



Lifeboats



Maritime Search and Rescue Manual

MAY 2019

DEVELOPED FOR LOW-RESOURCE AREAS

About this manual

The primary aim of the *Maritime Search and Rescue Manual* is to save lives by providing a resource containing essential skills, knowledge and guidance for those operating in a maritime environment.

The resource is designed for organisations based in areas with limited access to equipment.

This manual has been designed as a guidance document and can be adapted to suit the local environment.

This manual will be reviewed after 3 years. Please send any comments and feedback to: international@rnli.org.uk

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Piloted and developed by:



Lifeboats

Royal National Lifeboat Institution
West Quay Road
Poole
Dorset
BH15 1HZ
England

Tel: +44 (0) 1202 663000
Web: RNLI.org
Email: international@rnli.org.uk

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Terminology

COG – Course Over Ground

CSP – Commence Search Position

OSC – On-Scene Coordinator

SMC – Search Mission Coordinator

SOG – Speed Over Ground

SRU – Search and Rescue Unit

Unit 1: Personal protective equipment (PPE)



Learning outcomes

- 1.1 Know what personal protective equipment (PPE) is.
Know the different types of PPE to be used while afloat.
Understand the appropriate uses of PPE.
Be able to put on and adjust personal protective equipment correctly.
- 1.2 Know the maintenance and care that is needed for your PPE.
- 1.3 Know what to do if you end up in the water.

1.1 Personal Protective Equipment (PPE)

What is PPE?

Personal protective equipment, or PPE, is equipment or clothing provided to ensure that a person can carry out their own particular role in comparative safety when it is used or worn correctly.

PPE is only useful when correctly fitted and adjusted. Training is essential. It is the user's responsibility to check that PPE is maintained, cleaned, serviceable for use and is stored correctly.

Safety Helmet

- Provides warmth.
- Provides impact protection.
- The face shield protects from the elements (and from blood during first aid).



Drysuits

- Designed for more extreme conditions.
- User is more likely to enter the water.

Maritime PPE

PPE for going to sea is primarily concerned with three main areas of personal safety. They are to keep a person:

- dry
- warm
- afloat.

Lifejacket

- Provides buoyancy.
- Ensures correct body orientation in the water.
- Offers some impact protection.



Foul-weather clothing

- Usually made up of a waterproof jacket and trousers.
- Not designed for entering the water.

Unit 1: Personal Protective Equipment (PPE)

Staying warm and dry

If you are operating at sea in cold conditions, it is important to stay warm and dry. You can use different types of clothing and PPE, adjusting them to the environment, as necessary.

Tips for staying warm

Wear layers; more layers will trap air between them and keep you warmer. Eating hot food and drinks can help combat the effects of the cold.

A drysuit could be worn. It has waterproof wrist and neck seals to keep you dry

Gloves will keep your hands warm but could make tasks like ropework more difficult and hazardous

A pair of goggles or a helmet visor can protect your face from rain and spray

Warm hat

Fleece

High fit trousers over thermal underwear

Adjustable trouser bottoms

Non-slip shoes over thermal socks

Eat and drink regularly

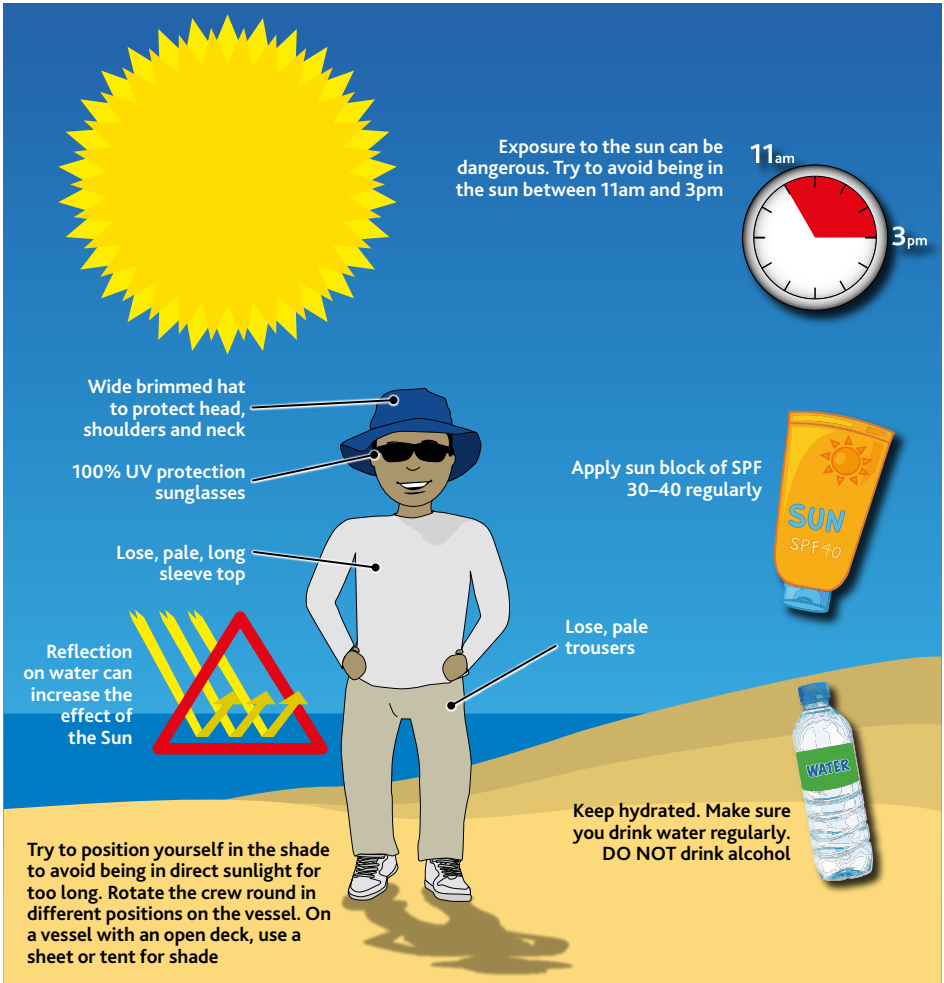
The infographic features a central illustration of a person in a blue and yellow drysuit with a blue hat. To the left, there are icons for purple gloves, yellow goggles, a steaming cup of coffee, and a sandwich. To the right, there is a smaller illustration of a person in a grey drysuit. The background is a dark blue sky with clouds and a brown ground surface.

Staying cool

If the conditions are particularly warm, then the user will want to wear clothing to try and keep them cool. The main function of this clothing is to keep the skin shaded from the sun.

Dehydration symptoms

Thirst, dry lips, dark urine colour are all signs of dehydration; rehydrate using water. Be aware, dehydration can lead to more severe medical issues, such as heat stroke or heat exhaustion.



Personal flotation devices (PFD)

Buoyancy aid

A buoyancy aid has inherent buoyancy and will help the rescuer to float if they enter the water but it will not keep their head out of the water if they become unconscious. It needs to be a bright colour.



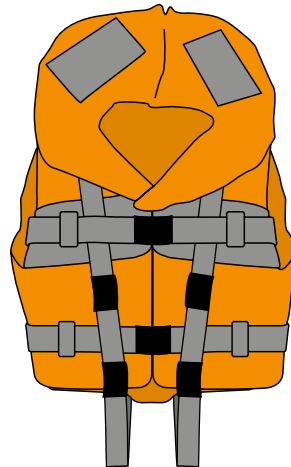
Lifejackets

There are many different types of lifejackets, including those with manual and automatic inflation. There are also foam lifejackets. A lifejacket is designed so that if you become unconscious it should keep your head above the water.

When they are inflated, lifejackets are sometimes larger than buoyancy aids and can be difficult to move in.

It is important that all PPE is the correct size and adjusted to an individual if it is to be effective.

Ensure that all straps and buckles are done up tightly and care should be taken to minimise the amount of loose ends.



Foam lifejacket

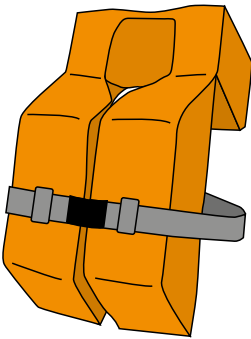
Foam lifejackets are made of closed-cell foam. They do not inflate as the foam provides all the buoyancy required.

Advantages:

- relatively cheap
- minimal maintenance required
- easy to put on.

Disadvantages:

- bulky for storage
- restrictive to move in
- uncomfortable to wear for long periods of time.



Automatic/manual-inflation lifejackets

Manual inflation lifejackets are activated by pulling the toggle, this mechanism releases gas from a cylinder to inflate the jacket. This can be a problem if the wearer is injured or unconscious and unable to manually inflate it.

Automatic lifejackets should inflate in the water. This is carried out with an automatic firing head. All automatic lifejackets can be manually inflated.

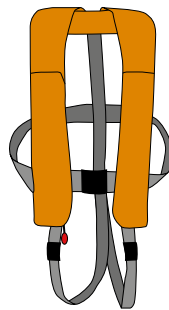
Advantages:

- more comfortable to wear as they are less bulky.

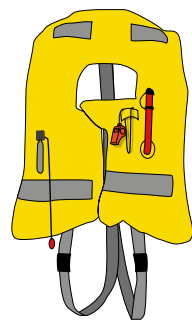
Disadvantages:

- once activated, the gas cylinder and components need to be replaced, which can be costly
- need to be serviced regularly.

Lifejacket (stowed)



Lifejacket (inflated)



Unit 1: Personal protective equipment (PPE)

Putting on personal protective equipment (PPE)

Buoyancy aid

Buoyancy aids come in a wide variety of designs. Some can be put on like a jacket while others are put on over the head and adjusted at the side.

The most important features of any buoyancy aid are that it fits comfortably, allows freedom of movement and helps you to float.

Make sure that any buckles are done up and straps are pulled tight so that the buoyancy aid fits properly.

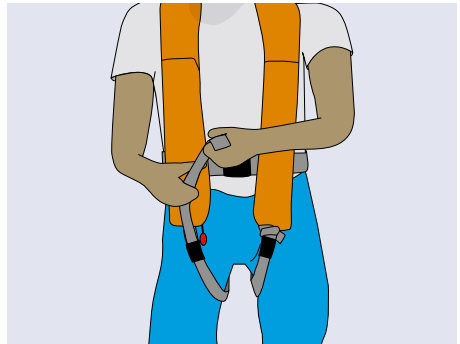


Lifejacket

When wearing a lifejacket it is vital that you fit it correctly, otherwise there is a danger that it may come off if you enter the water.

Ensure that any buckles are done up and any webbing straps are tightened.

Tuck away any excess webbing, so that it does not become a snag hazard.



Sprayhood

A spray hood will keep wind-blown spray away from your airways, making it easier to breathe and reducing the risk of drowning. It will also act as a high-visibility detection aid and stop heat escaping from your head.



1.2 Maintenance and care of PPE

It is essential that PPE is regularly maintained. Wash down PPE with fresh water and allow the PPE to dry naturally before returning to stowage.

Inflatable lifejackets should always be stored in clean, dry conditions and must be thoroughly dried after use, before being returned to their stowage. Failure to do so may cause the lifejacket to inflate automatically, due to moisture build up. Perform the following routine checks on your lifejackets:



Check the webbing and the stitching every three months. Also check zips buckles and other fasteners.



Check the gas cylinder is tightly screwed in every month. Always carry rearming kits for each type of lifejacket that you have onboard. If a lifejacket is accidentally inflated, you will be able to get it ready for use again straight away.



Check the CO2 bottle for corrosion every three months. A rusty cylinder should be replaced.

Every 6 months, inflate the lifejacket manually with a hand pump (use a hand pump to avoid moisture build-up inside the lifejacket). Leave it inflated for 24 hours to ensure there are no leaks or damage. Repack the lifejacket according to the manufacturer's folding instructions. Out of season, the lifejacket should be partially inflated (which removes creases in the material) and stored on a non-metal coat hanger.

1.3 What to do should you end up in the water

Adopt the H.E.L.P. position when alone in the water

- Heat Escape Lessening Posture.
- Inflate the lifejacket.
- Cross the legs and bend them up towards the body.
- Cross the arms and hold onto the shoulders of the lifejacket.
- At night, activate the lifejacket emergency light if fitted. Try and place this at the highest point to ensure good all round visibility.



Adopt the “huddle” position when all together in the water

- Inflate the lifejacket.
- Everyone huddle together.
- Try to attach to each other using a yacht harness if available. Thread the harness around the waist bands or lifting strops of the other lifejackets, NOT around the lifejackets stole.
- Being linked together keeps the crew closer together which helps to retain body heat and maintain morale. It also increases the chance of being spotted.
- At night, activate lifejacket emergency lights.
- Constantly monitor each other.



Attract attention





Learning outcomes

- 2.1 Understand what tides are and how tides will affect your ability to navigate safely.
 - Know where tidal information can be found.
 - Be able to calculate tidal stream.
- 2.2 Understand why checking the weather before going to sea is important.
 - Know where weather information can be found.

2.1 Tides

Definition

A tide can be defined as 'the movement of a body of water'.

This movement of water results in a regular and repeated rise and fall of the sea.

- The rise of the sea (tide coming in) is called a flood tide. At its maximum level, it reaches a period known as high water.
- The fall of the sea (tide going out) is called an ebb tide. At its minimum level, it reaches a period known as low water.

Tidal information

Tidal information can be obtained from a number of sources:

- tide tables
- newspapers
- internet
- almanacs
- tidal stream atlas.

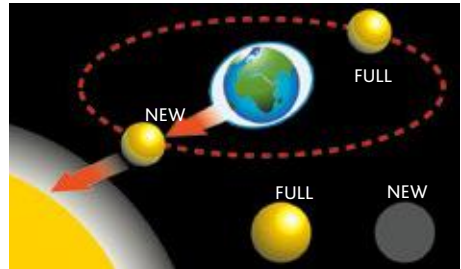
Types of tide

Tides are caused by the gravitational effect of the sun and the moon on the earth.

The tides are described as spring tides and neap tides. In a lunar month there will be two spring tides and two neap tides separated by approximately 7 days.

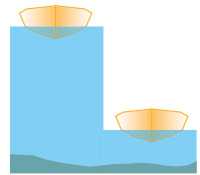
Spring tides (Full and New Moon)

When the sun, moon and earth are in line, we get a spring tide. With spring tides we get higher high waters and lower low waters.



The gravitational pull of the sun and the moon are in line. This will give a linear pull on the water over the earth's surface resulting in:

HIGH high water
LOW low water



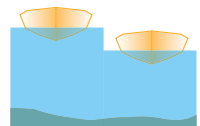
Neap tides (1st and 3rd Quarter Moon)

When the sun and moon are at right angles to the earth we get neap tides. With neap tides we get lower high waters and higher low waters.



The gravitational pull is now at right angles. This will evenly spread the water over the earth's surface resulting in:

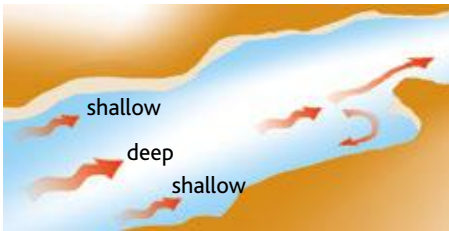
MODERATE high water
MODERATE low water



Tidal streams

Tidal streams are horizontal movements of water. They are affected by the shape of the land and the depth of the water. Generally, tidal streams:

- are strongest in deep, narrow channels and around headlands
- can make the sea rougher
- mean that watercraft operate on a moving carpet of water which means that the craft may not be travelling in the direction it is moving through the water
- mean that the speed over the ground (SOG) – the speed of actual travel – may be faster or slower than realised.



Tidal diamonds

Tidal information can be read from some nautical charts. This information is marked by a diamond-shaped symbol on the chart. Details of the tidal flow direction and rate are then shown in a table, which is printed on the chart for reference.



Tidal stream tables

Tidal Streams referred to HW

Hours	40°07'0N 5 49 50W		48°58'0N 5 48 50W		40°01'0N 5 27 0W		48°52'0N 5 10 0W		50°02'4N 5 02 2W	
	Dir	Rate (kts) Sp. Neap	Dir	Rate (kts) Sp. Neap	Dir	Rate (kts) Sp. Neap	Dir	Rate (kts) Sp. Neap	Dir	Rate (kts) Sp. Neap
Before HW										
8	337	0.8 0.2	351	1.7 0.8	290	0.9 0.6	256	1.8 0.9	201	1.0 0.5
9	002	1.8 0.7	327	2.3 1.1	290	0.8 0.5	204	1.3 0.6	339	0.1 0.0
4	060	2.4 1.2	336	2.0 1.0	329	0.3 0.2	234	0.4 0.2	008	1.0 0.5
3	010	2.0 1.2	302	1.6 0.8	049	0.4 0.3	045	0.4 0.2	011	1.4 0.7
2	068	1.6 0.8	023	1.1 0.6	065	0.6 0.3	064	1.0 0.6	055	1.3 0.8
1	031	1.1 0.6	008	1.0 0.5	082	0.8 0.4	089	1.4 0.8	032	1.5 0.7
After HW										
10W	123	0.8 0.3	113	1.4 0.7	097	0.8 0.4	067	2.3 1.1	028	1.3 0.6
1	188	1.7 0.8	134	1.8 0.9	107	0.7 0.3	078	1.4 0.8	030	0.8 0.3
2	181	2.5 1.2	137	1.8 0.9	124	0.4 0.3	082	0.8 0.4	202	0.4 0.2
3	194	2.5 1.3	156	1.8 0.9	301	0.3 0.2	303	0.4 0.2	196	1.2 0.6
4	210	2.1 1.0	166	2.0 1.0	334	0.4 0.3	323	1.4 0.7	185	1.2 0.6
5	223	1.7 0.8	172	1.8 0.9	363	0.8 0.4	347	2.3 1.1	187	1.4 0.6
6	285	0.4 0.2	288	1.4 0.7	278	0.8 0.5	287	1.8 0.9	202	1.2 0.6

Tidal stream tables provide specific data on tide direction and speed for the position indicated by the tidal diamonds. This is tabulated in 1-hour intervals either side of high water and shows rates for both spring and neap tides.

The information for each diamond is presented in the same way:

- the co-ordinates next to the diamond is the position in Latitude and Longitude at which the information was taken
- the first column of figures beneath each diamond is the direction of tidal streams in degrees true
- the second column of figures is the rate in knots of the flow of water on spring tides
- the third column of figures is the rate in knots of the flow of water on neap tides.

Unit 2: Tide and weather

Sawtooth

The Sawtooth is a visual and practical aid to understanding the direction and rate of the tide at any given time. Its purpose is to accurately predict the position of an object in the water after an elapsed period of time providing its last known position at a specific time is known. The following simple scenario will illustrate the Sawtooth method and the use of tidal diamond information.

Scenario

A report has been received saying that a person was spotted in the water at 11:00 at The Bellows. It is now 12:00.

Step 1, establish the required tidal information:

- determine, from the sources of information available to you, the time of high and low water
- whether the tides are springs or neaps.

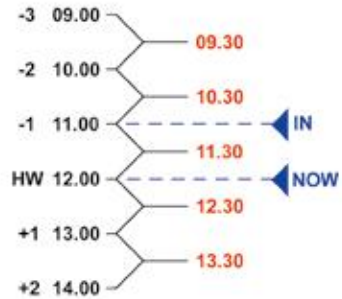
19	06.00	0.7
	12.00	6.7
	M 18.00	0.7
	● 00.00	6.7

Looking at the example above you will see that:

- high water is at 12:00, 6.7m
- low water is at 18:00, 0.7m
- this gives a tidal range of 6 metres
- a spring tide is indicated by the date being in red and the presence of the new moon symbol.

Step 2, draw out an evenly spaced Sawtooth:

- insert the high water time, that is 12:00
- insert hourly intervals – the peaks above HW decrease by one hour while the peaks below HW increase by one hour
- insert half hourly intervals in the troughs
- insert the time the person was reported in the water (11:00) and the current time (12:00).



Step 3, plot the person's last known position (LKP) on the chart and compile the tidal diamond information:

In this scenario the nearest tidal diamond will be A.



The person was reported in the water at 11:00 – this is at the mid-point of the high water minus one hour (HW -1 hr) period.

