RYA

Powerboat HANDBOOK

Paul Glatzel

RYA Powerboat Handbook
3rd Edition

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Foreword

The RYA Powerboat Handbook has been written to accompany the RYA Powerboat Scheme up to the level of the RYA Intermediate Powerboat and RYA Tender Operator courses at RYA Recognised Training Centres around the world.

More detailed information on specific subjects can be gained by reading:

- RYA Day Skipper Shorebased Notes – 3rd Edition (G113). This book covers the theoretical aspects of navigation, seamanship, meteorology, and collision avoidance (the 'rules of the road'), and has been written to support the RYA Day Skipper Theory course.
- RYA An Introduction to Navigation (G77).
- RYA An Introduction to Radar (G34).
- RYA Weather Handbook (G133).
- RYA Navigation Handbook (G6).

Practical Courses

There is no substitute for experience. No matter how detailed any book, practical experience onboard a boat with a trained instructor is worth its weight in gold. For the best possible preparation, use this book in conjunction with RYA tuition.

RYA Practical courses within the Powerboat Scheme include:

RYA Powerboat Level 1 (Start Powerboating)

RYA Powerboat Level 2 (Powerboat Handling)*

RYA Tender Operator

RYA Intermediate Powerboat Day Cruising

RYA Advanced Powerboat (Day & Night)**

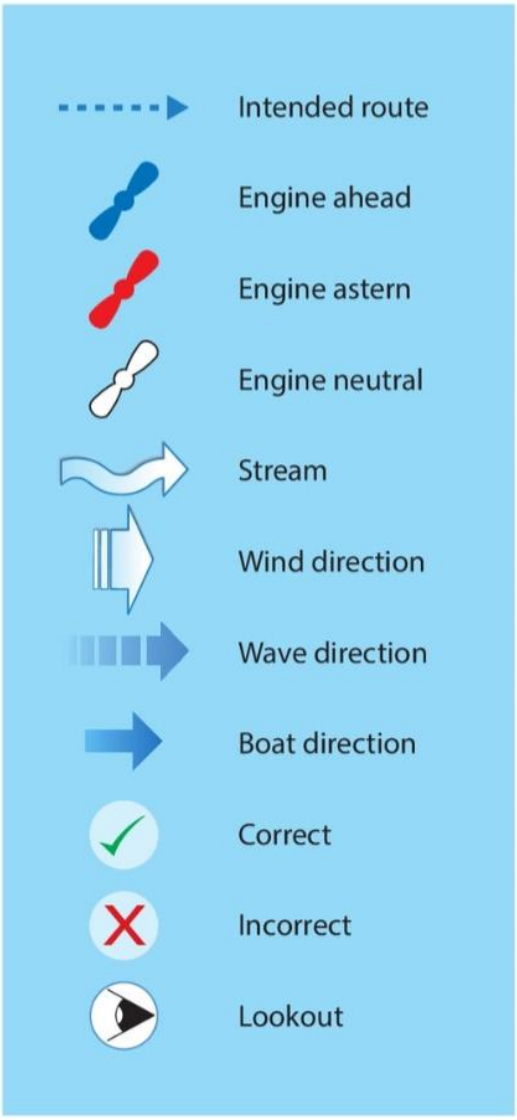
RYA Safety Boat***

*The book RYA Start Powerboating (G48) supports this course and is supplied as part of the material for it.

**The RYA Advanced Powerboat Handbook (G108) supports this course.

***The RYA Safety Boat Handbook (G16) supports this course.

Key to symbols



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Introduction

Powerboating is an exhilarating, fun and often fast activity. In recent years the number of people going afloat in powerboats has multiplied, generating many more boats on the water and making it evermore important to acquire skills to make the pastime safer and more enjoyable for all.

Whether you are a beginner or an experienced powerboater, this handbook will help develop and expand your skills. It also acts as a useful resource for the RYA Powerboat Scheme, and covers all of the areas of the syllabus up to the levels of the RYA Tender Operator and Intermediate Powerboat courses. In fact, some subjects are covered to a greater depth than required.

All boats work along the principles set down in this book. Whether you are fishing or cruising the coast, the same pre-start checks will have to be done before leaving port, the same safety issues will need to be considered and the same manoeuvres have to be performed to get to the open sea.

Although it is impossible to include every imaginable scenario in this book, we hope to give you the knowledge to assess a situation correctly and make an informed decision on what to do next.

Safety, preparation and briefing are the most important points to consider when going to sea. You must be well-informed and prepared before you leave harbour. If in doubt during any manoeuvre or pilotage situation, slow down and give yourself time to think the situation through. Your aim is to think at least one step ahead all the time, to try to anticipate what is going to happen next.

Becoming a capable and safe powerboater comes from a mixture of experience, training and common sense.

