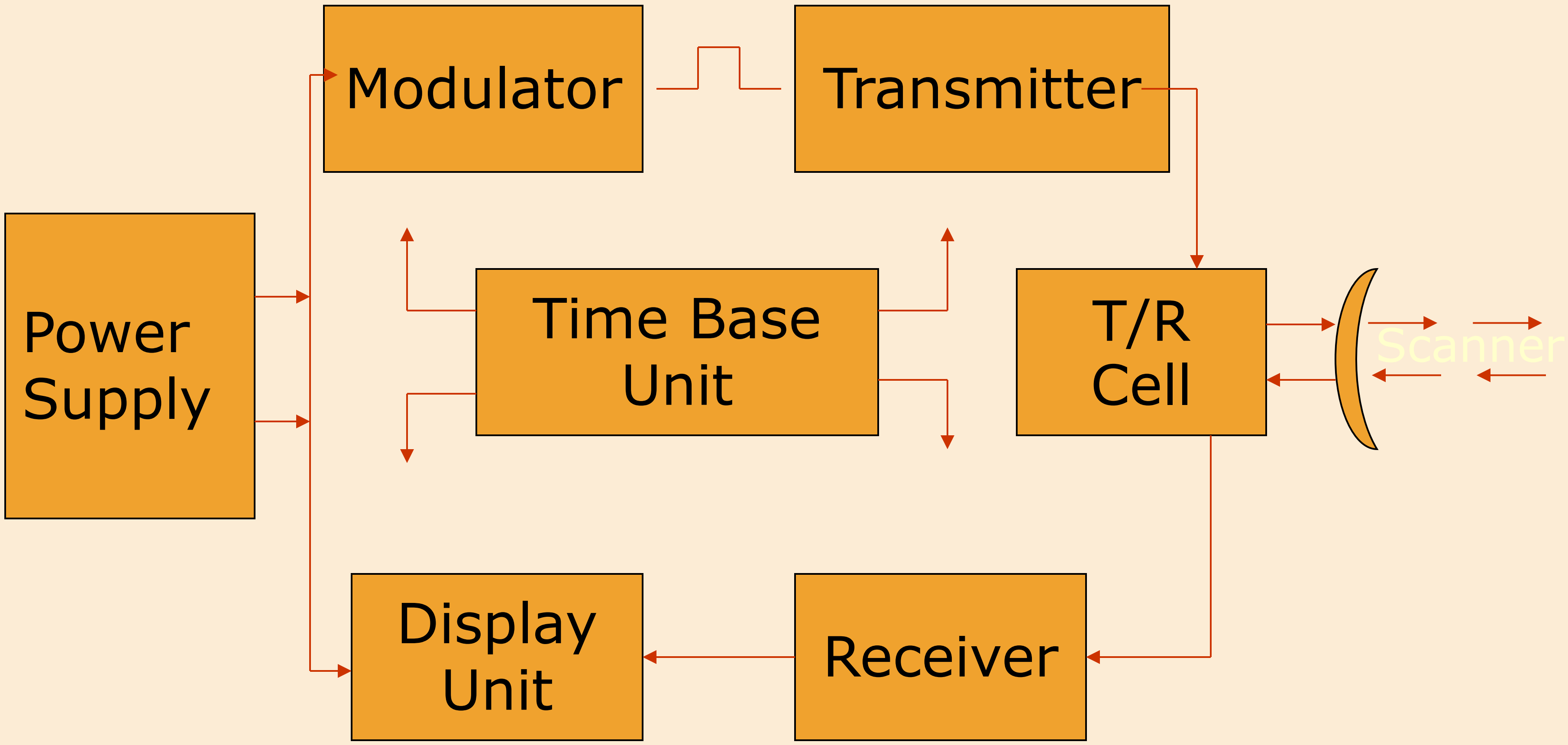
"X BAND" (3cm RADAR)

- Most common
- Smaller scanner than "S Band" to achieve desired Beamwidth & Definition
- Good for Coastal navigation due to High Picture definition and quality

"S BAND" (10cm RADAR)

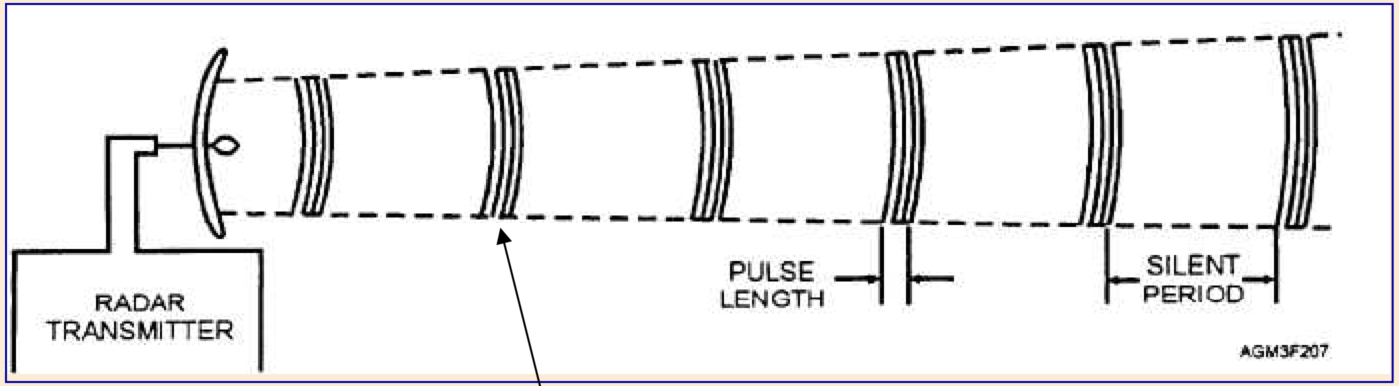
- Larger scanner required (up to 5 metres long!)
- Greater maximum range
- Greater power required
- Good for long range landfall navigation & early detection of targets for collision avoidance
- Less definition at shorter ranges

RADAR COMPONENTS



RADAR COMPONENTS

Read more about Radar components in the student handout/exercise book on pages 35 to 39



RADAR PULSE

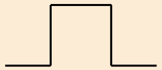
Trailing Edge

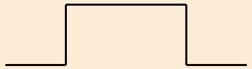
Leading Edge

- Speed of radio waves = 300,000,000 metres/second (or 162,000 N.Miles/second)

- A Pulse length is approx 1.0 micro second = **300 metres**

Pulse length

Short Pulse 

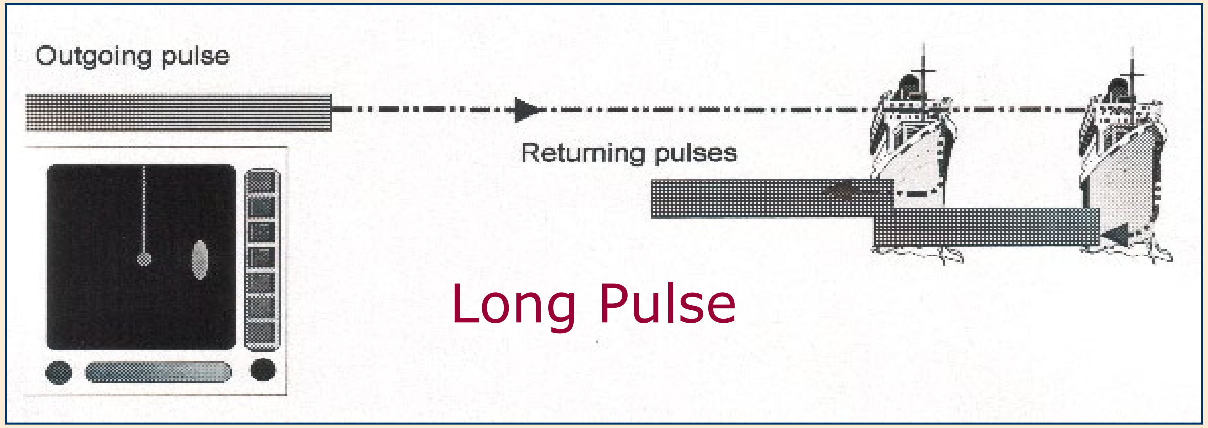
Long Pulse 

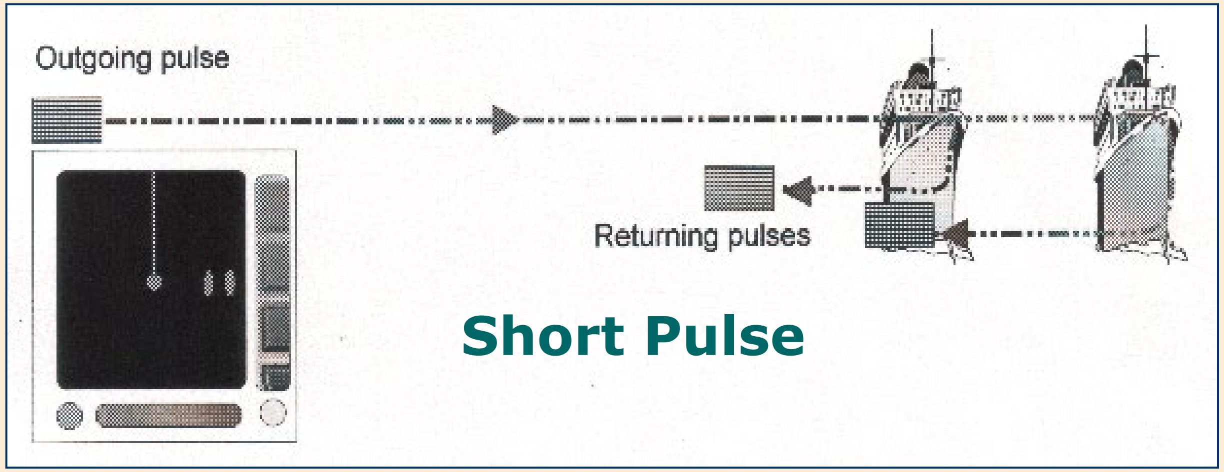
Determines:

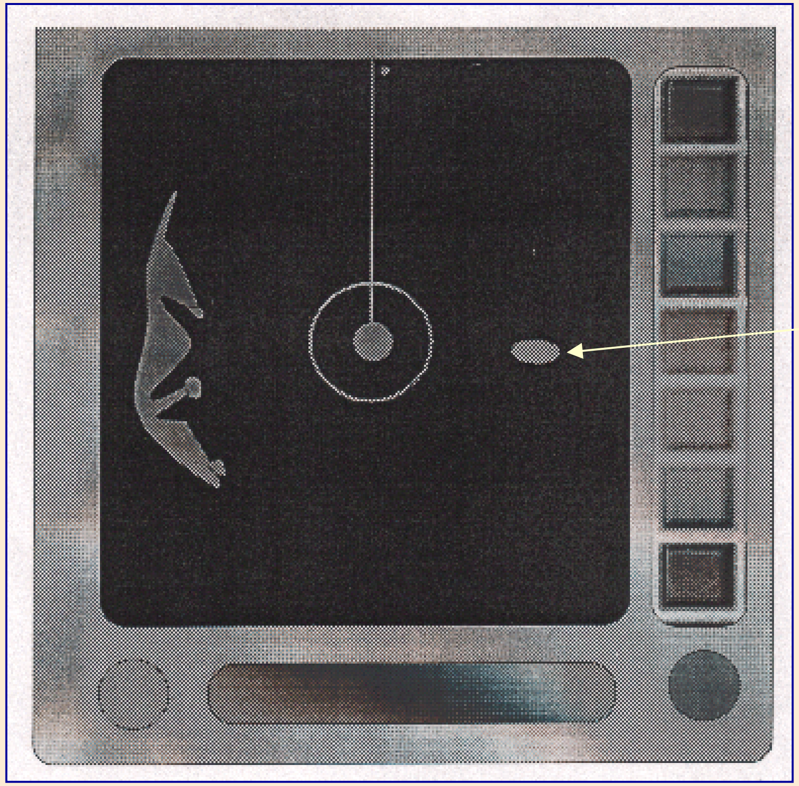
- Minimum Range
- Range Discrimination

RANGE DISCRIMINATION

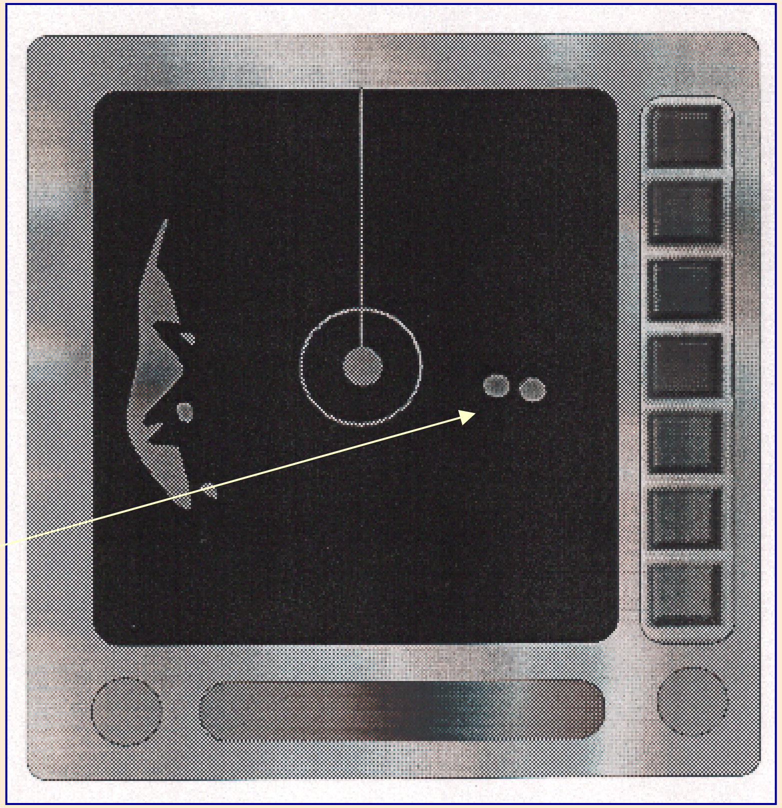
"Ability to distinguish between 2 targets on the same bearing, but at slightly different ranges"





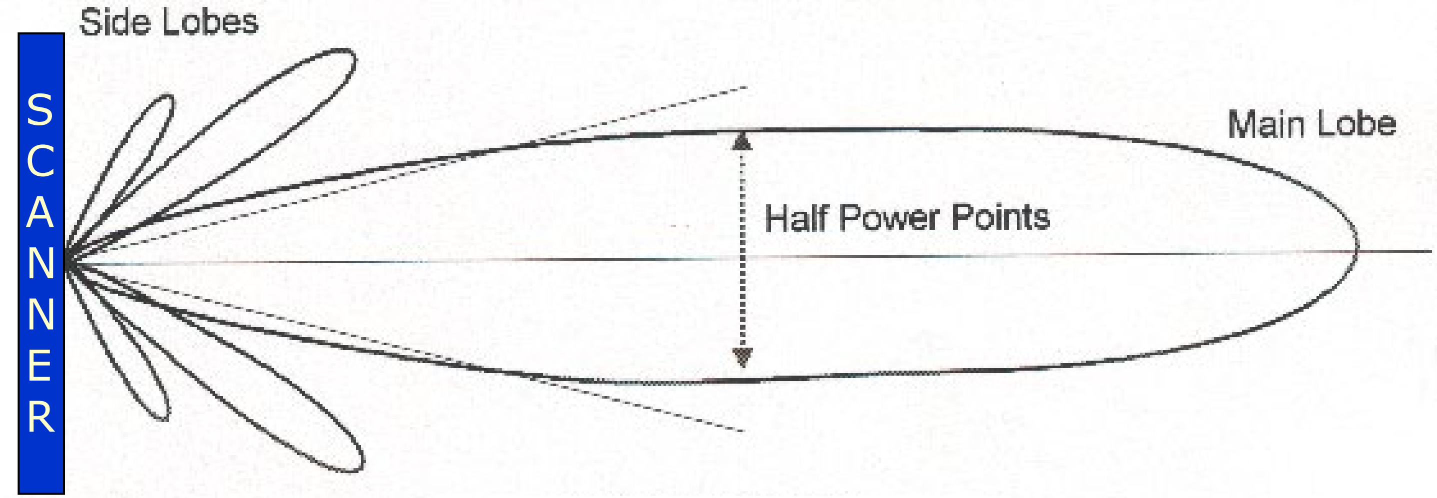


Long Pulse shows two nearby targets, on similar bearings, as one echo



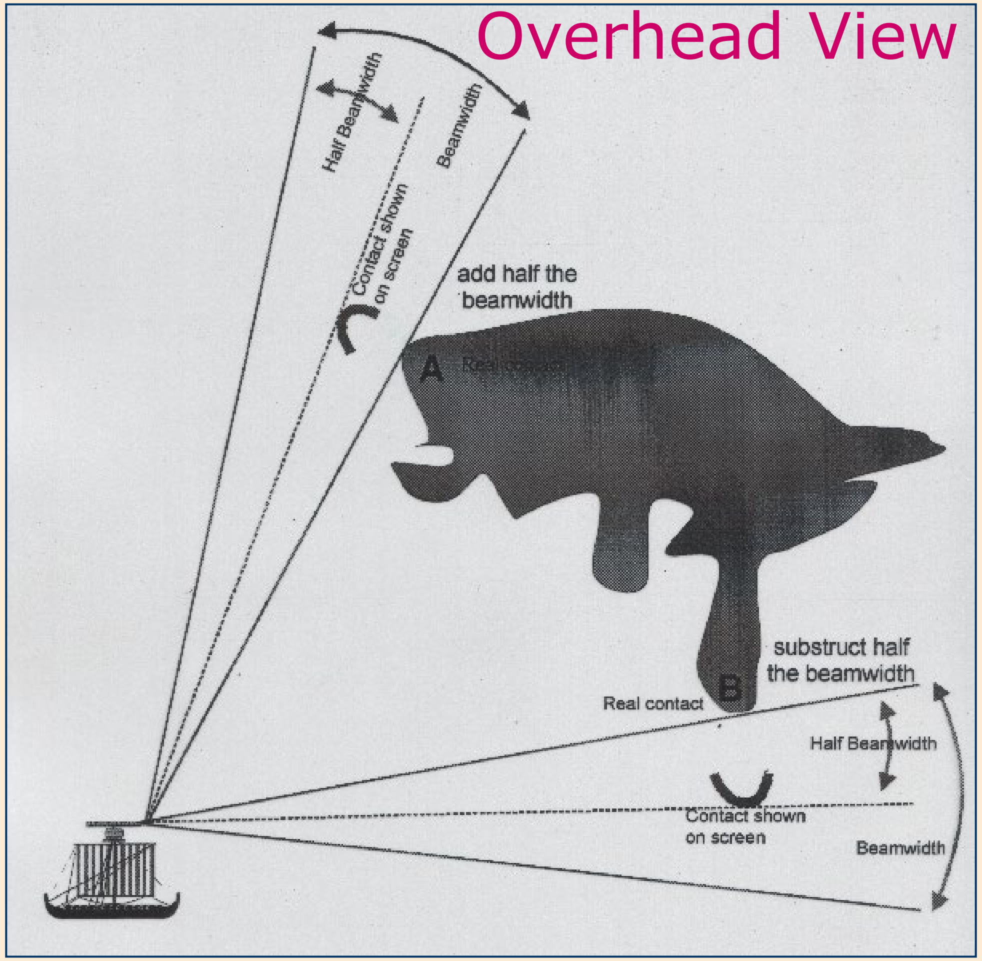
Short Pulse provides better range discrimination, and separates targets at close range

HORIZONTAL BEAM WIDTH



Overhead View

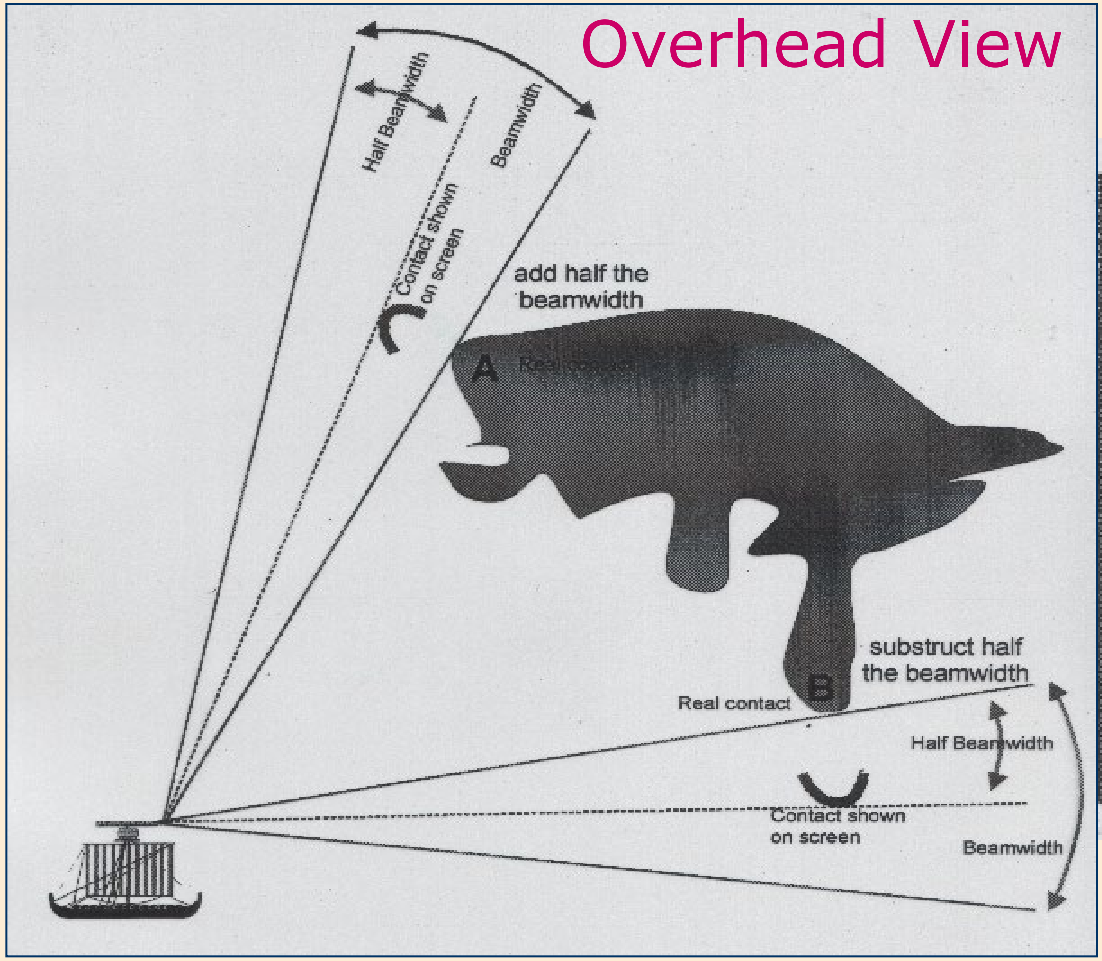
HORIZONTAL BEAM WIDTH

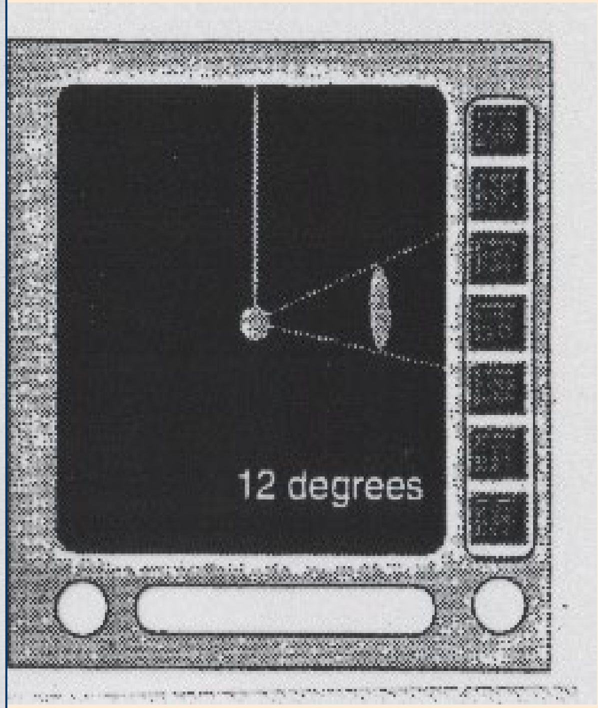


•A target echo will be appear on the screen the whole time the radar beam takes to sweep the target

•Radar Beamwidth enlarges targets - extending each side by an angle equal to half the actual beamwidth