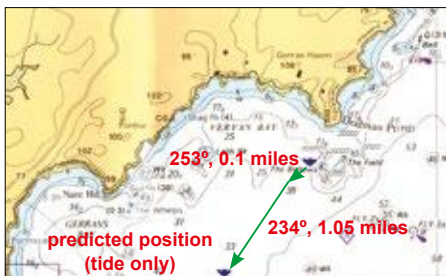
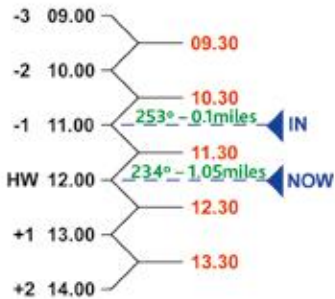
By referring to the tidal information for diamond A, on a spring range the tide is:

- travelling at 253° at 0.2 knots.
- at 11:30 the tide alters course and flows on bearing 234° at 2.1 knots.

This means that the person will travel:

- half an hour on bearing 253° at 0.2 knots for a distance of 0.1 miles
- half an hour on bearing 234° at 2.1 knots for a distance of 1.05 miles.

Step 4, record the tidal diamond information on to the Sawtooth and plot predicted position of the person on the chart:



2.2 Weather

Effects of weather

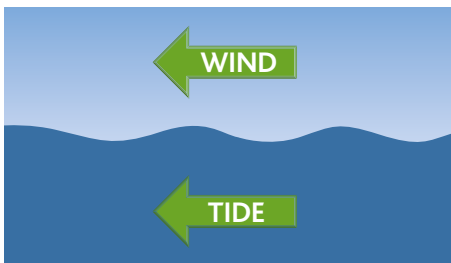
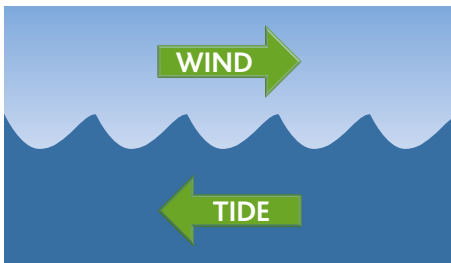
Prior to going to sea, check the tide and weather forecast.

Rain and fog can cause reduced visibility. This increases the risk of collision and may restrict your ability to conduct a thorough search.

Prolonged exposure to the sun can cause dehydration, resulting in reduced concentration and an inability to perform tasks effectively.

An understanding of wind strength, direction and what effect it will have on your vessel is essential. If the direction of the wind is against the tidal stream (wind against tide) the sea state will be worse.

The Beaufort scale on the following page will help to identify the characteristics of the sea in relation to the strength of the wind.



Weather information

Weather information can be obtained from a number of sources:

- television
- radio
- newspapers
- VHF radio
- internet
- local harbour or marina.



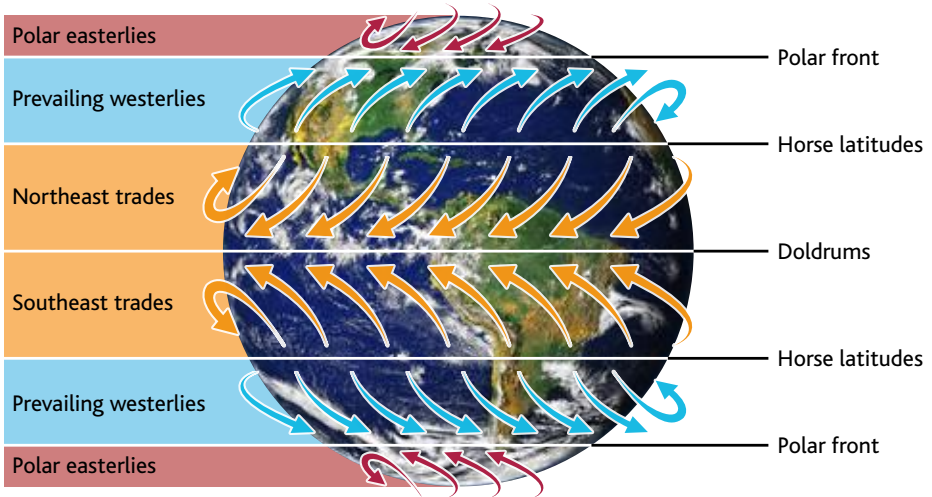
Remember: The wind speeds for each defined force on the Beaufort Scale must only be regarded as an AVERAGE speed. So gusts well up into the next force can be expected at times.

Beaufort Scale			Wind speed		
Force	Description	Sea characteristics	Knots	mph	km/h
0	 Calm	Like a mirror.	<1	<1	<1
1	 Light air	Ripples like scales are formed.	1–3	1–3	2–6
2	 Light breeze	Small wavelets, still short but more pronounced, not breaking.	4–6	4–7	7–11
3	 Gentle breeze	Large wavelets, crests begin to break; a few white horses.	7–10	8–12	12–19
4	 Moderate breeze	Small waves growing longer; fairly frequent white horses.	11–16	13–18	20–28
5	 Fresh breeze	Moderate waves, taking more pronounced form; many white horses, perhaps some spray.	17–21	19–24	29–38
6	 Strong breeze	Large waves forming; white foam crests more extensive; probably some spray.	22–27	25–31	39–49
7	 Near gale	Sea heaps up; white foam from breaking waves begins to blow in streaks.	28–33	32–38	50–61
8	 Gale	Moderately high waves of greater length; edge of crests break into spindrift; foam blown in well-marked streaks.	34–40	39–46	62–74
9	 Strong gale	High waves with tumbling crests; dense streaks of foam; spray may affect visibility.	41–47	47–54	75–88
10	 Storm	Very high waves with long overhanging crests; dense streams of foam make surface of sea white. Heavy tumbling sea; visibility affected.	48–55	55–63	89–102
11	 Violent storm	Exceptionally high waves; sea completely covered with long white patches of foam; edges of wave crests blown into froth. Visibility affected.	56–63	64–73	103–117
12	 Hurricane	Air filled with foam and spray; sea completely white with driving spray; visibility very seriously affected.	64+	74+	118+

Prevailing weather systems

Prevailing winds are winds that blow predominantly from an individual direction over a particular point on the Earth's surface. The dominant winds are the trends in direction of wind with the highest speed over a particular point on the Earth's surface. A region's prevailing and dominant winds are enacted by global patterns of movement in the Earth's atmosphere.

In general, easterly flow occurs at low and medium latitudes globally. In the mid-latitudes, westerly winds are the rule and their strength is largely determined by the polar cyclone. It is advisable to be aware of the local prevailing weather systems.





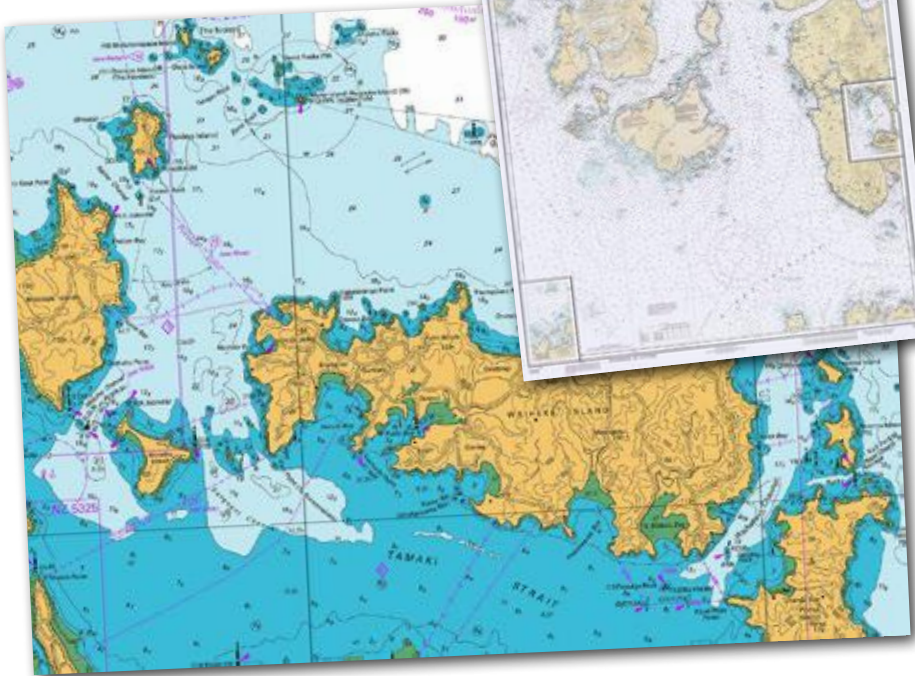
Learning outcomes

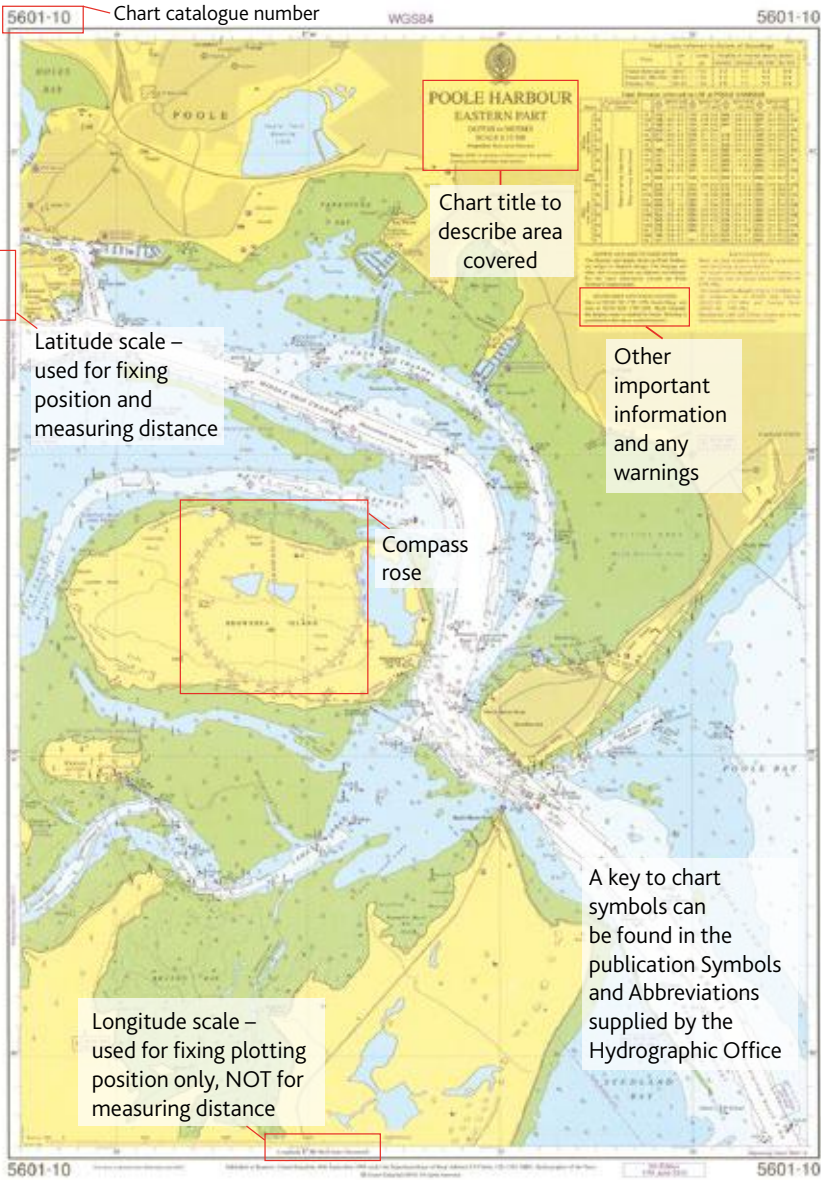
- 3.1 Be able to do basic chartwork and navigation.
- 3.2 To understand latitude and longitude.
- 3.3 Be able to plot your position on a chart.
- 3.4 Be able to plot a course using a range and bearing.
- 3.5 To understand the basic functions of a GPS unit.

3.1 Basic chartwork, navigation and buoyage

There are many different makes of charts available. The main differences between these charts are colours, paper, type of information displayed, scale and layout.

A chart shows the nature and form of the coast, the depth of the water and general character and configuration of the sea bottom, location of dangers to navigation, the rise and fall of the tides, location of man-made aids to navigation and the characteristics of the earth's magnetism. Some of these are identified on the following page.





The chart above is reproduced with kind permission of The United Kingdom Hydrographic Office. (Crown Copyright 1998)

Unit 3: Basic navigation

Compass rose

The compass rose is used to measure angles and to create headings for use with the compass. It also contains information on the difference between true and magnetic north at its location.



Colours on charts

Various colours are used to distinguish between areas of the chart, such as land (yellow), drying heights (green), shallow water (blue) and deep water (white).



Latitude and longitude

The marked latitude and longitude scales appear at the edges of and at intervals across the chart and are used for finding/fixing position.



5601-10

This chart is derived from Admiralty charts (2011).

Published in Taitian.

Tidal diamonds

Tidal diamonds may be situated at various positions on the chart. They tell the mariner that specific information regarding tidal direction and rates is available for that position. The tabulated information relating to these can be found elsewhere on the chart or in the chart pack.



Local information

Local information that may affect navigation is included on the chart or in the chart pack. This could include prohibited zones, military practice firing areas, dredging zones, overfall areas.

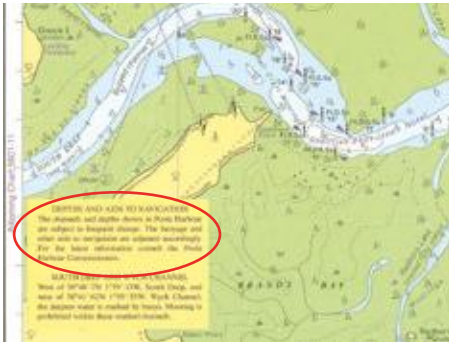


Chart symbols

On nautical charts, symbols and abbreviations are used to convey a lot of navigational information to the mariner. Each symbol has only one meaning, but it is vital that these 'coded messages' are correctly interpreted as many of them warn of specific dangers to navigation.

IALA Maritime Buoyage System

The IALA Maritime Buoyage System defines two regions in the world: IALA A is used by countries in Africa, most of Asia, Australia, Europe and India. IALA B is used by countries in North, Central and South America, Japan, Korea and the Philippines.

The difference between the two systems is the colour and light characteristics used for lateral marks, as follows:

- IALA A port lateral marks and lights are coloured red. Starboard lateral marks and lights are coloured green.
- IALA B port lateral marks and lights are coloured green. Starboard lateral marks and lights are coloured red.

The similarities

Aside from the different lateral marks, both systems use identical cardinal, isolated danger, safe water and special marks.

For the purposes of this manual, we will be using the IALA Maritime Buoyage system for region A.

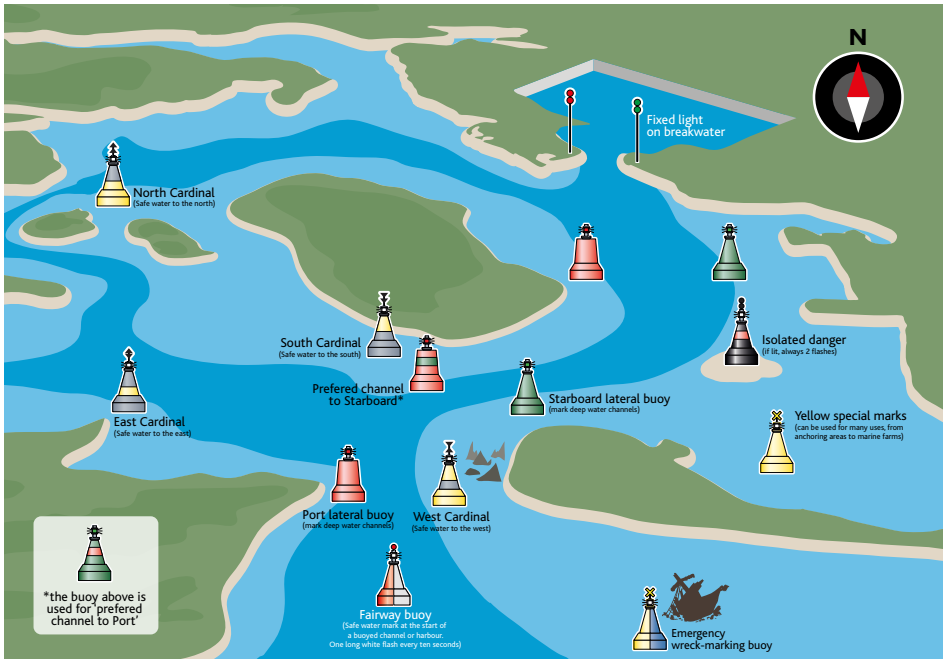


Key

- Region A (Port is red)
- Region B (Port is green)

IALA region A buoyage

The following graphic shows a typical harbour using the IALA region A buoyage system.



To aid identification, many buoys are lit. The light characteristics are often different but they will be shown on the chart. Common characteristics are flashing (Fl) when there is more dark than light, Isophase (Iso) when there is an equal amount of light and dark and Occulting (Oc), a rhythmic light when the period of light is clearly longer than the period of dark. A light showing at Fl(2) 10s means that the light will flash twice in a 10-second period.

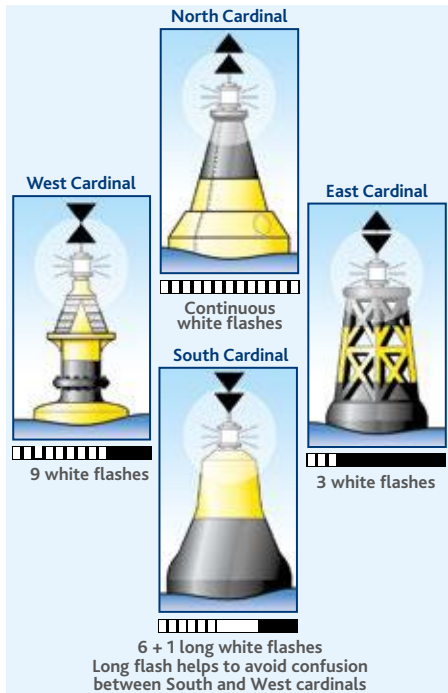
Unit 3: Basic navigation

Cardinal mark

Cardinals refer to the four cardinal points of the compass and are directional buoys. That is, they indicate the way to go to find the best navigable water. The cardinals surround, or mark a hazard. Safe water is to the north, south, east or west of the respective cardinal mark.

Each buoy is coloured with its own combination of black and yellow bands and each of the top marks comprise a combination of two black arrows.

The shape of an individual buoy can also vary provided the defining features of colour and top mark are maintained. Lights, when fitted, are white and will flash in the dedicated sequences either quick or very quick.



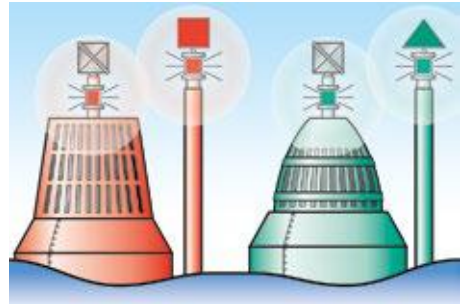
Lateral marks

Lateral marks are used to indicate well-defined channels. When used in conjunction with the direction of buoyage symbol on the chart they indicate the sides of the route to be followed.

The **PORT** mark is usually a **can** or **post**, coloured solid **red**. If a top mark is fitted it will be a single red can. When a light is fitted it will be **red**.

The **STARBOARD** mark is usually a **cone** or **post**, coloured solid **green**. If a top mark is fitted it will be a single green cone, pointed upward. When a light is fitted it will be **green**.

The sequence of light flashes can be anything with the exception of the 2+1 combination.



Preferred channel marks

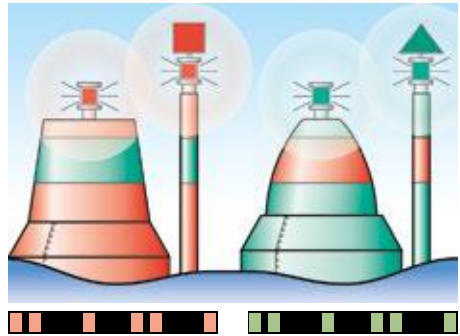
These are modified lateral marks used to indicate the preferred route when a channel divides to form two alternative channels to the same direction.