The RYA Powerboat Scheme consists of a number of courses aimed at powerboaters with different levels of experience and areas of interest. It is aimed at those using planing and displacement craft, both at sea and on inland waterways. The courses generally suit open powerboats up to about 10m, at which point the RYA Motor Cruising Scheme courses become relevant.

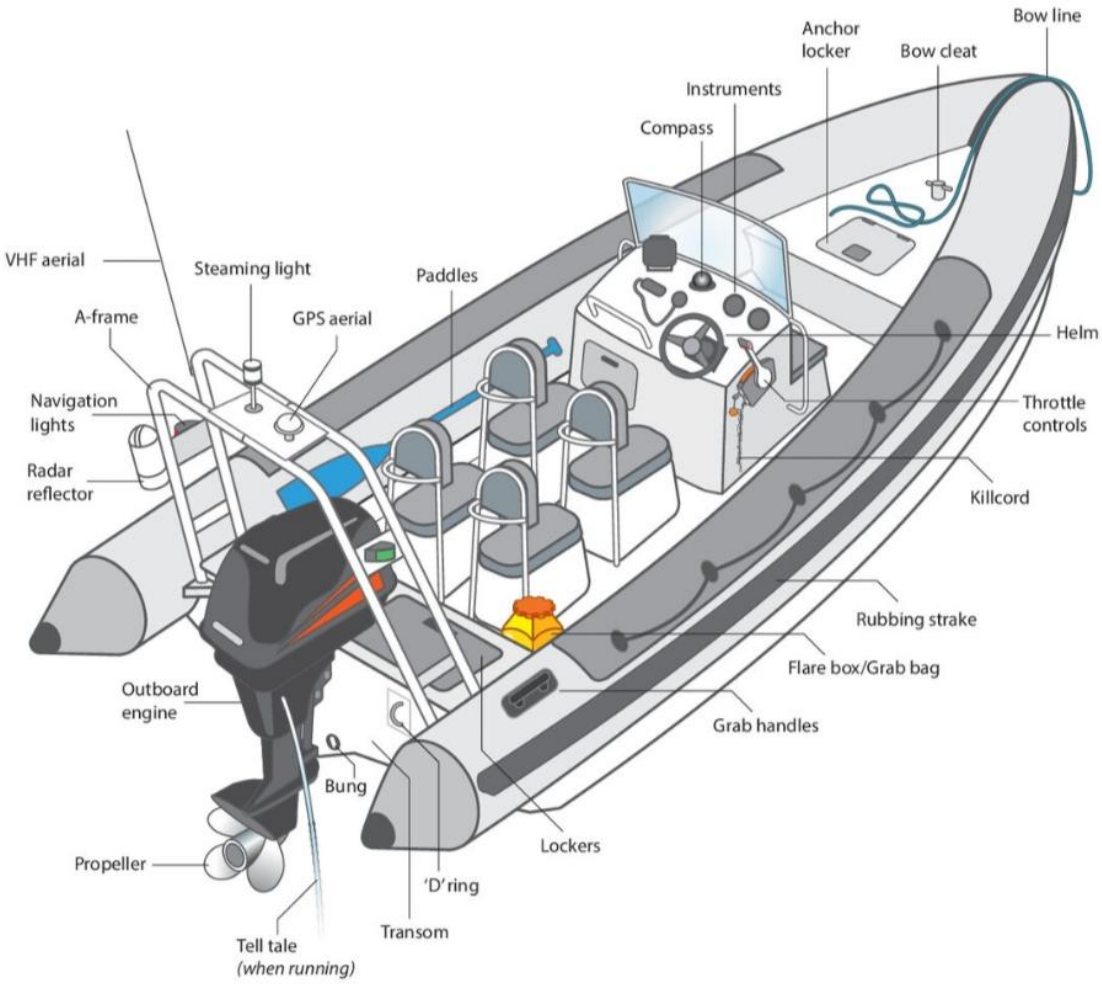
The RYA Motor Cruising Scheme courses are aimed at those using motor cruisers. These are typically planing or displacement craft, with accommodation, either with single- or twin-engine installations. The scheme consists of Start Motor Cruising, Helmsman, Day Skipper, Advanced Pilotage, Coastal Skipper, and RYA Yachtmaster® Certificates of Competence. The supporting Theory courses are an excellent way to develop the theoretical knowledge before taking the Practical courses.

Inevitably, there is no clear divide between the Motor Cruising and Powerboat Schemes, and those seeking courses on craft around the cut-off point should chat to both a Motor Cruising Recognised Training Centre (RTC) and a powerboat RTC to find out which course suits their boating requirements.