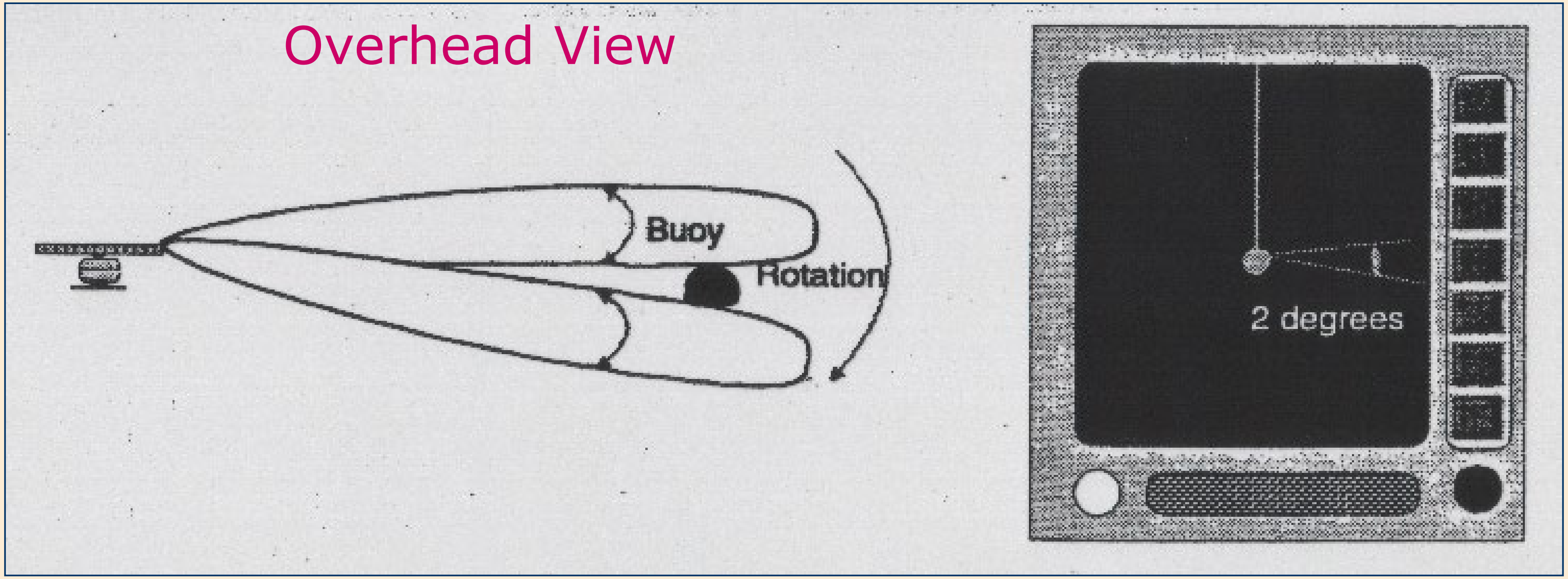
HORIZONTAL BEAM WIDTH





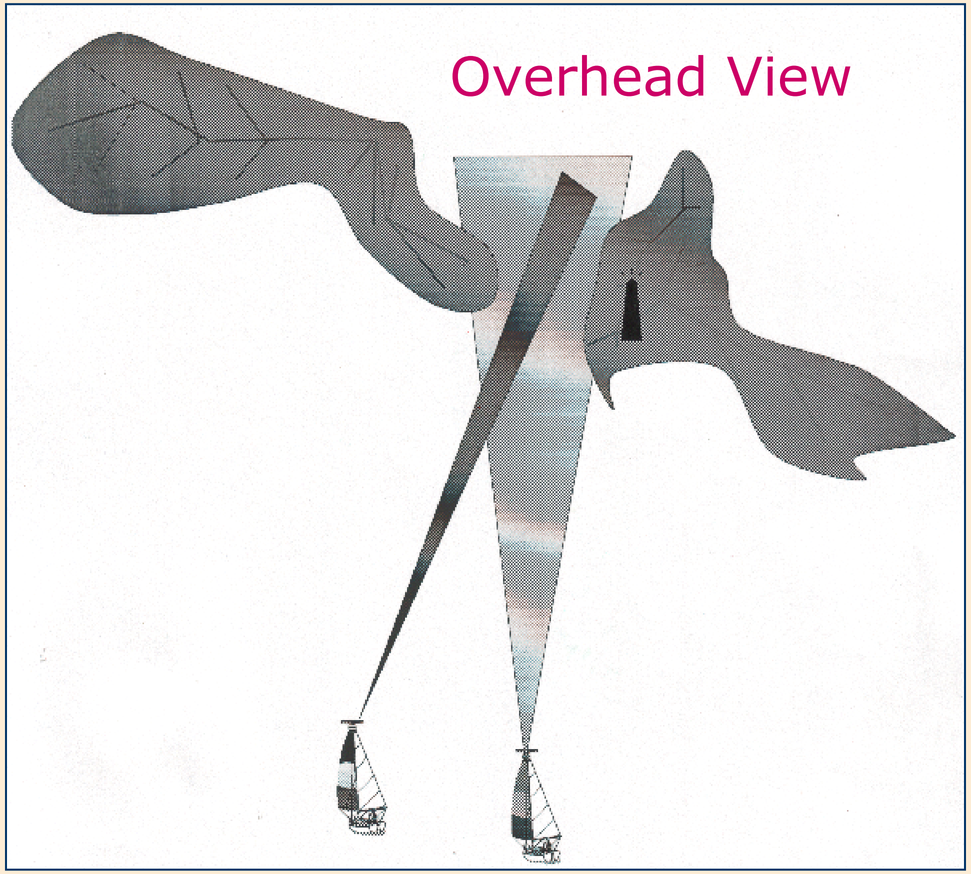
With a Radar Beamwidth of 2°, an island 10° wide will appear to extend 1° further on either side (total 12° wide)

HORIZONTAL BEAM WIDTH



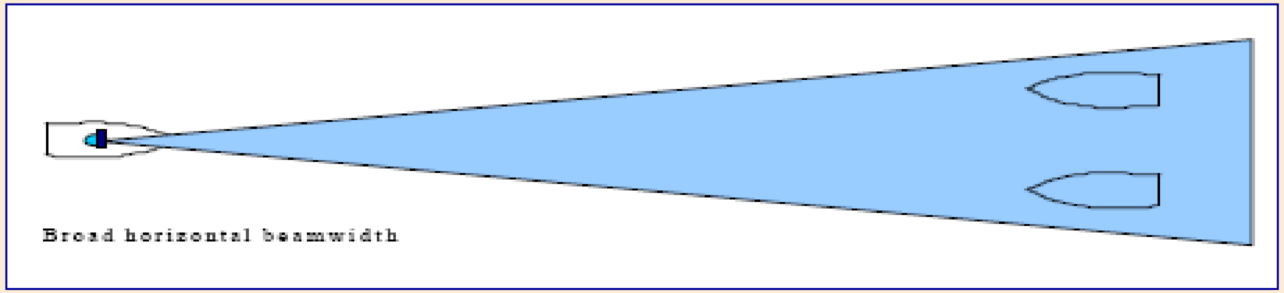
A small target ½° wide, will appear as a target 2° wide on the radar screen

HORIZONTAL BEAM WIDTH

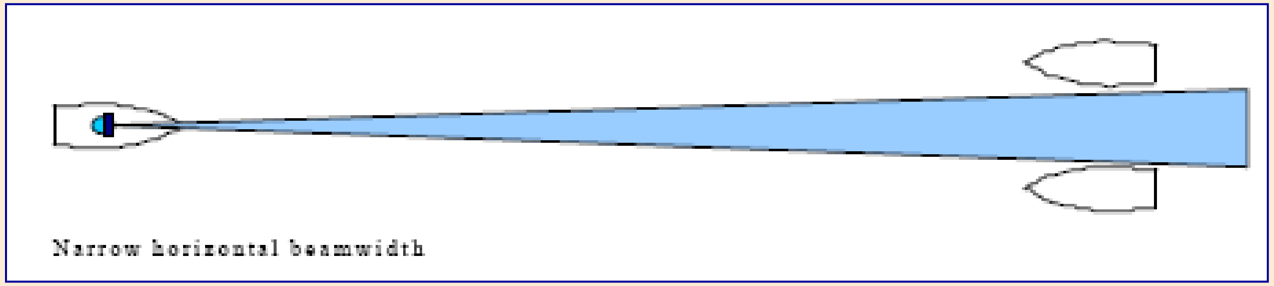


BEARING DISCRIMINATION

"Ability to distinguish between 2 targets on the same range but at slightly different bearings"

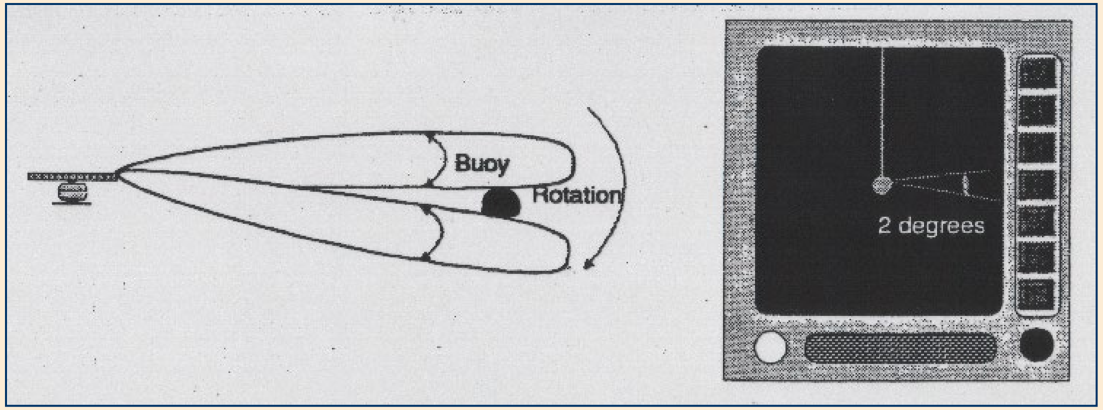


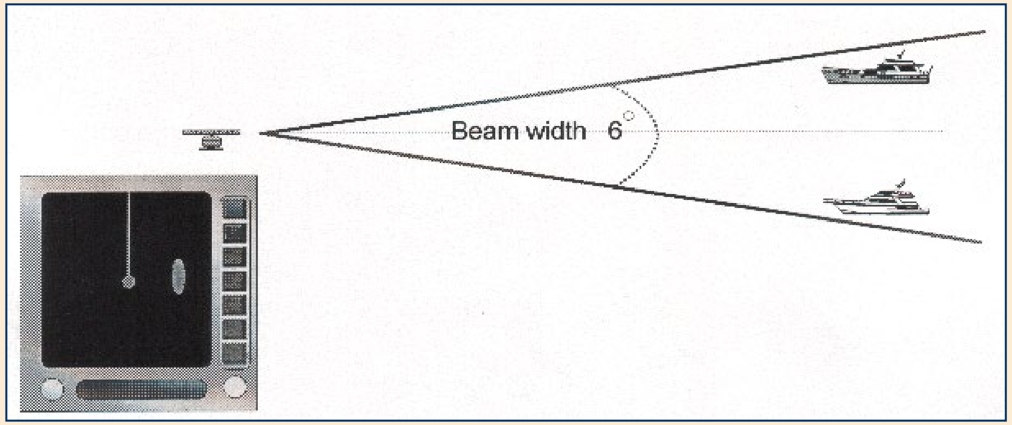
Wide Horizontal Beam Width



Narrow Horizontal Beam Width

LARGE / SMALL BEAMWIDTH



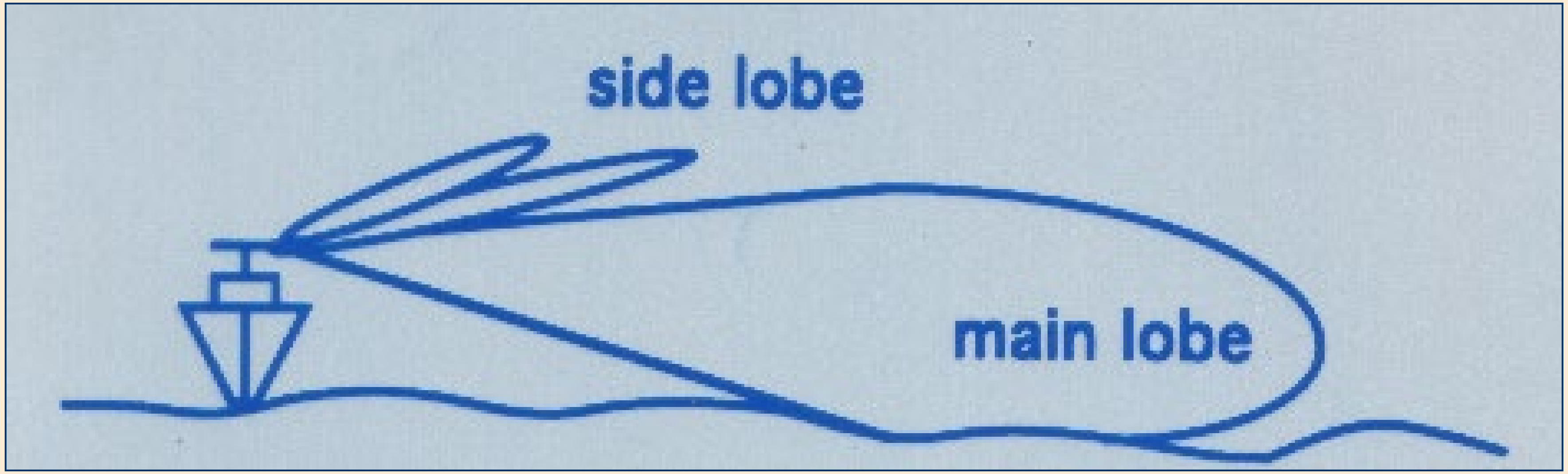


<u>Large Beamwidth</u>

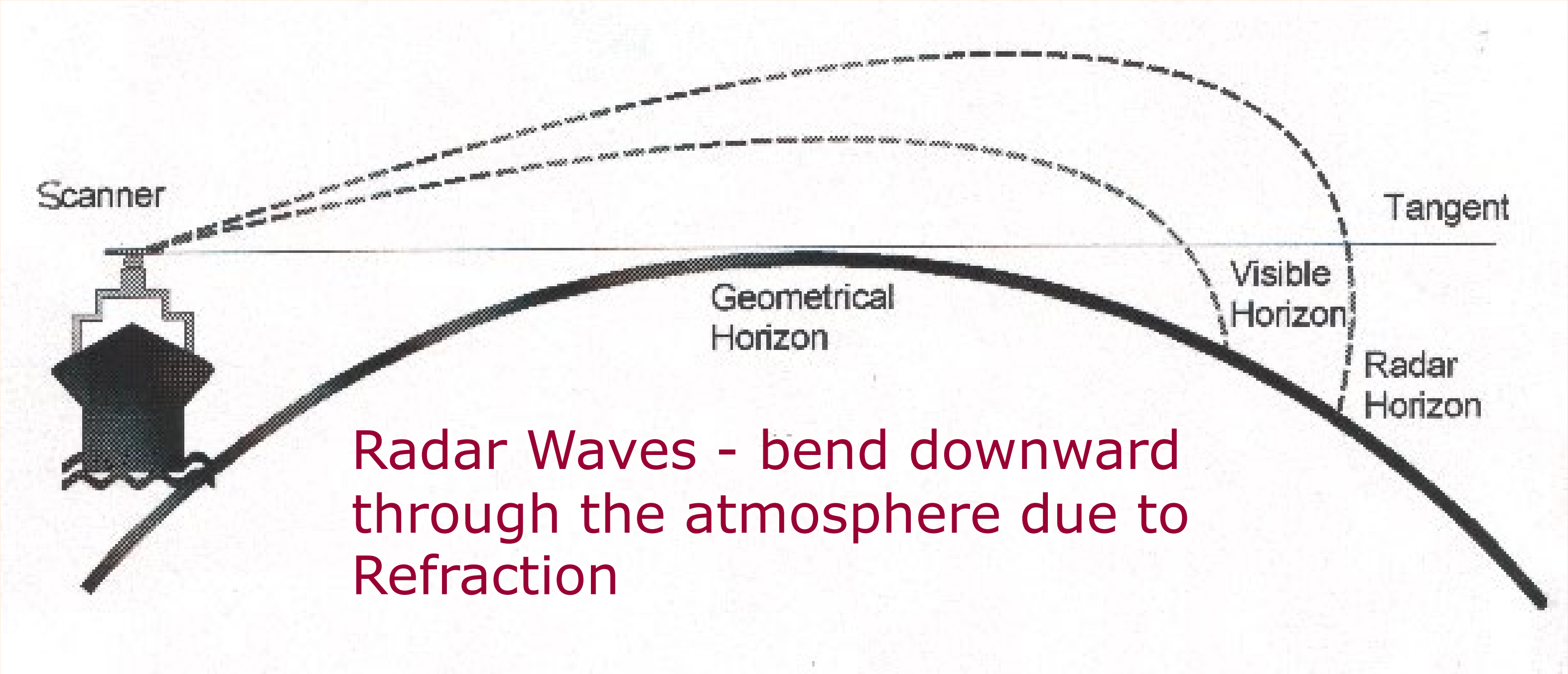
Advantage: Smaller, weaker echoes will be painted on the screen larger, hence a better chance of being detected

Disadvantage: Poor bearing discrimination

VERTICAL BEAM WIDTH

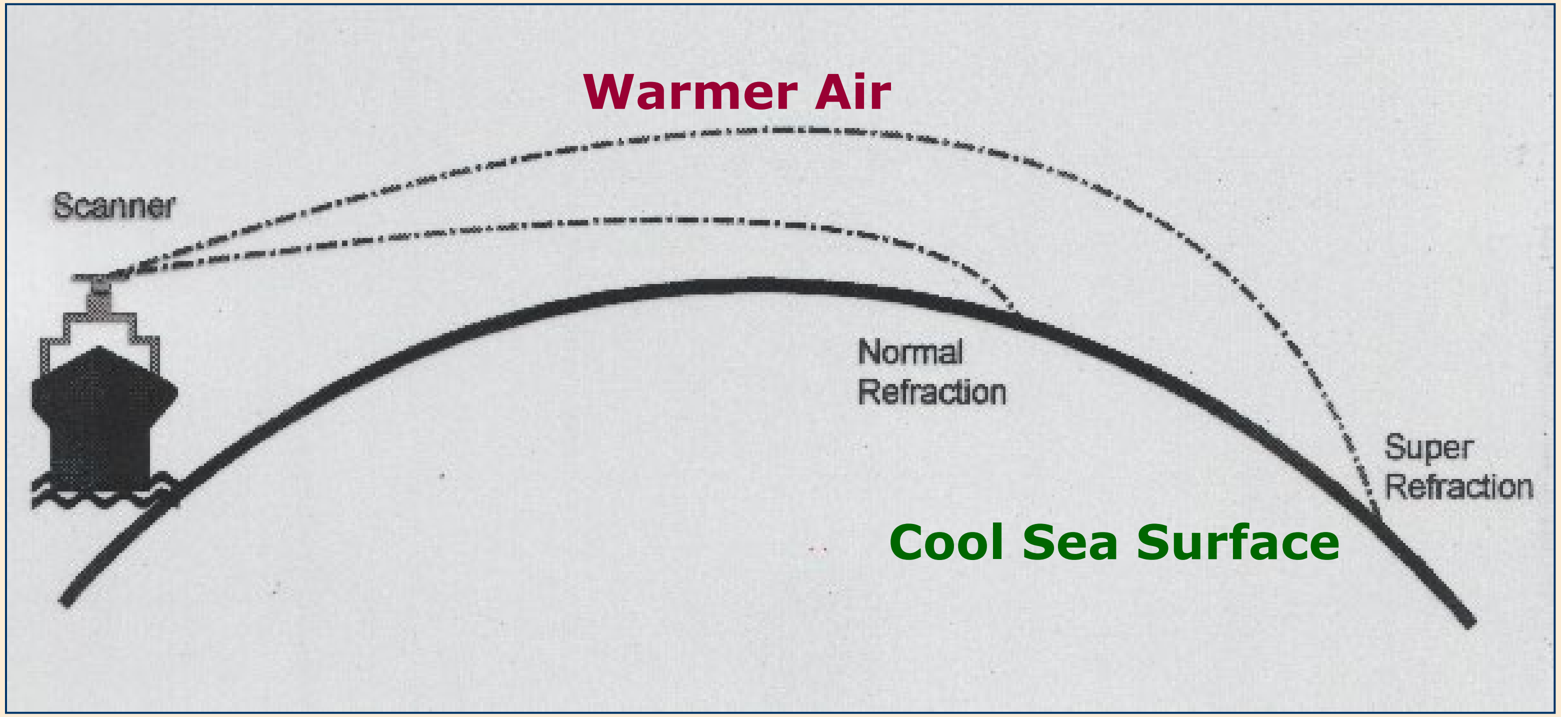


Large Vertical Beam width so as not to lose targets in rough seas due to pitching/rolling motion of vessel

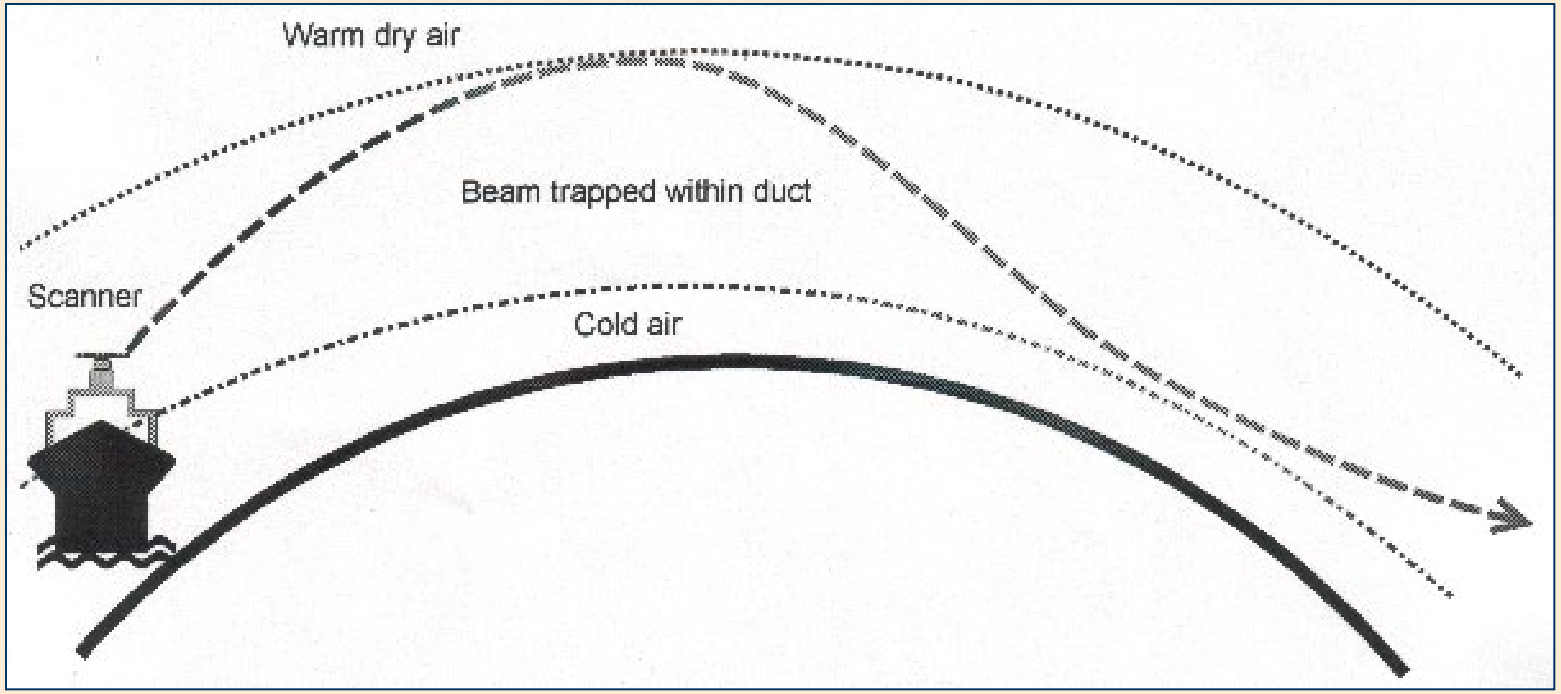


Under normal atmospheric conditions Radar Horizon is approx 6% greater than Visual Horizon

Effects of Weather
Super - Refraction

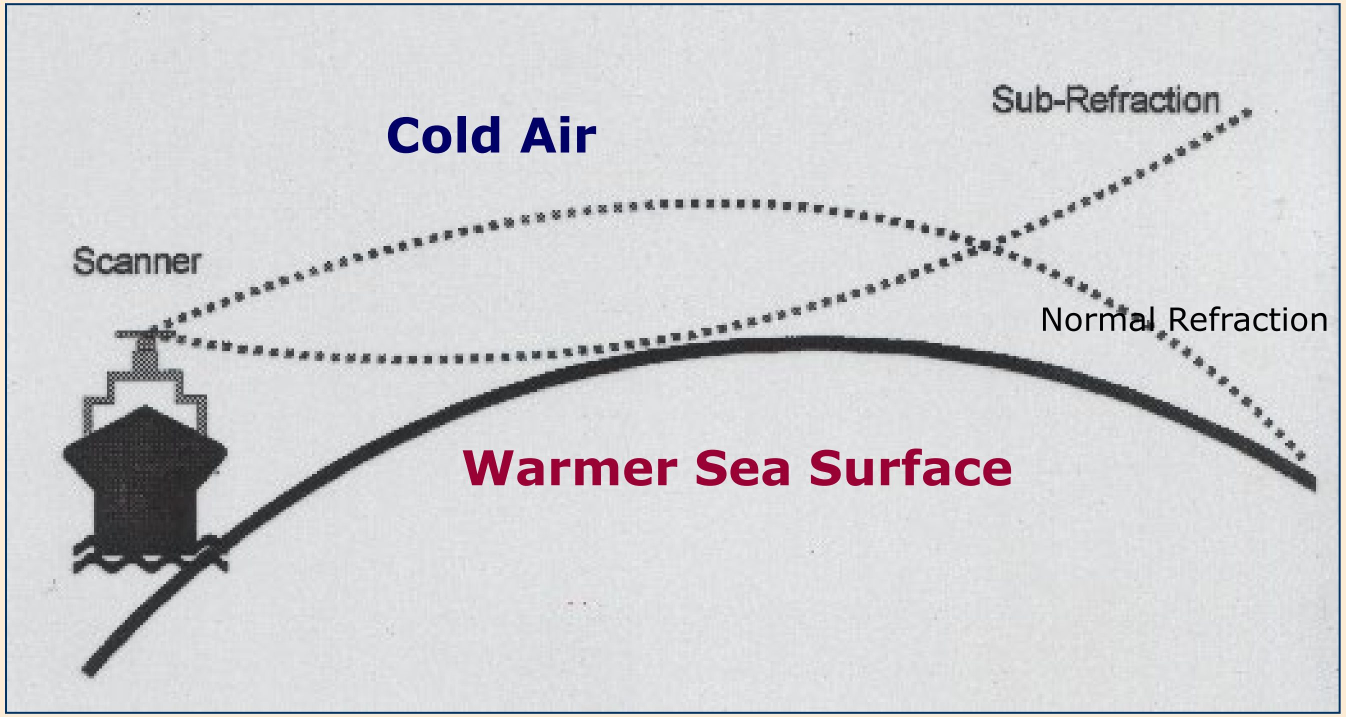


Effects of Weather
Ducting



<u>Second Trace Echoes</u> may appear from targets beyond maximum radar range

Effects of Weather
Sub-Refraction



Effects of Weather

Read more about effects of weather in the student handout/exercise book on pages 35 to 39

Distance to Radar Horizon

Distance to the radar horizon

$$\text{Range} = 2.21\sqrt{H} + 2.21\sqrt{h}$$

H = Height of Target in metres

h = Height of Scanner in metres

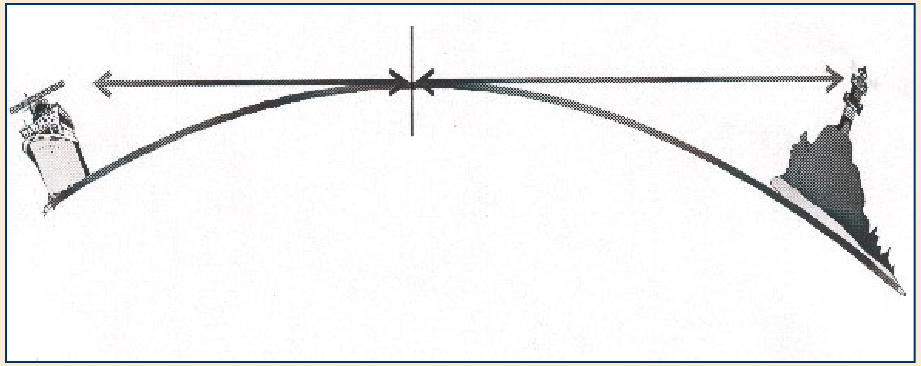
Target is 16metres above sea level, scanner height is 4 metres.