To indicate that the preferred channel is to port, the starboard lateral mark is modified with a red band.

To indicate that the preferred channel is to starboard, the port lateral mark is modified with a green band.

Remember – the colour of the band indicates the way to turn to take the preferred channel.

A light when fitted is red or green as appropriate to the buoy and the sequence of flashes is 2+1.

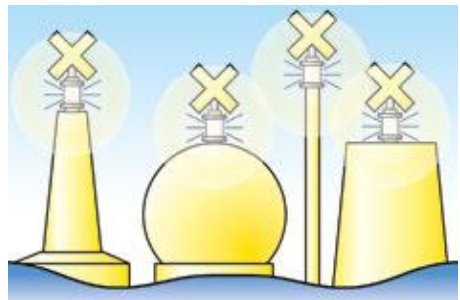


Special marks

Special marks locate areas of special interest. The nature of the marked feature is only apparent from reference to a chart. Special marks may be used for a variety of reasons, such as marking sewerage outfalls, swimming areas, historic wrecks.

The mark can be any shape but is always yellow. The top mark is a yellow cross.

A light, when fitted is yellow. The sequence of flashes may be anything not used by white lights.



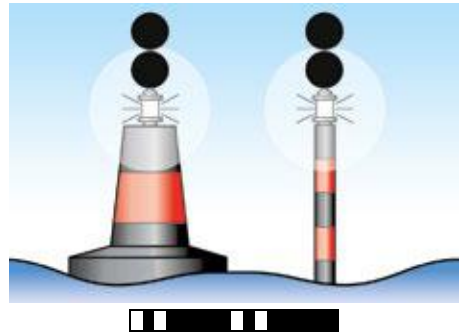
Unit 3: Basic navigation

Isolated danger marks

Isolated danger marks identify the location of isolated dangers of limited extent that have navigable water all around them.

Marks are black buoys or posts with one or more red bands around them. The top mark is two vertically aligned black balls.

A light, when fitted, is white and flashes in a group of two.

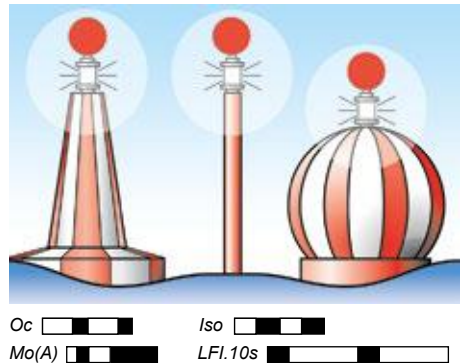


Safe water marks

Safe water marks indicate there is navigable water all round a mark. It may be used as a centreline, mid-channel or landfall buoy or to indicate best passage point under a bridge.

Marks are red and white striped buoys or red posts. The top mark is a single red ball.

A light, when fitted, is white. Sequence is Occulting (Oc), Isophase (Iso), Morse Code A (Mo(A)) or a single long flash in a period of 10 seconds (LFI.10s).

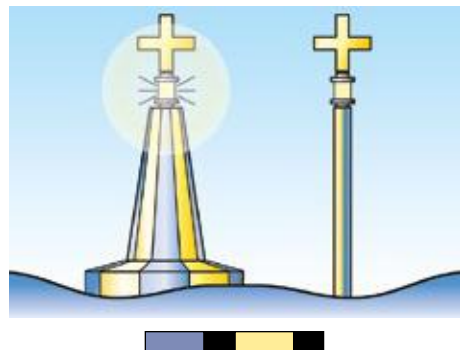


Emergency wreck marks

Emergency wreck marks temporarily locate the position of a wreck until a permanent form of marking has been carried out.

Marks are blue and yellow striped buoys or posts. The top mark is a yellow cross.

A light, when fitted, is an alternating blue and yellow flashing light where the blue and yellow 1-second flashes are alternated with an interval of 0.5 seconds.



3.2 Latitude and longitude

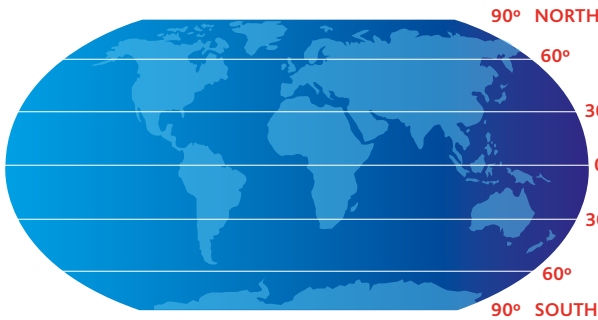
Every location lies on a line of latitude and a line of longitude – a unique position.

Degrees of latitude are parallel, so the distance between each degree remains almost constant. Since degrees of longitude are farthest apart at the equator and converge at the poles, their distance varies greatly.

The lines of latitude start at the equator (0°) up to the North or South Poles (90°).

The lines of longitude start at the Greenwich Meridian (0°) around to the International Date Line (180°).

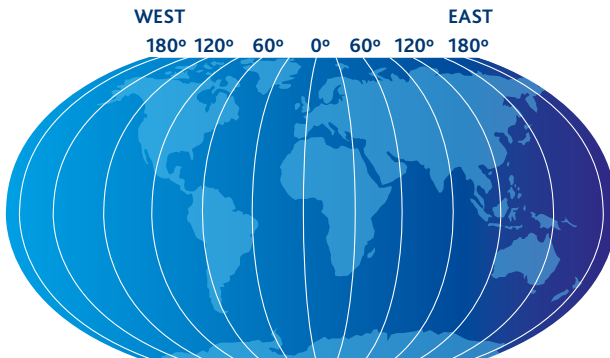
Parallels of latitude



On the latitude scale:

- 1° is equal to 60 nautical miles (NM).
- Each degree is split into 60 minutes ($60'$).
- $1'$ is 1 NM.
- 1 NM = 1852 metres.
- 1 NM = 10 cables.
- 1 cable = 185 metres.

Meridians or lines of longitude



On the longitude scale:

- 1° is equal to 60 nautical miles at the Equator (0°), reducing the further North or South you move.

3.3 Plotting a position

A latitude and longitude can be obtained from a GPS, if available. To plot your position on a chart you can use a plotter, dividers or straight edge of a ruler. A plotter is easier to use on a small powerboat. Below are several tools you may need:



1 2B pencil or Chinagraph and a soft eraser

A well-sharpened 2B soft lead pencil needs to be soft so it does not leave a mark on the chart after it has been rubbed out. A clean gentle eraser and a pencil sharpener to keep your chart work accurate. An alternative to the pencil is a Chinagraph for use in wet conditions on laminated charts, check cards and publications.

2 Drawing compass

Used to draw distances and arcs onto chart.

3 The Portland speed, time and distance calculator

The Portland speed, time and distance calculator is a slide rule used to calculate speed, time or distance.

4 Dividers

Dividers are an accurate measuring device used for measuring distances on a chart.

5 Stopwatch

A stopwatch can be used for measuring time taken to travel a certain distance or the elapsed time travelled.

6 Rib plot

The rib plot is a smaller version of the plotter with no moving parts.

7 Bearing compass

Uses the earth's magnetism to determine horizontal direction. A compass is often fixed to the boat (ship's compass) or can be hand held (a bearing compass).

8 Plotter

The plotter is used to plot bearings and distances onto your chart.

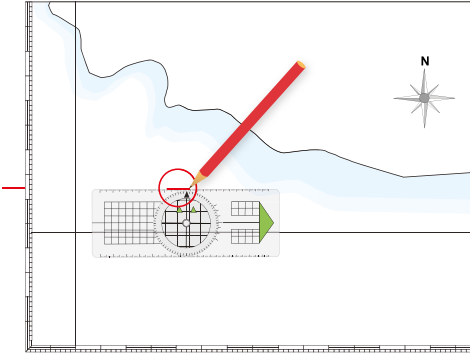
9 Parallel rules

Normally carried on larger vessels where a large chart table is available. Used to transfer bearings and distances from one part of the chart to another.

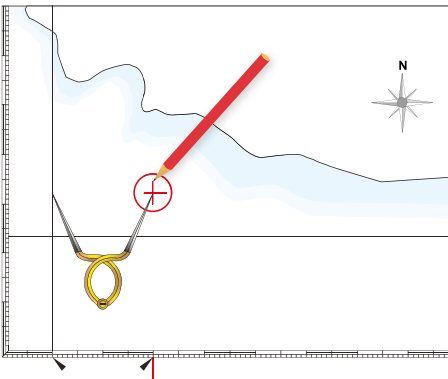
10 Notebook

A notebook to maintain records.

To plot your position, first of all mark off the latitude. Make a horizontal line in the area you expect it to cross the line of longitude.

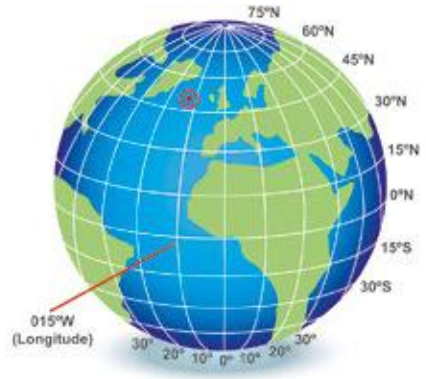


Then mark off the line of longitude from the scale at the top or bottom of the chart.

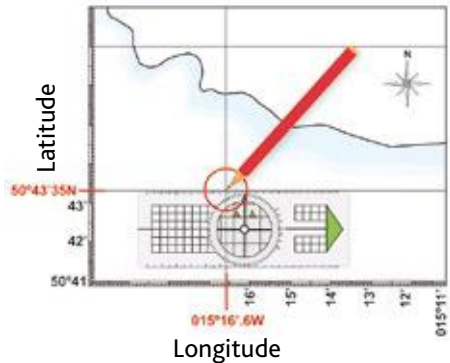


The actual position is where the lines cross.

Once you've fixed your position onto the chart, put a circle around it and note the time. Confirm your position using other references.



The position is $50^{\circ}43'.35N$ $015^{\circ}16'.6W$
where the lines intersect
The position can then be transferred
to the chart

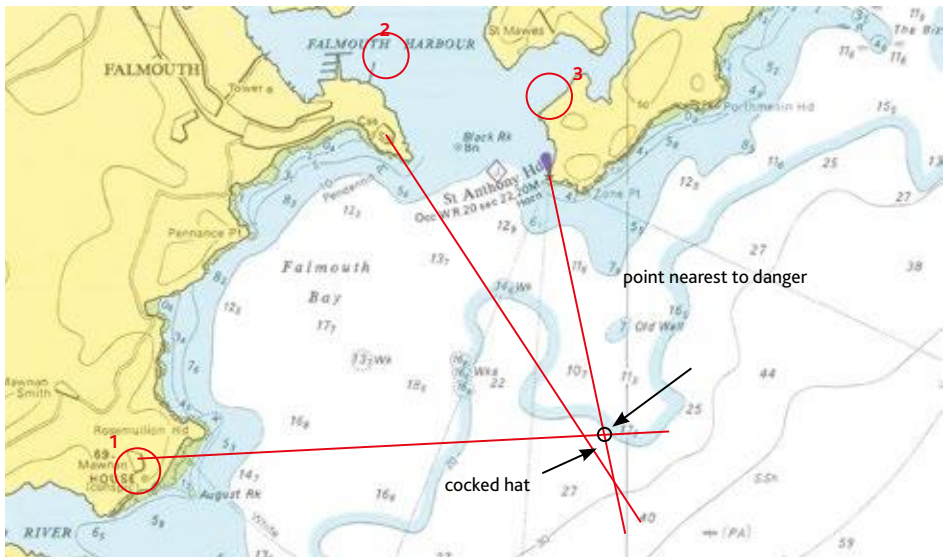


A visual three-point fix

This technique is used to quickly confirm current position. To use this technique first identify three fixed charted features, preferably on shore. On the chart below the three features are a prominent house (1), a castle (2) and a directional light (3).



Use a hand compass to take your bearings



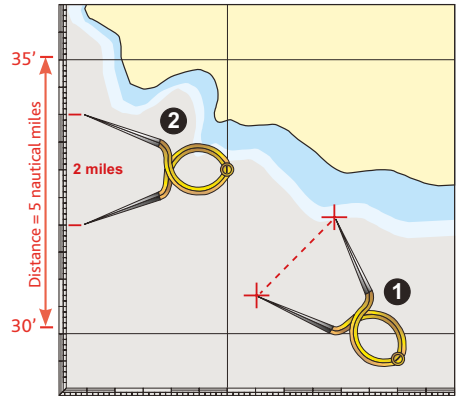
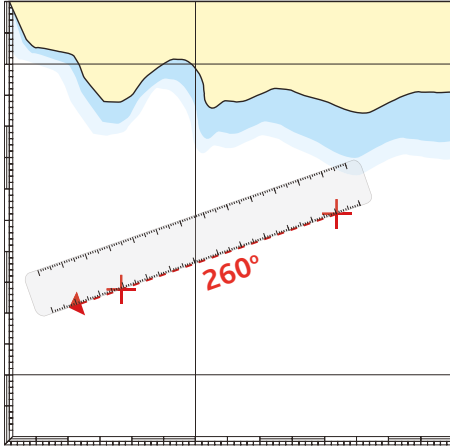
To plot a position:

- take and record a bearing to each feature
- note the time each bearing taken
- convert each bearing to true bearing
- plot the true bearings on the chart.

Due to the effects of wind and tide, it is unlikely that all three bearing lines will intersect at the same point. Instead, they will tend to form a small triangle, or cocked hat. The SAR unit's exact position is somewhere within this triangle and should be plotted at the point nearest to danger – in this case the point closest to land, indicated by a black circle.

3.4 Plotting a course

Draw a line from the start point to the destination. Check to see if there are any hazards along the route.



Take a bearing on a chart

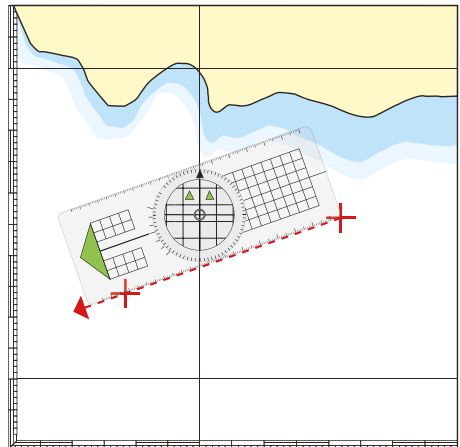
Place the plotter along the line on the chart, with the arrow pointing in the direction of travel. Turn the wheel so that the arrow points north. Read off the bearing indicated.

Range and bearing

Measuring range/distance on a chart

To measure the range or distance, place one point of the dividers at your start point and the other point at your finish point. Then take the dividers to the latitude scale on the side of the chart. Always use the latitude scale located in the same horizontal region that you are measuring.

Remember that 1' equals 1 nautical mile.



Read off the degrees on the compass rose – this gives you the bearing.

3.5 GPS (Global Positioning System)

The most common way for the modern navigator to fix a position will be with GPS. The GPS uses satellites in space to triangulate, as long as it can receive the signals, it will give a very accurate position.

GPS receivers do go wrong, so it is vital that navigators have more than one method to fix their position. GPS should be used in conjunction with a nautical chart.



Make sure that you are familiar with your particular kind of unit.



Learning outcomes

- 4.1 Know the key rules of the International Regulations for Preventing Collisions at Sea (IRPCS).
- 4.2 Know what navigation lights should be shown on your vessel.

4.1 Key rules

International Regulations for Preventing Collisions at Sea (IRPCS)

There are many rules within IRPCS. Some of the key rules are listed below:

- **Rule No. 2 - Responsibility**

It is your responsibility to stay out of danger. Remember, nothing in the rules overrides common sense. If necessary, you may depart from the rules to avoid immediate danger.

- **Rule No. 5 - Lookout**

This rule states that a proper lookout must be maintained through a full 360° at all times, using all available means, such as looking, listening, radar, AIS (automatic identification system) and VHF.

- **Rule No. 6 - Safe speed**

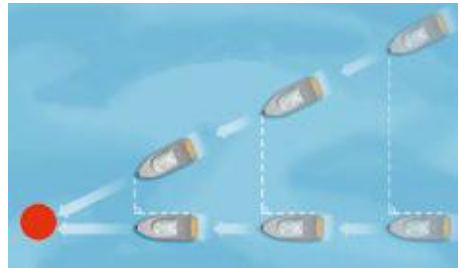
This rule states that you should operate at a safe speed. This will change depending on factors such as visibility, density of traffic, manoeuvrability, background lighting, weather and depth.

- **Rule No. 7 - Risk of collision**

Constant bearing with decreasing range

A risk of collision exists when a vessel is on a constant bearing with decreasing range.

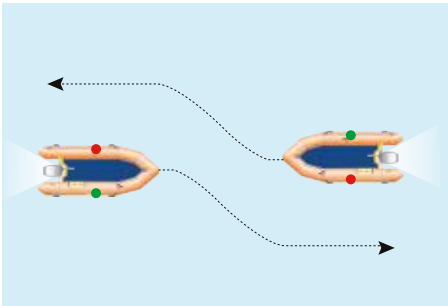
Should you suspect that a risk of collision exists, take a series of bearings from your vessel to the other vessel. If these bearings do not change much as you are getting closer, there is a risk of collision. Take early action to avoid collision using the necessary rules of avoidance.



• Rule No. 8 - Actions to avoid collision

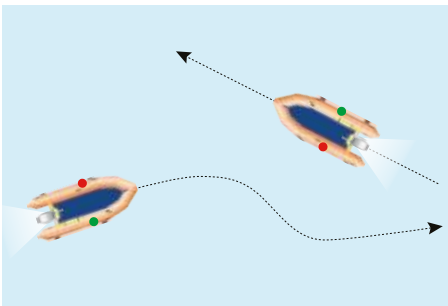
Head-on situation

When power-driven vessels approach each other head-on, you should alter your course to starboard, passing down each other's port side.



Crossing situation

When two power-driven vessels are crossing, if the vessel appears on your starboard side, you should steer to starboard to stay clear.



Top tips

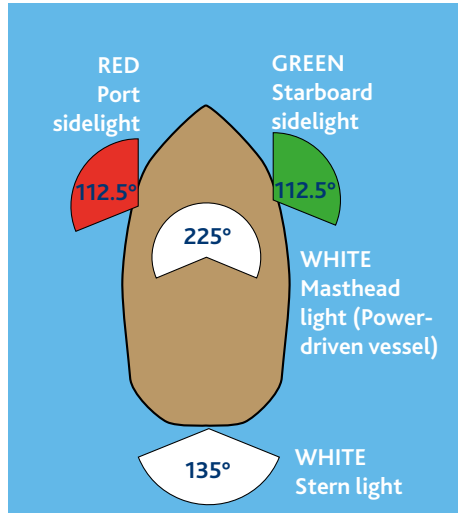
If you see a red port light – give way.

or

Remember to give way to vessels on the right.

4.2 Navigation lights

- Navigation lights are the lights that a vessel should show between sunset and sunrise, and also in restricted visibility. The lights will vary according to the size of the vessel and will be different depending on whether it is a power-driven vessel or sailing vessel.



A standard power-driven vessel less than 50m in length



A standard power-driven vessel – less than 7m in length, less than 7 knots speed, should display an all round white light. (As a bare minimum)

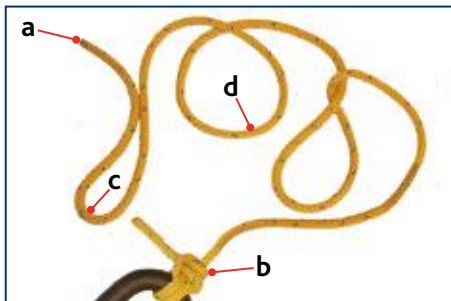


Learning outcomes

- 5.1 Know the terms used when describing a rope.
 - Understand the hazards involved when working with ropes.
 - Be able to prepare and throw a heaving line.
- 5.2 Understand the different types of knots and their uses.
 - Be able to tie each knot.

5.1 Ropework

Working ropes contain a great deal of energy with the potential to part and recoil, which could present a serious risk of injury to unaware crew. It is important that everyone operating on a rescue vessel is aware of how to stay safe when working the deck to ensure that they don't become a casualty themselves.