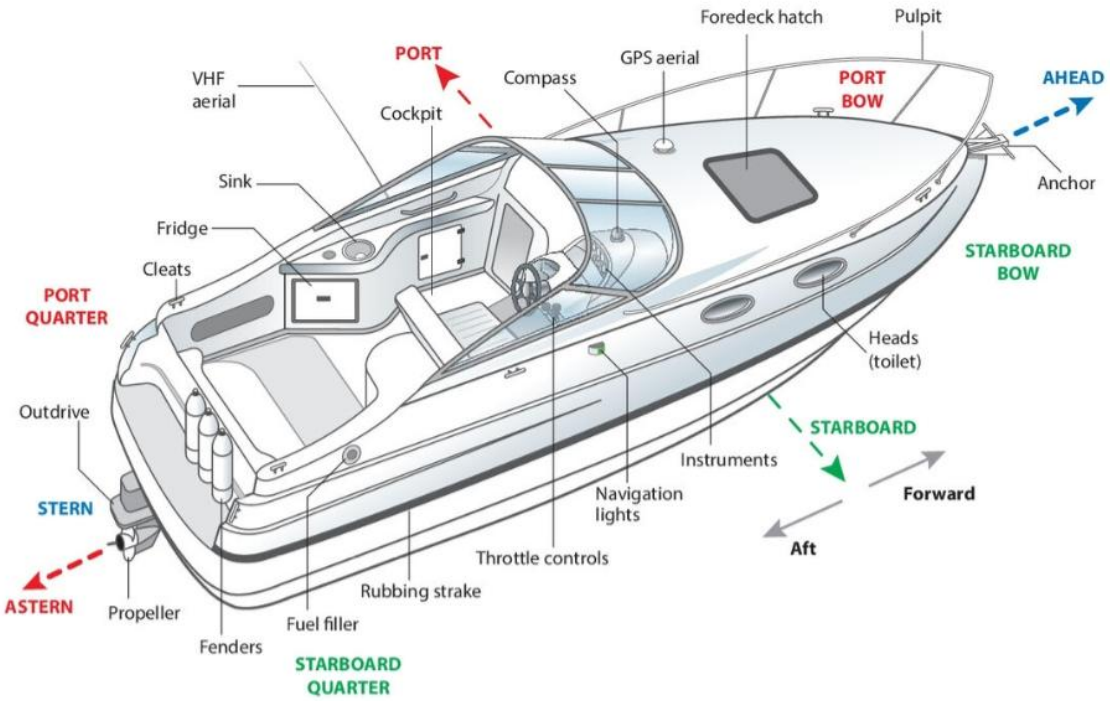
Chapter 1

Parts of a Boat

RIB (Rigid Inflatable Boat)



Sports Boat


Foredeck hatch
Pulpit
PORT
GPS aerial
VHF aerial
Compass
PORT BOW
AHEAD
Cockpit
Anchor
Sink
Fridge
STARBOARD BOW
Cleats
PORT QUARTER
Heads (toilet)
Outdrive
STARBOARD
Instruments
Navigation lights
Forward
STERN
Aft
Throttle controls
Rubbing strake
ASTERN
Propeller
Fuel filler
Fenders
STARBOARD QUARTER

Chapter 2

Types of Boats, Engines, Hulls, and Seating Arrangements

It is possible to have as much fun in a four-metre boat as in a large twin-engine fast cruiser. Your choice of boat depends on its intended use and where it is to be used. Problems may arise if a boat is not used for its designed purpose, or used in areas where sea conditions are far worse than those intended for its design. When choosing a boat you should consider where you intend to use it, and what for.

Choosing a Boat

There are a number of factors to consider when choosing a boat:

- Intended use: A boat used for fishing in the winter is somewhat different to a boat used for water-skiing in the summer. Each boat is designed with a particular use in mind and it is important to choose one that will meet your needs.
- Boat budget: Boating is perceived as being expensive, but it need not be. A small second-hand sportsboat or RIB can be an ideal starter boat while not costing too much. A large budget need not mean more enjoyment.
- Running costs: Buying the boat is only the first part of the cost. Fuel, equipment and storage should also be budgeted for. Fuel will usually cost more afloat and there can be a difference in costs between diesel and petrol. Storing the boat in a marina or boat park or having the trailer serviced could cost a significant amount, while insurance and servicing plus the initial outlay on safety equipment can all bite a large chunk out of your bank balance. Do your sums and get quotes on running costs before buying as it may be better to start with a smaller boat that you can afford to use more often.
- Area of use: The intended area of operation will be a major consideration. An area with a strong tidal race and often choppy conditions requires a boat with the hull characteristics, strength and power to deal with them. The same boat used on an inland lake may well be slow when compared with other boats on the same water. Equally, boating in an area where quayside petrol is unavailable may influence your decision to buy a diesel-engine boat.