$$\text{Range} = 2.21\sqrt{16} + 2.21\sqrt{4}$$

$$= (2.21x\ 4) + (2.21x2)$$

$$= 8.84 + 4.42$$

$$= 13.3 \text{ nautical miles}$$

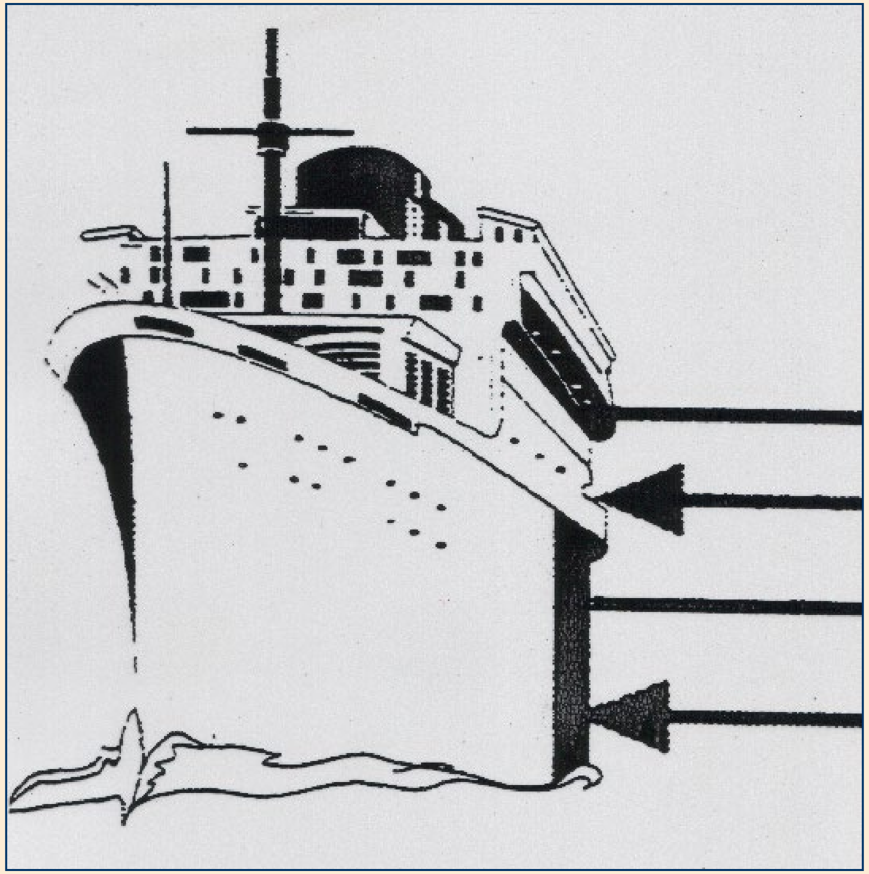


ECHO STRENGTH

- **SIZE**
- **MATERIAL**
- **ASPECT**
- **SHAPE**
- **SURFACE TEXTURE**

Target SIZE

SIZE
Material
Aspect
Shape
Surface Texture



Target MATERIAL

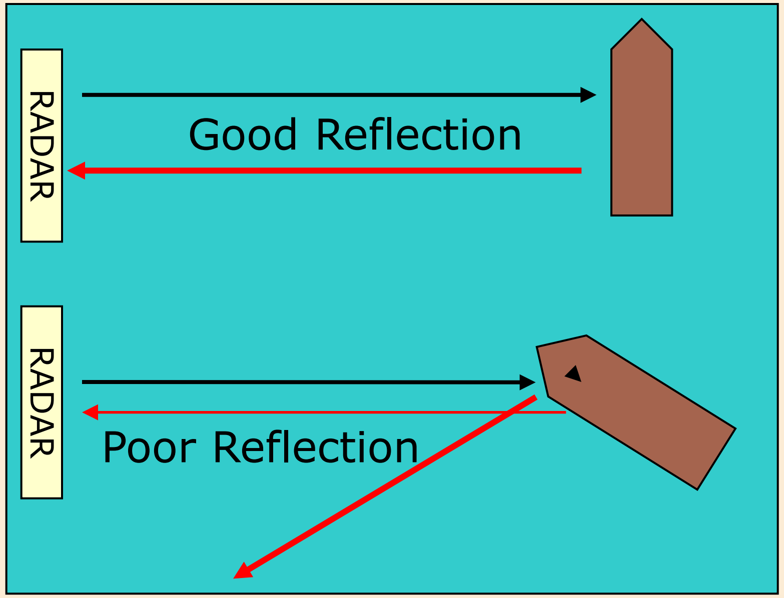
Size
MATERIAL
Aspect
Shape
Surface Texture

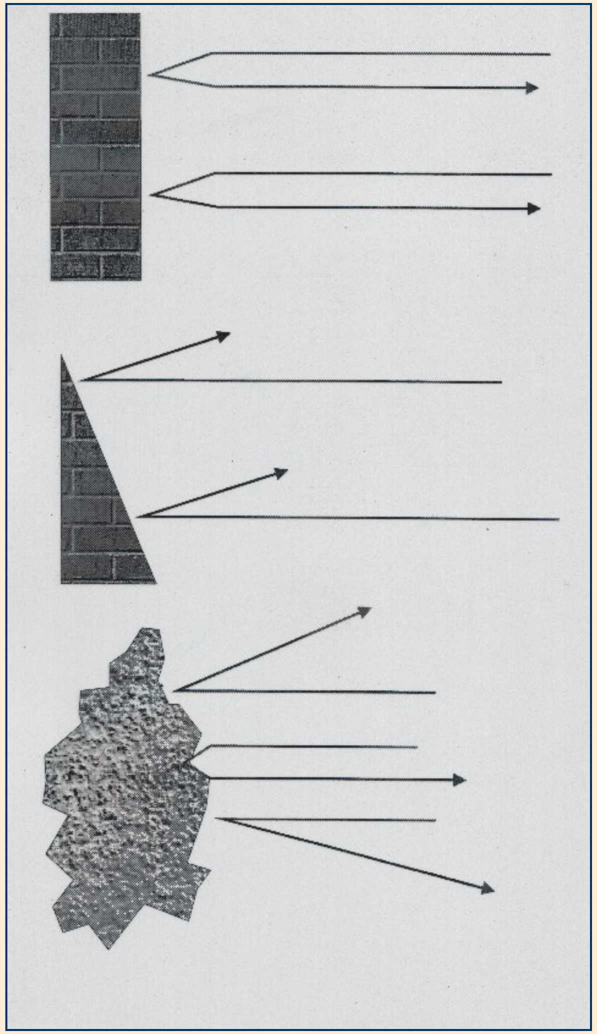
Strongest echoes:
- Metal
- Rock
- Concrete

Weak Echoes:
- Wood
- GRP/Plastics
- Sand
- Mud

Target ASPECT

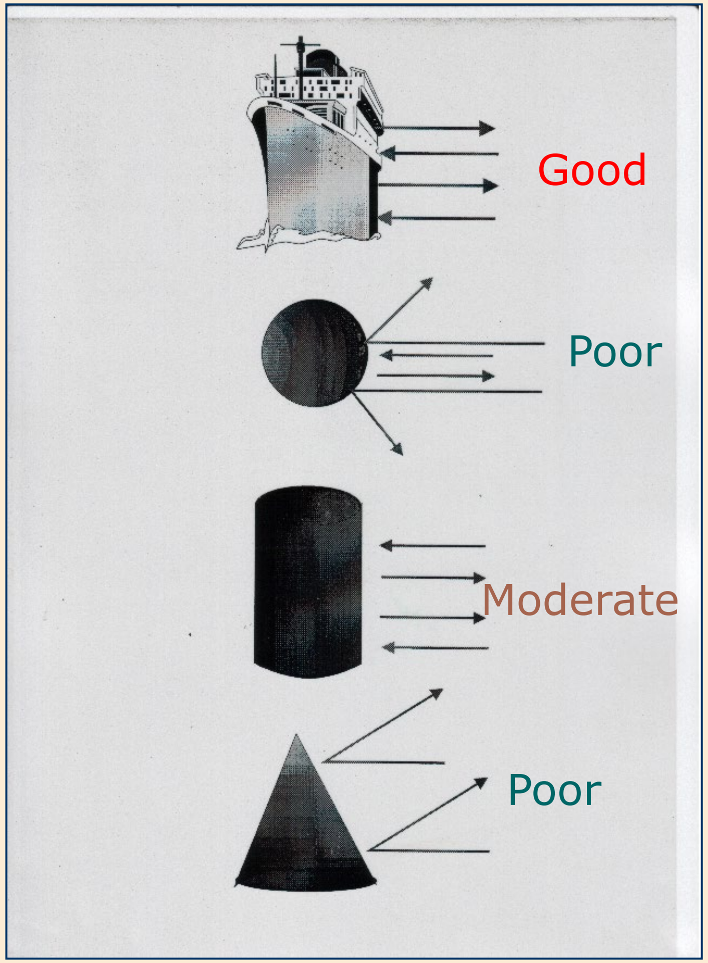
Size
Material
ASPECT
Shape
Surface Texture





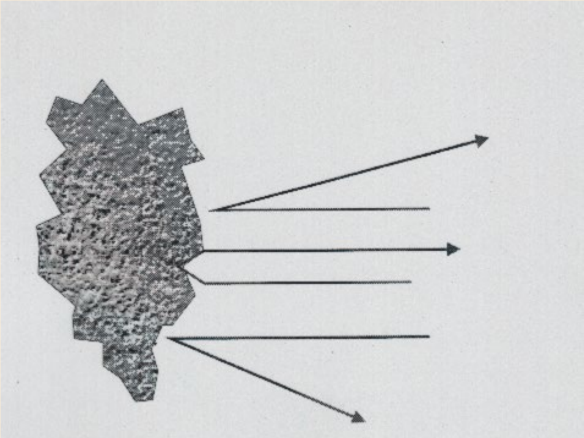
Target SHAPE

Size
Material
Aspect
SHAPE
Surface Texture



Target TEXTURE

Size
Material
Aspect
Shape
SURFACE TEXTURE

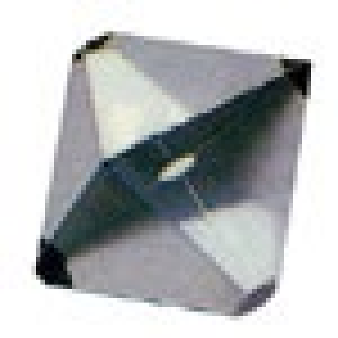


Mirror smooth surface produces very weak echo, unless perfectly aligned at right angle to radar beam

Rough surface texture scatters energy evenly – gives a fair echo at any aspect

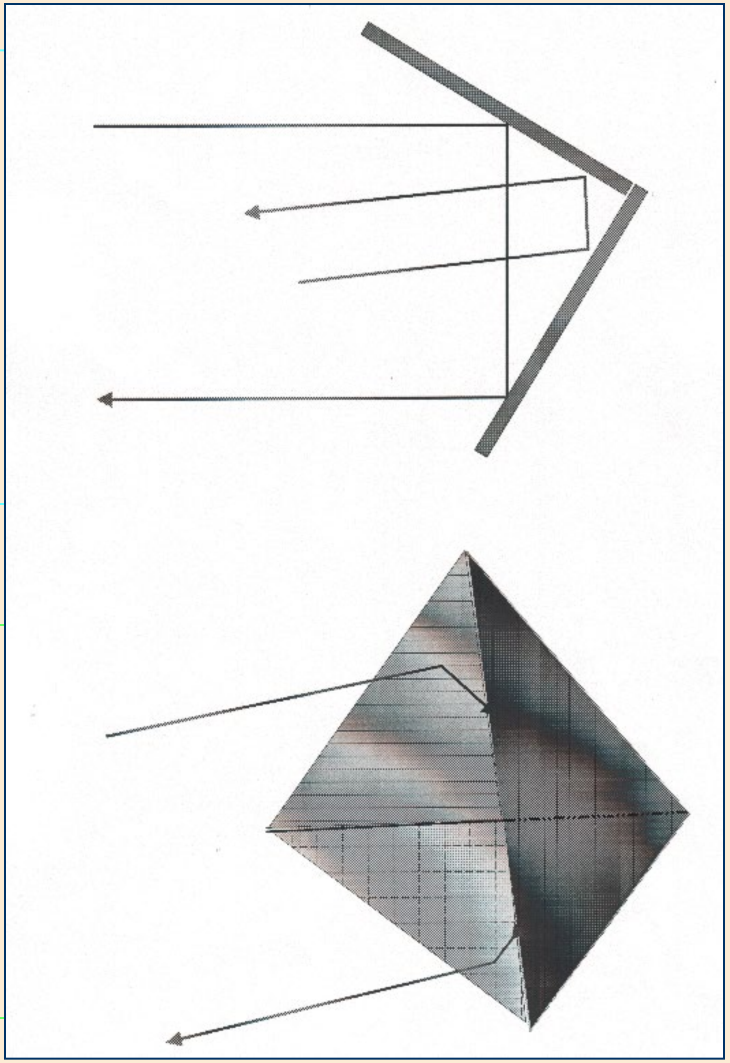
RADAR REFLECTORS

- PASSIVE



Octahedral

- ACTIVE
  - Racon
  - Ramark
  - Sart

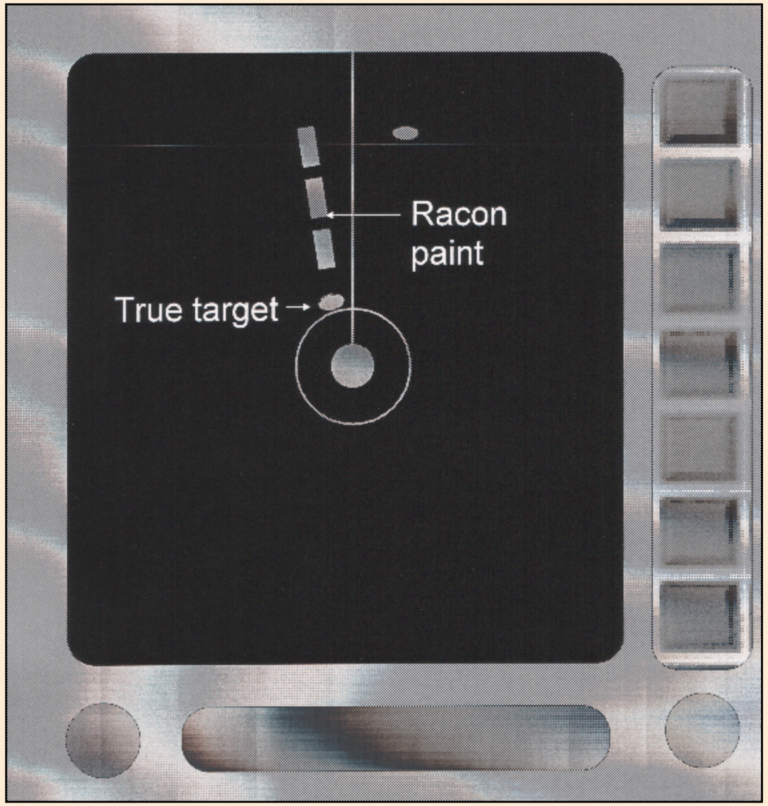


RACON

- Beacon's Morse Code letter painted on screen

- Beacon code (morse) is shown on chart

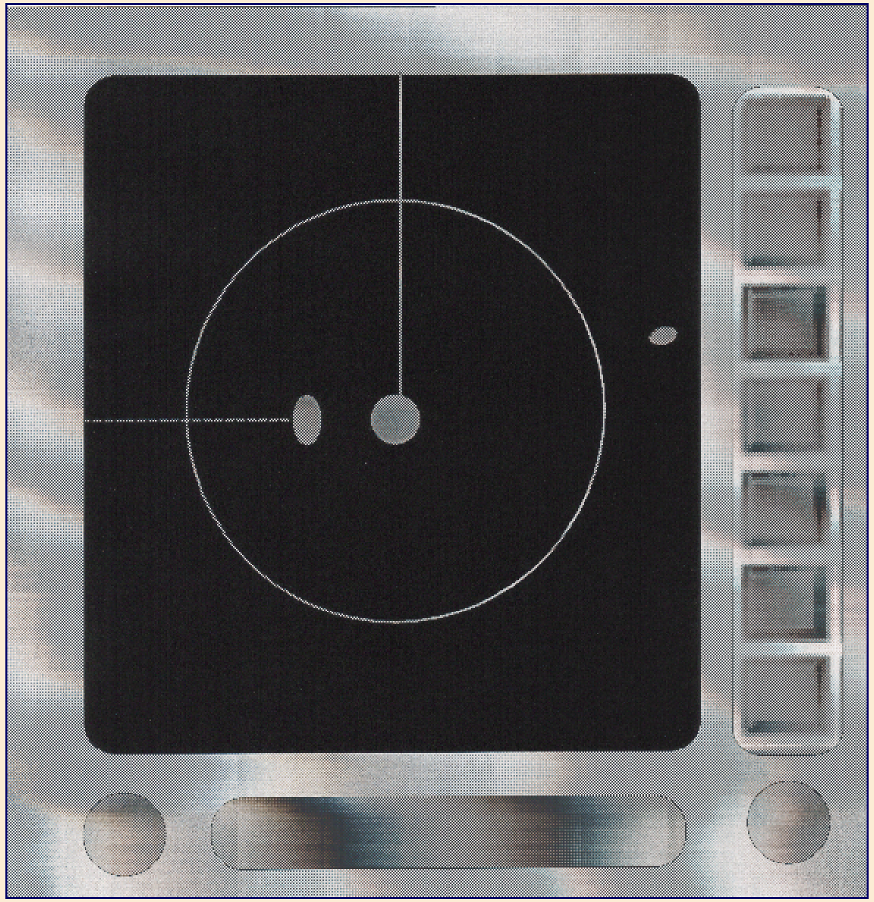
The racon signal is shown here as a long line followed by two short ones followed by a long. The signal is marked by a light blue field



Triggered by Vessel's Radar Pulse

RAMARK
(Radar Marker)

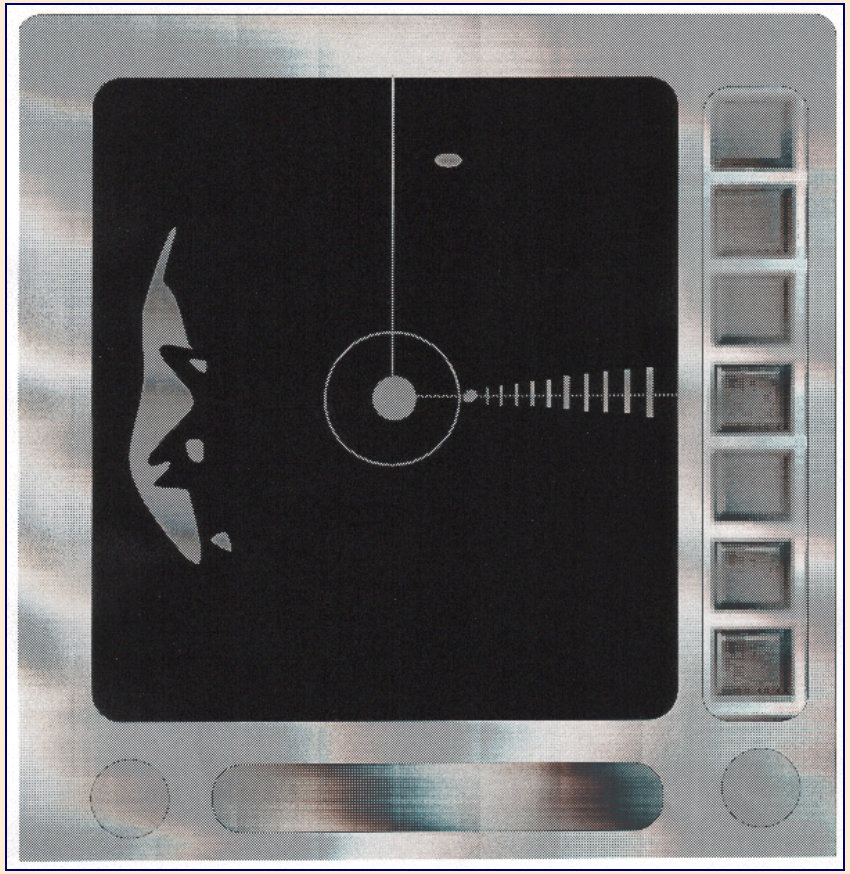
- Transmits continuous pulse
- Radial line extends from centre of beacon out to edge of screen
- Disadvantage – may mask important echoes on screen
- None in Australia



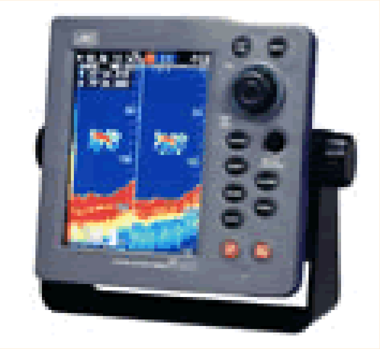
SART
(Search and Rescue Transponder)

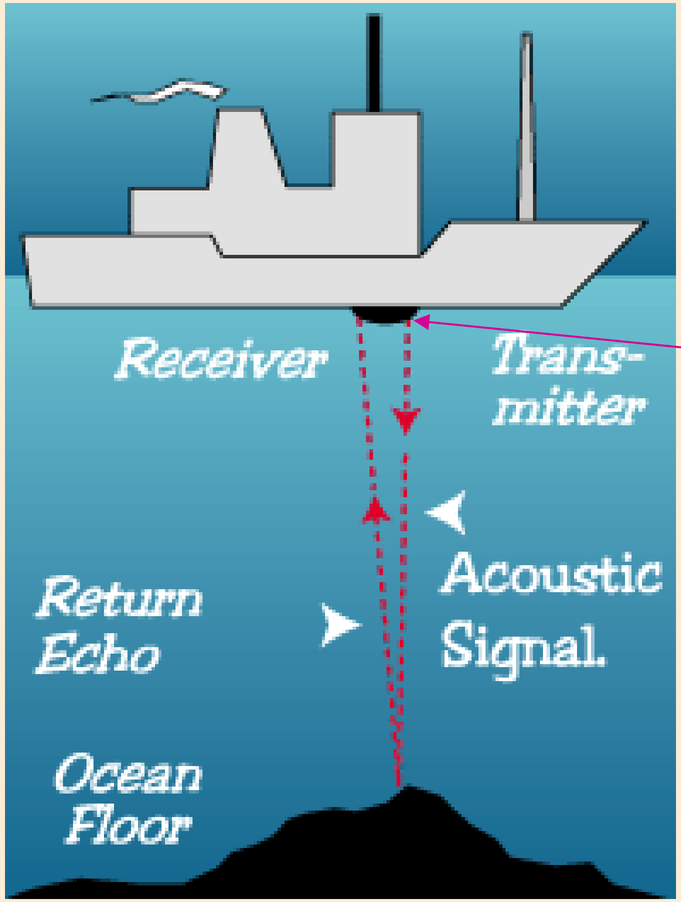
Triggered by Vessel/Aircraft Radar

-12 "blips" extend outward from SART's position along its line of bearing



ECHO SOUNDERS

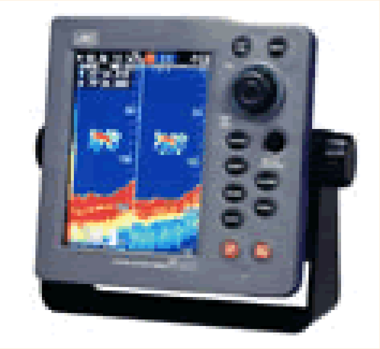


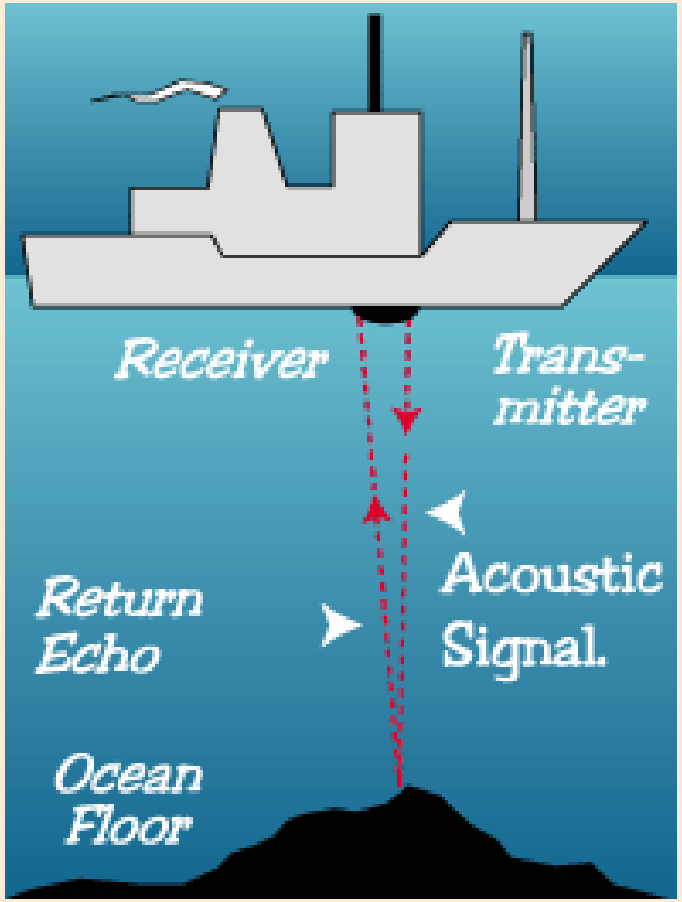


Ultra sonic signals sent downwards, and echoes received by transducer

Unit interprets and displays information on screen

ECHO SOUNDERS



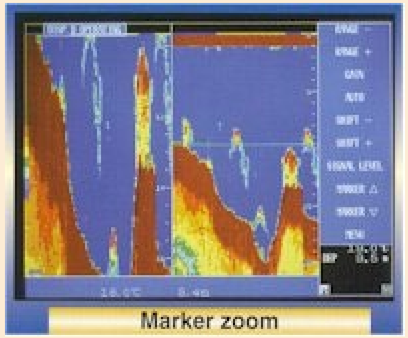


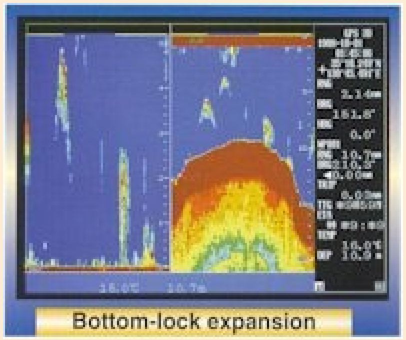
Most units can be adjusted to show actual depth of water, or depth below keel

ECHO SOUNDERS

Display screens are either colour or monochrome

Many units can display Split Screens, Bottom Lock Expansion, Marks and other operator options (Shallow/Depth alarms, Fish Alarms…)





ECHO SOUNDERS - Common Controls

• GAIN

Amplifies received signal – too much Gain causes interference ("noise" on screen)

• RANGE

Selects maximum depths – Zero always on top of screen – *(if no depth reading seen on screen, increase range)*

• RANGE PHASING

Provides a "window" which can be moved down or up throughout the water column without changing scale

- *Screen (Picture) Advance Speed*
- *METRE/FATHOM Selection*
- *DEPTH ALARMS (Shallow/Deep)*
- *Digital Depth readout*
- *Fish Alarm*
- *Zero/Draught adjustment*