Terms used when describing rope:

- a. Running end/working end
- b. Standing part
- c. Bight
- d. Loop

Safety points for working with ropes:

- NEVER stand on a rope, in a bight, within a loop or in the line of recoil.
- When slipping or undoing a rope under load, extreme caution must be taken to avoid the rope from running away out of control.
- Make sure you are vigilant at all times when working with bitts, blocks, cleats, capstans or bollards to prevent hands from becoming trapped when a rope slips.

- The wearing of rings is strongly discouraged. Serious injury, including amputation may result if a ring snags.
- Wearing gloves when handling rope and wire carries certain risks. Therefore, the wearing of gloves is left to the discretion of the crew.



Throwing a rope

There are many situations in which a crew member may be required to throw a rope, for example, when tying up alongside a pontoon or when setting up a tow on a casualty vessel. It can be very difficult to coil and throw a thick rope, so a heaving line could be used.

Heaving line

A heaving line is a light, flexible line with a weighted end (such as a monkey's fist), which can be thrown between vessels or the shore easily.



A heaving line can be used to pass a tow rope to a casualty vessel or a berthing rope to a pontoon. It can also be used to act as a messenger line between two vessels.

Preparing for throwing

Prepare the heaving line for throwing by firstly checking that it is free from knots and kinks.

The heaving line also works better when wet.

Coil the heaving line neatly then split the coil into two, with the weighted end in your throwing hand.

Never secure the end to your body.

It can be dangerous if the heaving line is thrown while the vessel's propellers are turning.

Before throwing the heaving line the following should be taken into consideration:

- the weather conditions, especially the wind
- the throwing position, which should be clear of other people and any snag hazards.

Throwing the heaving line

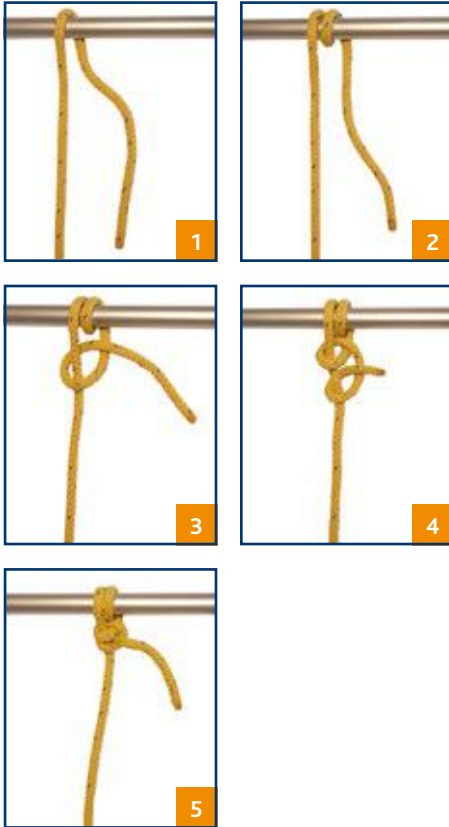
The heaving line is best thrown with the throwing arm straight. Allow the heaving line to run freely out of the non-throwing arm.



5.2 Knots

Round turn and two half hitches

Easy to tie and can be undone while under load.

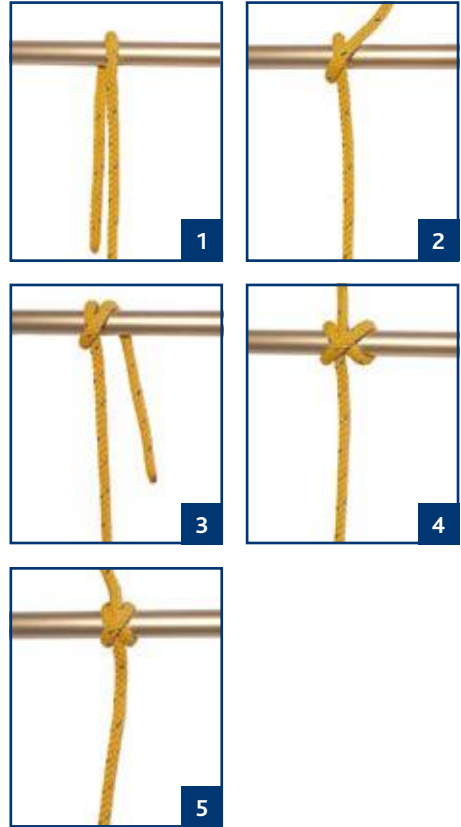


Appropriate uses for this knot:

- Secure a rope under load to a spar, rail or shackle.

Clove hitch

Good for fenders and light loads, can work loose.



Appropriate uses for this knot:

- Secure a rope to a spar, rail, ring, post or similar fitting.

Double sheet bend

Good for joining two lines, especially if they are different thicknesses. It can only be undone without a load on.



Appropriate uses for this knot:

- Join two ropes together of unequal thickness.

Bowline

The most used knot in boating. Will take a great load and can still be released. Can only be undone when there is no load.

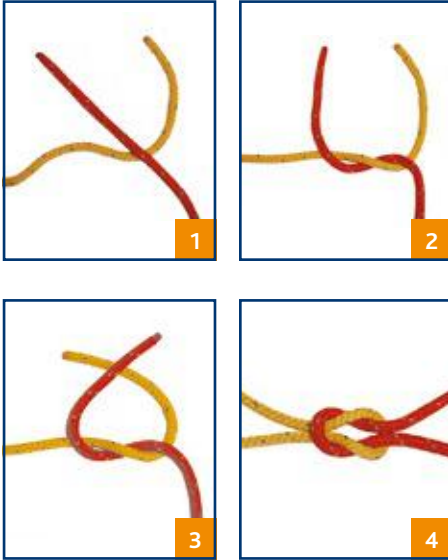


Appropriate uses for this knot:

- A temporary eye in rope of all sizes.
- Use as a lifeline.

Reef knot

Good for joining two lines of equal thickness.

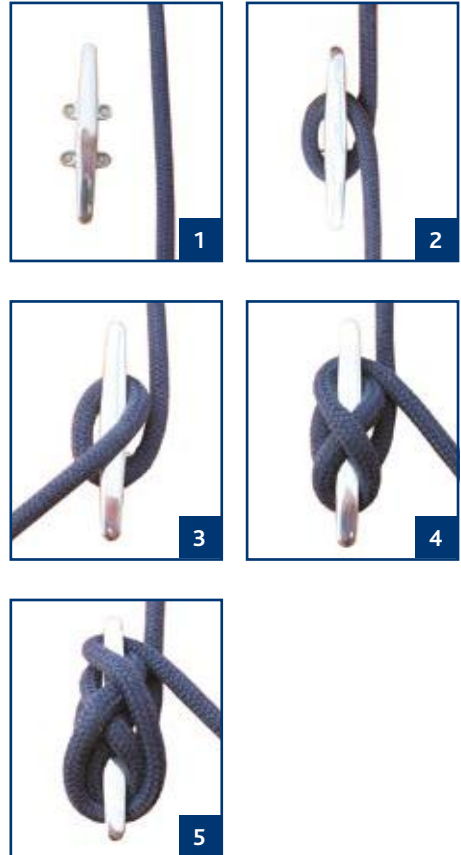


Appropriate uses for this knot:

- Join two ropes together of approximately equal thickness.
- Tie the ends of a rope around an object, for example, a sack or sail.

Cleating off

- Take a complete turn around the cleat.
- Follow this with two figures of eight.
- Finish with a complete turn.



Unit 6: Rescue vessels

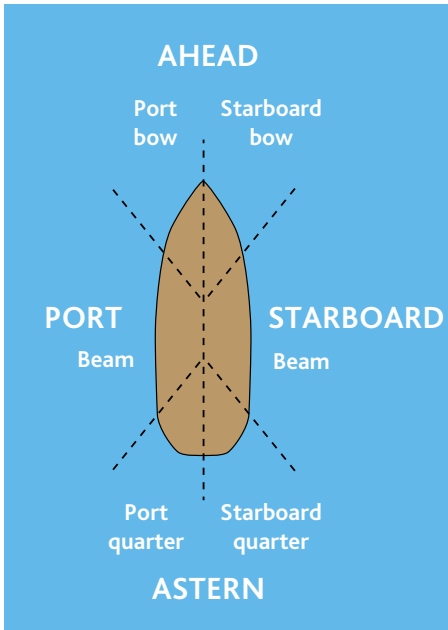


Learning outcomes

- 6.1 Know the terms used to describe the different areas of a vessel.
- 6.2 Know the different types of vessels.
Know the basic layout of your vessel.
- 6.3 Understand how overloading a vessel affects its stability.
- 6.4 Know the different types of engines and drives.
- 6.5 Know the different spares that should be carried for the equipment and type of vessel you have.
- 6.6 Know which servicing and checks should be carried out on your vessel.
- 6.7 Know the recommended safety kit to be carried on the rescue vessel.
Know where the safety items are located on the vessel.

6.1 Terms used

Different areas of a vessel are given particular names to avoid confusion.



6.2 Types of vessels

Inflatable boats

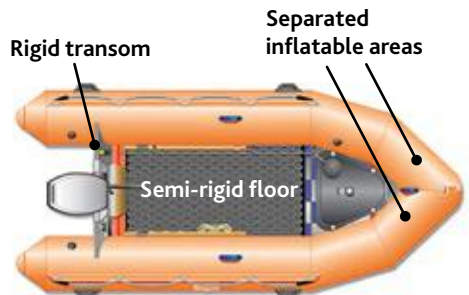
Inflatable boats usually have a semi-rigid floor and rigid transom. The inflatable areas are separated in case they are damaged. This isolates the damage to one area and not to the whole of the boat. Inflatable boats sometimes have an inflatable keel fitted that helps manoeuvre the boat more easily.

Advantages

- Good handling ability.
- Can be waded easily in shallow water.
- Can be repaired easily.

Disadvantages

- Can be uncomfortable for operators.
- Limited endurance.
- Limited space for equipment and personnel.



Rigid inflatable boats (RIBs)

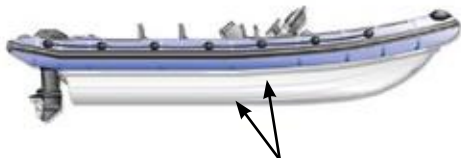
The rigid inflatable boat (RIB) is a combination of the inflatable and rigid boats.

Advantages

- RIBs tend to be larger than inflatable boats, and therefore can carry more people.
- Generally a better sea capability than inflatables.

Disadvantages

- RIBs have higher sides than inflatable boats, which may make it harder to get casualties into the boats.
- They may not be as stable as inflatable boats, especially if they take on water.



Rigid hull and keel



Rigid boats

Rigid boats are the most common boat type. They have the greatest variety of hull shapes, and many types of materials can be used for their construction.

Advantages

- There are many varieties available, which means that there is probably a model available that is suitable for most rescue needs.
- Most can be launched from a slipway.

Disadvantages

- Rigid boats have higher sides than inflatable boats, which may make it harder to get casualties into the boats.
- They may not be as stable as inflatable boats, especially if they take on water.



Skiff

A skiff can be made out of wood or fibreglass and is commonly used as a fishing boat.

Advantages

- Readily available locally.
- Easily repaired.
- Can be beached.

Disadvantages

- Can become very unstable if overloaded.



6.3 Stability

Rescuers should be aware of the limits of the vessel they are operating. They are responsible for making sure the vessel is correctly balanced, which includes checking the maximum number of people and the maximum combined weight of people and equipment that should be carried onboard.

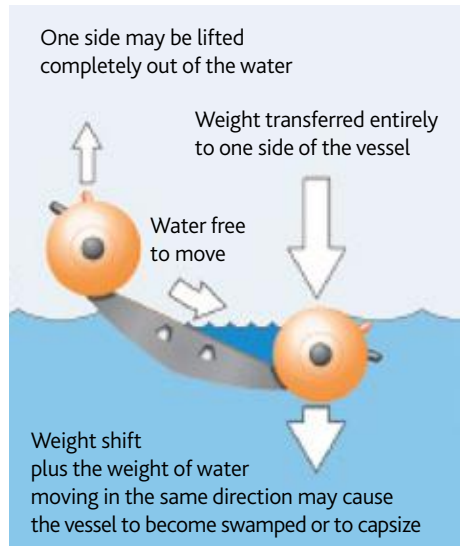
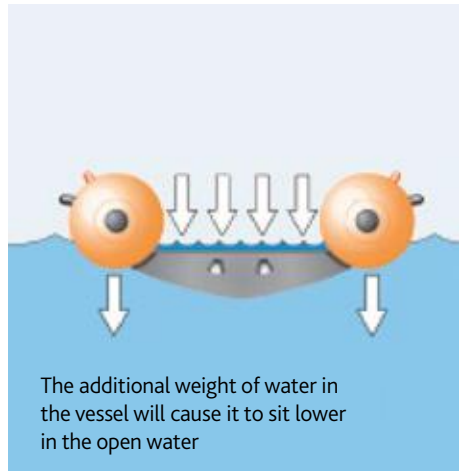
Do not overload the vessel.



Free surface water effect

Free surface water effect is when water collects in the vessel and is allowed to move freely.

This could affect the stability of the vessel if the weight shifts due to crew movement, a sharp turn or sea state. The rescuer should ensure that the minimum amount of water is allowed to collect in the vessel.



6.4 Types of engines and drives

An inboard engine can be run on petrol or diesel. Diesel is more common and has better fuel efficiency.

Inboard engines are usually easy to maintain because you can access all of their parts. If regular maintenance is carried out, diesel engines can be very reliable.

The inboard engine can be connected to many different drive systems, for example, shaft drive, outdrive or jet drive.



Shaft drive

Shaft drive systems provide a fixed direction of thrust and use rudders to steer the vessel.



Outdrive

An outdrive directs its engine 'leg' to provide directional thrust to steer the vessel.

Outboard engines run on petrol and are self-contained units that can be removed from the vessel.

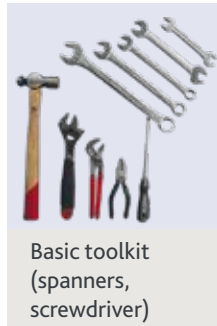


Outboard engine

These engines can be trimmed in shallow water and steered by either a direct tiller or remote steering wheel.

6.5 Boat and engine spares

Each vessel should carry spares for the equipment and type of vessel you have. Some examples are:



6.6 Regular servicing and checks

Inboard and outboard

- fuel system
- propellers
- electrical systems.

Inboard engine

- oil
- fluid
- belt
- water cooling.

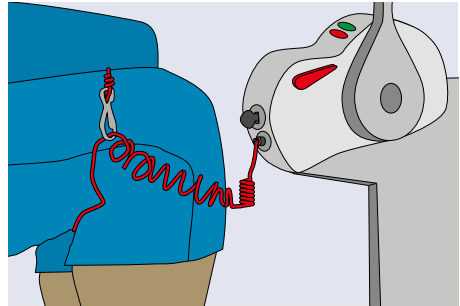
Outboard engine

- water cooling
- oil levels (four-stroke).

Make sure that you are familiar with your own engine and layout.

6.7 Boat safety equipment

It is recommended that various safety kits are carried onboard the rescue vessels.



Kill cord

A kill cord will stop the engine if you move away from the helm or if you fall out of the vessel. This then stops the vessel running away and injuring you or others.

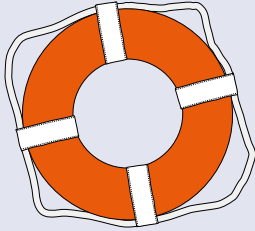
Always check that the kill cord works. Attach it to yourself, preferably around the leg, whenever the engine is running.



Bucket or bailer

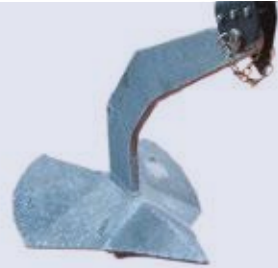
A bucket will have many uses onboard. One of the most useful will be to bail out water if the vessel starts to sink.

Unit 6: Rescue vessels



Lifebuoy

A lifebuoy should be fitted with reflective materials and marked with the vessel's name.



Anchor

An anchor can be used to hold a vessel in position if the vessel's engine breaks down.



Boat Compass

A boat compass is used to show your relative direction on a vessel.



Chart

A chart is a map of your area, showing features and hazards.



Hand Held Compass

A hand held compass can be used to take a three point fix to determine your position.



Navigation lights

Navigation lights identify your vessel so that others can see you at night-time and in poor weather.



A comprehensive first aid kit should be able to deal with most minor injuries onboard. It should also have bandages to deal with severe bleeding.



A fire extinguisher should be carried for use in case of a fire.



A flare pack should be carried and can be used when in distress. The amount and type of flares needed vary depending on the operating area of the vessel. Do not use parachute / rocket flares near helicopters!

See Distress signals section.

Unit 6: Rescue vessels

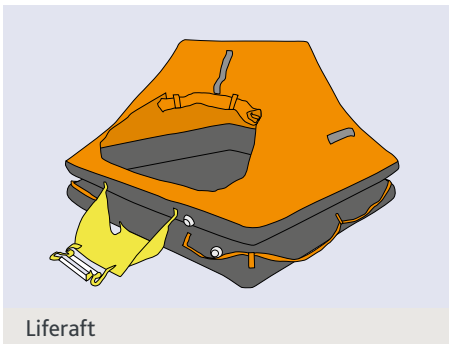


A VHF radio is used for communication. It can be used to raise the alarm when in distress.



GPS, or global positioning system, is an electronic device that uses satellites to calculate its position.

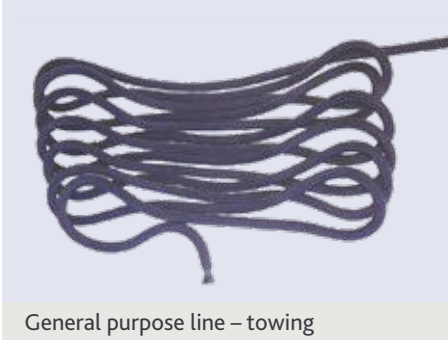
A latitude and longitude position is given, which can be very useful when navigating or in times of distress.



A liferaft is an emergency craft that can be used if the main vessel is damaged. It can also be used to help survivors from another vessel if space is limited onboard.



A radar reflector is used to help smaller vessels show up on another vessel's radar display.



General purpose line – towing

A long line can have many uses. One of the common uses on a rescue vessel will be for towing other vessels. The best tow lines will be 'dynamic' or have some stretch. This will avoid snatching.



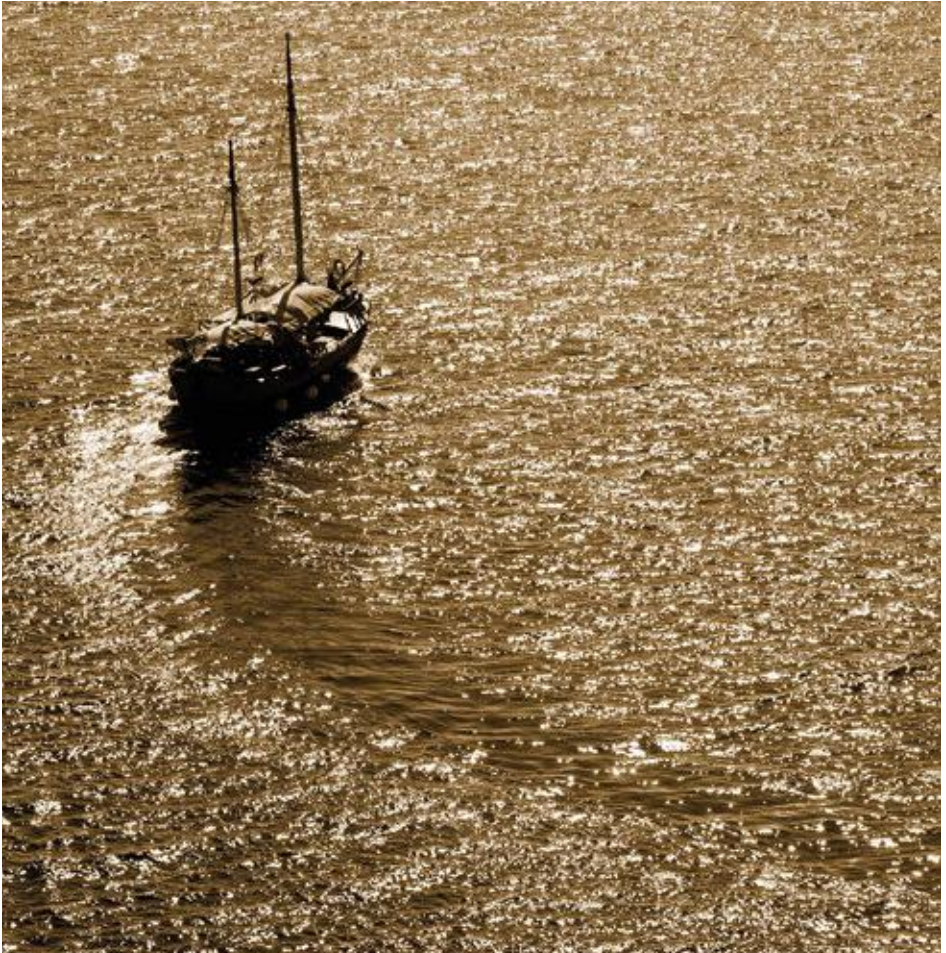
Throw bag

Most throw bag ropes are constructed from polypropylene in a bright colour. This provides a high visibility rope that is soft to handle and floats well. They are not designed for use in hauling or high tension applications.