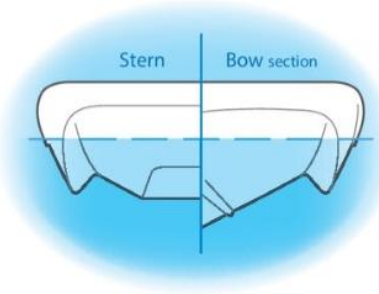
In some countries boats are categorised by the type of water they are to be used on:

Sheltered waters Boats that operate in daylight only, in estuaries, inshore or inland waters, close to a safe harbour of refuge where shelter may be found within approximately one hour if the weather should worsen. Boats in this category are likely to be around six metres or less in length.

Inshore Boats that cruise along the coast, within 10 miles of land and approximately four hours of passage time from a safe harbour or refuge in which shelter may be found, by day or night.

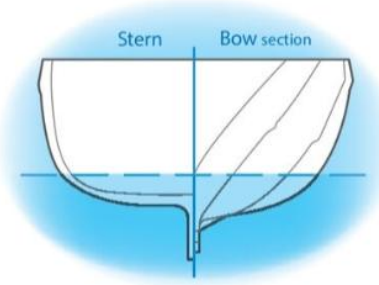
Offshore Boats that cruise around the coast and to different countries, making offshore passages of between 50 and 500 miles. Boats in this category are likely to be over eight metres.

Boats and Hull Shapes



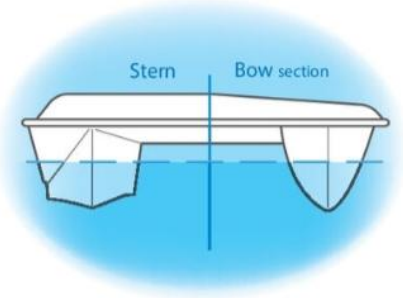
Dory Dory hulls offer a smaller wetted area than 'V' hulls and plane easily. However, they tend to 'slam' into waves and are only suitable for inshore use. They are mainly found on sheltered waters and are very stable. The hull has a deeper 'V' forward that flattens out towards the stern. This gives better action through waves and good planing features.

Dory-style vessels often have a cathedral hull, which gives a stable semi-flat-bottomed boat with good speed in calm water. Good load-bearing design but may have little grip in the water during turns. Excellent for lakes and sheltered waters.



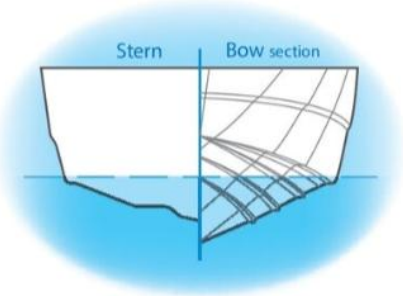
Displacement Displacement hulls tend to be far more rounded and work by pushing water out of the way as they move. They tend to be slow, but very seaworthy. Their speed is governed by waterline length.

Displacement boats are generally safe and slow boats with inboard engines. They may offer accommodation and some luxuries, and are popular as workboats.



Catamarans Catamarans have two hulls, giving excellent stability and load-carrying capabilities and requiring less power for the equivalent-size vessel for similar performance.

Catamarans are often used as small ferries and fishing boats. They are also found as race boats, as the reduced wetted-surface area allows greater speed.



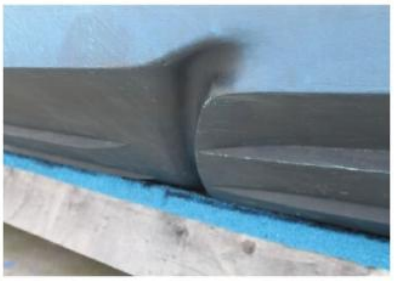
'V'-shaped hulls 'V'-shaped hulls are good in waves and rougher conditions. A deep 'V' hull slices through waves but tends to have less internal space because it has less beam (width). A flatter 'V' has a better beam but compromises its ability to slice through waves, and may 'slam' through/over the waves.

Speedboat (4–8m) Small, fast, good for water-skiing and as a family runabout. Hulls vary from a very deep 'V' (generally boats with an offshore pedigree) to a flatter 'V', which potentially has better interior space due to a wider beam. Smaller boats mainly have outboards but most over six metres have inboard engines with an outdrive.

Fast fishers A popular style of boat due to its suitability for choppier coastal waters. They offer a sheltered wheelhouse and a large, open-decked area at the rear. Although designed for coastal fishing they are also suitable as a family day boat. Some have fairly deep 'V' hulls that have the ability to cope with rougher conditions. Available with both outboard and inboard engines.

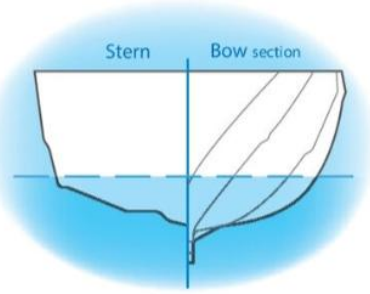
RIB – Rigid Inflatable Boat Designed initially for rescue and safety work, but very popular as a family boat. Hull types range from deep 'V' to far flatter hulls. In competent hands, a well-designed RIB can handle seas far in excess of those handled by other comparable-sized boats due to their design and buoyant tubes. Lengths vary from three metres to 10 metres. For those over seven metres, inboard engines become available – almost exclusively diesel.