ECHO SOUNDERS – Bottom Interpretation

Intensity of echo varies with bottom composition, water depth, frequency, sensitivity

SMOOTH BOTTOM – usually Sand or Mud

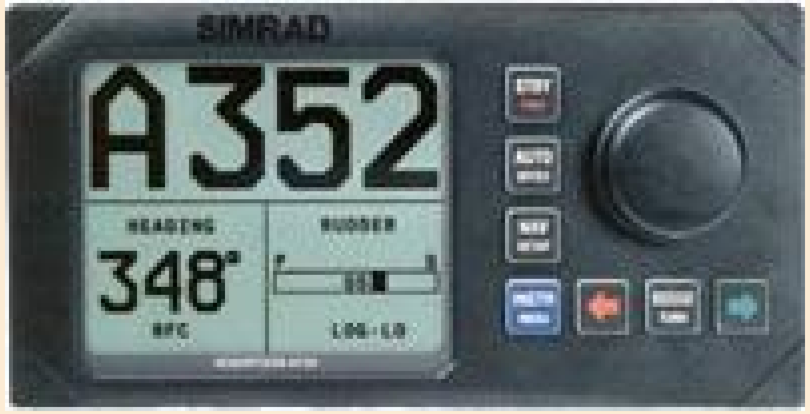
RUGGED BOTTOM – generally Coral or Rock

HARD BOTTOM

– Can cause 2^{nd} and 3^{rd} (Multiple) Echoes

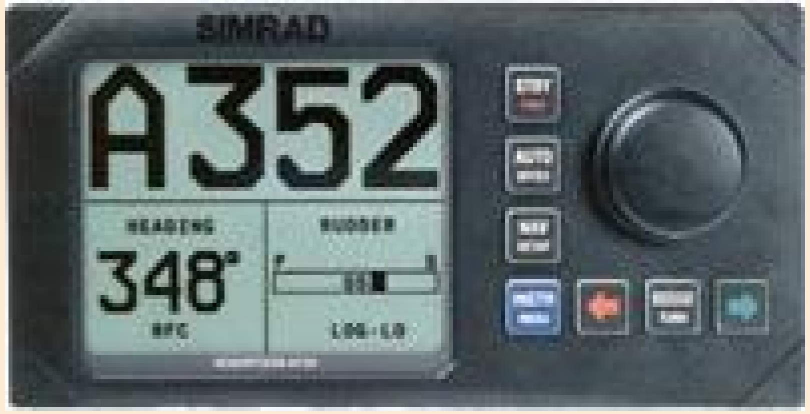
- Pulses are reflected number of times between seabed and vessel hull
- Remedy: Reduce sensitivity

AUTO PILOT



All watchkeepers must know how to Engage & Disengage the Auto Pilot (“Stand-by” switch)

AUTO PILOT



- Steers vessel along course with minor fluctuations, over long periods of time
- Can steer straighter than helmsman
- Able to be interfaced with other electronic navigational equipment – **<u>USE EXTREME CAUTION</u> – SAFER NOT TO INTERFACE WITH GPS/PLOTTER -** Can lead to complacency – strict navigational watch must be maintained at all times

AUTO PILOT - Controls

“STANDBY”

Engages/Disengages autopilot

“RUDDER”

Amount of rudder angle to maintain course

“COUNTER RUDDER”

Counteracts tendency of vessel to overshoot course setting

“WEATHER”

To desensitize off-course setting in rough weather

“TRIM/BIAS/WEATHER HELM”

To give more helm on one side than the other (i.e. side wind)

AUTO PILOT - Some Rules

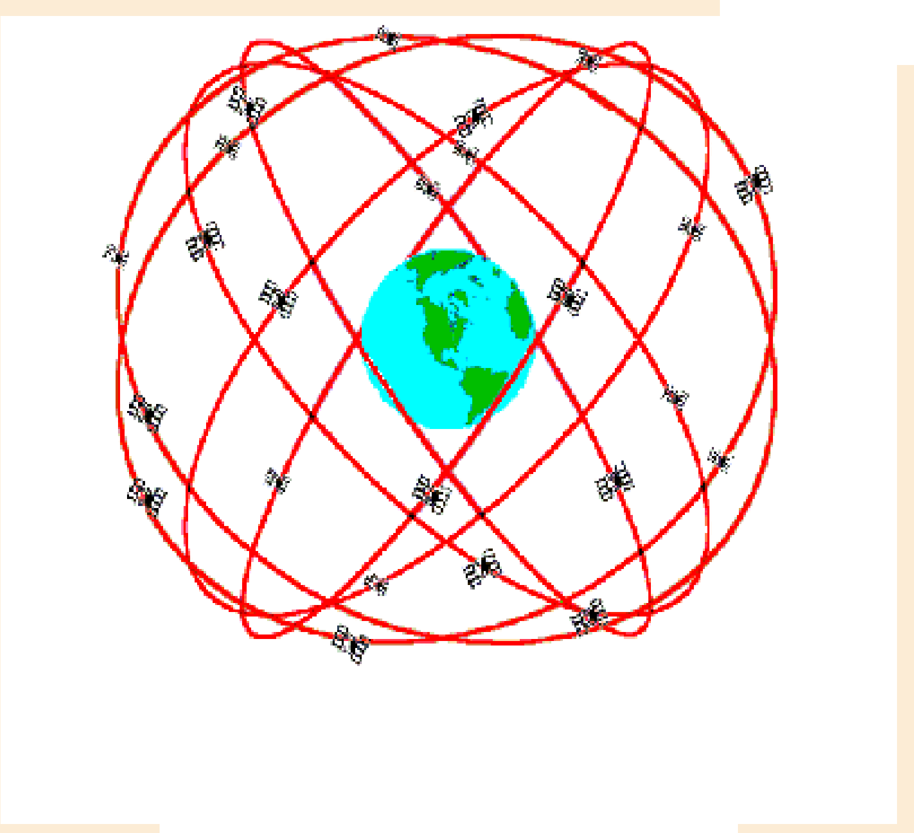
DO NOT USE AUTO PILOT:

- Within harbour limits
- In any close-quarters situation
- For Course alterations greater than 20°
- In Heavy weather
- In Heavy traffic density
- In Fog/poor visibility
- Close to navigational dangers (reefs, rocks, beacons)

GPS - PLOTTER

GPS - How does it work?
How accurate is it?

GPS - Some Facts



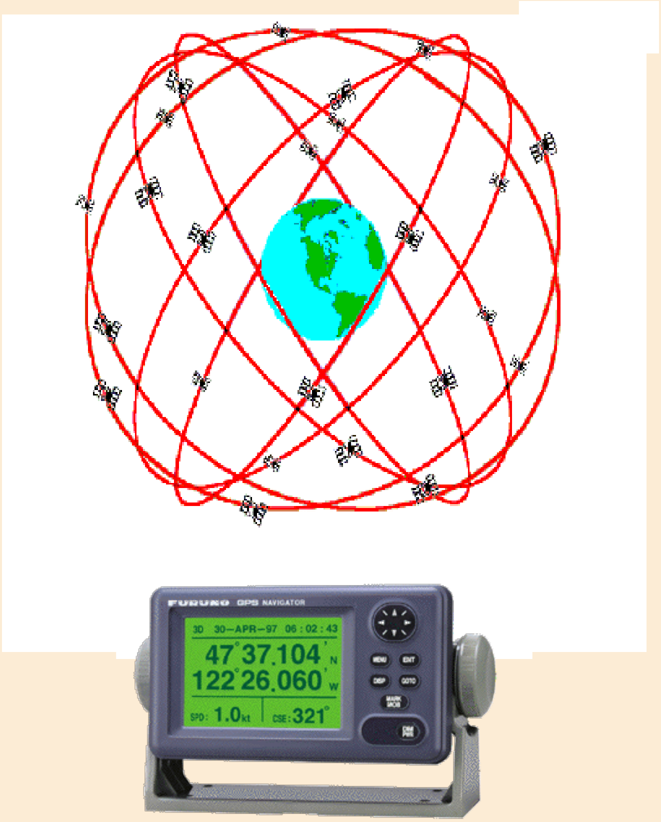
20,000 km above Earth

12 hour orbits

There are currently 31 operational Global Positioning System (GPS) satellites in orbit, according to the Federal Aviation Administration. These satellites are maintained and operated by the U.S. Department of Defense. A minimum of 24 satellites are required for global coverage, but the constellation can accommodate up to 32, with 31 typically operational at any given time.

GPS - How does it work?

•GPS Position obtained by "Satellite Ranging"



GPS Receiver requires:

Distance to Satellite

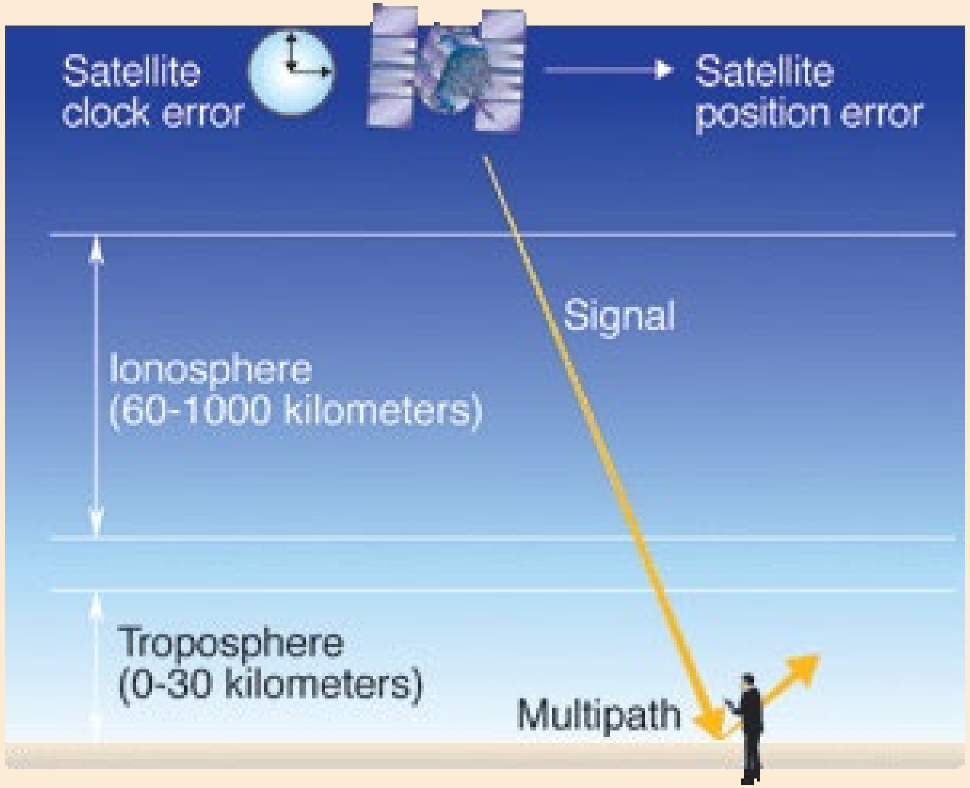
(Calculated by measuring time taken for radio signal to travel from satellite to receiver)

Position of Satellite

(Continuously broadcast by Satellite)

GPS - Errors

- Satellite Clock Error
- Satellite Orbital Error
- Atmospheric Delay
- Multi Path Signals
- Poor Geometry (HDOP)



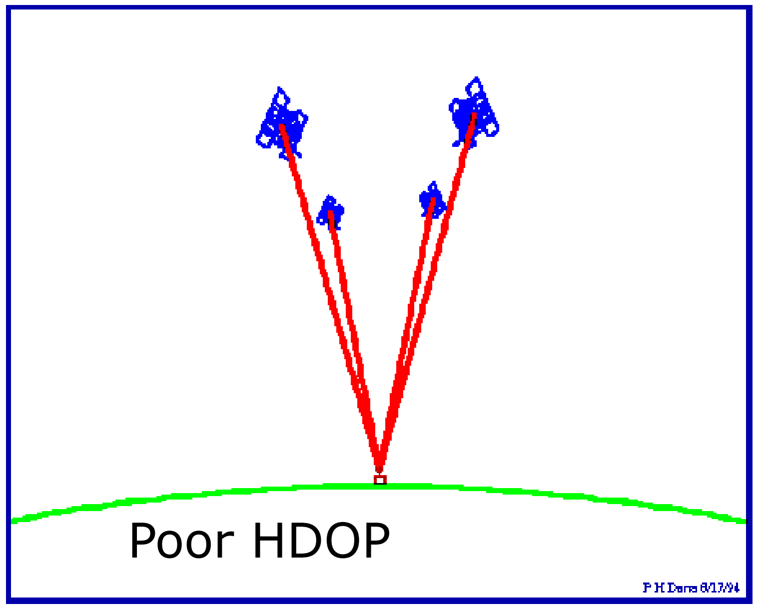
GPS - Accuracy

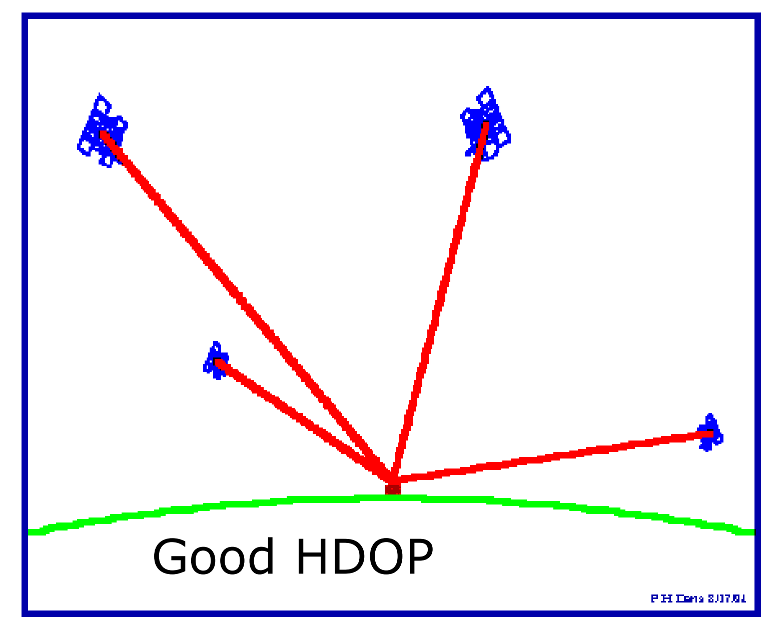
- GPS position calculated by <u>triangulation</u>
- The better the Satellite spread, the better the Position Fix
- **<u>HDOP</u>**

  (Horizontal Dilution of Precision)

  = Accuracy of Position Fix

  - *HDOP values higher than "6" are not acceptable*
  - *The <u>lower</u> the HDOP number, the <u>more accurate</u> the Position Fix **(2 - 3 = good fix)***





ELECTRONIC CHARTS AND PLOTTERS

Input from GPS

Ensure correct <u>Datum Offset</u> is being used if required otherwise your position will NOT be as indicated on the Electronic Chart

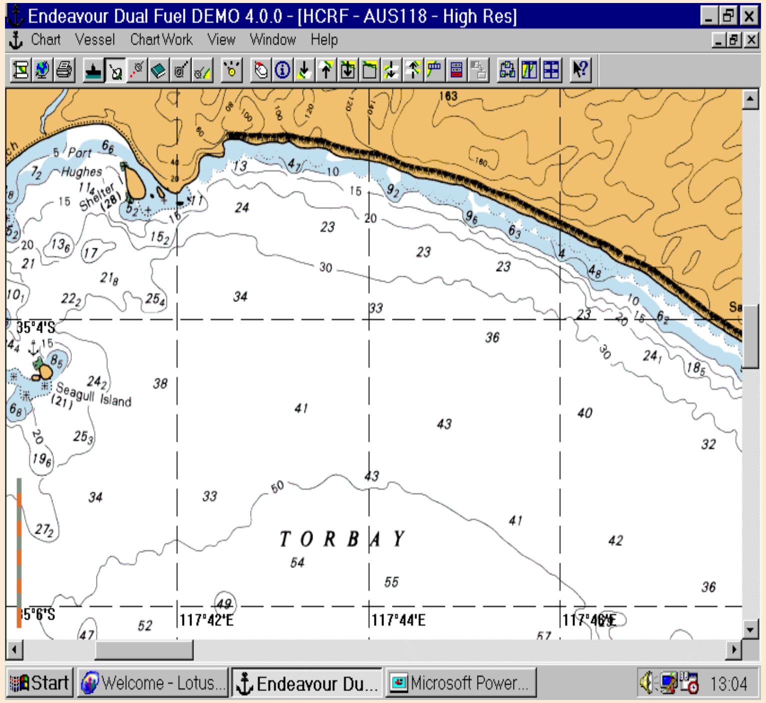
Datum offset information is included in Chart Title when required to be used

WAYPOINT NAVIGATION

"WAYPOINTS" – Co-ordinates in Latitude & Longitude

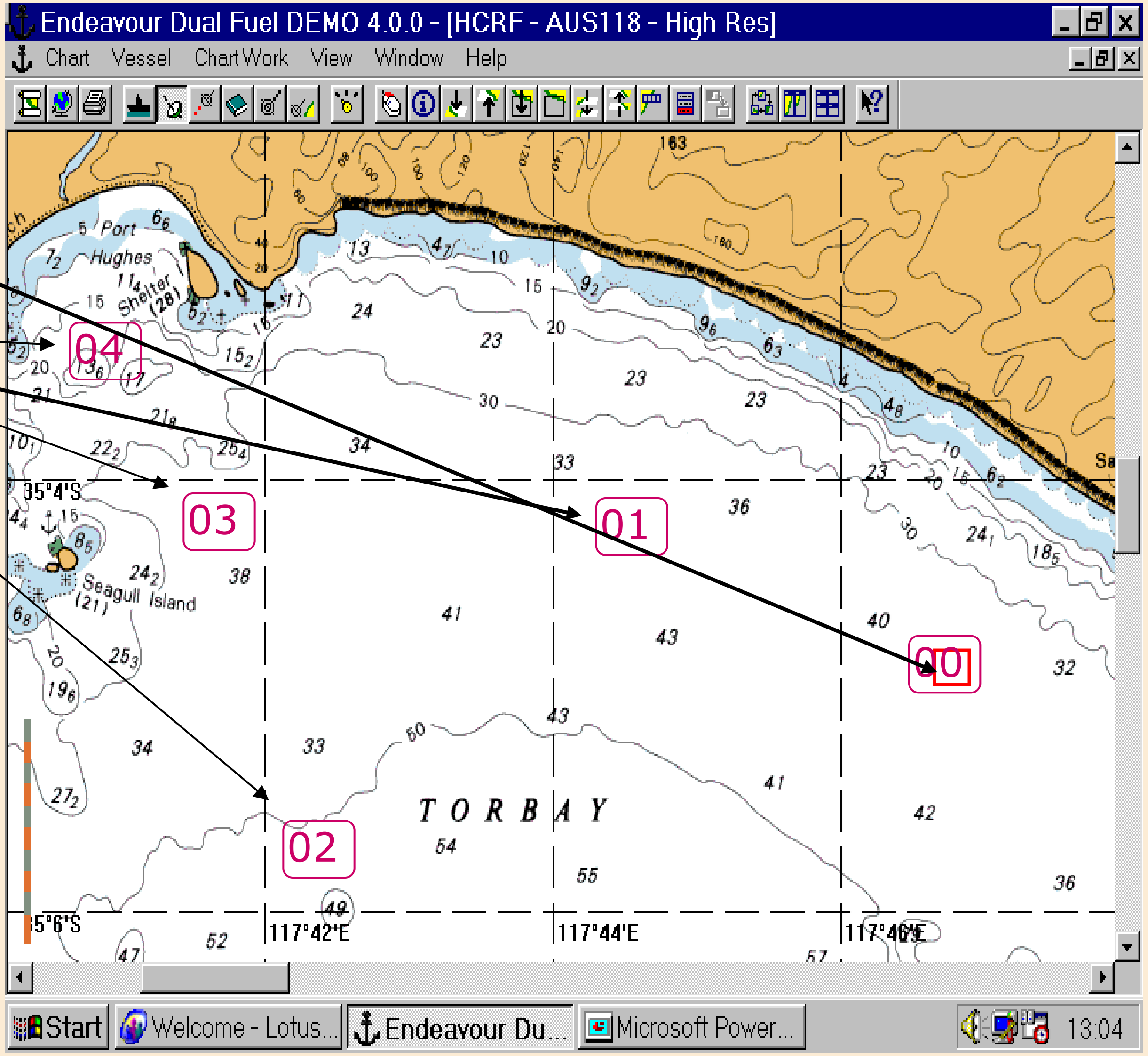
Commonly used to indicate point where a "Change of Course" is to be made when planning a safe passage

May also be used to mark other points of interest (e.g. fishing spots)



ELECTRONIC NAVIGATION

- **Vessel position is constantly indicated on chart**
- **Waypoints may be entered where appropriate**
- **Any Waypoint may be selected as a "Go to" destination**
- **When navigating keep your vessel on the Waypoint track**



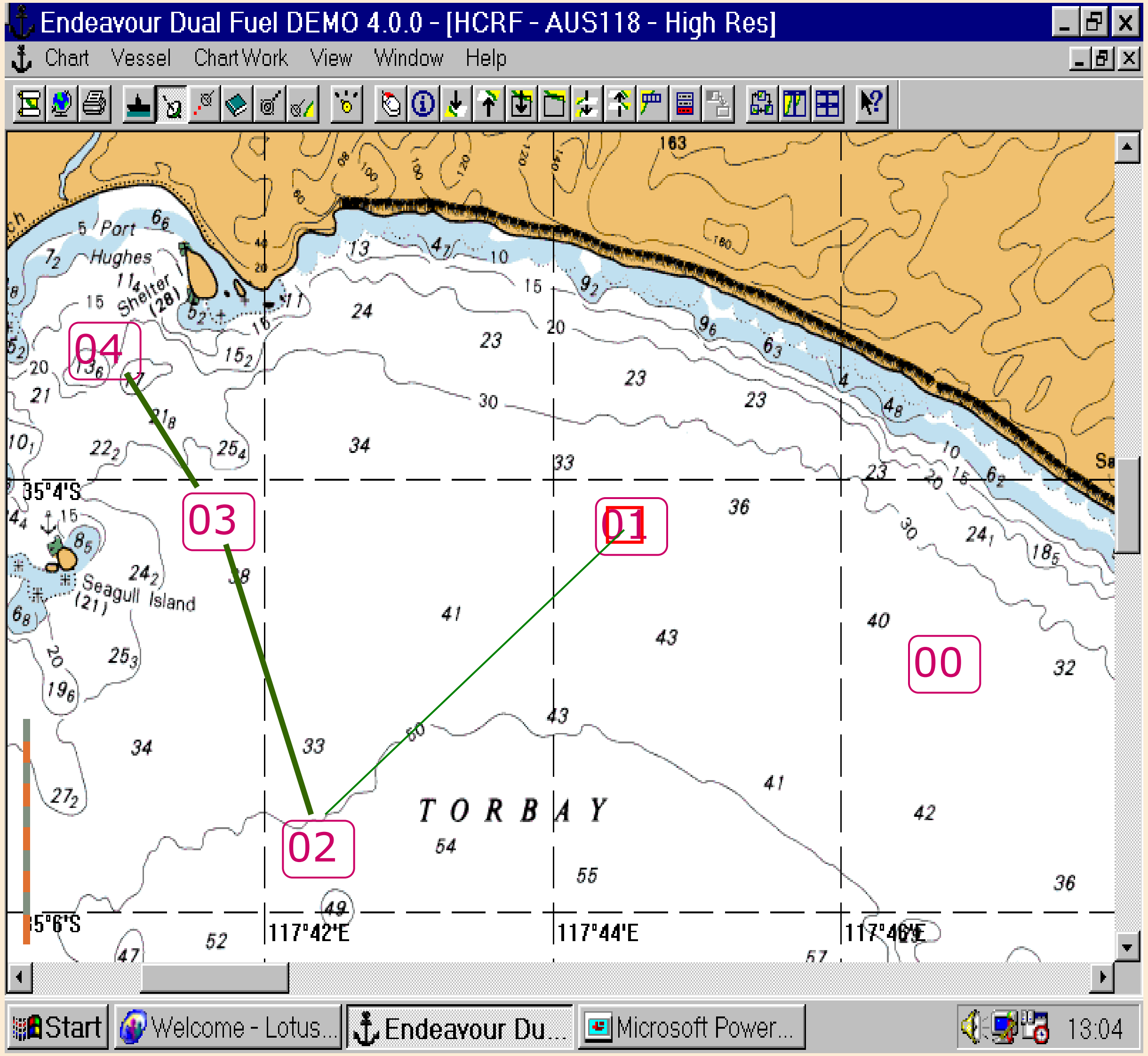
ELECTRONIC NAVIGATION

- When you arrive at Waypoint, select next Waypoint destination

- A <u>Waypoint Route</u> can also be selected where future tracks will be shown

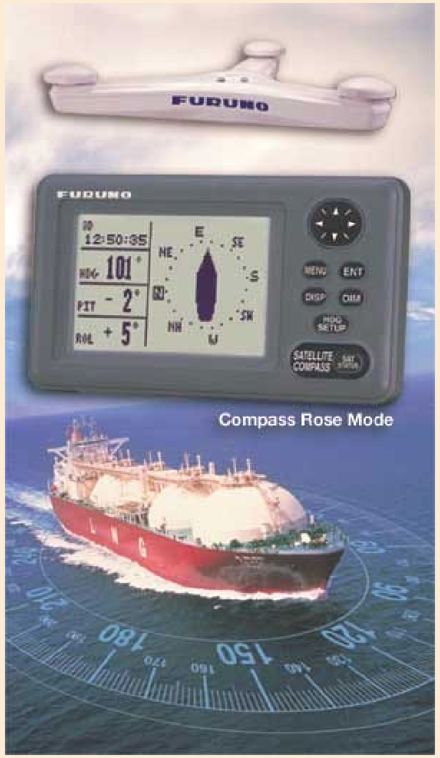
- Alter course and navigate to selected Waypoint

- Alarm zones may be set around Waypoints to warn when your vessel is a set distance away



SATELITE COMPASS

- Extremely accurate
- Cheaper and not as bulky as a Gyro Compass
- Does not rely on earth's magnetic field
- Not affected by metallic objects
- No moving parts to maintain



Watchkeeping

Navigational watchkeeping

- The intended voyage must be planned, taking into account all pertinent information and any course laid down shall be checked before the commencement of the voyage.
- Frequent checking of the vessel's position utilising all the available navigational aids, cross-referencing the accuracy of one method with another, ensuring that the vessel follows the desired course.
- The watchkeeper should also have a full understanding of the operation and limitations of all the safety and navigational equipment available.
- The watchkeeper's duty is primarily that of keeping watch and should not be required to carry out any additional duties that could interfere with the keeping of a safe navigational watch.

Navigational equipment

- The watchkeeper should have a good working knowledge of the navigational equipment at their disposal, taking into account the limitations, errors and idiosyncrasies of the equipment in use. The watchkeeper shall not hesitate to use the helm, engines or sound signalling appliances of the vessel.