Immersion suits

An immersion suit is designed to reduce the effect of cold water if the wearer has to abandon ship. Many immersion suits also aid flotation.



Learning outcomes

- 7.1 Know the different types of engine controls on vessels.
- 7.2 Be able to drive the vessel safely in different situations.
- 7.3 Be able to use pivot points in order to manoeuvre the vessel.
- 7.4 Understand the factors that can affect boathandling.

Every vessel will behave differently in the water depending on lots of different factors, such as drive system, loading and hull shape. Different engines have different controls. It is important that the operator becomes familiar with the controls of the vessel they will be operating.

7.1 Engine controls



Twist throttle

Commonly found on outboard engines and operated like a motorbike throttle. Gears are usually found on the side of the engine but could be part of the twist grip.



Single throttle

Single throttle controls can be found on both inboard and outboard powered vessels. A single engine is controlled by one lever. Pushing the levers forward for ahead, pulling backwards for astern and positioning centrally for neutral.



Dual throttles

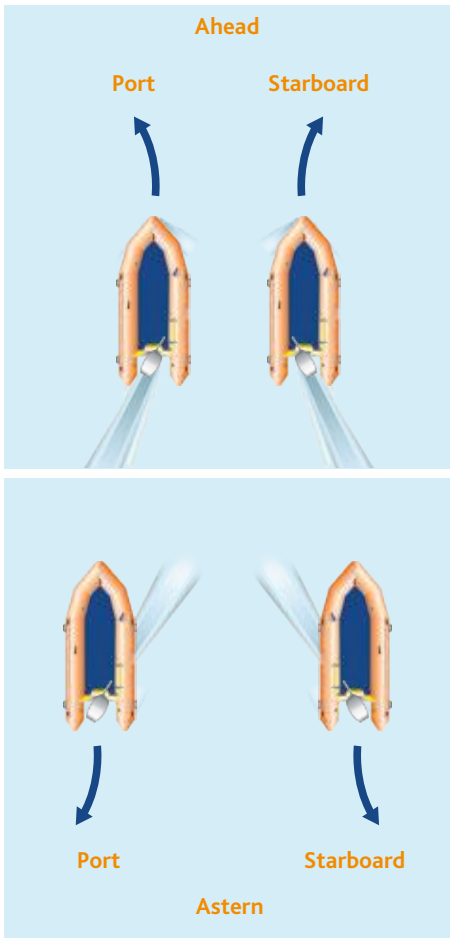
Dual throttle controls can also be found on both inboard and outboard powered vessels. Two engines are controlled by two individual levers. Each lever works the same as a single throttle control. Having two engines that can be controlled independently give the boat extra manoeuvrability.

7.2 Boathandling

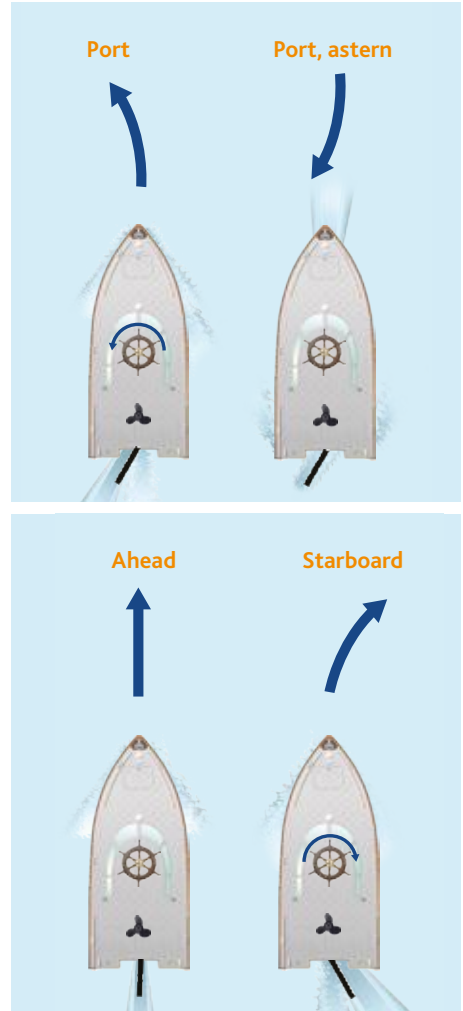
Steering the vessel

Vessels are normally steered using either a tiller or a wheel. Some more modern vessels are now using joystick control.

Outboard/Drive



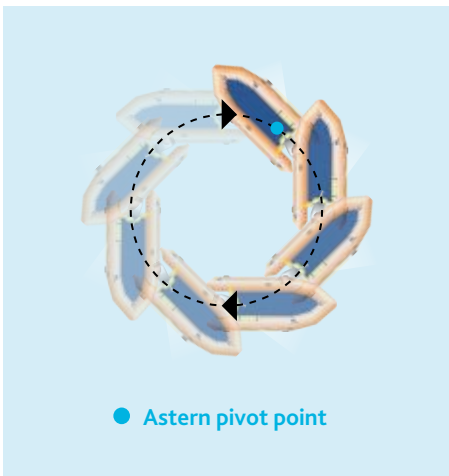
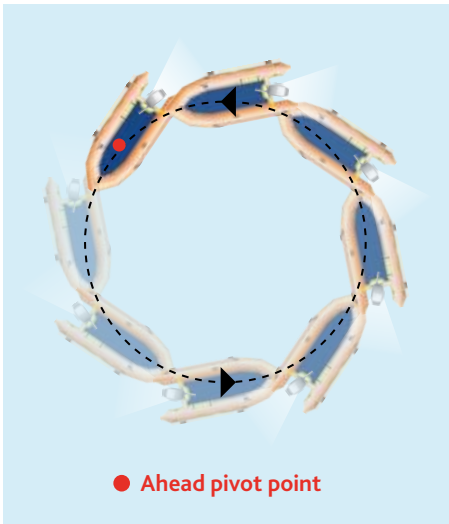
Fixed shaft (propeller and rudder)



Note, due to the effect of the propeller, a fixed shaft drive will noticeably drag to one side in astern.

7.3 Pivot points

In forward gear, a vessel pivots around a point forward of its centre. When going astern, the pivot point moves towards the back (aft), making the turn tighter.

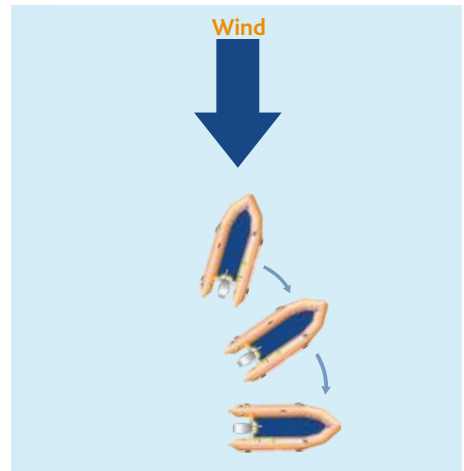


7.4 Factors affecting boathandling

Wind

Vessels will drift downwind and naturally lie at right angles to the wind or with their bow slightly downwind.

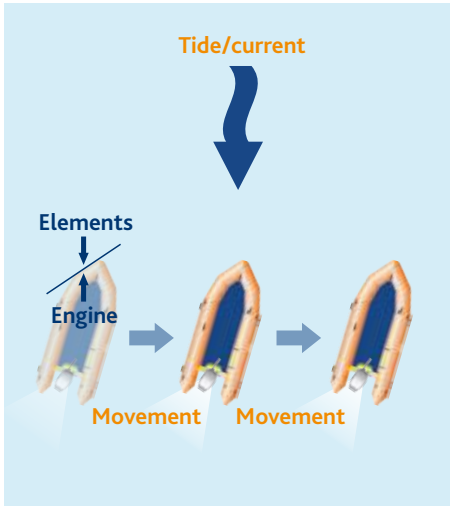
The speed that this will happen depends on the amount of wind and type of vessel.



Unit 7: Boathandling

Tide/current

We can use the tide/current to help us manoeuvre the vessel in a controlled manner.



This will also work if the stern is placed into the tide/wind. This is a very effective technique to get into some tight berths.



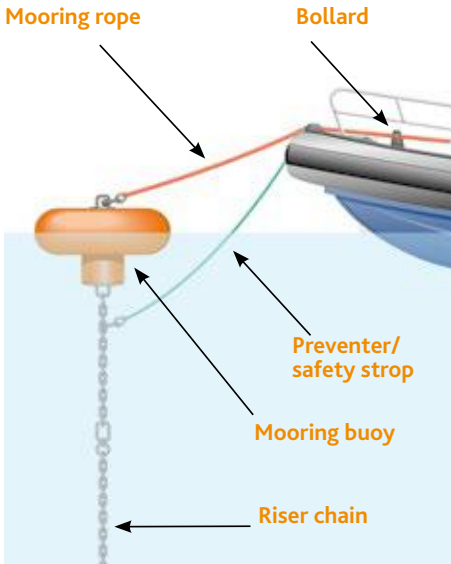
Learning outcomes

- 8.1 Be able to approach and secure a vessel to a mooring buoy.
- 8.2 Know what to consider when berthing.
Be able to berth your vessel (if applicable to your local situation).
- 8.3 Understand how to beach a vessel safely.
Be able to beach your vessel alongside a stationary object.

8.1 Mooring

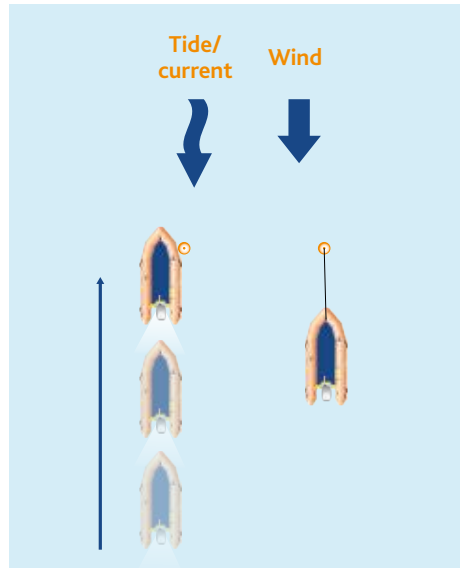
Mooring to a buoy

A mooring buoy is attached to the seabed by chains, anchors or weights, to which a vessel can be secured.



Approach

Approach the buoy slowly, facing into the wind/tide. Using small amounts of forward and neutral gear, manoeuvre up to the buoy and tie up.



- Make sure that you have briefed your crew and have them ready with the lines.

8.2 Berthing

There are several things to consider when berthing:

- rise and fall of tides
- direction and strength of wind and tide
- depth of water (study charts/depth sounder)
- proximity of other vessels
- suitability of berth/mooring to your vessel
- hazards.

Stern/bow lines

- These stop the stern/bow coming away.

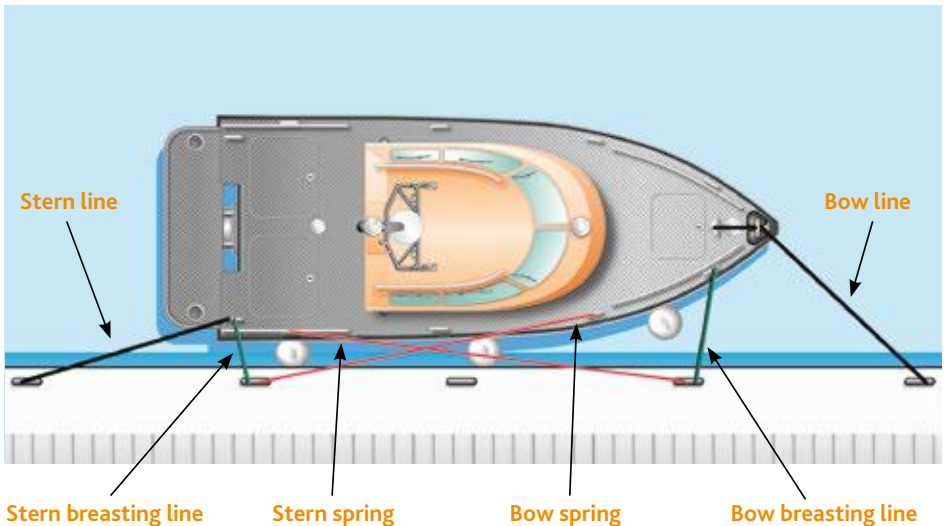
Springs

- These stop the vessel from moving forwards and backwards.

Breasting lines

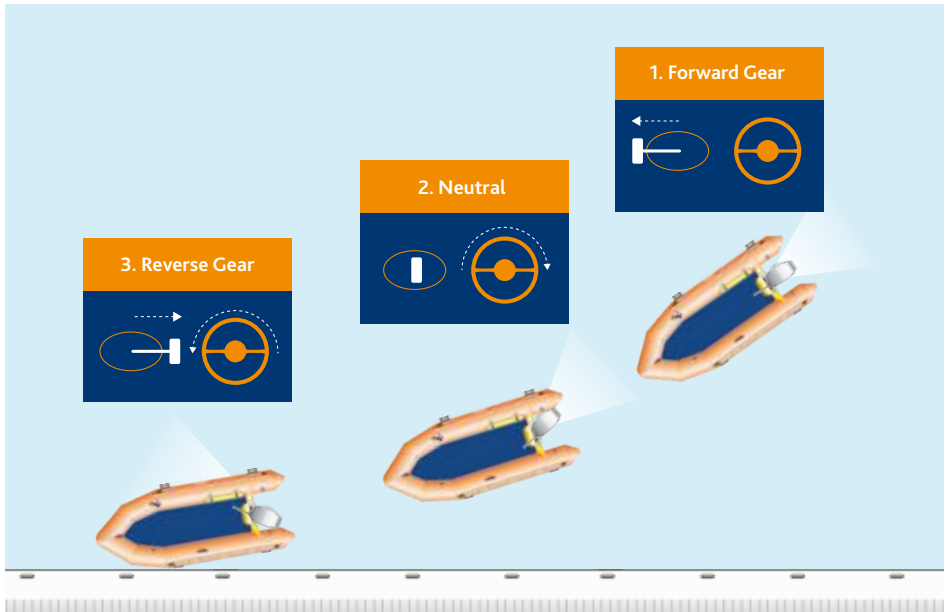
- These are additional lines to hold the vessel closer if needed.

Note: in some cases you may have to account for the rise and fall of the tide by adjusting the length of the lines.



Approach

- Approach at slow speed with an angle of approximately 30°.
- As you get closer turn away in neutral, then if needed apply forward gear.
- To stop and bring the vessel parallel, steer towards and use a small amount of reverse gear.



8.3 Beaching

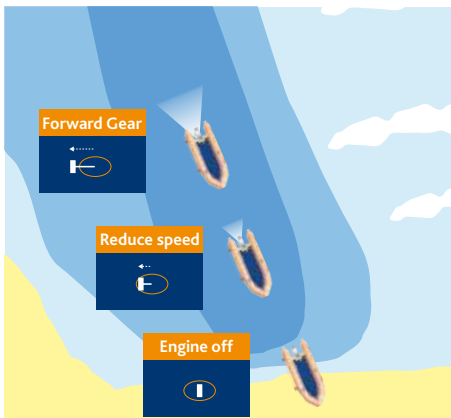
There may be times where a rescue vessel is required to beach. Beaching a vessel refers to driving it towards the shoreline until it comes to a stop in shallow water due to the contact between the hull and the sand. You may have to beach the vessel in order to remove a casualty or to recover the vessel onto a trailer.

Be aware that beaching a vessel can be dangerous, only perform this activity if absolutely necessary.

Factors to consider

Prior to beaching a vessel, the helm should consider the following:

- underwater hazards, such as rocks, anchors or fishing gear
- the gradient of the beach
- other water users
- positioning onboard the vessel
- wave patterns.



Approach speed and positioning

Before beaching, the helm will inform everyone of their intentions. This allows them to brace themselves during beaching. The helm should use sufficient throttle control in order to maintain momentum and steerage through shallow water and onto the beach.

At an appropriate time before the hull makes contact with the beach, the engine(s) should be switched off and lifted (where possible). The momentum of the vessel will allow it to glide up the beach until it comes to a stop.

Prior to getting out of the vessel, the crew should check for any tidal surges (waves) that may cause the vessel to move.





Learning outcomes

- 9.1 Know the reasons to anchor.
Understand the factors that affect anchoring.
Be able to anchor safely.

9.1 Anchoring

Definition

An anchor is a piece of equipment on the vessel that is attached to a length of chain or warp, sometimes both. When in shallow water it allows you to temporarily maintain the vessel's position.

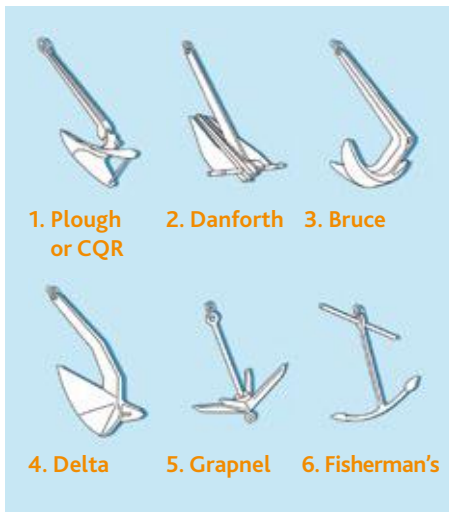
Reasons for anchoring

A vessel may need to anchor:

- to take shelter or lie up in restricted visibility
- in an emergency to protect the vessel, for example, with an equipment failure
- to save a vessel from drifting
- if you want to leave the vessel.

Types of anchor

Anchors vary in size, design and weight. Some of the more common types of anchor include:



1. Plough or CQR

- Has a good holding to weight ratio.
- Has a hinged section that can aid stowage.

2. Danforth

- Has a good holding to weight ratio.
- Stows flat.
- Good for holding in clay, sand and mud.

3. Bruce

- Has a good holding to weight ratio.
- Good all-round holding.

4. Delta

- Has a good holding to weight ratio.
- Good all-round holding.

5. Grapnel

- Often folding, making it easy to stow on a small vessel.
- It has a poor holding to weight ratio.

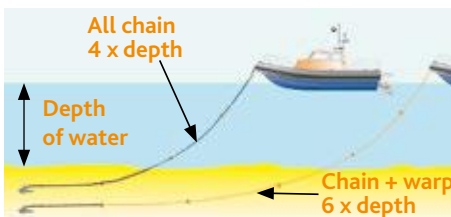
6. Fisherman's

- Traditional type, good for rocky and weedy seabeds.
- Bulky to stow.

Unit 9: Anchoring

How an anchor works

The anchor lies flat on the seabed until the vessel pulls on the anchor warp. This then drags the anchor along the seabed, which helps it dig itself in.



- The amount of chain used should be at least 4 times the depth of water.
- The amount of chain and warp used should be at least 4–6 times the depth of water.