Fast cruiser A great family boat offering a good mix of accommodation and deck area. Always inboard and mostly diesel fuelled. Upwards of eight metres, twin-engine installations are quite common. The high topsides increase their windage, so care needs to be taken when berthing.



Stepped hulls Developed originally for race boats, stepped hulls are now increasingly found on leisure craft and may give rise to some specific considerations when handling the craft at higher speeds. See Chapter 9 regarding handling a stepped-hull boat.

Innovative craft Technology moves on rapidly with new drive systems appearing, hull types evolving to include vessels that have foils, and electric propulsion systems becoming more popular. Keep an eye on the boating press and websites to stay abreast of new developments.



Semi-displacement Combines features of the 'V'-shaped and displacement hulls. Good seakeeping, but not overly quick and may need lots of power to go faster.

Engines and Drives

Outboards Outboards are by far the most common engine and drive system on small powerboats. The major advantage is that they are a self-contained engine, drive, and steering system that can be easily and quickly replaced if required. The outboard can be 'trimmed up' to allow shallow-water operation and so it is clear of the water if left afloat. Very small outboards for tenders can be petrol or electric powered. Above this, outboards up to approximately 200 horsepower (hp) are exclusively petrol powered. Above 200hp, outboards are largely petrol powered but diesel outboards are available and becoming more common in the commercial/military sector.

Outdrives In effect, the lower part of the outboard is bolted onto the transom, but the engine is inside the boat. This is the most popular option for medium- to large-size powerboats as it allows for better weight distribution by placing the engine inboard/further forward. Additionally, the engine gets better protection from the elements and may be easier to service in the boat. The outdrive leg is steered left or right using a wheel.

Shaft drives Shaft drives are common on ski and working boats and increasingly on some of the small, fast, fishing-type craft. A shaft drive allows the engine to be positioned further forward to aid the interior design or weight distribution. The propeller shaft attaches to the engine and runs through waterproof through-hull fittings to the propeller. A separate rudder is used to steer the boat using thrust from the propeller.

Jet drives The positioning of engine and drive unit is similar to that of an outdrive. However, this time the engine drives an impeller that sucks in water through a grille below the hull and jets it out under high pressure through a small hole to produce thrust. A steerable nozzle directs the jet of water to give power and steerage. A deflector ('bucket') is used to give ahead and astern control.

Forward-facing drives While similar in some aspects to outdrives, these are positioned below the hull with the props facing the front of the boat. They are typically the preserve of larger vessels above 11–12 metres and can be combined with a joystick for close-quarters manoeuvring.

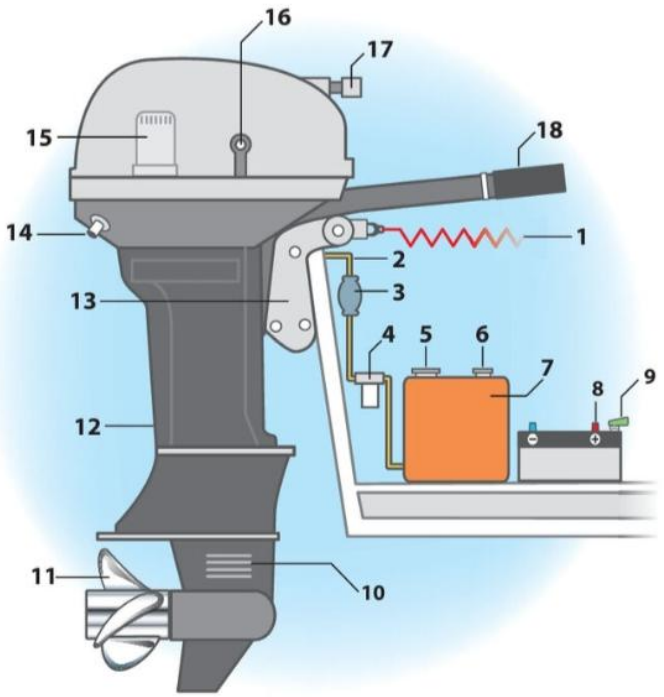
Twin-engine installations Twin-inboard engines are common on craft over about eight metres long, with twin-outboard engine installations increasingly common too. Twin-outboard arrangements can be found fitted to vessels up to about 16m long. Some larger and faster vessels may have three or more outboards fitted.

A key feature of twin-engine installations is the ability of a craft to turn within its own length at slow speed using the techniques outlined in chapter six. Both twin-inboard or twin-, triple-, or quad-outboard installations are often also fitted with joystick controls which allow fine, precise control of the vessel in close-quarter situations.