Master's instructions to watchkeepers

- The watchkeeper should inform the Master immediately in the following circumstances: o if restricted visibility is encountered or expected.
- if the traffic conditions or the movement of other vessels is causing concern.
- if difficulty is experienced in maintaining course.
- on failure to sight land, a navigational mark or to obtain soundings by the expected time
- if, unexpectedly, you sight land, a navigational mark or to obtain soundings.

Master's instructions to watchkeepers

- on the breakdown of engines, steering gear or any essential navigational equipment.
- if the radio equipment malfunctions. o in heavy weather if in any doubt about the possibility of weather damage. o if the vessel meets any hazard to navigation such as ice or derelicts.
- in any other situation in which he/she is in any doubt.
- Despite the requirement to notify the Master immediately in the foregoing circumstances, the officer in charge of the navigational watch shall in addition not hesitate to take immediate action for the safety of the ship, where circumstances so require.

Watchkeeping principles

- It is essential at **ALL TIMES** to maintain a watch on the vessel, adequate to the prevailing circumstances and conditions. The following are some of the factors that should be taken into account when determining the composition of the watch.
- at no time should the bridge be left unattended.
- weather conditions, visibility, daylight or darkness;
- proximity of navigational hazards;
- use and condition of navigational aids in use;
- whether the vessel is fitted with automatic pilot;
- any additional unusual demands that may be placed on the watchkeeper by the operational activities of the vessel.

Watchkeeping principles

- It is essential that the watchkeepers are well rested and not impaired by fatigue. The watchkeeper should not be under the influence of alcohol or narcotics so as to be able to maintain an efficient and competent watch. If the watchkeeper is not satisfied with the fitness of the relieving watchkeeper to take over the watch, the watch should not be handed over and other arrangements made with the Master's instructions as to the relieving watchkeeper.
- The watchkeeper should have a good working knowledge of the navigational equipment available, taking into account the limitations, errors and idiosyncrasies of the equipment in use. The watchkeeper shall not hesitate to use the helm, engines or sound signalling appliances of the vessel.

Watchkeeping duties and responsibilities

- **A watchkeeper is not to leave the bridge unless properly relieved.**
- Regardless of the presence of the Master in the wheelhouse, the watchkeeper continues to be responsible for the safe navigation of the vessel until the Master expressly takes over the con of the vessel. If in any doubt as to the safety of the vessel the watchkeeper shall notify the Master immediately.

Taking over the watch

- When taking over the watch the relieving watchkeeper shall satisfy him/herself of the vessel's position, confirm its intended course/track and speed and note any dangers to navigation or alterations of course expected during the watch.
- The hand over should include but not be limited to:
- standing orders and other special instructions of the Master relating to navigation of the vessel
- position, course, speed and draught of the vessel
- prevailing and predicted tides, currents, weather, visibility and the effect of these factors upon course arid speed

Taking over the watch

- navigational situation of the operational condition of all navigational and safety equipment
- the errors of magnetic and gyro compasses the presence and movement or' any vessel in sight or known to be in the vicinity
- the conditions and hazards likely to be encountered during the watch
- machinery state
- cargo state o state of auxiliary vessels/tenders
- operational activities

Lookout

- A proper look-out shall be maintained at all times in compliance with rule 5 of the International Regulations for Preventing Collisions at Sea, 1972 and shall serve the purpose of:
- Maintaining a continuous state of vigilance by sight and hearing as well as by all other available means, with regard to any significant change in the operating environment.
- Fully appraising the situation and the risk of collision, stranding and other dangers to navigation.
- Detecting ships or aircraft in distress, shipwrecked persons, wrecks, debris and other hazards to safe navigation.

Lookout

- The lookout must be able to give full attention to the keeping of a proper lookout and no other duties shall be undertaken or assigned which could interfere with that task.
- The duties of the lookout and helmsperson are separate and the helmsperson shall not be considered to be the look-out while steering, except in small ships where an unobstructed all-round view is provided at the steering position and there is no impairment of night vision or other impediment to the keeping of a proper look-out.
- The officer in charge of the navigational watch may be the sole lookout in daylight provided that on each such occasion:

Lookout

- The situation has been carefully assessed and it has been established without doubt that it is safe to do so.

- Full account has been taken of all relevant factors, including, but not limited to:
  - state of weather
  - visibility,
  - traffic density
  - proximity of dangers to navigation

Lookout

- the attention necessary when navigation in or near traffic separation scheme.

- Assistance is immediately available to be summoned to the bridge when any change in the situation so requires.

Watchkeeping at anchor

- The watchkeeper will ensure that the vessel maintains her position at anchor. In addition keeping the following points in mind:
- Ensure that an effective lookout is maintained
- Ensure that periodic inspection rounds of the vessel are carried out.
- Notify the Master and undertake all necessary measures if the vessel drags anchor.
- Ensure the engines and auxiliary machinery is ready as per the Master's instructions.
- State of tide
- Position of other vessels at anchor or passing traffic in relation to the swinging circle of the vessel.

Watchkeeping at anchor

- State of the weather and the latest forecast.
- Position of appropriate beam bearings for early warning of dragging anchor.
- The condition and lay of the anchor and cable/rope.
- Ensure that the correct lights or shapes are exhibited at all times
- Take measures to prevent environmental pollution and comply with pollution regulations.

Watchkeeping in port

- Ensure that the vessel is moored securely at all times.
- Ensure that there is adequate and safe access to the vessel from the wharf
- The state and range of the tide and the effect this would have on the mooring ropes and the gangway.
- Appropriate signs are up in relation to the working of the vessel.
- Know who is onboard the vessel both from the vessels crew or shore personnel.
- Put up appropriate notices with regards to the sailing time of the vessel etc. for the benefit of the crew.

RADAR PLOTTING

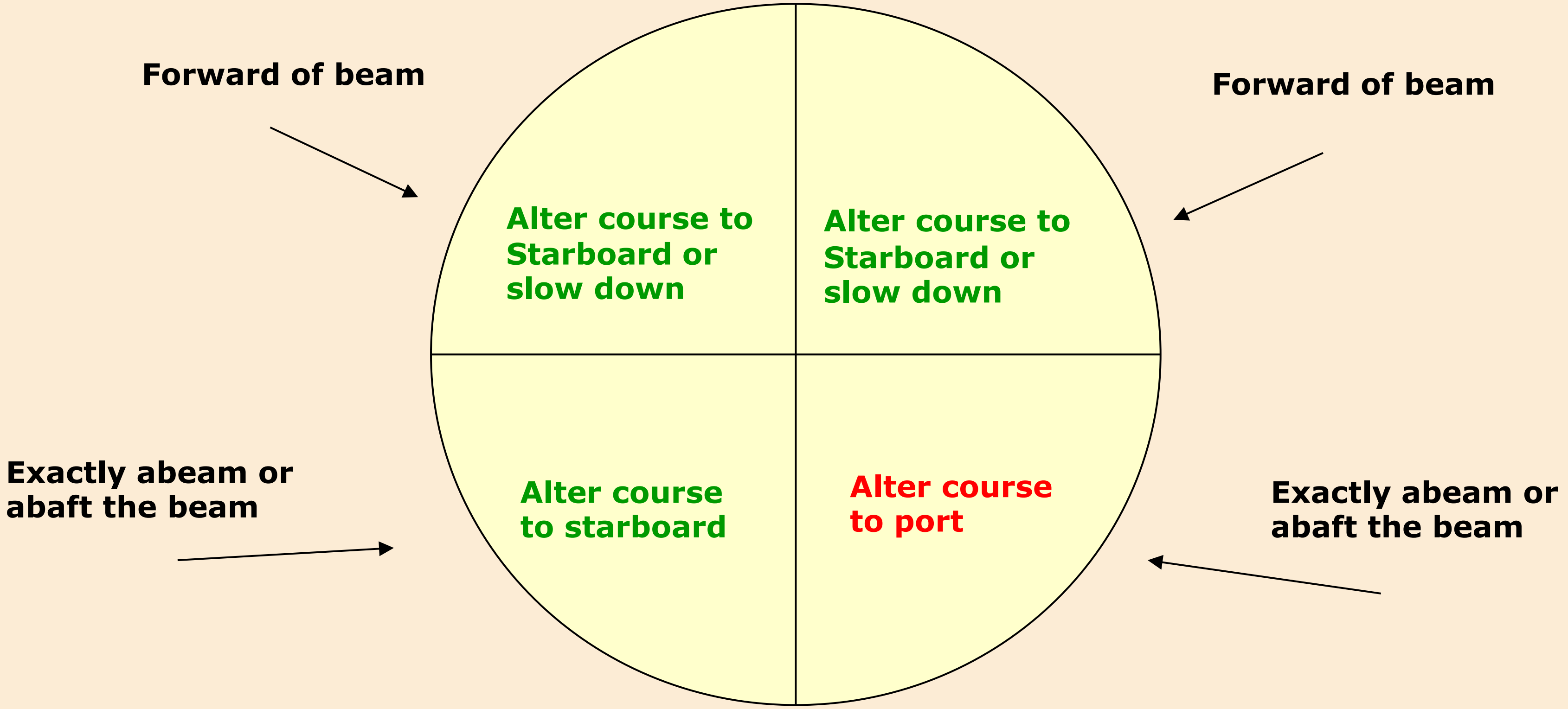
- Why do we need to know how to plot targets on a Radar Plotting Sheet?

  - To prevent collision

  - If cannot be done automatically

    Necessary to know other vessel's Heading & Speed (cannot be determined by visual observation)

"RULE 19"
Restricted Visibility - Targets on Radar only



Two situations

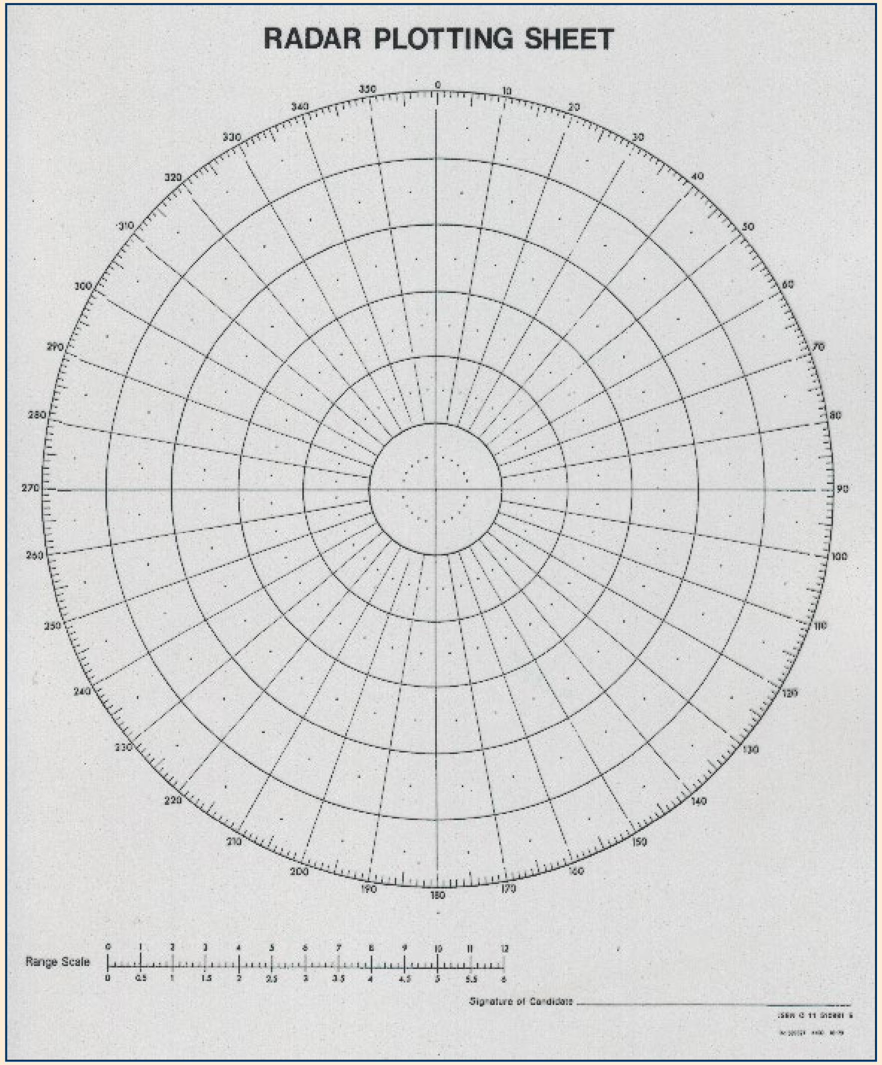
1. **Target Forward of beam** – avoid altering course to port, other than for a vessel being overtaken

1. **Target on Beam, or Aft the Beam** – avoid an alteration of course towards a vessel abeam or abaft the beam

How do we plot other vessels?

PLOTTING REPORT

LAST BEARING	
DRAWING	
LAST RANGE	
RANGE INCR. / DECR.	
CPA RANGE	
CPA TIME	
TARGET COURSE	
TARGET SPEED	
ASPECT	
NEW CPA	
NEW CPA TIME	



•Draw your ship's True course (330°T) on edge of plotting sheet

•Plot each contact by its Range and Bearing from you

-Label 1st contact "O"

-Label LAST contact "A"

•Construct Relative Motion line OA, and extend well past centre of plotting sheet

•Draw line CN at right angles to OA line from centre C

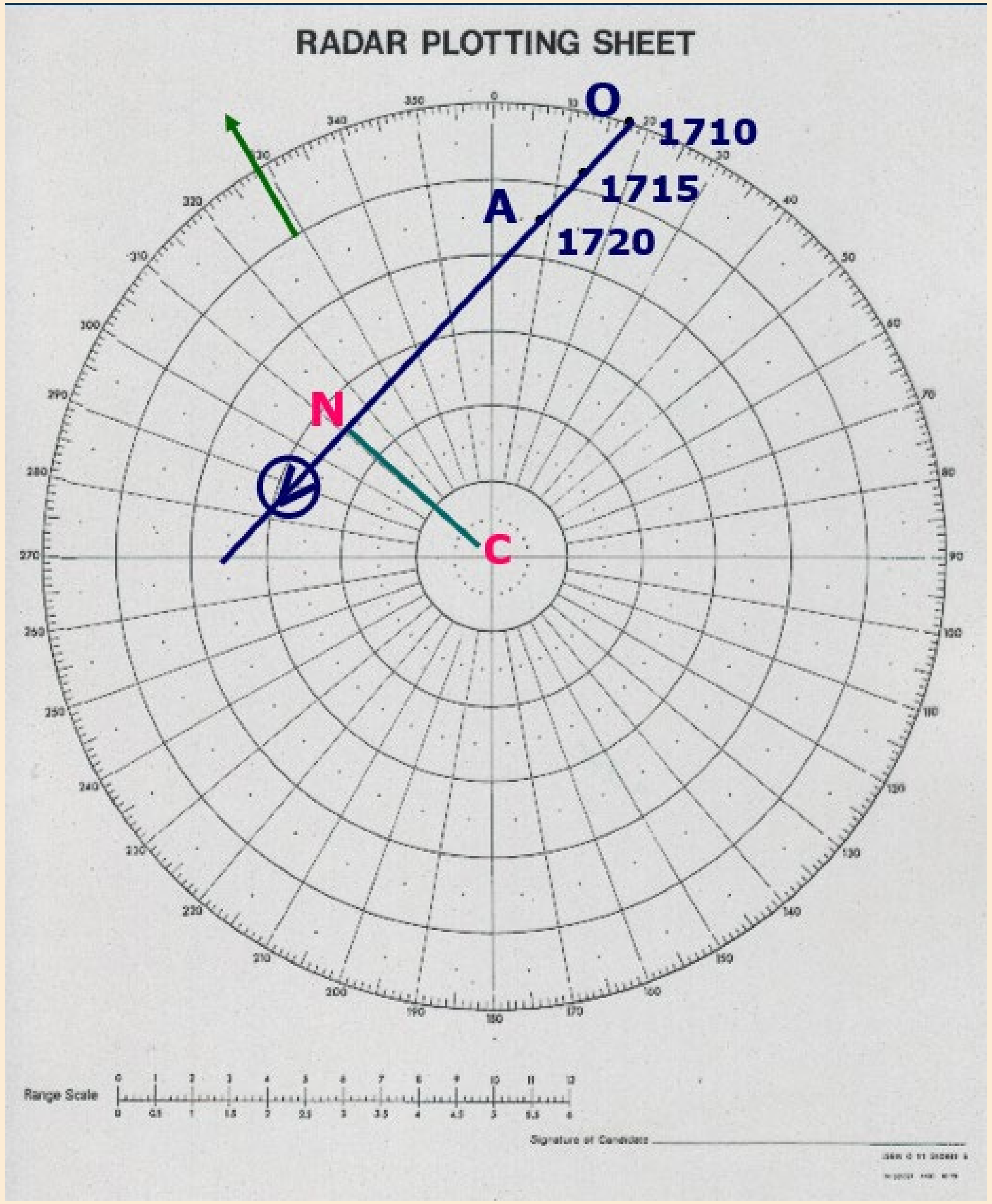
•Distance CN is Closest Point of Approach (CPA)

•Time of CPA

$$= \frac{AN}{OA} \times \text{Plotting Interval (min)}$$

(Add this to time of last plot)

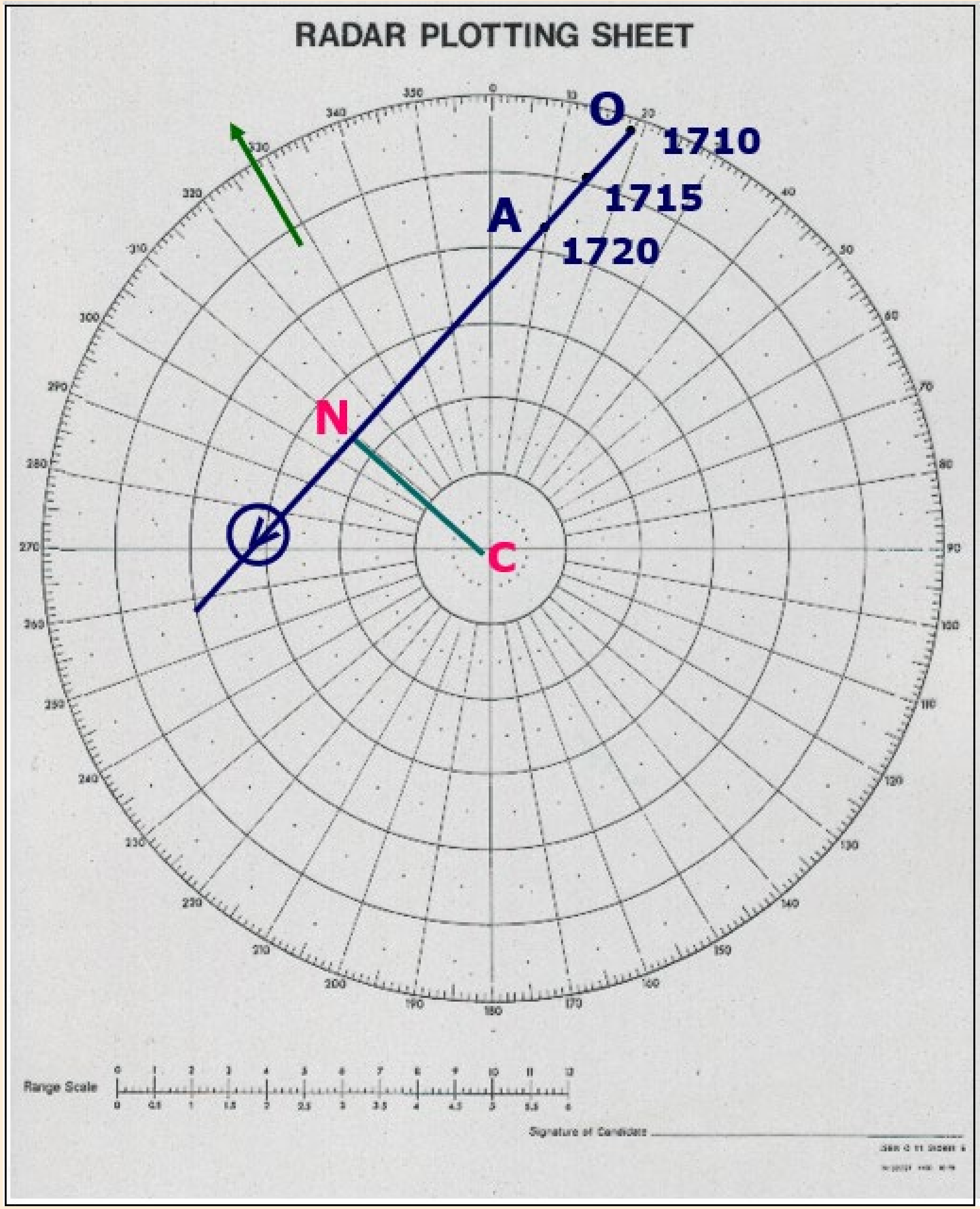
You are at the centre of the Plotting Sheet



Filling out the Plotting Report

PLOTTING REPORT

LAST BEARING	**012T°**
DRAWING	**Ahead**
LAST RANGE	**4.4 Miles**
RANGE INCR. / DECR.	**Decreasing**
CPA RANGE	**2.2 Miles**
CPA TIME	**1743**
TARGET COURSE	**-**
TARGET SPEED	**-**
ASPECT	**-**
NEW CPA	**-**
NEW CPA TIME	**-**



Example   Own vessel on course **330°T**, speed 18 knots. You observe the following:

Time	Bearing	Distance
1710	020T°	6.0
1715	017T°	5.2
1720	012T°	4.4

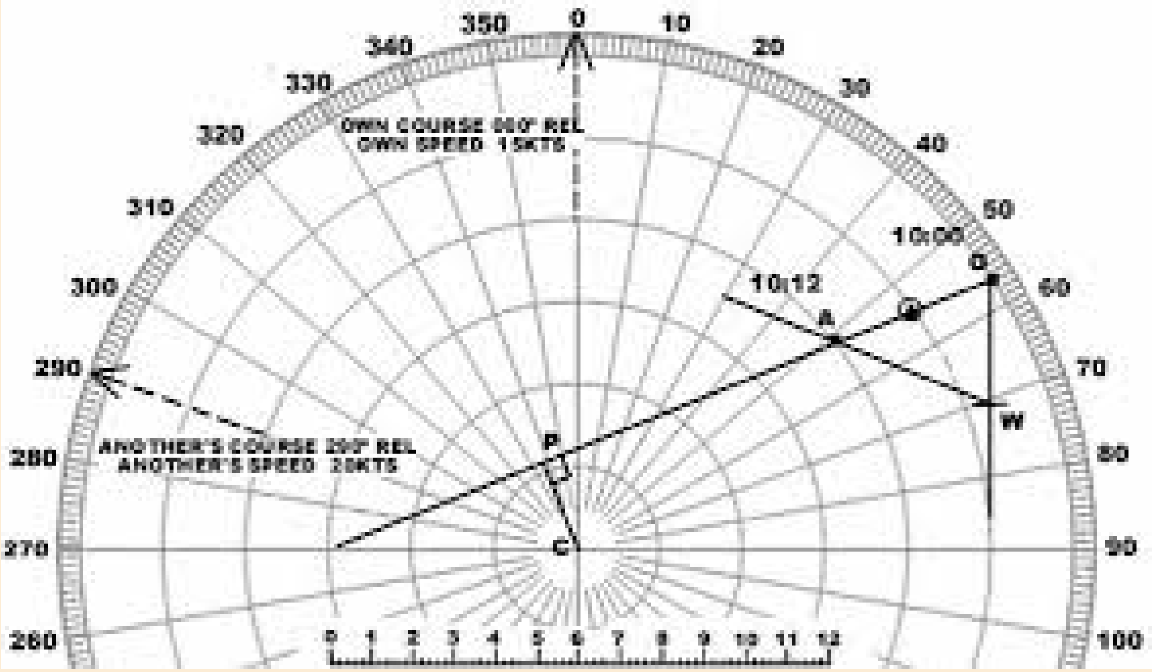
Find:
CPA (Closest Point of Approach)
TCPA (Time at Closest Point of Approach)

- Do exercise on Plotting Sheet

Radar plotting exercises on finding CPA, TCPC & BCPA

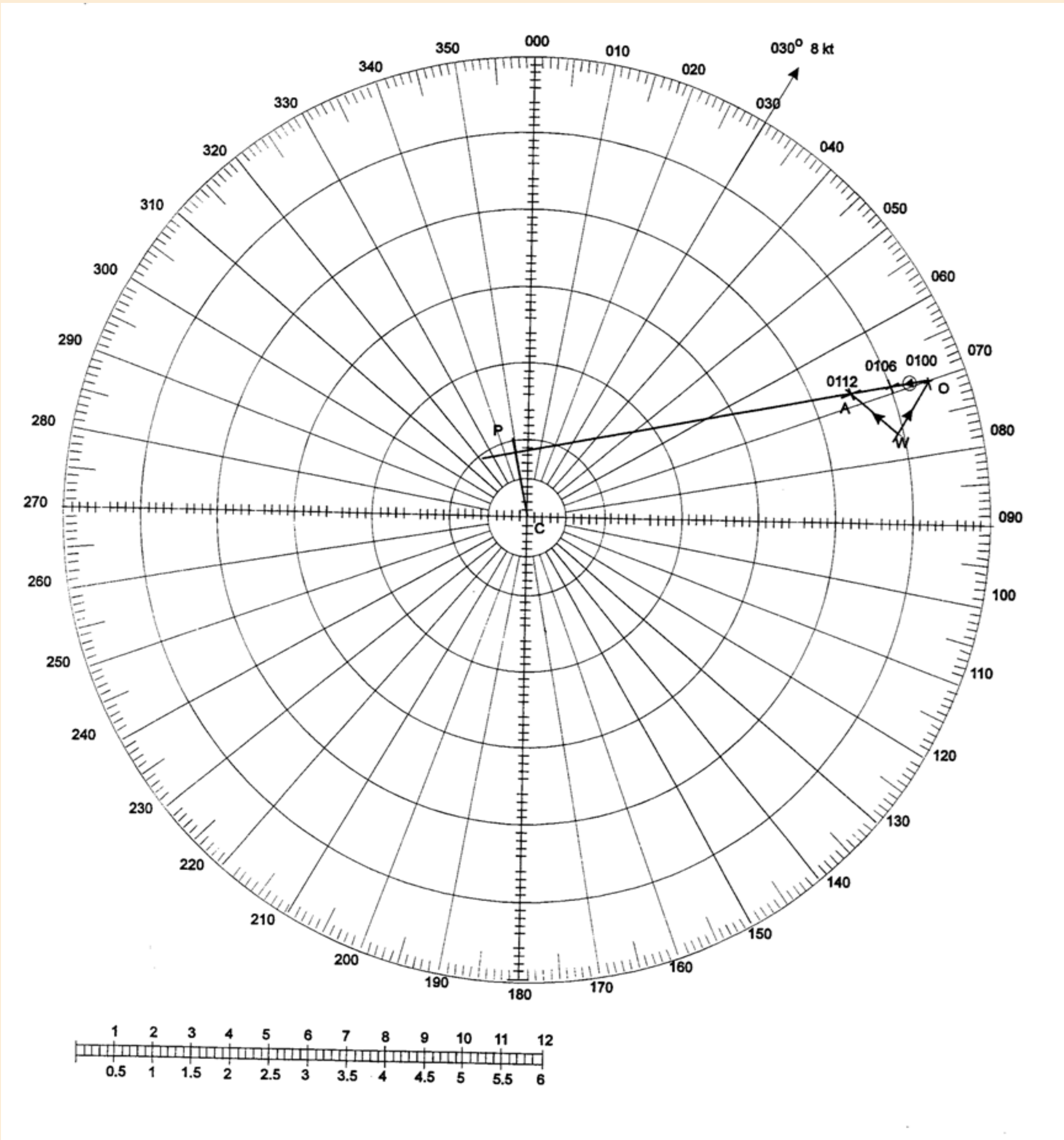
Complete exercise 5 located on page 44 in the student resource/exercise book