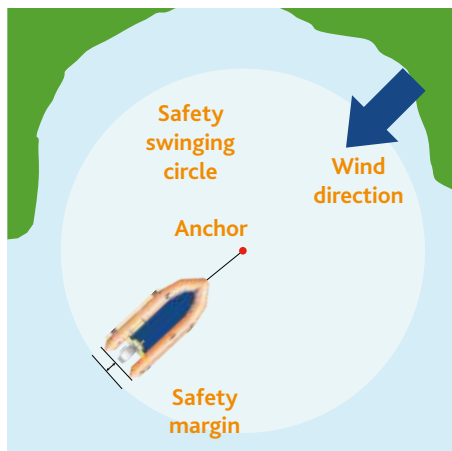
To check the anchor is holding, use two fixed points to form a transit. If A and B move towards or away from each other, the anchor is not holding.

If the anchor drags, more cable should be used, or reset the anchor in a different place.

It is important to remember that wind and tide affect a vessel's position when at anchor, and that these can change without warning.

Before anchoring it is essential that a **safety swinging circle** can be established.

The swinging circle (or swinging room) is the distance a vessel can move around its anchor. Swinging room is important because if other vessels or objects are within a vessel's swinging circle they may collide.



Factors to consider prior to anchoring

Before anchoring the vessel, the skipper should take the following factors into consideration prior to deploying the anchor:

- the strength and direction of the wind in order to choose a location that offers the best protection
- the depth of water and rise and fall of the tide in order to allow safe under-keel clearance (if required)
- proximity to hazards, such as other vessels, cliffs or underwater hazards
- the type of seabed.



Learning outcomes

- 10.1 Be able to recover a man overboard.
- 10.2 Know the methods to recover a person onboard.
Be able to recover a person onboard.

Unit 10: Man overboard (MOB) and person recovery

10.1 Man overboard

If someone falls overboard, the following points should be carried out if possible:

- Shout loudly 'man overboard'.
- If possible, throw a lifering to them. Even with a lifejacket on, extra buoyancy may help/comfort them.
- One of the rescuers should look and point at the man overboard (MOB) until they have been recovered.

- Press the MOB button on the GPS/chart plotter (if there is one) – it may help in locating the casualty.
- Send a Digital Select Calling (DSC) distress alert and mayday. It is better to stand-down rescue assets than launch them to a far more serious situation later. You can never be 100% sure it will go perfectly.
- Assess the wind and decide on the direction of approach.

Approaching a man overboard

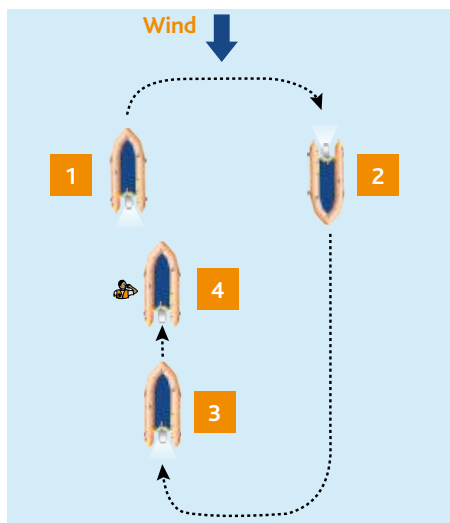
There are two main methods to approach a man overboard.

Method 1 – Into the wind

1. Reduce speed gradually and assess the conditions.
2. Position the vessel six boat lengths downwind/down sea of the MOB.
3. Approach the MOB at minimum speed. Brief the rescuers which side you intend to recover the MOB.
4. Once you have reached the MOB, if conditions allow and it is safe to do so, switch off the engine and recover them.

Advantages

- Suits smaller vessels with low freeboard and good access forward.
- Allows waves to be taken head on.



Disadvantages

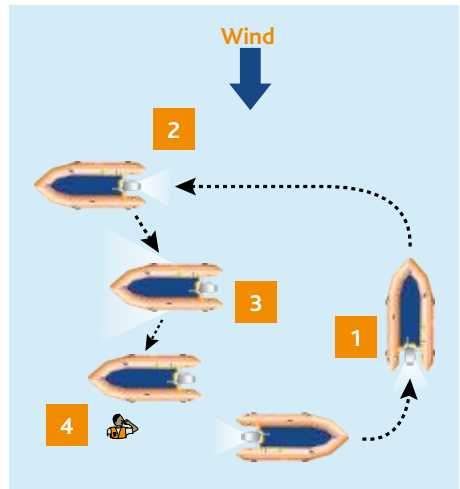
- If the helm misjudges the approach, this could lead to the MOB going under the bow and result in injury.
- A higher bow limits the ability to reach and see the MOB over the final few metres.
- The helm needs to drive the vessel until the casualty is reached.

Method 2 – Drift-down approach

1. Reduce speed gradually and assess the conditions.
2. Position the vessel beam to the wind, upwind of the MOB.
3. While drifting down to the MOB, maintain the vessel's line using small amounts of forward and reverse gear. Position the crew ready to recover the MOB.
4. Once the vessel is in this position, contact can be made with the MOB and recovery can take place. If conditions allow, and it is safe to do so, switch off the engine.

Advantages

- Suits vessels with a high bow with limited forward access.
- The whole of the side of the vessel provides a larger target/collection area.
- Provides some shelter to the MOB.
- Allows more time for preparation such as use of VHF and recovery equipment.



Disadvantages

- Being beam-on to waves can be uncomfortable and in large breaking seas, dangerous.
- Requires wind to drift down.

Unit 10: Man overboard (MOB) and person recovery

10.2 Person recovery

Should you end up in the water, ensure you are familiar with different methods of how to recover yourself back onto your particular boat. Practise this on a regular basis.



If necessary, try to create a 'step' to help you climb out of the water and into the boat.

When recovering a casualty onboard, it is important to ensure that we reduce the risk of injury to rescuers through appropriate manual-handling techniques and positioning.

Utilising the lowest deck point to the water surface, the rescuer should keep themselves low with a minimum of three points of contact with the boat, wherever possible.

The following images are some example options for recovering a casualty. Ensure that you are familiar by regularly practising the recovery methods specific to your boat.



Facing towards the sponson



Facing away from the sponson



Learning outcomes

- 11.1 Understand the considerations to take into account before towing other vessels.
- 11.2 Be able to set up an astern tow.
- 11.3 Be able to set up an alongside tow.

11.1 Factors to consider when setting up a tow

Towing, by its very nature, is a hazardous operation. It requires a high level of seamanship from all involved. Each situation will present a different set of circumstances. It is important that risk versus benefit principles are applied prior to deciding to set up a tow.

Prior to towing the following needs to be considered:

- weather
- sea state
- water depth
- vessel size and condition
- number of people onboard
- is towing the best option?
- should all persons be removed and the casualty vessel left?

Setting up a tow

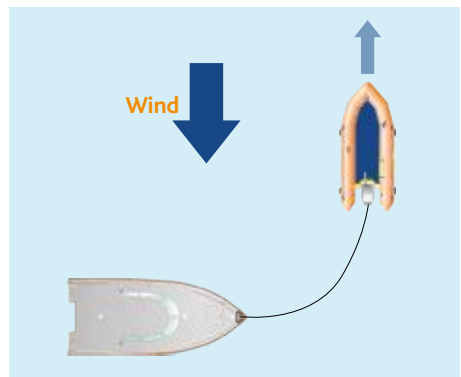
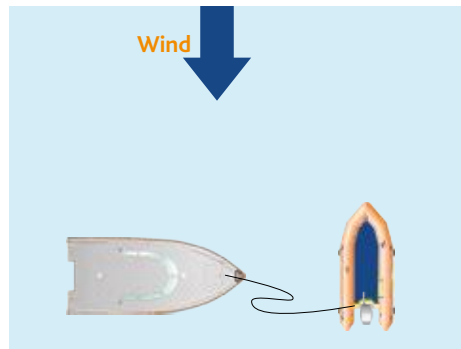
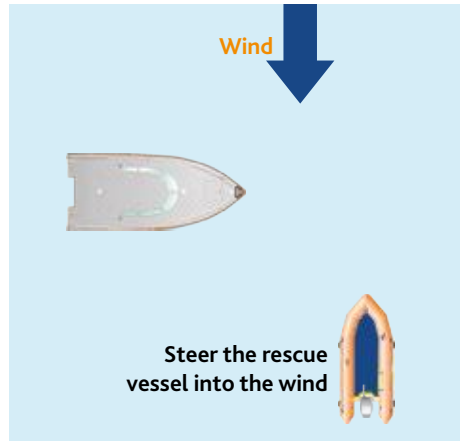
When setting up a tow, it is important to be aware of the different types of tows available.

11.2 Astern tow

An astern tow is used in open water when towing a disabled vessel behind the rescue vessel.

Crossing the 'T' approach

Crossing the 'T' is if the casualty vessel sits beam to wind.



Head to Sea approach

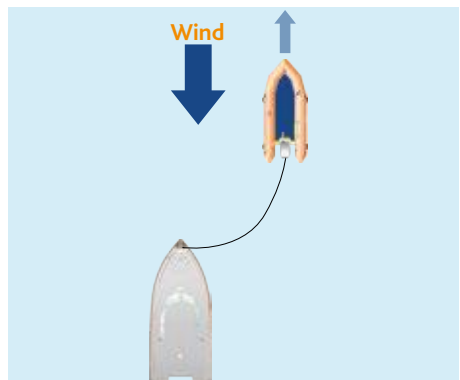
Vessels are usually head to sea because they could be anchored or attached to a mooring buoy.

The helm advises the crew on which side the tow is to be rigged and passed to the casualty.

The helm approaches the casualty and the crew passes the tow line as early as is practicable.

The helm positions the lifeboat a short distance from the casualty vessel, but does not continue to drive away. This will allow the crew member time to secure the tow line.

The crew member on board, having caught the tow line, passes it under any stanchions and through the fairlead of the vessel. The line must be secured to a strong point on the boat. Once secure, the helm slowly takes up the tow.

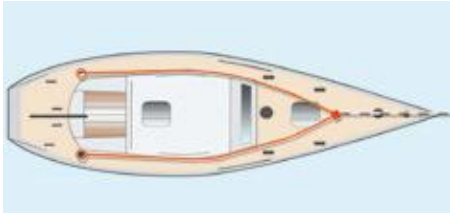


Onboard the casualty vessel

Pass the tow rope to the bow of the broken-down vessel and ask the people onboard to secure the rope to the vessel.

Make sure that the tow rope is secured to strong points on the vessel. These strong points need to be secure within the structure of the vessel.

Where possible, tie the rope to several strong points to share the load.



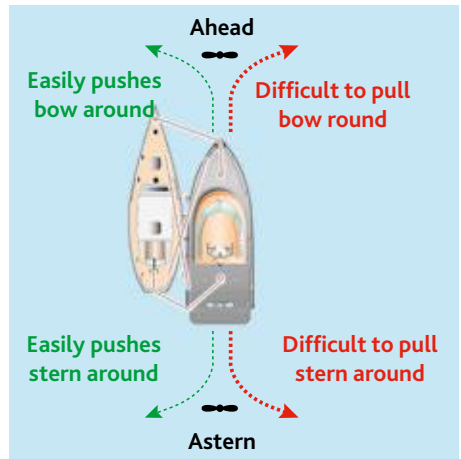
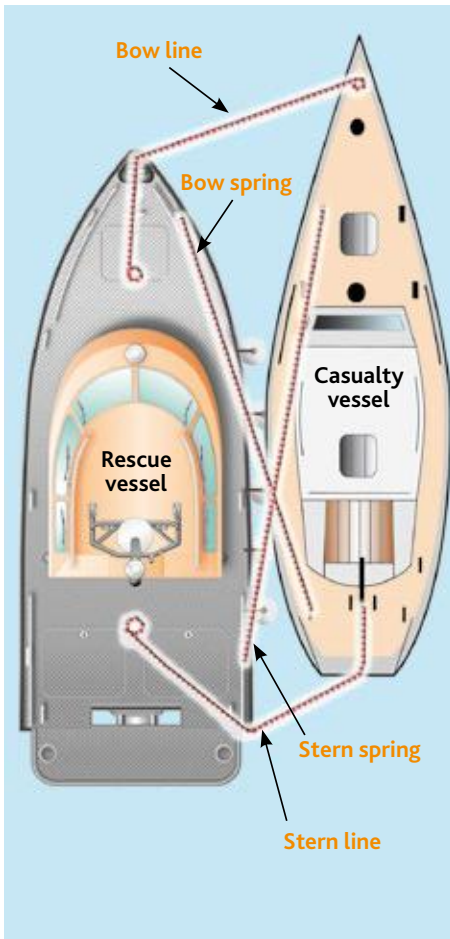
Key points:

- In rougher conditions make the tow as long as possible while matching the wave phase.
- Weighting the tow rope will reduce snatch loading.
- It is important to be able to change the length of the tow rope, for example, when entering a harbour entrance or to minimise chafe.



11.3 Alongside tow

An alongside tow is used when space is limited, for example, when entering harbours, marinas or small entrances. This gives the helm the ability to manoeuvre both the rescue vessel and casualty vessel with more control within a confined space.



Unit 12: Distress and Emergency Situations



Learning outcomes

- 12.1 Understand the different type of distress signals.
- 12.2 Be able to send a MAYDAY distress call.

12.1 Distress signals

There are a number of international ways of notifying others that you are in distress. They can be categorised as follows:

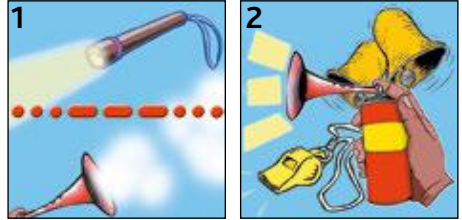
- Physically
- Sound and Light
- Flags and Shapes
- Electronically
- Radio and Telephone
- Pyrotechnics (Flares)

Physically



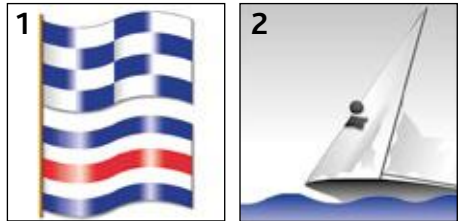
The slow and repeated raising and lowering of the arms.

Sound and light



1. SOS sent in morse by any means - sound or light.
2. A continuous sounding fog horn, bell or whistle. A gun or other explosive device fired at intervals of about a minute.

Flags and shapes



1. The flag N-overver arranged above the flag C-harlie as shown. (This is the International Code Signal of distress.)
2. A square placed above or below a ball (or anything resembling a ball).
3. Although not strictly a distress signal the Victor Flag does indicate that a vessel is in need of assistance.

Electronically



Emergency Position Indicating Radio Beacon (EPIRB)

The EPIRB must be registered with the appropriate authorities. It is registered to an individual boat and is stowed on deck to be released manually or automatically.

When activated it sends a distress signal to a ground station via a satellite system pinpointing the position of the stricken vessel.

Possible drawbacks to the EPIRB are accidental activation and being sold to a different boat and not being re-registered.



Search And Rescue Transponder (SART)

A SART shows your position on another boat's radar.

It reacts to radar by showing up as a series of 'radar blips' on the bearing of the casualty vessel.

As it gets closer to the casualty vessel, the more complete the rings become on the rescue vessel's radar.

Eventually the radar rings form a complete circle when the rescue vessel is approximately 1 mile from the casualty.

Telephone & radio



Mobile phones

It must be stressed that although a mobile phone may be used as a means of notifying others of an emergency situation, it should only ever be considered as a secondary device. Using a mobile phone has several limitations:

Battery life:

When relying on battery power alone, the availability of service may become unreliable. A problem could arise part-way through a distress call if the phone's battery were to lose its charge.

One-way communication:

A mobile phone only offers one-way communication and does not allow rescue vessels to listen in on the conversation between casualty and coastguard. Also, the mobile phone's radio wave frequency cannot be used with DF- Directional Finding equipment.

Waterproofing:

Generally, even the "waterproof" phones suffer in a salt water environment.

Service area:

The area coverage of the service providers has increased to cover most of the channel, but this cannot be guaranteed for all service providers.



CHANNEL 70

Radio Distress Alert

Digital Selective Calling (DSC) - Distress Alert

The DSC is a radio system which transmits a digital distress message on channel 70. It is activated by pressing and holding down the Distress button. This represents an "undesigned" DSC distress alert.

If time permits, a "designated" distress alert may be sent which alerts listeners to the type of emergency taking place (i.e. fire, sinking etc).

A DSC Distress Alert must be followed by a distress VHF radio voice call.



Personal locator beacon (PLB)

A PLB is an electronic aid to location, which can be activated when in a distress situation, alerting the rescue authority of your position.



CHANNEL 16

VHF Voice Call

VHF radio/telephone - distress call

The VHF radio is used to alert the coastguard, and other vessels in the area, to an emergency situation.

The VHF radio is better than a mobile phone for distress calling as other vessels in the area, rescue boats and helicopters will be able to hear and contact the casualty.

Note: Anyone can make a distress call. It is one of the few circumstances where you do not require a radio operator's certificate to operate the VHF radio.

12.2 The "MAYDAY" distress call

A Distress Alert is an open broadcast radio call with the top priority rating.

It is a transmission made when:

"A vessel, aircraft, vehicle or person is threatened by grave and imminent danger and requires immediate assistance."

The word 'Mayday' comes from the french 'm'aidez - meaning 'assist me!

The format of a Mayday call is always as follows:

- M** • MAYDAY repeated three times
- I** • Identification repeated three times
- R** • Repeat MAYDAY and identification once only
- P** • Position - latitude and longitude or range and bearing from a known position
- D** • Distress, nature of
- A** • Assistance required
- N** • Number of persons on board
- I** • Information
- O** • Over

Example:

'MAYDAY'

- (Mayday) **M** • 'MAYDAY' - 'MAYDAY' - 'MAYDAY'.
- (Identity) **I** • This is Motor Vessel 'Alpha', 'Alpha'. 'Alpha'.
- (Repeat) **R** • MAYDAY, Motor Vessel 'Alpha'.
- (Position) **P** • My position is Two zero zero from Rame Head, one five miles.
- (Distress) **D** • I am on fire, holed and sinking.
- (Assistance) **A** • Immediate assistance required.
- (Numbers) **N** • There are four persons on board.
- (Information) **I** • I am abandoning ship, description of vessel etc.
- (Over) **O** • OVER

All messages concerning a distress alert must start with the word 'MAYDAY'

Unit 13: Search and rescue (SAR) information and planning



Learning outcomes

- 13.1 Risk versus benefit.
- 13.2 Understand the abbreviations used in searching.
- 13.3 Know the process and information needed to respond to search and rescue (SAR).
- 13.4 Know the two main types of searches.
- 13.5 Understand how to calculate track spacing and sweep widths.

13.1 Risk versus benefit

Before undertaking a rescue the rescuer must decide whether the risk to the rescuers is worth the likelihood of a successful rescue.

When rescuing a casualty, your priorities are:

1. You
2. Crew
3. Vessel
4. Casualty.

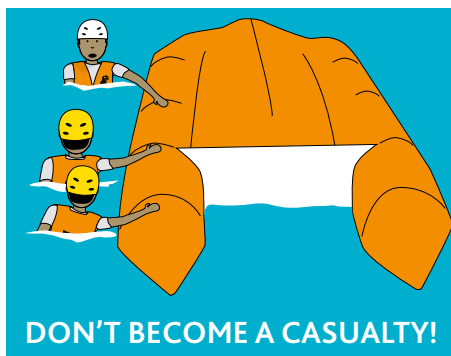
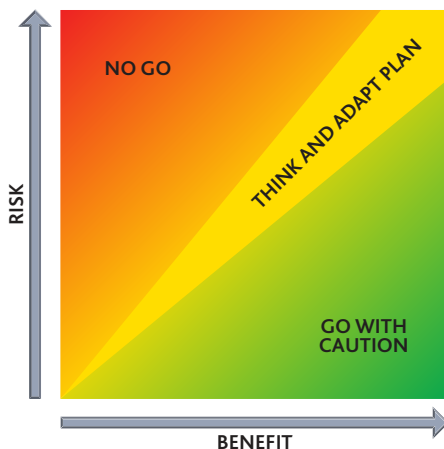
The rescuer should:

- take account of the hazards and potential risks when considering a rescue
- develop a plan that minimises the risk to both rescuers and casualties.