Emissions All new engines need to meet strict emissions legislation. All new petrol engines sold are 'four-stroke' (meaning the oil to lubricate their moving parts is in the sump of the motor, like a car) with 'two-strokes' only being available to commercial operators. A 'two-stroke' engine is one where oil is mixed with the fuel to lubricate the engine.

Electric outboards are available for small tenders and up to about 25hp for some small craft. Higher horsepower ratings for some installations are available where batteries can be fitted into the vessel. These are often linked to innovative drive arrangements. As battery technology develops and charge points become more available, this will become a far more popular option for many.

Outboard Engines (shows tiller control, only present on some smaller outboards)

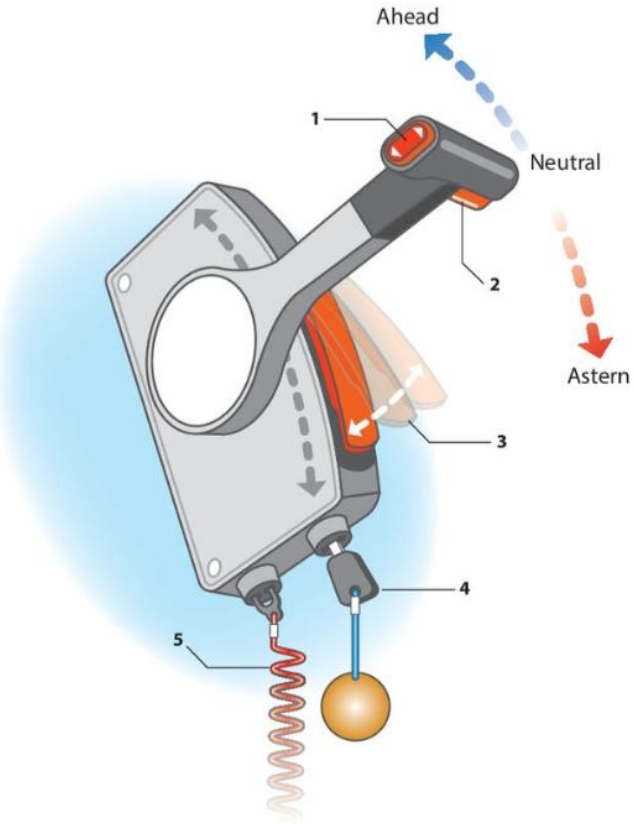


1. Killcord
2. Fuel line
3. Fuel bulb
4. Fuel filter
5. Fuel filler
6. Fuel tank vent
7. Fuel tank
8. Starter battery
9. Battery isolator switch
10. Cooling water inlet grille
11. Propeller
12. Outboard leg
13. Transom mounting bracket
14. Cooling water tell-tale
15. Oil reservoir – inside cowling (two-strokes)
16. Gear operating lever
17. Engine hand start
18. Throttle control/tiller

Throttle System

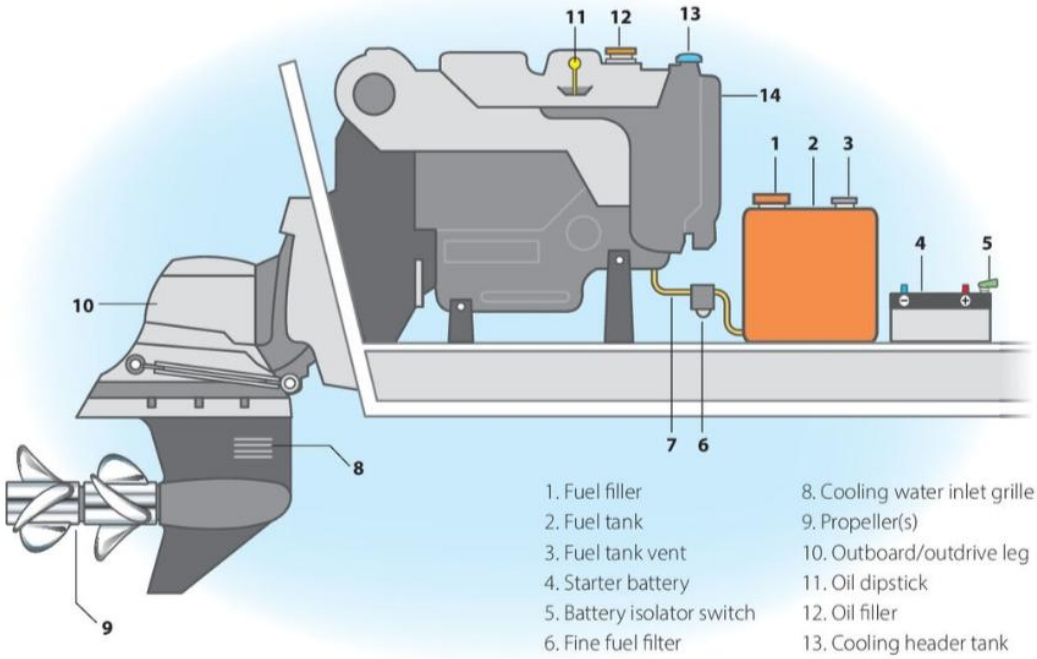
1. Trim control
2. Gear lever interlock (not always present)
3. Fast idle control (some boats only)
4. Ignition switch
5. Killcord

Tip – Always attach the killcord correctly – see chapter 4.