Plotting target course and speed



Your vessel is steering 030o at 8 knots. The observations of the target were as follows:

Time	Bearing	Range
0100	070o	11.0 miles
0106	069o	10.0 miles
0112	068o	9.0 miles



To find the distance you have travelled:

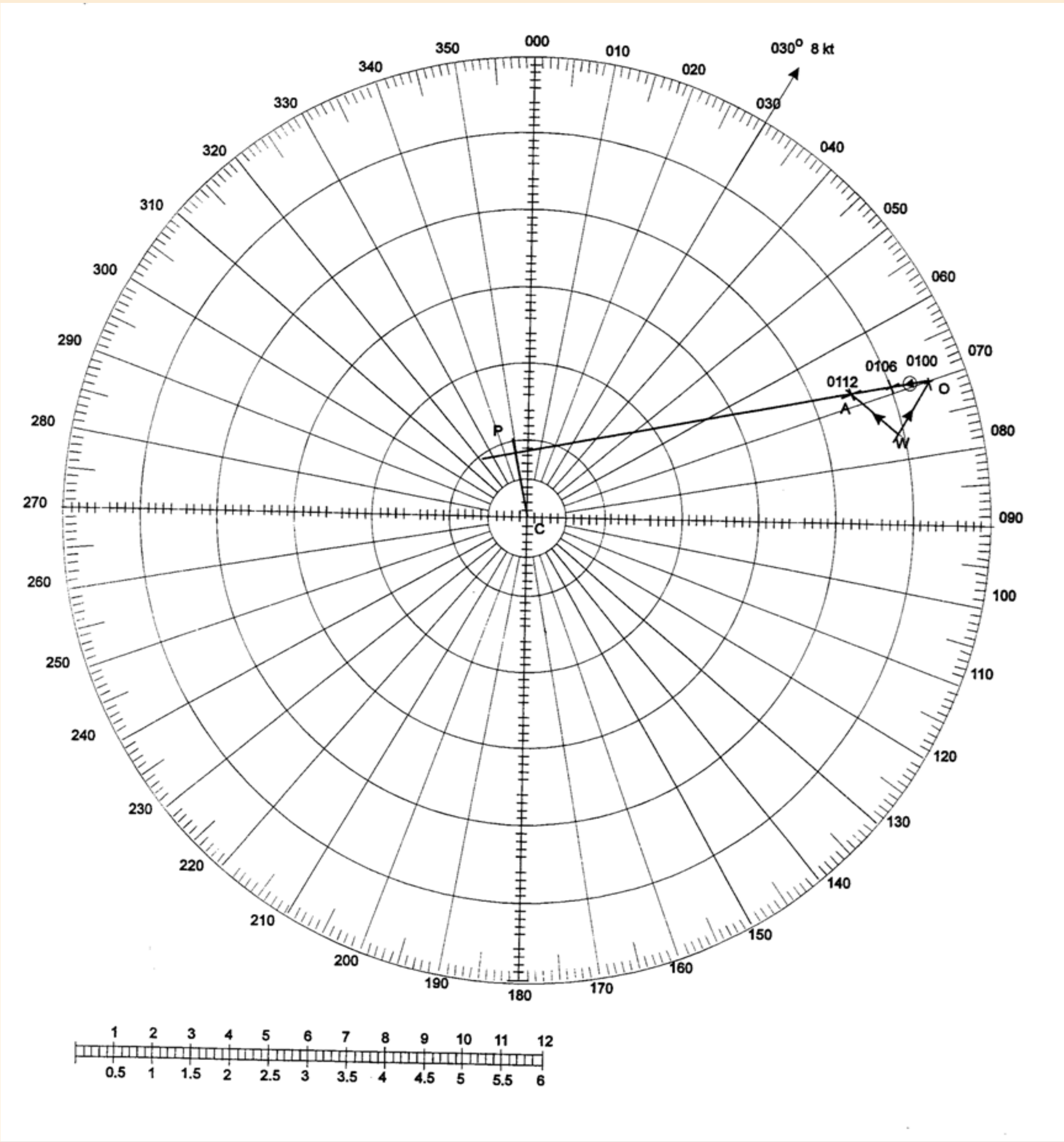
Distance = speed x time in minutes divided by 60

IE 8 Kts x 12 minutes divided by 60 equals
1.6 miles

Mark of your course 030 degrees

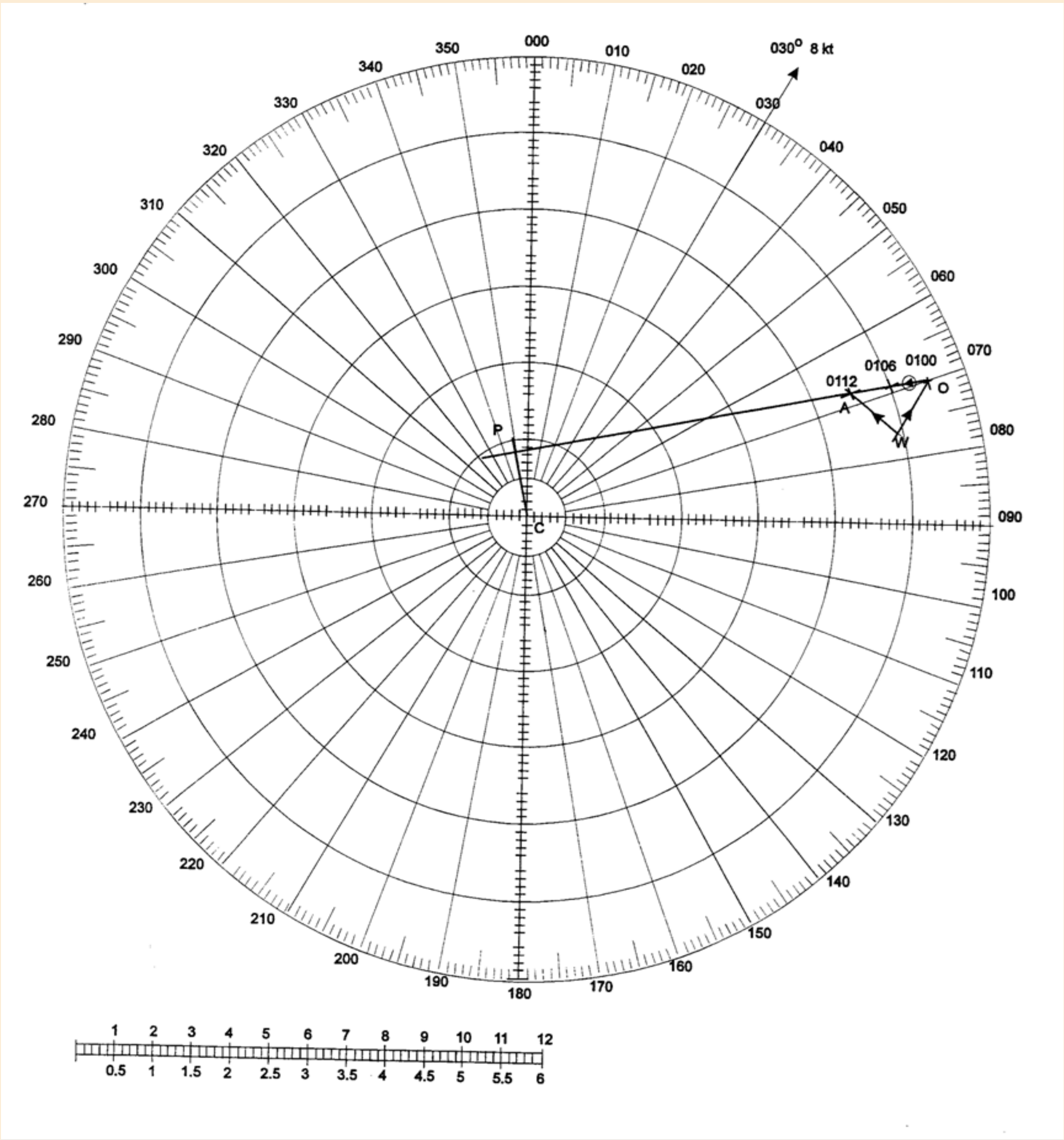
Then parallel rule to **O** draw line in opposite direction to **W**

Dividers from **O** 1.6 miles to **W** then draw line to **A**

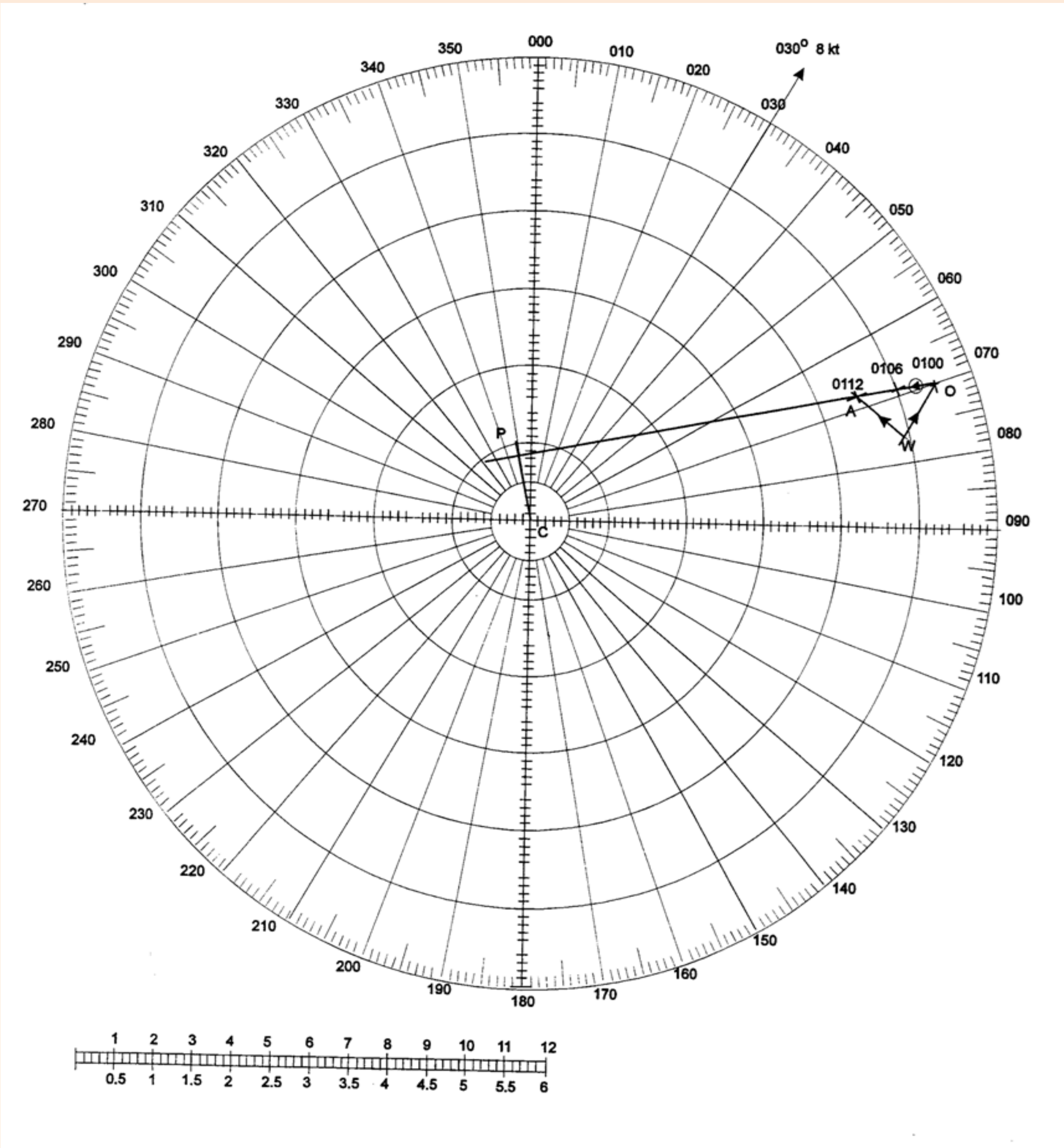


The point W is called the ’zero speed position’—in other words the position where a stationary target (a target with zero speed) would be at the end of the plotting interval. The line WO represents your vessel’s course, and the distance you have travelled in the plotting interval of 12 minutes.

= way of own vessel



This triangle, made up of the three points O, A and W, is called the plotting triangle.

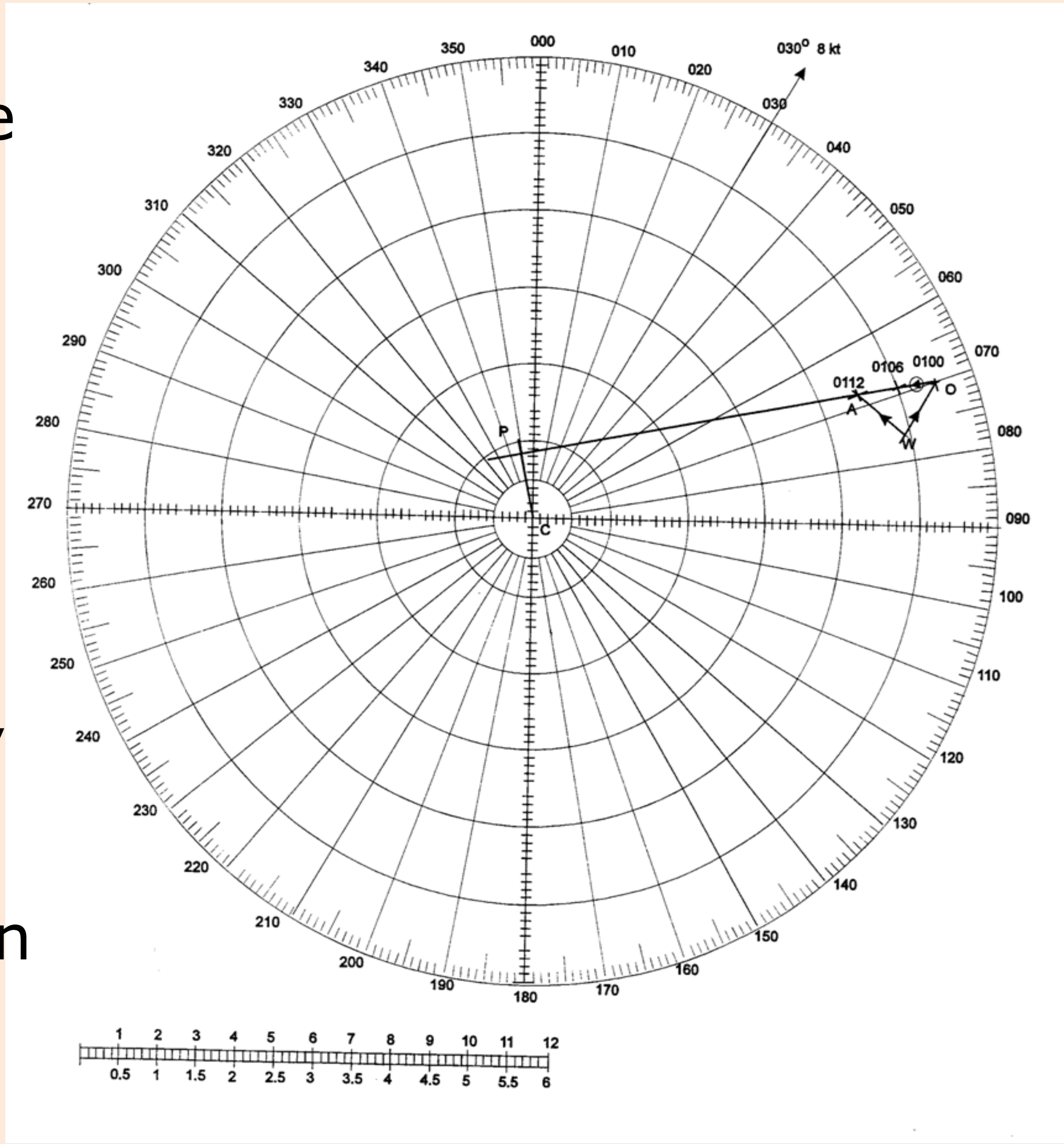


Course

Put your parallel rulers along the line WA, move them across to pass through the centre spot of the plotting sheet. point where the ruler cuts the bearing scale on the outside of the plotting sheet will give you the direction of WA, target's true course.

Note that you must always take the direction from W towards A, not the other direction.

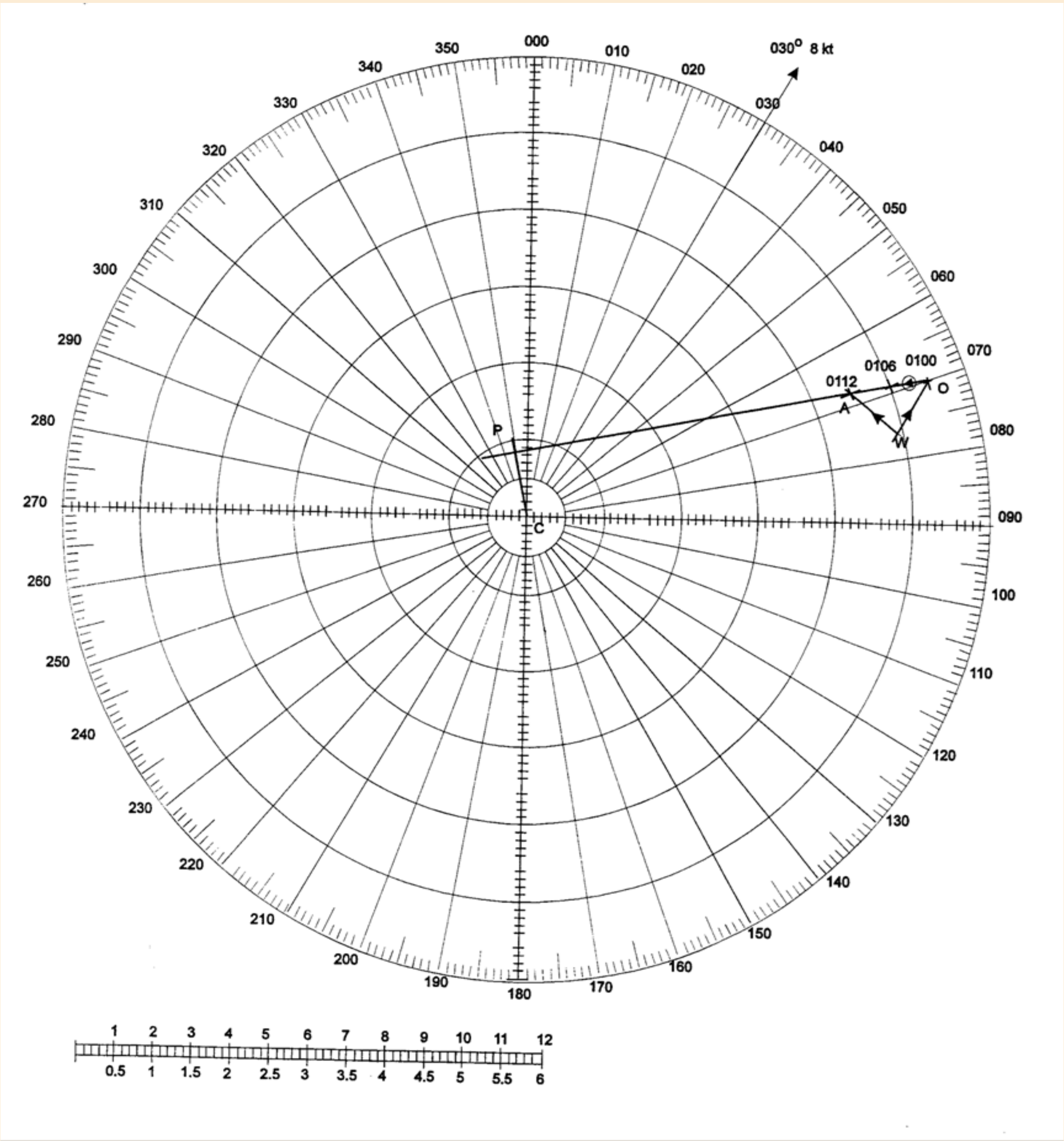
In this case, the target's course is 310°.



Speed

Measure the length of WA. This represents the distance the target has travelled in the 12 minute plotting interval. You will find that the length is 1.6 miles.

To calculate the speed of the target:

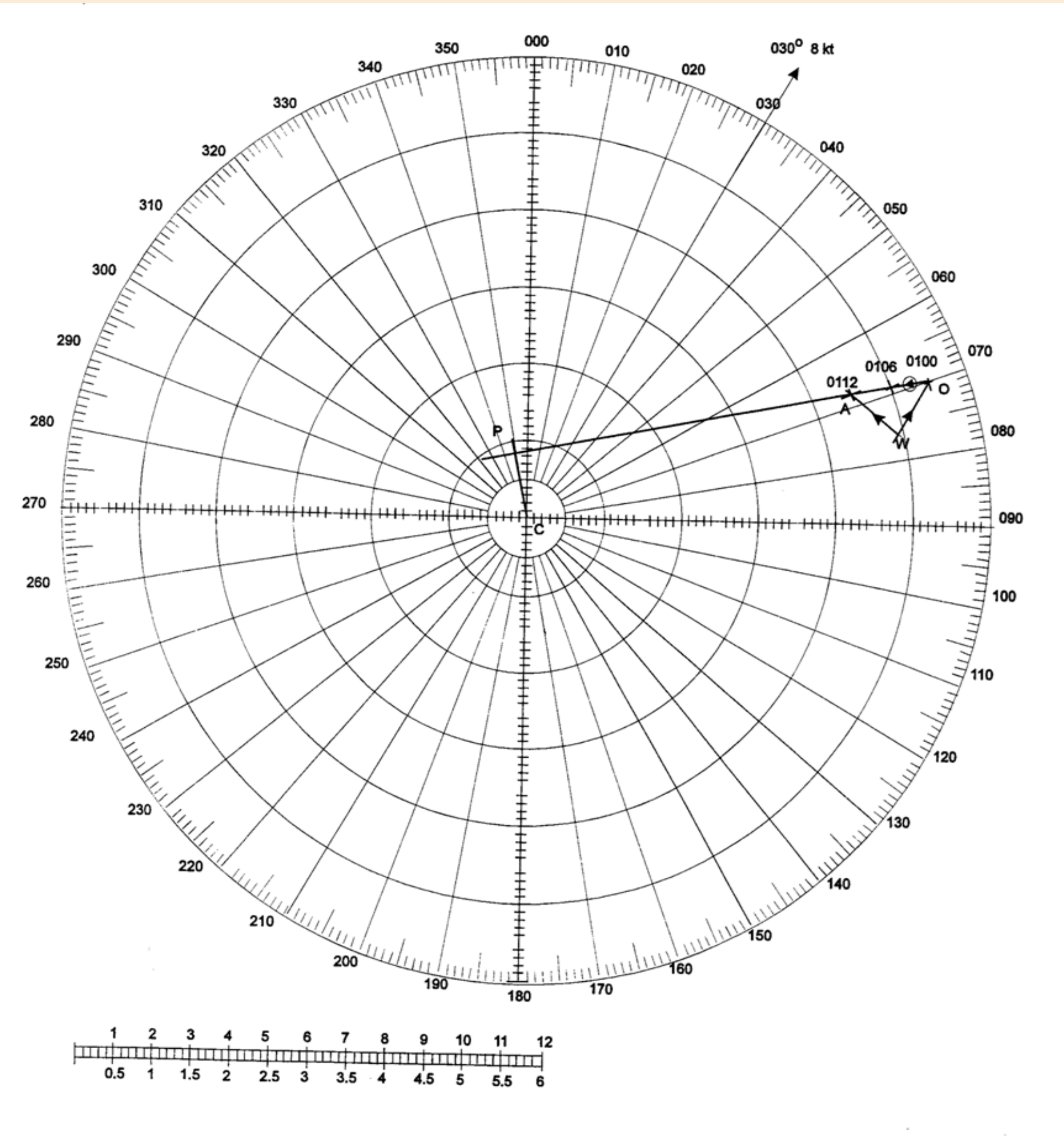


- OA is the echo’s relative track, distance the echo moved in plotting interval. It is not the target’s course and speed.

- WO your course, and distance your vessel travelled in the plotting interval. Note that the direction from W towards O shows the direction of your course.

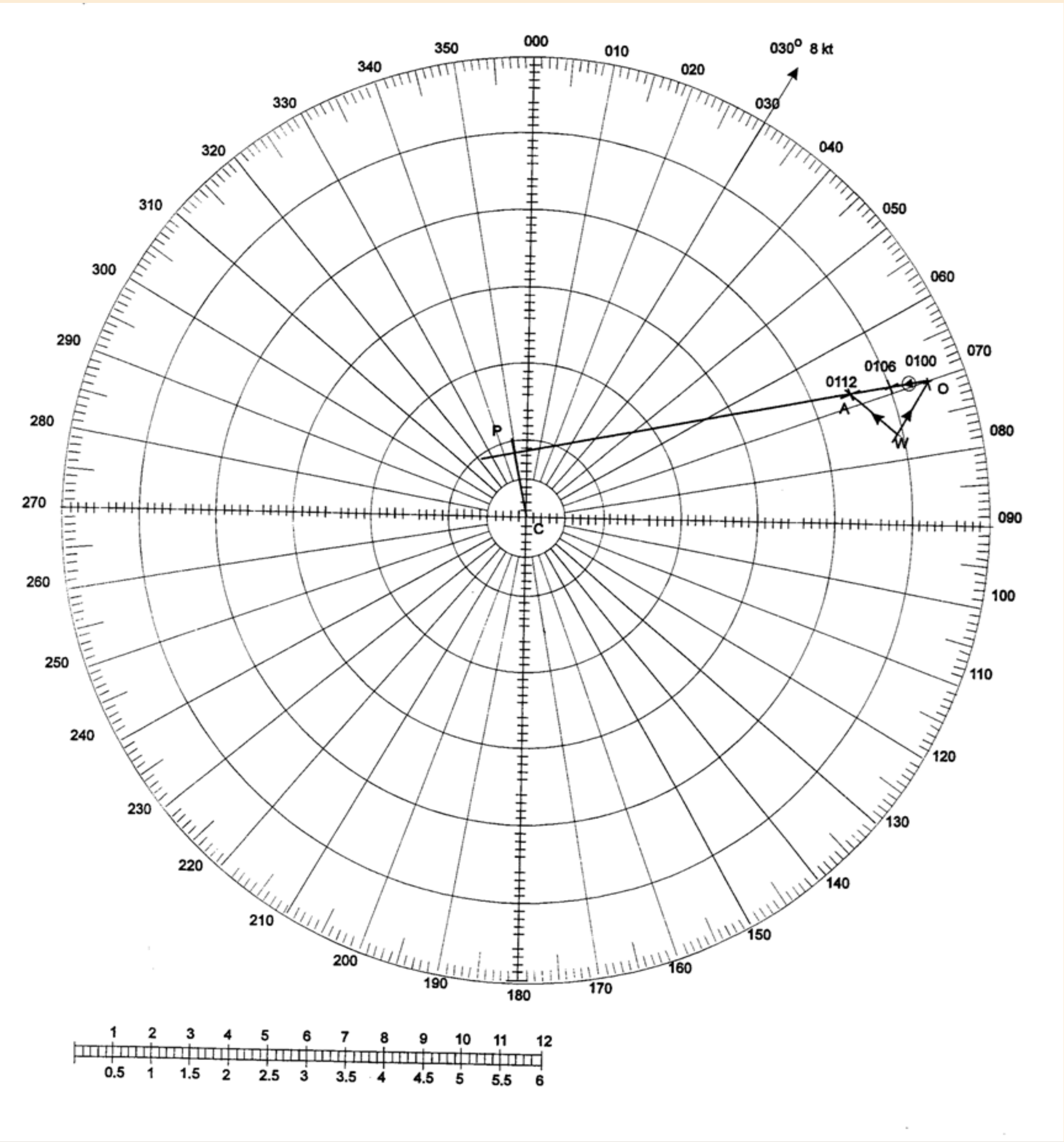
One method to remember this line is WO = Way of Own, i.e.