The chart should be used to plot the level of risk, from low to high on the vertical axis. The degree of benefit to be gained from effecting a successful rescue should be plotted from low to high on the horizontal axis.

This process can be completed as a mental model before a rescue, and re-evaluated during the rescue.

- Consider other options such as:



13.2 Search abbreviations

There are some terms that you need to be familiar with:

- **SRU – Search and rescue unit**
A unit of trained personnel who are provided with equipment suitable for search and rescue operations.
- **SMC – Search mission coordinator**
The official who is temporarily assigned to coordinate the response to an actual or apparent distress situation.
- **CSP – Commence search position**
This is the position, normally specified by the search mission coordinator, where the search and rescue unit is due to start its search.
- **OSC – On-scene coordinator**
A person designated to coordinate search and rescue operations within a specified area.

13.3 Tasking process

You can use RAPEL to help with search and rescue:

Record

Assess

Plan

Execute

Learn

1. **Record** the information you are given about the search and rescue you are being tasked to.
2. **Assess** this information to work out what you will do.
3. **Plan** – Based on the information you can then start to formulate a plan.
4. **Execute** – Once you have formulated your plan you can then execute it. Sometimes it may be necessary to change the plan based on new information.
5. **Learn** – Always remember to have a debrief after the incident. Bring out any learning points.

SMEAC Brief

It is important that all crew are aware of the situation and any other information that may be relevant to them. This information can be given to the crew in the form of a SMEAC brief.

Unit 13: Search and rescue (SAR) information and planning

Below is an example of a completed narrative for a SMEAC brief.

SITUATION:

- Ground:
- Hazards:
- Weather:
- Other agencies:
- Event:

S

MISSION:

- Our mission is:
- In order to:

M

EXECUTION:

- General outline:
- Grouping / Tasks:
- Emergency Plan:

E

ADMINISTRATION:

- Dress:
- Equipment:
- Food / Water:
- Medical:
- Transport:
- Casualty routine / Evacuation:

A

COMMAND AND COMMUNICATION:

- Type:
- Call signs:
- Lost comms:
- Frequency/Talkgroup:
- Ops normal:
- Confirmation of understanding:
- Questions?

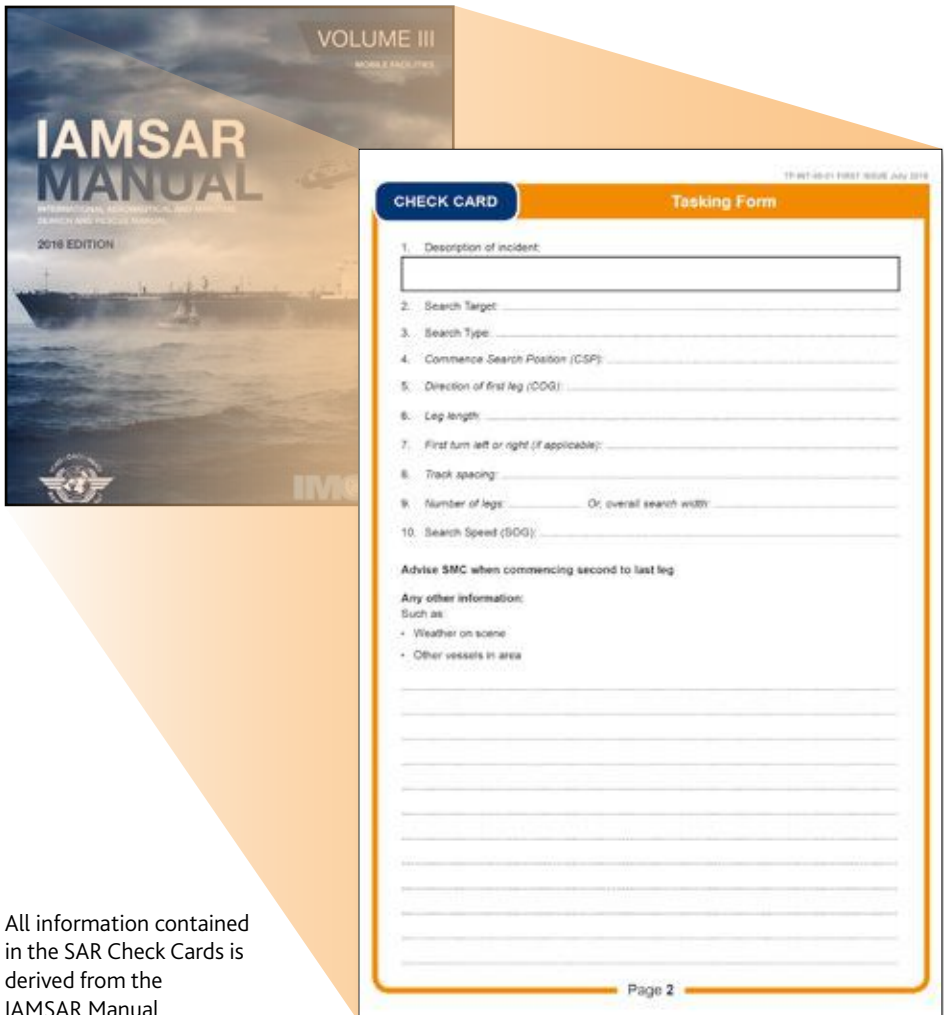
C

Unit 13: Search and rescue (SAR) information and planning

Tasking form

It is important that you have some way of recording information when an incident has occurred. This information may be needed to pass to other rescue vessels and organisations so accuracy and as much detail as possible should be obtained.

You can use a check card to record your tasking information.



The image shows the cover of the IAMSAR Manual, Volume III, 2018 Edition, on the left. The cover features a photograph of a large ship at sea and the IAMSAR logo. On the right, a SAR Check Card Tasking Form is displayed. The form is titled 'CHECK CARD' and 'Tasking Form' and includes the following fields:

1. Description of incident:
2. Search Target: _____
3. Search Type: _____
4. Commence Search Position (CSP): _____
5. Direction of first leg (ODG): _____
6. Leg length: _____
7. First turn left or right (if applicable): _____
8. Track spacing: _____
9. Number of legs: _____ Or overall search width: _____
10. Search Speed (SDG): _____

Advise SMC when commencing second to last leg

Any other information:
Such as:

- Weather on scene
- Other vessels in area

Page 2

All information contained in the SAR Check Cards is derived from the IAMSAR Manual

13.4 Types of searches

You may be asked to carry out two types of searches. These can be a datum or an area search. Which search you undertake will be determined by:

- timescale
- accuracy of information.

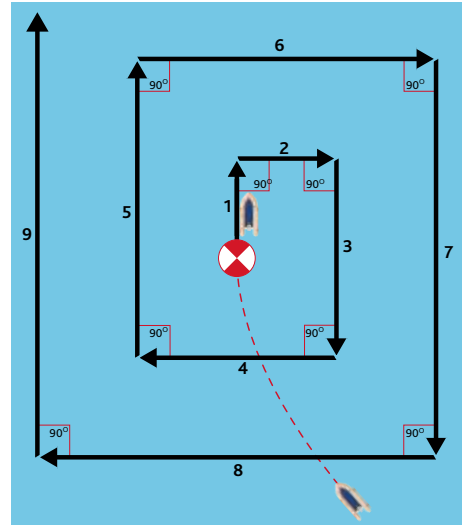
Datum search

A datum is a geographic point, line or area used as a reference in search planning. A datum position is the most probable position of the casualty with the information available.

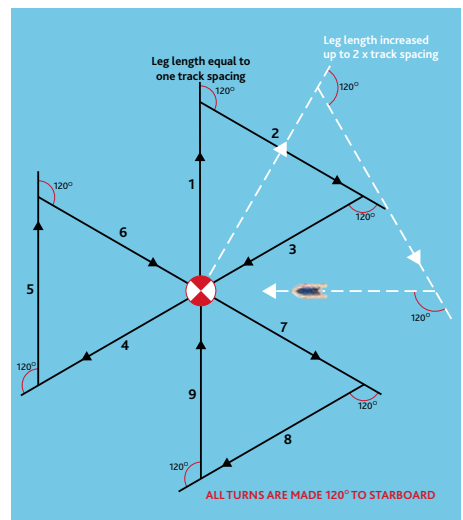
Datum searches are water based.

- The area covered by the search moves as the search vessel and casualty are affected by tide or wind.
- They rely on there being a good initial datum – a distinct start point for the search.
- Only use the steering compass for heading. Do not use course over ground (COG) and do not pick a point on the shore to steer to. As the search is a water search, the search area must be allowed to move due to tide/wind.

There are two types of datum searches:



1. Expanding square search



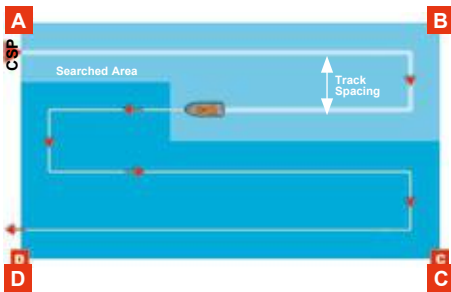
2. Sector search

Area search

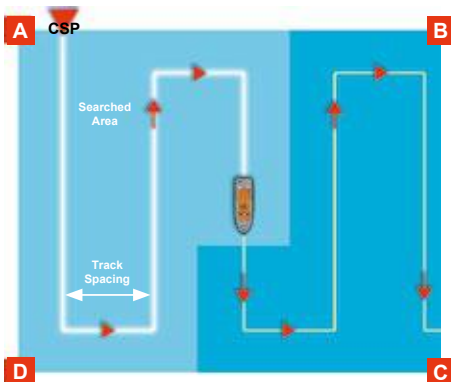
Area searches are used when the information is dated or less accurate and where there are many possibilities of where the casualty could be. They are calculated using:

- up-to-date tide information
- wind strength and direction to calculate the leeway (wind drift) of the casualty
- wind information from the last 24 hours to establish wind-driven current.

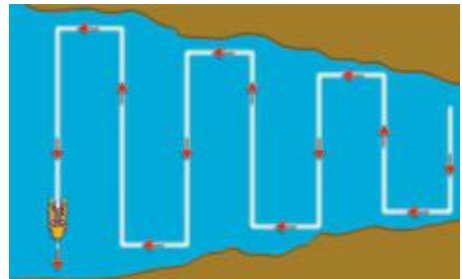
There are several types of area searches:



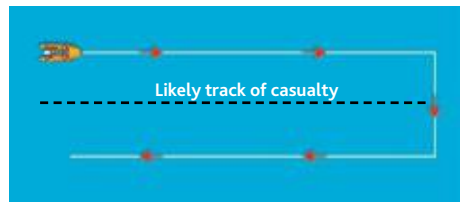
1. Parallel track search



2. Creeping line ahead search



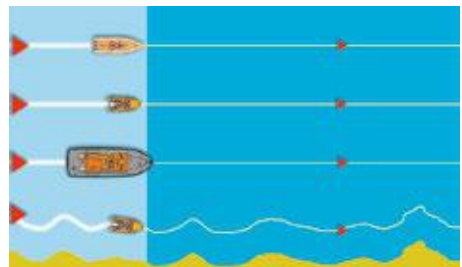
3. Keyhole search



4. Track line search



5. Goalkeeper search



6. Line abreast search

13.5 Setting up a search

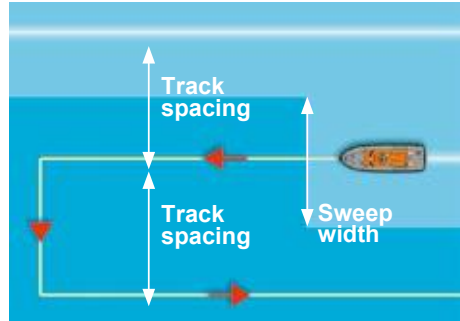
When setting up a search you need to work out the sweep width and track spacing.

Sweep width






This is how far the crew look either side of the vessel. Sweep width is the distance either side of the vessel, added together, that the casualty can be expected to be spotted.

Track spacing

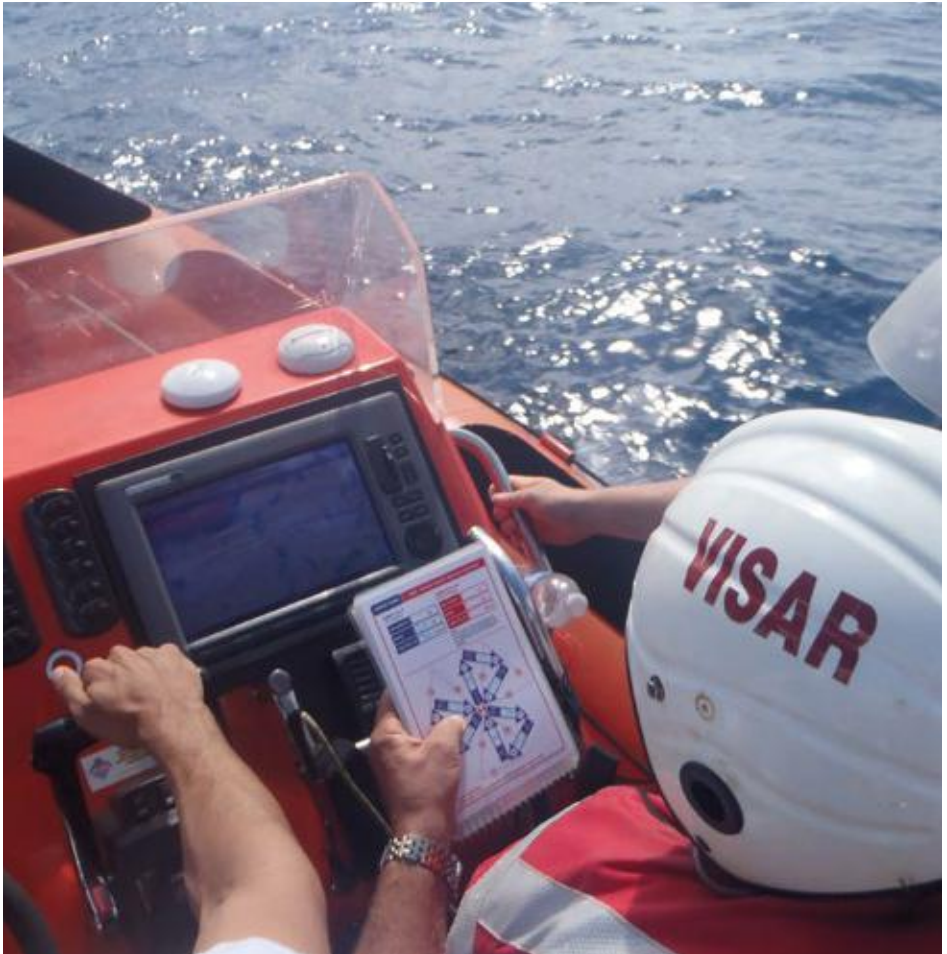
The track spacing is the distance between each track the rescue vessel takes and is equal to sweep width. Speed and track spacing should be consistent and appropriate to the conditions, scenario and size of rescue vessel.



To work out the sweep width, use the following table:

		WIND SPEED / SEA STATE ON-SCENE		
		<16kts / <0.6m Sea	16-25kts / 0.6m-1.2m	>25kts / >1.2m Sea
		ASSUMED SPEEDS		
TARGET TYPE		20 knots	12 knots	8 knots
	PERSON IN WATER	SWEEP WIDTHS		
	Visibility <3NM	30secs (0.17 nm)	30secs (0.10 nm)	30secs (0.07 nm)
	LIFERAFT			
	Visibility 1NM	2mins 30secs (0.83 nm)	2mins (0.40 nm)	1min 30secs (0.20 nm)
	Visibility 3NM	6mins (2.00 nm)	5mins (1.00 nm)	3mins 45secs (0.50 nm)
	Visibility 5NM	8mins (2.66 nm)	6mins 45secs (1.35 nm)	5mins (0.67 nm)
	POWER AND MFV <5m			
	Visibility 1NM	1min 15secs (0.42 nm)	1min (0.20 nm)	45secs (0.10 nm)
	Visibility 3NM	2mins 30secs (0.83 nm)	2mins (0.40 nm)	1min 30secs (0.20 nm)
	POWER & MFV 5m-15m			
	Visibility 1NM	2mins 30secs (0.83 nm)	2mins (0.40 nm)	1min 30secs (0.20 nm)
		ASSUMED SPEED		
TARGET TYPE		10 knots		
	PERSON IN WATER	SWEEP WIDTH		
	Visibility <3NM	60secs (0.17 nm)		

Unit 14: Datum searches



Learning outcomes

- 14.1 Be able to calculate a datum position and search radius.
- 14.2 Be able to do an expanding square search.
- 14.3 Be able to do a sector search.

14.1 Rapid response method

The rapid response method (RRM) is a way of working out the datum and search radius.

It is generally used up to 1 hour after the incident.

You need:

- a drift start position (DSP)
- a datum time (your estimated time of arrival or ETA)
- tidal data
- wind speed and direction
- type of casualty.

1. Plot the drift start position (DSP)

The drift start position (DSP) is the position from which the casualty is known or is estimated to have started to drift.

The DSP may be a sighting of a vessel in distress, a position given by electronic means or a piece of evidence left floating in the water (flotsam) from a casualty vessel.

You also need to have the drift start time (DST). This is the time at which the casualty started to drift. It is important to get an accurate time but it may have to be estimated.

Using the information you have, plot the drift start position and drift start time on a suitable scale chart.



2. Estimate the time to arrive on scene

To work out the estimated time of arrival (ETA):

- measure the distance from where you are to the DSP
- work out how fast the rescue vessel will be able to travel in the conditions.

Once you have your ETA (for example, 30 minutes), then find out how much the casualty will have drifted with the tide in that time. This is known as the **tidal vector**. Mark this tidal vector on your chart.



3. Leeway drift

The leeway is the amount of drift of an object in the water caused by the wind. It can be calculated from a known formula depending on the type of object and wind speed.

Use the wind speed and direction at the scene. Then use the Rapid Response Method check card on the next page to work out the distance that the casualty will drift – the leeway drift – over 1 hour. If the ETA is, for example, 30 minutes, then the leeway drift will be half this.

Draw this distance on the chart as a line (or vector). It is drawn in a direction directly downwind.