Inboard Engines

These tend to be available on craft of six metres upwards and are often found on sportsboats over seven metres and most sports cruisers. Single engines are normal up to about eight metres; above this, twin installations are more popular. Either outdrives or shafts are used, depending on the boat.



1. Fuel filler
2. Fuel tank
3. Fuel tank vent
4. Starter battery
5. Battery isolator switch
6. Fine fuel filter
7. Fuel line
8. Cooling water inlet grille
9. Propeller(s)
10. Outboard/outdrive leg
11. Oil dipstick
12. Oil filler
13. Cooling header tank
14. Oil filter

Inboards v. Outboards

In most cases, the decision is determined by the boat you buy, although an increasing number of larger craft offer models that can be fitted with either twin inboards or twin-/triple-outboard arrangements.

Inboards	Outboards
• Available in petrol or diesel, and occasionally electric. • Diesel may be the preferable option when waterside petrol is not easily available. • Can be cheaper and simpler to service as they are essentially marinised car or truck engines. • Often provide a sundeck area above the engine.	• Newer outboards are very reliable and too complex for anything other than basic troubleshooting. • Can be raised out of the water at rest to prevent weed growth. • Far better power-to-weight ratio than comparable inboards. • Diesel outboards are available above about 200hp although still rare. • Mounting on transom increases deck space. • Possible to replace outboards quickly when necessary.

Throttle Systems

Throttle controls for outboard and outdrive installations on boats up to about six metres have a small safety catch (the 'interlock') which needs to be engaged to allow the throttle to be used. Throttle systems are very basic. They allow forward drive, reverse drive, or neutral to be engaged. Pushing the throttle 'forward' increases power to quicken the boat's speed through the water.

Throttle systems on larger outboard and inboard systems are increasingly 'fly by wire' and electronically control the engine, rather than by using a metal ('push-pull' type) cable. Care should always be exercised with all throttle systems to ensure that the throttle is not accidentally engaged or moved. The lack of resistance in these electronic controls may make them more susceptible to being knocked to a high-power position.

Safety Always keep a hand on the throttle and the steering wheel to allow instantaneous reaction to the conditions faced, actions of other craft, or the failure of some aspect of the mechanics of the craft.

Starting Procedure

The engine-starting procedure varies from boat to boat, so this section acts only as a guide. Depending on how, and where, you launch and start your boat, many of these checks can be carried out beforehand.

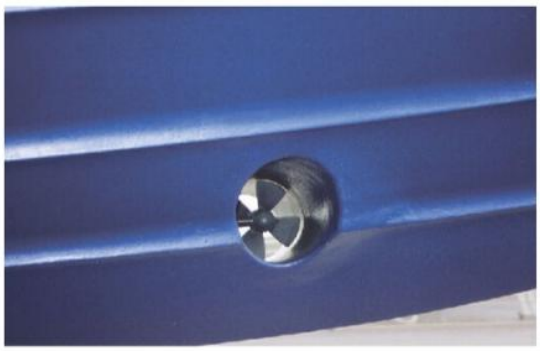
Create a checklist to ensure that you perform all of the checks and procedures that you need to.

Consult the owner's manual for starting instructions specific to your boat. Engines and throttle systems vary but the pre-start checks may include:

Pre-start Checks	Starting
• Turn batteries on. • Check fuel level and that the fuel is turned on. • Check engine-oil level. • Check oil levels for all other systems. • Check coolant level. • Check drive belts for condition and tension. • Check raw-water filter is clear of weed and obstructions. • Ensure air vent on tank is open on smaller outboards. • Vent engine bay using blower.	• On some outboards, squeeze bulb to prime fuel. • Attach killcord. • Ensure that the engine is in neutral. • On older models, engage choke/fast idle. Reduce as engine warms. • Check prop is clear. • Start engine. • Check cooling-water 'tell tale'. • Test killcord works. • While tied alongside, engage gears briefly to check operation.

Bowthrusters and Joystick Controls

Bowthrusters and joystick arrangements are increasingly common on small boats. The bowthruster is controlled from a joystick on the helm and pushes the bow of the boat either to port or starboard. They are used to bring the bow neatly alongside a pontoon or improve the angle of approach at slow speed. Only a small amount of power is needed, otherwise too much movement is created.