The way your own ship is going.



- The line WA is the target’s true course, and the distance the target has travelled in the plotting interval. Again, note that the target’s course is from W towards A

= WAY of Another



Radar plotting exercises on finding target course & speed

Complete exercise 5 located on page 45 in the student resource/exercise book

The full report

Aspect

Aspect is how own ship appears to the target vessel. It is given as a relative bearing with reference to the target vessel's fore and aft line.

It is expressed as a relative bearing (red or green) according to whether the observing ship is on the port or starboard side of the target ship. You can check this on your plot.

Aspect can be determined in two ways:

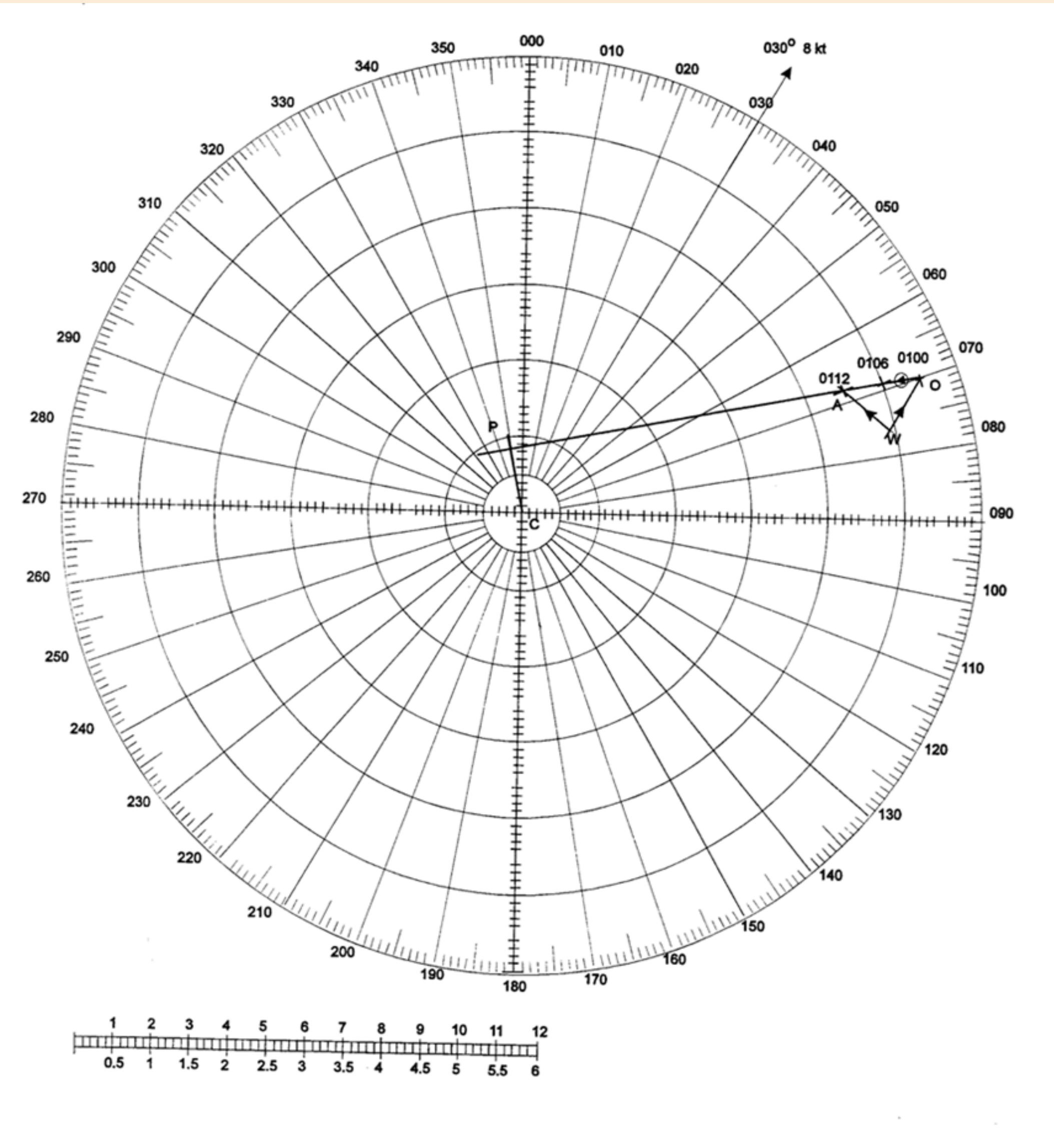
- From the plot, by measuring the lesser angle between the target vessel's course (line WA on Figure 2) and a line joining both vessels (AC).
- Mathematically, by taking the lesser angle between the target's true course and the reciprocal of the target's last bearing.

Figure 2: Aspect

RADAR PLOTTING FULL REPORT

PLOTTING REPORT

LAST BEARING	68
DRAWING	forward
LAST RANGE	9
RANGE INCR. / DECR.	dec?
CPA RANGE	1.7
CPA TIME	53
TARGET COURSE	310
TARGET SPEED	8
ASPECT	R62
NEW CPA	
NEW CPA TIME	



USEFUL FORMULA

<u>Time of Closest Point of Approach</u>

TCPA $= \dfrac{AN}{OA} \times$ **Plotting Interval *(minutes)***

SOME MORE RULES/DEFINITIONS

"Close Quarters Situation"

- Where vessels pass at a distance which is not considered safe *(due to speed, course, sea conditions, weather, traffic density etc)* and may lead to risk of collision

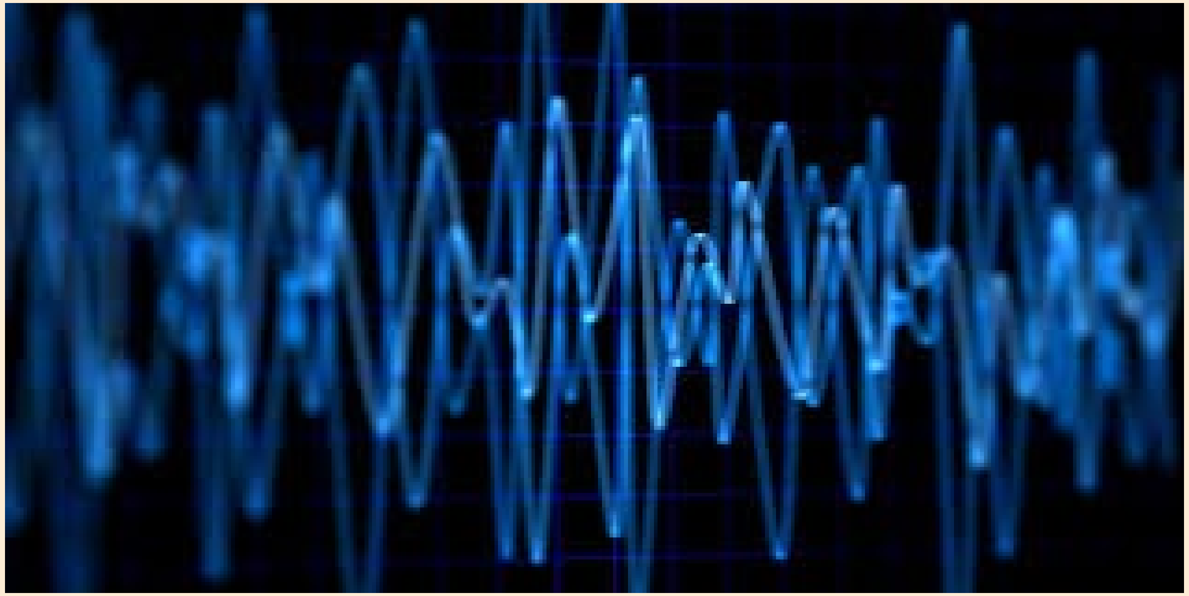
Rules for using Radar in Clear Visibility

- Collision Regulations state that Radar must be operating at all times in order to keep a proper lookout
- Also used for navigation purposes

Radar plotting exercises on completing the full report

Complete exercise 3 located on pages 46 to 48 in the student resource/exercise book

Signals



Morse signalling

- Morse signalling is carried out by flashing a light, sound or flags. The symbols, which represent letters, are expressed by two elements called a dot (short) and a dash (long) signalled singly or in combination. The procedure for Morse signalling and the code itself is listed in the International Code of Signals, which is produced by the International Maritime Organisation.
- At sea, the most common method of signalling by "flashing" is by using an "Aldis" lamp. An "Aldis" lamp looks like a car headlight except that it cylindrical. It is held in the hand and the light directed toward the other vessel through a sight. The flashes are initiated by a trigger action. They can be used by day or night; the more powerful ones have a daylight range of about 8 miles. In an emergency any light source can be used such as a torch or searchlight or whatever.

Morse signalling

Alfa	• —	November	— •	1	• — — — —
Bravo	— • • •	Oscar	— — —	2	• • — — —
Charlie	— • — •	Papa	• — — •	3	• • • — —
Delta	— • •	Quebec	— — • —	4	• • • • —
Echo	•	Romeo	• — •	5	• • • • •
Foxtrot	• • — •	Sierra	• • •	6	— • • • •
Golf	— — •	Tango	—	7	— — • • •
Hotel	• • • •	Uniform	• • —	8	— — — • •
India	• •	Victor	• • • —	9	— — — — •
Juliet	• — — —	Whisky	• — —	0	— — — — —
Kilo	— • —	Xray	— • • —		
Lima	• — • •	Yankee	— • — —		
Mike	— —	Zulu	— — • •		

How to learn morse code

- A 'dot' is considered to be one unit and a 'dash' to three units. That means that a 'dash' when flashed or sounded is three times as long as a 'dot'. The pause between each 'dot' and 'dash' is one unit: between each letter is three units, and between each word is seven units.
- **Learn the individual letters in-groups as shown next.**

How to learn morse code

- 1 T, M, O
- 2 E, I, S, H
- 3 A, U, V
- 4 N, D, B
- 5 A, W, J
- 6 C, K, P, G
- 7 R, L, Q, Z
- 8 F, X, Y
- 9 figures 0 to 9

How to learn morse code

- **Learn one column at a time before proceeding to the next column.**
- It is best to learn Morse with at least one other person. When practising 'flashing' it is best to have a third person to write down each letter as the reader calls it out. Where a partner cannot be found it's possible to learn to recognise the different letters by "flashing" into a mirror and watching the reflection. As always practise makes perfect. One day your very life may depend on being able to recognise a single 'flashed' letter such as U, (you are running into danger).

Phonetic alphabet

- The Phonetic alphabet was designed for the pronunciation of letters and figures by radiotelephony or voice over the loud hailer. Each letter of the alphabet is given a code word that starts with the same letter. These words are pronounced in such a fashion that they cannot be mistaken.
- This phonetic alphabet is found in the "International Code of Signals" and also in the "Handbook for Radiotelephone Vessel Station Operators".
- Note: There are two versions of "International Code of Signals" one produced in Britain and the other in the United Stated. As you would expect the two versions are arranged differently.

Phonetic alphabet

- Use the phonetic alphabet whenever you are required to spell a word. Remember practise makes perfect. Continued use of it will make you proficient.

Phonetic alphabet

Phonetic Alphabet

A - alpha
B - bravo
C - charlie
D - delta
E - echo
F - foxtrot
G - golf
H - hotel
I - india
J - juliet
K - kilo
L - lima
M - mike
N - november
O - oscar
P - papa
Q - quebec
R - romeo
S - sierra
T - tango
U - uniform
V - victor
W - wiskey
X - x-ray
Y - yankee
Z - zulu

Single flag meanings

- The single letter flags used for signalling have individual meanings. These flags may be hoisted individually to indicate their meaning or in a group, to be decoded using the International Code of Signals.


INTERNATIONAL CODE FLAGS AND PENNANTS
WITH MEANINGS
ALPHABET FLAGS
ALFA
Have diver down, keep clear
BRAVO
Dangerous goods
CHARLIE
Yes
DELTA
Keep clear, maneuvering with difficulty
ECHO
Altering course to Starboard
FOXTROT
Disabled, communicate with me
GOLF
Require a pilot
Fishing: Hauling nets
HOTEL
Pilot on board
INDIA
Altering course to Port
JULIETT
On Fire, have dangerous cargo, keep clear
KILO
Wish to communicate
LIMA
Stop instantly
MIKE
My vessel is stopped making no way
NOVEMBER
No
OSCAR
Man overboard
PAPA
In harbour: All persons report on board
QUEBEC
Request free pratique
ROMEO
SIERRA
Engines going astern
TANGO
Keep clear, engaged in pair trawling
UNIFORM
You are running into danger
VICTOR
Require assistance
WHISKEY
Require medical Assistance
XRAY
Stop your intentions, Watch for signals
YANKEE
Dragging my anchor
ZULU
Require a Tug
Fishing: Shooting nets
SUBSTITUTES
1st
2nd
3rd
1
2
3
4
5
6
7
8
9
0

International code of signals

- 4.Two-letter signals supplemented if necessary with a numeral.
- 5.A table of complements which can be used with one or two-letter signals.
- 6.Three letter signals.
- •Single-letter signals are allocated to signification's, which are urgent, important, or of very common use.
- •Two-letter signals are from the general section.
- •Three-letter signals beginning with M are from the Medical Section.

International code of signals

- The code follows the basic principle that each code should have a complete meaning; in certain cases complements are used when necessary to supplement the available groups. Complements express variations in the meaning of the signal. For example:

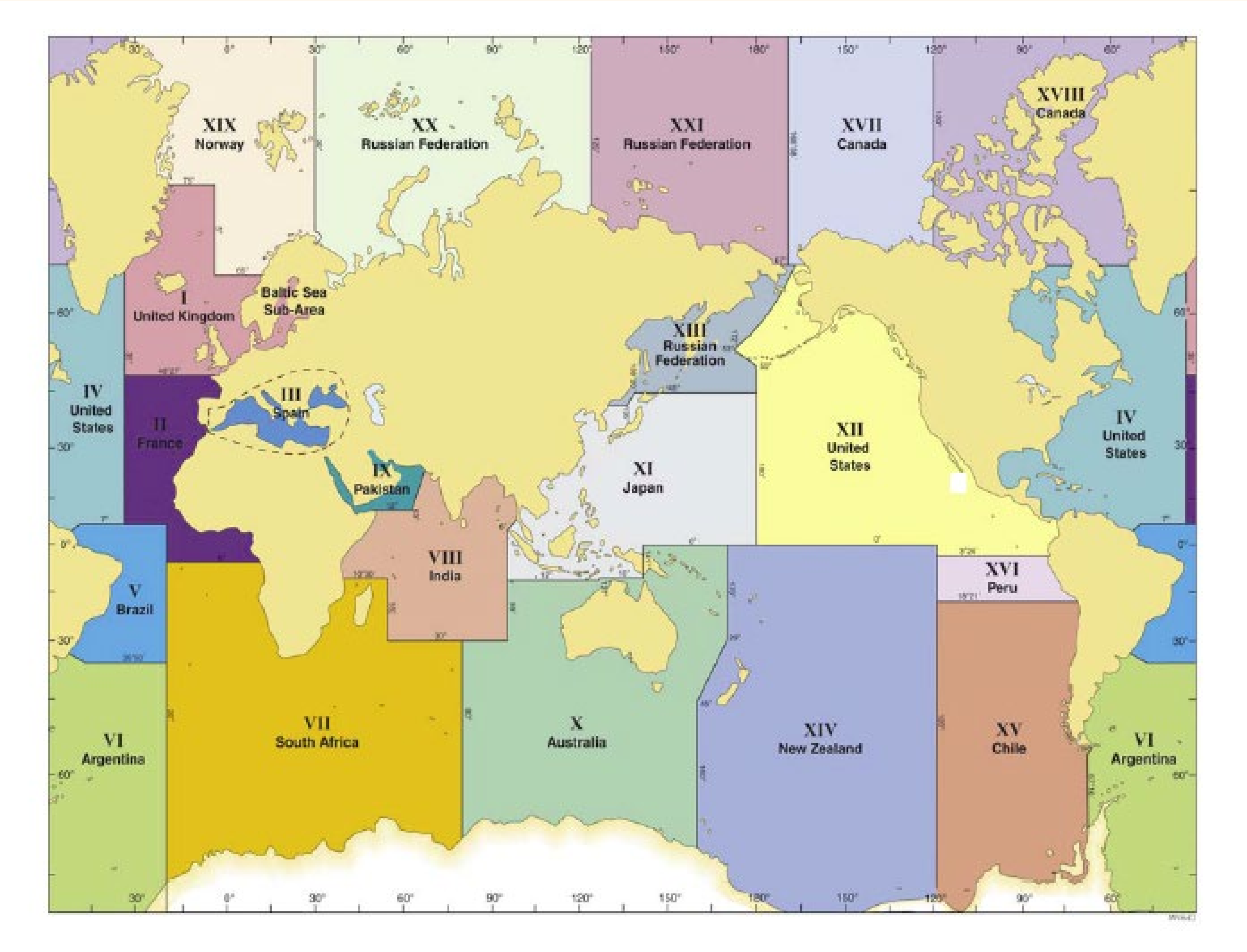
- TE I am bottom trawling
- TE1 I am trawling with a floating trawl

International code of signals

- To be able to hoist signals from the International Code of Signals you will require at least 26 alphabetical flags, 10 numerical flags, 3 substitutes and an answering pendant onboard. Detailed instructions for signalling by flags are given in the 'International Code of Signals

Search and rescue

- The oceans of the world have been divided into 21 areas for **SAR** purposes; the Australian area of responsibility is designated as **NAVAREA X.**



Search and rescue

- On 1 July 1997, a new Commonwealth civil search and rescue organisation, **AusSAR** was established. **AusSAR** is a discrete business unit of the Australian Maritime Safety Authority **(AMSA)** and has assumed responsibility for both aviation and maritime search and rescue.
- When a vessel or an aircraft is in distress in the Australian Search and Rescue Region **(SRR)**, assistance may be given by ships in the vicinity and/or the following authorities may give assistance:

Search and rescue

- **AMSA** through **AusSAR**, specifically the Joint Rescue Co-ordination Centre Australia **(JRCC Australia)** is responsible for **SAR** for all civil aircraft, for merchant ships outside port limits and for small craft beyond the capacity of local **SAR** resources.
- **JRCC Australia** is located in Canberra and co-ordinates aircraft and surface vessels involved in **SAR** operations within the Australian **(SRR).**
- **JRCC Australian** is also the Australian Mission Control Centre **(AUMCC)** for the International **COSPAS/SARSAT** distress beacon detection system.
- **JRCC Australia,** which is manned continuously, may be contacted through any Australian Coastal Radio Station **(CRS)** or **INMARSAT**.

Search and rescue

- Limited Coastal Radio Stations **(LCRS)** keep watch on the International RTF distress frequencies.
- The INMARSAT Land Earth Station **(LES)** at Perth provides communications through both the Indian Ocean Region **(IOR)** and Pacific Ocean Region **(POR)** satellites.
- Details of **Australian Maritime Communications Stations (MCS)** can be found in relevant Admiralty List of Radio Signals and International Telecommunications Union publications.
- Royal Australian Air Force **(RAAF)** is responsible for **SAR** operations involving Australian and foreign military land-based aircraft: but may provide assistance to other **SAR** authorities.

Search and rescue

- Royal Australian Navy **(RAN)** is responsible for **SAR** in respect of naval ships and shipborne aircraft, but may provide assistance to other **SAR** authorities.

- State and Territory Police Forces are responsible for **SAR** operations involving fishing vessels and pleasure craft within the limitations of their **SAR** resources.
- Vessels fitted with suitable radio equipment can make a significant contribution to safety by guarding an appropriate International distress frequency for as long as practicable.

Search and rescue

- Guidance for Masters involved in SAR operations is contained in the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR) Volume III. It is a SOLAS requirement that mariners carry a copy of IAMSAR Volume III for guidance during SAR operations.

Assistance by SAR aircraft

- Aircraft (other than helicopters) employed on search and rescue duties usually carry droppable survival equipment and marine markers.
- These aircraft may be able to assist a vessel in distress by confirming location, marking position, dropping survival equipment or directing rescue vessels to the area.
- Droppable equipment may consist of life rafts with bright yellow or orange buoyant rope attached or hellboxes containing survival equipment.
- Australia maintains dedicated SAR aircraft and helicopters which are available at short notice.
- Where possible aircraft will be equipped with VHF Direction Finding, equipment for the location of EPIRB transmissions.

Assistance by SAR aircraft

- To assist in recognition by aircraft, the position of the vessel should be given as accurately as possible. When time permits, a description of the ship, including any unusual features, colour of hull, funnel and superstructure should be given.

Use of helicopters

- Helicopter assistance in the Australian SRR is generally limited by relatively short ranges and low operating speeds.
- Helicopters may be used to supply equipment and/or rescue or evacuate personnel.
- Advice concerning helicopter-ship operations is contained in the IAMSAR manual or may be sought from JRCC Australia.
- On no account should the strop or winch wire, when lowered from the helicopter to the vessel, be secured to any pant of the vessel or allowed to become entangled with any rigging or fixtures.

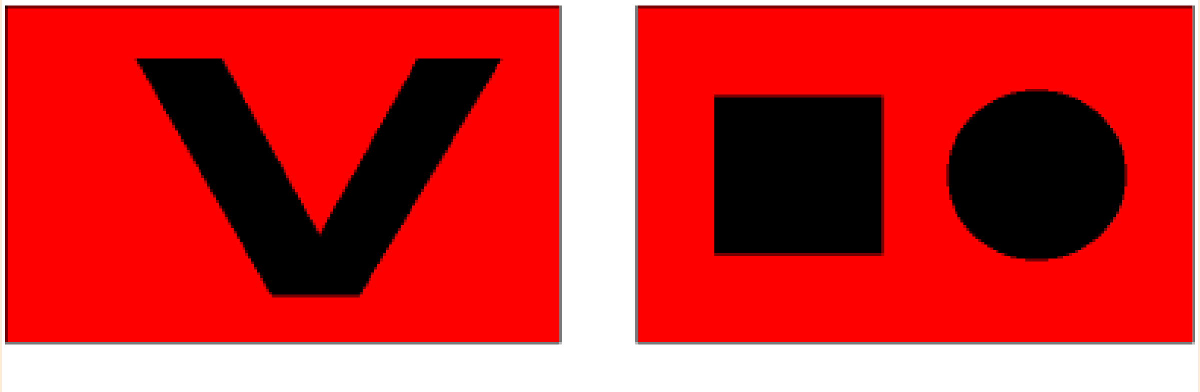
Use of helicopters

- Where a helicopter is unable to safely operate over the deck of a ship, the helicopter may be able to lift a person from a boat or raft towed astern on a long painter.

- In bad weather, survivors are sometimes more easily recovered from the sea than the ship itself, particularly if it is a yacht.
- If a ship wishes to contact a helicopter during a SAR operation it may do so by visual signals, direct radio communication or through JRCC Australia.

Distress signals for SAR

- Searching aircraft frequently experience difficulty in locating small vessels to help overcome this problem in the Australian SRR area either of the two signals illustrated below may be used to indicate a vessel in distress requiring assistance. These signals are not meant to replace pyrotechnic signals already carried by small craft, but should be carried in addition to those signals.
- These signals are supplementary to the international distress signals and if possible, the international signal NC (i.e. flag N over flag C) should be hoisted.



Use of ships in assisting aircraft

- Aircraft, which ditch in the sea generally, remain afloat for only a short time. In view of this, Masters of ships proceeding to assist should do so with the greatest possible speed.
- Ships may receive information of distress on any of the internationally recognized RTF distress frequencies or by INMARSAT.
- Additionally, by an aircraft directing a vessel to the location of a distress or by signals emanating from survivors.
- Further advice concerning action to be taken in any of these eventualities can be found in the IAMSAR maunal.

Use of ships in assisting aircraft

- All information concerning an aircraft in distress at sea is to be passed to JRCC Australia by the most expedient method; further action will then initiated shore authorities.
- Where possible, if DF equipment is fitted, bearings of any radio signal should be obtained.

Communications with aircraft searching for survivors

- An aircraft engaged on **SAR** operations would be briefed to listen on a specified frequency and ships will be advised by **JRCC Australia** of the frequency adopted.
- In the absence of specific advice, the primary air/sea communications frequency is **156.8 MHz (Channel 16)**.

Communications with aircraft searching for survivors

- When it is necessary for an aircraft to direct a surface craft to the place of distress the aircraft may do so by transmitting precise instructions by any means at its disposal. If such instructions cannot be transmitted, or if considered desirable for any other reasons the following manoeuvres performed in sequence means that the aircraft wishes to direct a surface craft towards a distress position:
- Circling the surface craft at least once.
- Crossing the projected course of the surface craft close ahead at low altitude and:
  - rocking the wings or
  - opening and closing the throttle, or

Communications with aircraft searching for survivors

  - changing the propeller pitch.
- **Note:** Due to high noise level on board surface craft, the sound signals in (2) and (3) may be less effective than the visual signal in (1) and are regarded as alternative means of attracting attention. Repetition of such manoeuvres has the same meaning.
- Heading in the direction in which the surface craft is to be directed.
- A vessel receiving the above signals should reply in the following manner: ·
- When acknowledging receipt of the signals:
  - hoist the "ANSWERING" pendant close up, or
  - flash the Morse Code procedure signal "T" by light, or

Communications with aircraft searching for survivors

- change heading onto the indicated direction. ·
- When indicating inability to comply:
  - hoist the international flag "N (NOVEMBER), or
  - flash the Morse Code procedure signal "N" by light.
- The following manoeuvre by an aircraft means that the assistance of the surface craft to which the signal is directed is no longer required: crossing the wake of the surface craft close astern at low altitude, and:
  - rocking the wings or
  - opening and closing the throttle, or
  - changing the propeller pitch.