Unit 14: Datum searches

TP-ALB-133 ISSUE B - Date of last revision: November 2010

SAR – Rapid Response Method check card

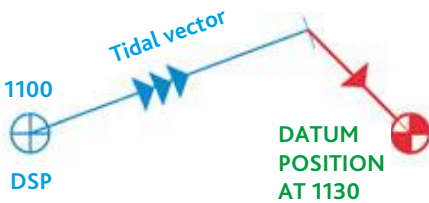
Type of target		Leeway rate formula (u = mean wind speed (knots))
Person in water (PIW)	PIW unknown state (mean values)	$0.011 \times u + 0.07$
	PIW with lifejacket	$0.02 \times u$
	Vertical	$0.005 \times u + 0.07$
	Sitting	$0.012 \times u + 0.004$
	Survival suit, face up	$0.014 \times u + 0.1$
	Scuba suit, face up	$0.007 \times u + 0.08$
	Deceased, face down	$0.015 \times u + 0.08$
Marine liferafts	No ballast pockets, general (mean values)	$0.042 \times u + 0.03$
	No ballast pockets, no canopy, no drogue	$0.057 \times u + 0.21$
	No ballast pockets, no canopy, with drogue	$0.044 \times u - 0.2$
	No ballast pockets, with canopy, no drogue	$0.037 \times u + 0.1$
	No ballast pockets, with canopy, with drogue	$0.03 \times u$
	Shallow ballast pockets, with canopy (mean values)	$0.029 \times u - 0.004$
	Shallow ballast pockets, with canopy, no drogue	$0.032 \times u - 0.02$
	Shallow ballast pockets, with canopy, with drogue	$0.025 \times u + 0.14$
	Shallow ballast pockets, with canopy, capsized	$0.017 \times u - 0.1$
	Deep ballast pockets, with canopy, unknown capacity and loading (mean values)	$0.03 \times u + 0.015$
	4–6-man deep ballast pockets, with canopy, loading and drogue unknown, general (mean values)	$0.029 \times u + 0.04$
	4–6-man deep ballast pockets, with canopy, no drogue, loading unknown	$0.038 \times u - 0.04$
	4–6-man deep ballast pockets, with canopy, no drogue, light loading	$0.038 \times u - 0.04$
	4–6-man deep ballast pockets, with canopy, no drogue, heavy loading	$0.036 \times u - 0.03$
	4–6-man deep ballast pockets, with canopy, with drogue, loading unknown	$0.018 \times u + 0.03$
	4–6-man deep ballast pockets, with canopy, with drogue, light loading	$0.016 \times u + 0.05$
	4–6-man deep ballast pockets, with canopy, with drogue, heavy loading	$0.021 \times u$
15–25-man deep ballast pockets, with canopy, loading and drogue unknown, general (mean values)	$0.036 \times u - 0.085$	
15–25-man deep ballast pockets, with canopy, no drogue, light loading	$0.039 \times u - 0.06$	
15–25-man deep ballast pockets, with canopy, with drogue, heavy loading	$0.031 \times u + 0.07$	
Deep ballast pockets, with canopy, capsized	$0.009 \times u$	
Deep ballast pockets, with canopy, swamped	$0.01 \times u - 0.04$	
Aviation liferafts	4–6-person, no ballast pockets, with canopy, no drogue	$0.037 \times u + 0.11$
Personal watercraft	Sea kayak, with person, with aft deck	$0.011 \times u + 0.24$
	Home-made wooden raft	$0.015 \times u + 0.17$
	Home-made wooden raft, with sail	$0.079 \times u - 0.17$
	Surfboard, with person	$0.02 \times u$
	Windsurfer, with person, with mast and sail in the water	$0.023 \times u + 0.1$
Sailing vessels	Mono hull, full keel, deep draught, heavy displacement	$0.03 \times u$
	Medium displacement yacht	$0.04 \times u$
	Mono hull, fin keel, shoal draught	$0.04 \times u$
Power vessels	Totally enclosed lifeboat/life capsule	$0.038 \times u - 0.08$
	Outboard, no drogue	$0.07 \times u + 0.04$
	Light displacement cabin cruiser	$0.07 \times u + 0.04$
	Medium displacement cabin cruiser	$0.04 \times u$
	Flat bottomed, Boston Whaler	$0.034 \times u + 0.04$
	V-hull	$0.03 \times u + 0.076$
	V-hull, swamped	$0.017 \times u$
	Sportsboat, cuddy cabin, modified V-hull	$0.069 \times u - 0.08$
	Sport fishing boat, centre console, open cockpit	$0.06 \times u - 0.09$
	Commercial fishing vessel, type unknown, general (mean values)	$0.037 \times u + 0.02$
	Commercial fishing vessel, side/stern trawler	$0.042 \times u$
	Commercial fishing vessel, long liner	$0.037 \times u$
Commercial fishing vessel, gill-netter	$0.04 \times u + 0.006$	
Coastal freighter	$0.028 \times u$	
Flotsam	Fishing vessel general debris	$0.02 \times u$
	Cubic metre bait/fish box, general, loading unknown	$0.013 \times u + 0.27$
	Cubic metre bait/fish box lightly loaded	$0.026 \times u + 0.18$
	Cubic metre bait/fish box, full load	$0.016 \times u + 0.155$

4. Datum position

The end of this line is the datum position for the casualty.

Mark the datum position with the time calculated.

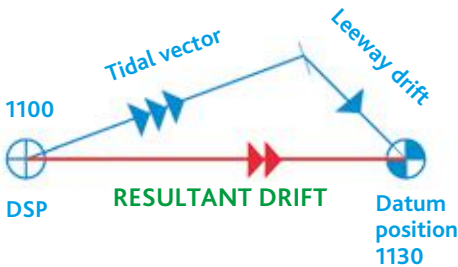
The datum position is the best guess that can be calculated based on the local wind and tide conditions.



5. Plot the resultant drift

Draw a line from the drift start position (DSP) to the datum position. This line, the resultant drift, is the path that the casualty will travel down as a result of the wind and tide conditions.

The datum position is the location that the search should be focused around and the resultant drift line should also be searched.



6. Calculate the search radius and search area

A search radius will provide the rescuers with information on how big their search area should be.

However, you need to take into account any error with the initial drift start position – known as the initial position error (IPE).

Means of Navigation	Fix Errors in Nautical Miles
Inertial Navigation System	0
SATNAV (e.g.: DGPS)	0.1 - 0.5 NM
Visual Three Line Fix	1.0 NM
Radar Fix	1.0 NM
Celestial Three Line Fix	2.0 NM
Marine Radio Beacon (3 beacon fix)	4.0 NM

Use the IPE table and take into account how the drift start position was reported. For example, if the drift start position was reported from a sighting (visual), then the IPE would be 1 nautical mile.

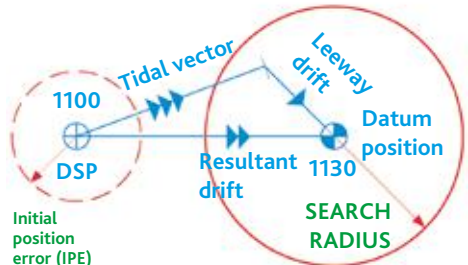
Plot the initial position error (IPE) around the drift start position.

Then measure the length/distance of the resultant drift and divide this by 3.

Then add the two together:
 $IPE + (\text{resultant drift} \div 3) = \text{search radius}$

Draw this search radius around the datum position.

This then gives you the search area.



Summary

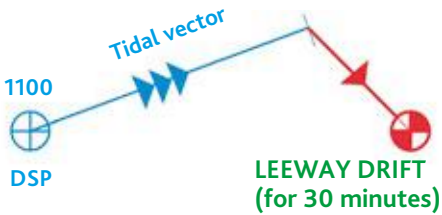
1. Plot the drift start position (DSP)



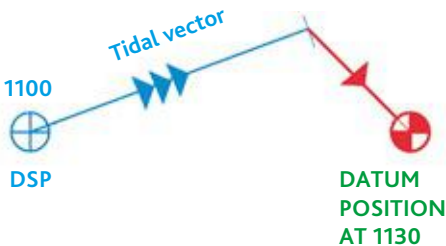
2. Estimate the time to arrive on scene



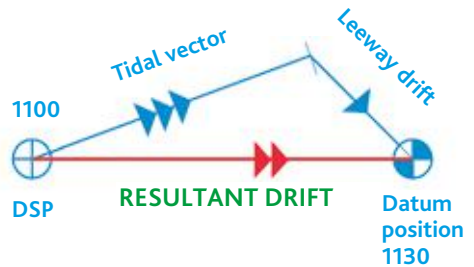
3. Leeway drift



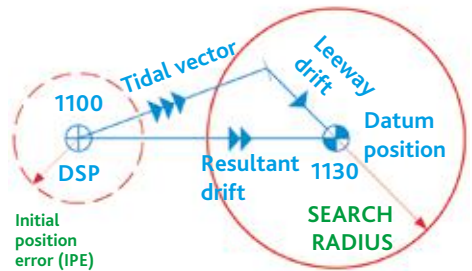
4. Datum position



5. Plot the resultant drift



6. Calculate the search radius and search area



14.2 Expanding square search

An expanding square search is best used when the casualty's position is confidently expected to be within a relatively small area. As with all datum searches the expanding square relies on a good initial datum.

As with both datum searches, it is better to only use a compass for the heading and stopwatch for timing the distance. Using a GPS or other electronic navigating system does not take into account the effect of the wind and tide on the casualty.

Preparation

- Once you know what you are searching for (person in the water, small boat, big boat), work out your speed, timings, and how far to look from the sweep width table.
- Multiply the leg timings as shown in the illustration and below.
- Decide on the appropriate initial heading.

The search is conducted in legs, starting from the datum.

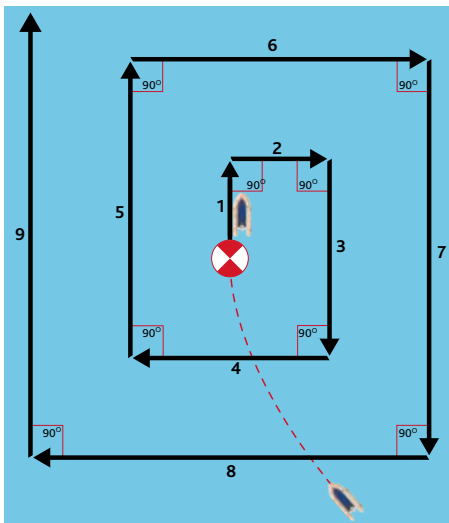
- Leg 1 = Track spacing
- Leg 2 = Track spacing
- Leg 3 = 2 x Track spacing
- Leg 4 = 2 x Track spacing
- Leg 5 = 3 x Track spacing
- Leg 6 = 3 x Track spacing

... and so on.

The track spacing is shown as 'S' on the illustration.

Carrying out the search

- Using the speed given in the sweep width table, set your speed on the first leg and keep this the same for all legs. Do not change this.
- Start the stopwatch and use the compass to head along the first leg for the set time. Use North, South, East and West to make steering easy.
- Ask the crew member who is monitoring the stopwatch to tell you the new course and bearing 10 seconds before making the turn.
- At the end of each leg turn 90° to starboard.
- Repeat using the required track time.



14.3 Sector search

A sector search is best used when the information about the datum is very fresh.

As with both datum searches, it is better to only use a compass for the heading and stopwatch for timing the distance. Using a GPS or other electronic navigating system does not take into the account the effect of the wind and tide on the casualty.

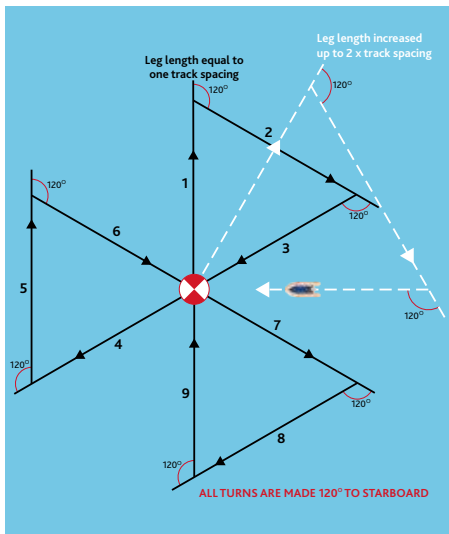
Preparation

- If there is no physical datum, place a fender or buoy with a line attached in the water (or something that will drift like the casualty you are looking for) to act as a datum point.
- Once you know what you are searching for (person in the water, small boat, big boat), work out your speed, timings, and how far to look from the sweep width table.

Carrying out the search

- Using the speed given in the sweep width table, set your speed on the first leg and keep this the same for all legs. If safe to do so, do not change this.
- Start the stopwatch and use the compass to head along the first leg for the set time. Use North for the first leg to make steering easier.
- The first 9 leg lengths are equal to 1 x track spacing.
- Ask the crew member who is monitoring the stopwatch to tell you the new course and bearing 10 seconds before making the turn.
- At the end of each leg, make a 120° turn to starboard.
- On leg 3, 6, and 9, look for your datum (fender/buoy) and, if necessary, adjust the direction of the vessel so that you go past the datum.
- As you pass the datum, come back onto course and restart the stopwatch.
- Repeat until you have carried out three full sectors.

If there is no success after one full rotation (three triangles), increase the bearing by 30° and increase the leg length by up to 2 x track spacing.





Learning outcomes

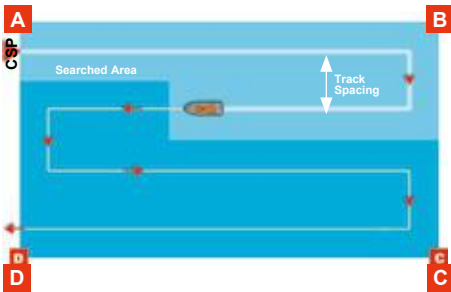
- 15.1 Understand the different types of area searches.
Be able to do an area search.
- 15.2 Understand search techniques.

15.1 Area searches

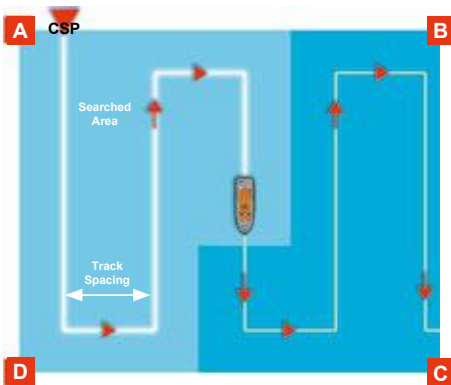
Parallel track and creeping line ahead

The two area searches most commonly used are the parallel track and creeping line ahead. They have the same coverage and efficiency. However one may be preferable to the other due to factors such as sea state, sun glare, moon light and the shoreline.

As with all ground-based searches electronic navigation system, such as GPS, can be used.



Parallel track search



Creeping line ahead search

Preparation

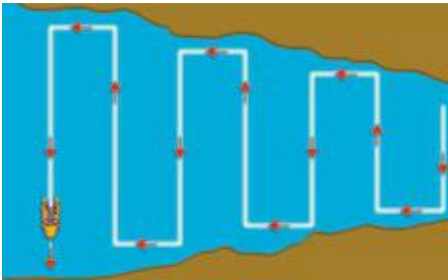
- Plot the commence search position (CSP) and search legs.
- Assess and identify any hazards in the area you have been tasked to search.
- Brief the rescuers.
- Prepare any equipment needed.

Carrying out the search

- Maintain the required speed over ground (SOG).
- Maintain the required course over ground (COG).
- Travel the distance of the leg length.
- Turn 90° in the requested direction.
- Travel the track space distance.
- Turn onto the reciprocal (opposite) heading of the initial leg.
- Update the SMC of any situational changes and if you are unable to complete any of the requests.
- Maintain a lookout.
- Maintain safe navigation.

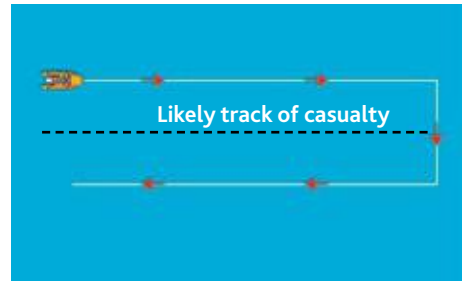
Keyhole

This search is similar to a creeping line ahead search, and is used in river estuaries, between islands or where there are sandbanks. The length of each leg is dictated by the river or sandbanks.



Track line

The search may be a single sweep along the length of the vessel's track. If the search is to consist of two legs, then each leg would be a half of a track spacing either side of the casualty's track.



Goalkeeper

Goalkeeper searches across the tide / river for a short distance whilst the casualty is drifting towards you. This is a combination of an area and drift search.

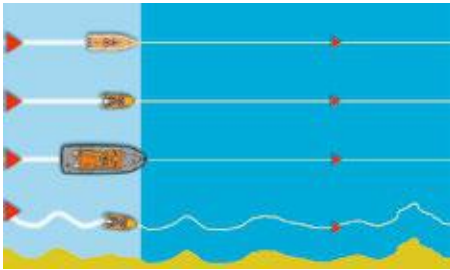


Multi-vessel

This search is based on the same principles as the single vessel parallel track and creeping line ahead search pattern.

The search vessels are spaced at the required track spacing in line abreast and will generally travel at the speed of the slowest vessel.

This is a useful search pattern when using vessels that have limited navigational capability – for example, fishing vessels.



Preparation

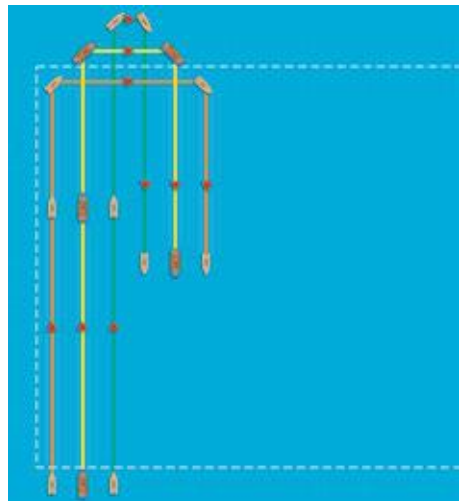
- An appropriate person would act as OSC. It may be preferable for the OSC to place themselves on a larger vessel assisting with the search that has more suitable equipment and a working platform.
- GPS and radar can be used.
- The OSC should position the vessels in the most appropriate order considering the vessels' characteristics and crews' competency.
- Each vessel is 1 x sweep width apart.

Carrying out the search

- All vessels are to stay at the speed of the slowest vessel and stay in line.
- Travel along the first leg for the set distance.

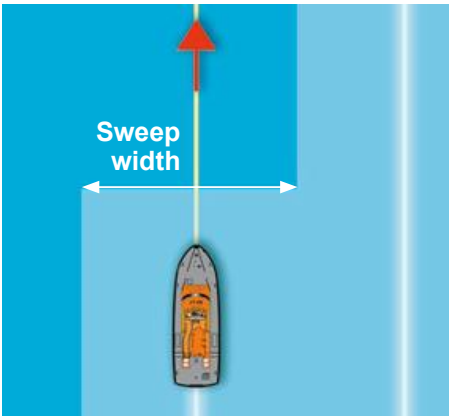
Carrying out a search turn

- Radar could be used to maintain the sweep width between vessels.
- All communications to be passed through the OSC.
- If there are any potential sightings, the whole search should be paused by the OSC while they are being investigated.
- At the end of this leg, the furthest vessel from the new course turns 90°.
- The vessel passes behind and crosses the wash, then the next furthest vessel turns 90°.
- This is repeated until all the vessels have turned 90°.
- Once the last vessel to turn has travelled one track spacing, that vessel should turn 90° and continue the process until all vessels are onto the reciprocal (opposite) heading of the initial track.
- Continue this process until you have covered the search area.



15.2 Search techniques

It is crucial that crew are looking out from the port and starboard sides of the vessel in order to cover the sweep width. If this is not done, the search will be ineffective.



Factors that may hinder your ability to search effectively include:

- weather
- sun glare
- sea state
- visibility
- casualty characteristics
- fatigue.

Some equipment that could assist with these factors are listed as follows:

Searchlights

A searchlight is a very bright light source with a powerful beam of light. A searchlight may be hand-held or can be mounted to a rescue vessel on a tilt-and-swivel mechanism. The searchlight can then be pointed in the required direction. Searchlights can be powered either by a battery pack or from the rescue vessel's own electrical power supply for use at night or in reduced visibility.

A searchlight has a narrow field of vision and will also affect your night vision. It may be preferable to use it only to light up distinct objects.



Binoculars

Binoculars have a narrow field of vision, they can be focused in onto a distinct object. Binoculars should only be used when you think you can see something. Overuse can affect your ability to readjust your focus.



White parachute rocket

These can be used when there is limited background light.



Radar

The radar may be used to locate and identify casualties, assist with multi-vessel search management and provide an assessment of visibility. Note that due to the limitations of radar, not all vessels and casualties will show up clearly, if at all, particularly a person in the water.



Scanning techniques

It is important that crew maintain a good all-round lookout, which includes listening for sounds such as whistles or shouting.

The most effective way to search for an object using your eyes is scan-focus-scan.

To do this you need to move your head through no more than 15° while keeping your eyes centred. When you are at the end of each arc, focus before repeating.

The reason for this is so that your eyes do not get tired, thus reducing the effectiveness of the search.



Learning outcomes

- 16.1 Know what to check following a search and rescue mission.
Understand why recording information is necessary.
Know what information needs to be recorded.

16.1 Post-incident procedures

Following a search and/or rescue operation it is important that rescuers follow the post-incident procedures in order to make their vessel ready for the next rescue mission.

Post-incident checks

- Refuel and check all engine fluid levels.
- Check the engine for damage and service if necessary.
- Check boat engine spares and ensure that any equipment used is stowed correctly.
- Replace any consumable items such as first aid equipment.



Keeping records

Recording incidents is important to measure and record success. It also helps improve the service and identify any patterns of people getting into difficulty, as well as help to build support from local government and other agencies.

Some of the information you may be asked to gather may include:

- tasking details
- name and age of the casualty
- what the incident was
- where the incident was
- what assistance you provided
- other rescue organisations or boats involved.

It is important to maintain the privacy of casualty details and not release them to the media.