Night search by aircraft

- An aircraft searching at night for pyrotechnic equipped survivors or small craft will either fire a green flare or, in the case of non military aircraft, switch on landing lights at three to five minute intervals and at each turning point in the search pattern. Survivors in the area should see at least two successive signals. Aircraft crew will acknowledge the sighting of distress flares by firing a succession of green flares and/or switching on the aircraft's landing lights.

Response action by survivors

- Survivors can assist in their detection by a searching aircraft if optimum use is made of what ever pyrotechnics they have available. A flare should not be fired until after the aircraft's signal has ended. A second flare should not be fired until a full minute after the first flare. When the aircraft is about a mile away a further flare should be fired.
- To increase the chances of being located, survivors should always attempt to maintain a continuous all-round visual lookout at night, as well as by day.

GMDSS

- The Global Maritime Distress and Safety System **(GMDSS)** came into effect on 1 February 1992.
- All ships over 300 gross tonnes on international voyages, and hence subject to the convention, have been required to comply with carriage requirements of the GMDSS system since 1st February 1999.

GMDSS

- Australia's maritime area (search and rescue region, and Navarea X) has been declared a **GMDSS 'A3'** area; that is for distress and safety purposes the area will be supported by both satellite and **HF** terrestrial radio services. The Australian GMDSS HF DSC network is provided by the Commonweath with stations located at Charleville Queensland and Wiluna Western Australia, and conrolled from a single manned network control centre located in Canberra. **(MMSI 005030001)**. The network will serve commercial vessels to which the **SOLAS** Convention applies and be accessible to other non-SOLAS vessels such as fishing vessels and pleasure craft provided they fit compatible radio equipment.

GMDSS

- Australia operates **INMARSAT** Land Earth Stations **(LES)** located in Perth and linked to both the Pacific Ocean Region **(POR)** and Indian Ocean Region **(IOR)** satellites.

- Communications via these satellites include distress priority channels and a Safety NET service for Maritime Safety Information **(MSI)** using enhanced group calling **(EGC)**.

- The Safety NET service enables vessels to automatically receive Marine Safety Information **(MSI)** appropriate to their area of operation.

GMDSS

- Australia is associated with the international **COSPAS/SARSAT** system as a Ground Segment Provider.
- This satellite system is designed to assist search and rescue operations using **EPIRBs** operating on **406 MHz** EPIRB's, and providing alert and location data to rescue coordination centres **(JRCC).**
- The regional ground segment includes satellite data receiving antennas and processing equipment located at Cave Point, Albany (Western Australia), Bundaberg (Queensland) and Wellington, (New Zealand).
- These provide data to the Mission Control Centre, which is located at the JRCC in Canberra.

GMDSS

- HF distress and safety services for SOLAS equipped vessel's is provided by AMSA based in Canberra with stations at Wiluna,(WA) and Charlwville (QLD), by two means HF Digital Selective Calling (DSC) and HF Narrow Band Direct Printing (NBDP) after initial contact is made by a DSC call.
- MSI (Maritime Safety Information) services are provided by INMARSAT- C only by EGC (Enhanced Group Calling).

GMDSS

- **HF DSC.** Canberra, station/network identifier J**RCC Australia** using the callsign **VICTOR JULIETT CHARLIE**, (MMSI 005030001) maintains a continuous watch on the following DSC distress and safety channels.

- These are **4207.5, 6312.0, 8414.5, 12577.0 and 16804.5 kHz** It should be noted that AMSA HF and NBDP networks can only be accessed by making the initial contact by DSC.
- **No aural (voice) watch is kept on the HF radio telephony distress and safety frequencies.**

  HF NBDP. RCC Australia are capable of operation on the following NBDP distress and safety channels.
- These are **4177.5, 6268.0, 8376.5, 12520.0 and 16695.0 kHz.**

GMDSS

- HF distress and safety services are provided for non- SOLAS vessels through Limited Coast Radio Stations (LCRS) and Maritime Rescue Stations (MRS) in the Inshore Boating Radio Service. Stations monitored are **4125 kHz, 6215 kHz and 8291 kHz.** Navigation warnings (MSI) will be broadcast twice daily on **8176** kHz and at other times if urgent

Use of emergency position indicating radio beacons (EPIRB’s)

- The **AUMCC** is the regional Nodal Mission Control Centre for the **COSPAS/SARSAT** satellite distress beacon detection system.
- The COSPAS/SARSAT system is capable of detecting EPIRB's operating on 406 MHz and are detectable throughout the whole of the Australian SRR area with a high degree of accuracy

Use of emergency position indicating radio beacons (EPIRB’s)

- Ground antennas are at Albany (Western Australia) and Bundaberg (Queensland) Wellington (New Zealand) giving excellent coverage around the coast of Australia and in the Coral and Tasman Seas.

Use of emergency position indicating radio beacons (EPIRB's)

- EPIRBs should be switched on as soon as a distress situation occurs and **MUST REMAIN SWITCHED ON** until the rescue is concluded or until otherwise instructed by the rescue unit or rescue authority.
- Should inadvertent or accidental operation of an EPIRB occur, the beacon must be switched off and every effort made immediately to inform JRCC Australia through CRS, INMARSAT, relay via another vessel or any other means of communication.
- The report should include the position, and if known, the time of activation.
- **No action will be taken against any person reporting the inadvertent or accidental operation of an EPIRB.**

Use of emergency position indicating radio beacons (EPIRB's)

- In an emergency the **406 MHz EPIRB** should be activated as soon as possible as it provides global coverage.
- Global coverage is achieved due to the fact that even if the satellite does not have both the LUT and the EPIRB in sight at the same time, it will store the message received from the EPIRB till it comes across the next LUT, anywhere in the world, and then downland the information to it.
- That LUT will get in touch with the JRCC closest to the emergency.
- The operation of the EPIRB is easy. The instructions are printed on the side for clarification.

Use of emergency position indicating radio beacons (EPIRB’s)

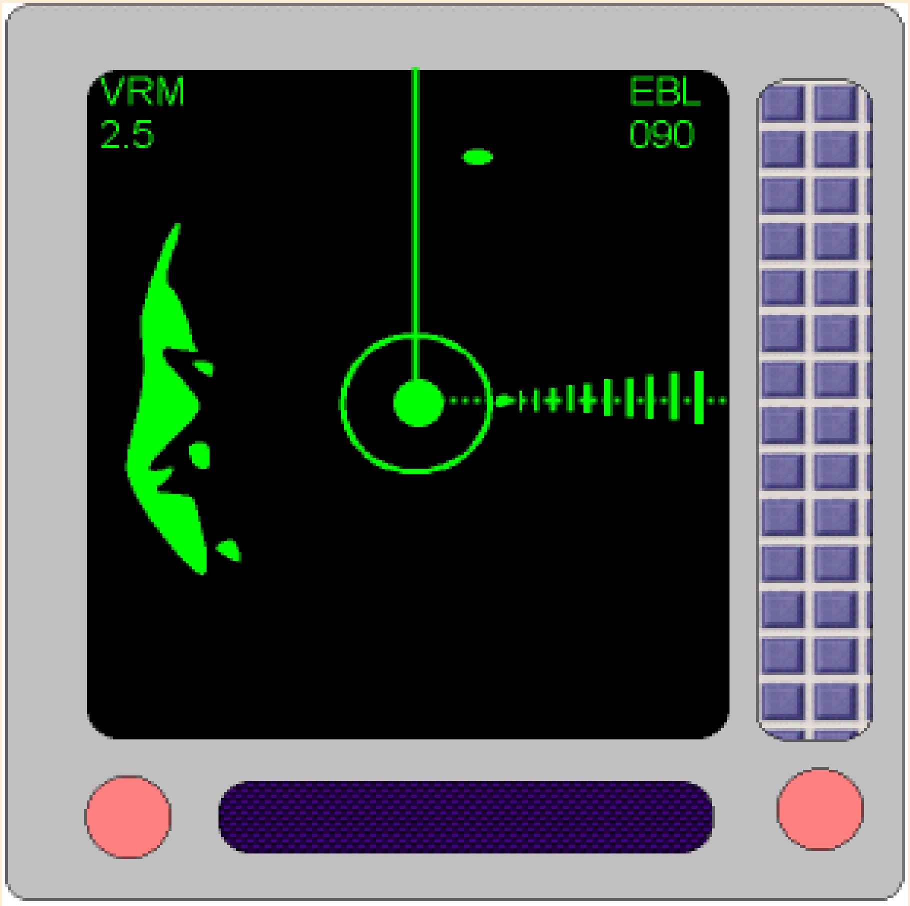
- EPIRBs' are designed to float upright in the water with their antennae extended, using the water as a reflector for its' signal.

- The EPIRB is designed to transmit continuously for a minimum period of 48 hours.

SART's

- A **SART** is a **S**earch **A**nd **R**escue Radar **T**ransponder which operates on X band or 3 cm radar.
- When the SART is switched on it stays in standby mode until triggered by another ship's radar.
- When triggered by a radar signal it automatically transmits its own unique signal, which is displayed on the other ship's radar screen.
- This signal consists of 8,12 or 20 blips in a straight line radiating, outwards on the screen.
- The first blip on the radar screen is the position of the SART. See figure next.

SART's



SART's

- When switched on the SART can stay in standby mode for 96 hours and then transmit continuously for a further 8 hours. It is fitted with a small speaker at its base and when transmitting sounds a beep. Unless the SART's instructions say different the SART should be kept **OUT** of the water and mounted as high as possible , like radar, it works in the line of sight.
- Both the SART and the EPIRB are recognised internationally as distress signals and must be treated as such. They form part of the requirements for the GMDSS equipment.

In class exercise

- Question 1: What are the general principles behind GMDSS?
- Question 2: Describe a SART and its function?
- Question 3: Explain how an EPIRB works and the use that the JRCC Australia makes of EPIRBs.

In class exercise answers

- Question 1: Global Maritime Distress and Safety System. Communications network dedicated to SAR, compatible with EPIRB transmissions on 406 MHz and VHF, HF and INMARSAT.
- Question 2: A search and rescue transponder which operates on x band or 3 cm radar. When triggered by a radar signal it automatically transmits its own unique signal, which is displayed on the interrogating radar screen.
- Question 3: Transmits a signal on VHF and UHF frequencies compatible with satellite system (GMDSS). JRCC can obtain location of the casualty, which narrows the search area and identifies ships in the area, which may be able to assist.

In class exercise

- Question 1: How would you operate an EPIRB for 'short bursts' or leave it activated when in use? Give reasons.
- Question 2: You are steaming at night in a heavy rainstorm with the radar on the blink, when through the rain and dead ahead you see a very powerful light flashing 'short short long' repeatedly. What does the signal mean?

In class exercise answers

- Question 1: EPIRBs should be switched on as soon as a distress situation occurs and MUST REMAIN SWITCHED ON until the rescue is concluded or until otherwise instructed by the rescue unit or rescue authority.
- Question 2: You are running into danger.

Master’s duties

Official logbooks and record books

- The number and type of records you will need to keep on board will depend on the **size, function and area of operation** of the vessel.
- Generally, all unlimited sea-going vessels, limited sea-going vessels of 35 metres and over and restricted sea-going vessels 50 metres and over, must keep an Official Log Book.
- Others are required to keep a Vessel Record Book

Official logbooks and record books

- Other types of records, which all vessels should maintain, include Engine Room and Vessel's Radio Logs.

- Vessels engaged in cargo handling are also required to keep records of all of the lifting equipment in the register of material handing equipment.

- Details in such a register would include date of purchase, test certificates, SWL, inspections, repairs etc.
- There are many reasons why the keeping of accurate records is important.

Official logbooks and record books

- In court proceedings, entries in the Official Log Book are admissible as evidence and may be accepted as proof of an offence or occurrence in the absence of contrary evidence. It is therefore essential that all entries are made in the correct manner, within the prescribed period and are signed and witnessed.
- All accurate details of incidents recorded at the time of the event will assist in later investigations and in the preparation of reports and insurance claims.
- Daily records of crew, passengers carried, weather etc. can help in making future business plans.
- Accurate engine room records are essential for planned preventative maintenance and trouble shooting.

Official logbooks and record books

- The entries to be made in the vessel record book should include but are not limited to:
- the date and time or arrivals and departures at each port of call or destination;
- any deaths and disappearances
- illness or injury of persons on board
- emergency procedures and drills
- details of any casualty to the vessel

Official logbooks and record books

- details of any assistance given to another vessel
- details of engine running and maintenance of machinery and equipment.
- Entries are to be made as soon as possible after the occurrence to which they relate. The date and time of the entry should be evident and all entries must be signed.
- In the event of a vessel being lost or abandoned the vessel log book is to be sent to a Superintendent/Authority as soon as possible. If practicable, all entries should be made out to the time of loss or abandonment.
- The Master is required to produce the Vessels log Book, for inspection when requested by the Authority.
- It is an offence to:

Official logbooks and record books

- willfully destroy the Vessel Record Book, or an entry in it
- willfully render illegible an entry
- willfully make a false entry or an omission
- sign an entry knowing it to be false.
- There are no limits to the number and type of entries made but once again they should be accurate and reflect the entire events of the day.
- Other information that is often found in a Vessels log book would include:
- names of crew and passenger numbers
- weather conditions

Official logbooks and record books

- departures from normal routine.
- compass checks - record of deviation errors
- summary of musters and drills held.
- Details of exact times and sequences of events can be easily confused with the passage of time.
- Always make a detailed record of any incident, check the facts, and if necessary have the entry witnessed.
- This may help to protect you at a later date, but remember it is an offence to make a false entry or to omit facts that should have been included.

Marine Incidents

- Generally a 'casualty' or 'incident' is deemed to have occurred when:
- a vessel is lost, abandoned, stranded, grounded, or materially damaged (whether by fire or otherwise), or has been in a collision with another vessel or with any other thing;
- there is a loss of life of injury to a person due to an accident occurring on a vessel.

Marine Incidents

- No matter how minor you may consider the grounding, fire, injury etc. to be, you must still follow the procedures of recording and reporting as:
- you are not qualified to assess damage done to your vessel
- there could be legal ramifications at a later date which could leave you unprotected.

Action to take in a collision with another vessel

- The Masters of each vessel involved must, without further endangering their vessel or persons on board:
- render all help necessary to the other vessel to save them from danger caused by the collision
- stand by until the other vessel requires no further help
- provide the other Master with sufficient particulars to allow identification of your vessel and its owners
- obtain the above information for your own records.
- The type of information sought would include the vessel's name and port of registry and the names of the ports from which the vessel sailed and to which it is bound.
- From that the Authorities will be able to ascertain all the other information required.

Action to be taken in all casualties or incidents

- If appropriate, sound muster stations and initiate emergency procedures. **This is when you will know if your drills have been effective!**
- Take whatever action you deem necessary as per your planned responses to minimise the danger while noting the chronological order of all the events leading up to and during the incident.

Action to be taken in all casualties or incidents

- Make a detailed entry into your Official Log Book/Record Book noting times, actions taken, response of other vessel, weather and visibility details, etc.

- These details will be required to substantiate reports, insurance claims and will be invaluable if the incident leads to an official investigation.

- Make a full written report to the authority at the earliest opportunity. (Within 72 hours).
- Failure to fulfill your obligations can result in fines and failure to offer assistance to another vessel in a collision can lead to imprisonment.

Lifesaving equipment

- Items requiring specific attention include:
- inflatable liferafts
- pyrotechnics
- fire fighting equipment
- miscellaneous equipment.

Inflatable liferafts

- Liferafts are supplied with survey certificates.
- The hydrostatic release is supplied with its own certificate.
- Before the liferafts service date has expired it is to be sent to approved service centre, where they are inspected.
- All deficiencies are made good and the liferaft is repacked and reissued a new certificate.

Pyrotechnics

- All pyrotechnics required to be carried by a vessel have to be properly packed and stowed and maintained in good condition at all times. This usually translates into keeping the pyrotechnics in a watertight container, properly marked and stowed in an easily accessible position.
- If the pyrotechnics have been maintained as above they are accepted as complying with the requirements for the following periods:
- Vessel and Lifeboat/Liferaft Pyrotechnics - 3 years from date of manufacture.
- Lifebuoy Smoke Signal - 3 years from date of manufacture.
- Lifeboat Buoyant Smoke Signals - 3 years from date of manufacture.

Fire fighting equipment

- All of your fire equipment must be kept fully charged and operational at all times. This means that if any of it is used at any time it must be recharged immediately. Replacement equipment must be brought on board if any is taken away for recharging or testing. Regardless of usage, each different type of extinguisher must be recharged at nominated intervals. All containers must be tested by hydraulic pressure to within 345 kilopascals of the pressure they were tested at the time of manufacture every 5 years.
- To ensure that your appliances comply it is necessary for them to be covered by Annual Test Certificate, which can only be issued by a body or firm, approved by the appropriate Authority.
- Inspection of all equipment should form part of your regular fire drills.

Miscellaneous equipment

magnetic compass

- Refer to NSCV PART C SUB-SECTION 7C – NAVIGATION EQUIPMENT for detailed requirements.

Adjustment

The compass/compasses fitted on a vessel are to be adjusted by a licensed adjuster of compasses before an initial Certificate of Survey is issued for that vessel.

Miscellaneous equipment

Thereafter vessels are required to have their compass/compasses adjusted b) an adjuster of compasses at intervals not exceeding 3 years, and on any other occasion, if:

- the vessel has undergone repairs or alterations which are likely to effect the accuracy of the compass
- the compass of the vessel is unsatisfactory or unreliable, in the opinion of the appropriate Authority
- the compass/compasses are replaced.

Miscellaneous equipment

If for any reason, the appropriate Authority determines that a compass adjustment is not required or that it can be deferred without detriment to the vessel, the appropriate Authority may exempt the vessel from compass adjustment for such period as the appropriate Authority may determine, if for example, you keep accurate and comprehensive records of compass checks in your log which show no change in deviation from that of your issued deviation card, you could be exempted.

The deviation card issued by an approved compass adjuster has to be displayed at all times in the wheelhouse of the vessel.

Miscellaneous equipment

- LPG Gas
- All gas installations must be inspected annually by a licensed and approved gas fitter and an appropriate safety certificate issued.
- Such an inspection would cover gas cylinders, pipe work, safety valves and all appliances.

Towage

- Towage is a service by which a vessel is assisted in its movements on or through the water, by another vessel, which is usually operating under the specific terms and conditions of a Towage Contract. This contract is based on an agreed amount of remuneration, which is usually much lower than what could be expected in the case of a salvage claim decided on by a Court. The majority of tug owners operating in the field of coastal and deep sea towage normally utilise their own particular form of towage contract which will include, apart from the main terms such as price, payment details, free time and demurrage, a section to cover general towage conditions which basically define the insurance and liability aspects.

Salvage

- Salvage is covered under Australian Federal Law - **NAVIGATION ACT 2012 - SECT 241**
- The basic principle of salvage is that when a person or persons save or help to save a vessel and/or her cargo from a danger, then the successful salvor is entitled to a reward provided that:
- the property must be exposed to an eminent marine peril and would have been lost without the salvors efforts
- the salvor must have no pre-existing covenant with the vessel involved and the danger must be real
- the salvor must act voluntarily

Salvage

- the services must be successful in saving or helping to save the property at risk.
- It is most important not to confuse salvage with your statutory obligations to render assistance to a vessel in distress or in the case of a collision.
- In salvage your services are voluntary and offered toward property as opposed to saving human life.
- Before the Master of a vessel engages in salvage the master should consider the following factors, amongst others.
- The Master should ensure that they does not endanger their own vessel or crew in the subsequent operation.
- The Master should be totally satisfied that their endeavours will lead to success.

Salvage

- The Master should advise the owners of the intention to salvage.
- The Master should establish that the operation does not invalidate the insurance of his vessel.
- The Master should inform any charterers and check for the "Deviation Clause" in the Charter Party or Bills of Lading.
- Many salvage agreements can be made between the salvor and the vessel being salvaged.
- The salvor can bargain for the reward beforehand but it is not necessary/prudent to do so as it is very difficult to correctly estimate the amount of effort that may have to be put in to effect success.
- Therefore salvage agreements are usually "OPEN" which means that a specific amount is not fixed but will be decided by arbitration.

Salvage

- The form of agreement most commonly employed nowadays is the Lloyd's Standard Form of Salvage Agreement and is known as The Lloyd's Open Form 0r "LOF".

Advantages of the LOF

- To the salvor:
- It is prima facie evidence of the nature of the service to be rendered preventing the owner from contesting the claim on the basis that the property was not maritime, not in danger or that the salvor was not a volunteer.
- It provides for disputes to be settled by arbitration.
- Provides for out of pocket expenses incurred rendering the service to be paid almost immediately.
- Provides that the salvor will not exercise their maritime lien for 14 days if in this time the owners of the property put up bail.
- This saves the cost of arresting the vessel and provides a bail fund to which the salvor alone has access.

Advantages of the LOF

- The agreement is reached quickly and the reward arrived at fairly by arbitration.
- To the owners of salved property:
- Prevents unsuccessful salvors claiming payment under the guise of a towage or hiring agreement.
- Benefit by the arbitration provisions in the same way as the salvor.
- Avoids loss of earnings by property being arrested provided they put up the bail within 14 days.

Signing the agreement

- At the time of entering into agreement it is not necessary nor is it usual, to physically sign the "LOF" so long as there is good evidence that the parties have agreed to carry out the salvage under this form of agreement.
- It is sufficient for a simple agreement on a sheet of paper to be signed stating that the services are to be rendered under the terms of "LOF".
- Even a witnessed Log entry would suffice.
- At the time of contracting it is important to obtain a clear and unambiguous agreement on a Place of Safety, as this will be used as a measure of success of the operation.

Salvage fund

- For any remuneration to be paid something of tangible value must have been saved from which to generate a salvage fund. The ultimate value of this fund will depend on the following criteria:
- the sound market value of the vessel at the time of becoming a casualty, less the cost of repairs
- the value of all cargo saved
- the value of any remaining bunkers.
- In no case can the final award paid exceed the value of the salved property. In determining the amount of remuneration to be paid to salvors, the following factors are mainly taken into account:
- the value of the property saved

Salvage fund

- the skill and efforts of the salvors
- The actions and skill of the salvors in preventing and/or minimising pollution and any threat to the environment
- the measure of success obtained by the salvor
- the nature and degree of danger involved
- time used and expenses/losses incurred
- the risks to equipment
- the promptness of the service rendered
- the efficiency of the salvor's equipment.

Life salvage

- You may have noticed in the earlier broad definition of salvage, that the saving of life was not mentioned.

- The fact of the matter is that internationally, life is not a salvageable item, because the Master has an international obligation, so far as is able and without the risk of serious damage to own vessel or the safety of crew and passengers.

- To render assistance to every person who is found at sea and in danger of being lost, even if the person concerned is the subject of a foreign state at war with the flag country.

- Hence the saving of life is placed outside the context of salvage.

- It is a duty and therefore will not constitute grounds for the salvage award.

In class exercise

- Question 1: Outline the requirements for Log/Record Book entries regarding musters and drills.
- Question 2: Should you make an error while making an entry into a Log/Record Book, how would you correct it?
- Question 3: What information must you supply to the Master of the other vessel in the event of a collision?
- Question 4: What 'casualties' or 'incidents' must be reported to the Authority?
- Question 5: How often do pyrotechnics need to be replaced?

In class exercise

- Question 6: State the pressure test interval for water, foam and dry chemical fire extinguishers.
- Question 7: How often does a magnetic compass have to be 'swung'?
- Question 8: Gas installations require a safety inspection every?

In class exercise answers

- Question1: The details of all drills and safety procedures carried out must be entered in the LOG/Record Book. Should a scheduled drill not have been carried out due to weather or other reasons, these reasons must be noted in the log and the drill carried out as soon as practical after the cancellation.
- Question 2: Cancel the entry by drawing a line through it while leaving it legible. Sign the correction.
- Question 3: Sufficient to allow identification of your vessel and its owners.
- Question 4: All incidents, however minor.

In class exercise answers

- Question 6: Every 3 years. The date of manufacture and expiry date are stamped on them.
- Question 7: 5 years.
- Question 8: Every 3 years.
- Question 9: 1 year.

Prepare for service and maintenance work

Every vessel, as part of the SMS system must have a planned maintenance system which engineers, masters and crew must follow.

Every vessel must have operating procedures in the SMS which engineers, masters and crew must follow.

After every trip you need to assess the maintenance and servicing that is required before the vessel goes back to sea.

If at sea for extended periods you need to access the planned maintenance to assess what will need servicing before the vessel returns to port.

You will need to ensure you have the required parts and materials on board plus spares in order to meet your obligations for maintaining the ship under the NSCV and OH&S.

Prepare for service and maintenance work

You must undertake and record regular inspections of operating machinery, this will also identify additional items that may require maintenance other than what is planned.

Before starting any servicing or maintenance work consult the manufacturers hand books and technical manuals for the correct procedures and specifications.

Failure to consult the manuals could breach OH&S.

Prepare for service and maintenance work

The ships SMS system must have a technical manual, this should contain all manufacturers manuals for the ships equipment including servicing and maintenance instructions for ALL EQUIPMENT.

If you do not have these manuals you need to obtain them from the manufacturers or GOOGLE is a good friend especially for older equipment

Don’t sail without the manuals.

Prepare for service and maintenance work

Maintenance needs to be planned with all crew on board and sometimes shore based staff if they are required to carry out some work.

Before starting any servicing work ISOLATE the equipment to be worked on, affix DO NOT USE LABELS, remove keys, and make sure crew know of work being carried out.

Good communications are the key to a safe work place for all.

Prepare for service and maintenance work

Always select the appropriate tools for the job, do not use tools that are damaged or worn.

Make sure you use the appropriate PPE.

Make sure you have all the correct parts and materials on hand.

Make sure the area is cleared away and free from clutter that could cause you to fall, stumble, trip or slip.

Prepare for service and maintenance work

Carry out all identified service work to specification and be observant for abnormal wear or damage.

Do regular oil sample analysis for early warning of problems that cannot be seen.

Always replace worn components with manufacturer approved parts and adjust to manufacturers specifications, or you will not be meeting your OH&S requirements.

After work is completed always do an operational check before returning it to operational service.

Prepare for service and maintenance work

Clear away and clean up work area disposing of all materials in accordance with company policies, procedures and laws.

Document all materials disposed of in oil and garbage disposal logs.

Complete maintenance paper work, fill out engineers log, service reports, sign off defect reports if you have fixed a registered defect.

Clean and pack away tools and order replacement parts for those used, to maintain spares levels.

Every vessel must carry sufficient tools to carry out diagnosis, service and repairs at sea, tools need to be in good condition and checked to insure they are all there.

THE END OF MARN019