Joystick controls control the movement of the engine through 'fly by wire' steering and throttle arrangements. On twin/triple installations, the engines move independently to achieve vessel movement in all directions. Some manufacturers now link a single/twin outboard(s) to a bowthruster to achieve a similar level of control. This gives very precise control in close-quarter situations without the need to touch the throttles or steering.

Fuel Choice

When choosing a boat with an inboard engine there may be a choice between petrol, electric and diesel engines. Here are some comparisons between each engine.

Petrol	Diesel	Electric
• Risk from a fire is higher • Availability of petrol limited in some locations. • Option for trailered boats to use garage to refuel. • Lots of different sizes and manufacturers making engines.	• Generally more expensive than petrol engines. • Good availability of fuel in remote locations. • Often have a longer life span. • Heavier than equivalent petrol engines.	• Limited battery life an issue. • Charging options still limited. • Small number of craft offering an electric option.

Steering Systems

A boat is steered either by means of a tiller on smaller outboard motors or more commonly by a steering wheel.

This steering wheel (rotated left or right) moves the outboard/sterndrive or rudder appropriately to create a turn.

How the wheel is connected to the drive/steering unit may vary from craft to craft.

The steering wheel may be connected to the engine/drive arrangement in a number of ways.

Hydraulic steering: A pump behind the wheel pushes hydraulic oil through pipes to move a ram that in turn moves the engine. This may be augmented with an electric pump.

'Fly by wire': Fully electric option where the wheel movement is transmitted to a motor attached to the engine/drive.

Metal cable: A thick metal cable from the wheel to the outboard manually moves the outboard/drive. Common on vessels with outboards less than 40hp.

Power steering combines hydraulic steering with a pump to reduce further the effort needed to move the drive unit.

The failure of a steering system at any speed can be highly dangerous and at higher speeds could prove fatal. Regularly check joints and connections, check oil levels and ensure there are no leaks in a hydraulic system.

Always drive with one hand on the throttle so that, should there be an issue with the steering, power can immediately be reduced.

Seating Arrangements

Where people are positioned in a boat can dramatically impact its handling characteristics, and the comfort and safety of those onboard.

There are a variety of places that a person can sit or position themselves in a boat. The advantages and disadvantages of each are:

	Advantage	Disadvantage
'Bowrider' Seats in Bow 	Great for sitting and relaxing when stopped or at very slow speeds in calm conditions.	Vertical movement of bow area can be considerable, with risk of serious injury (due to impact forces) and being ejected from the craft.
Seats Forward of Console 	Great for sitting and relaxing when stopped or at very slow speeds in calm conditions.	Transfer of impacts through back due to seating position may cause serious injury.
Jockey Seats 	Safe and sturdy position with feet planted on deck with hands on grab point.	Smaller people may struggle to get feet on the deck and so fail to be safe on the seat.
Rear Bench Seats 	Low bench seats afford good lateral protection and vertical movement of craft at stern is less.	Higher bench seats may expose passengers to lateral forces as vessel corners, risking ejection from craft.

Shock Mitigation

Options exist for impact matting or with shock absorbers built in on the deck or seats – although these systems are generally found on commercial craft used in more extreme conditions. Footwear with good impact protection can make a real difference too.

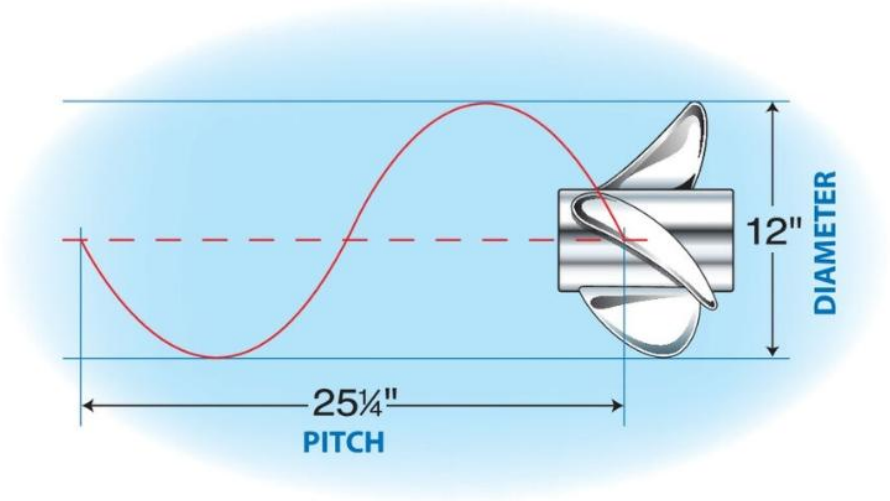
Driving for the Conditions

The helm must always drive a vessel with due consideration to all passengers but especially those in the least-favourable seating position.

Chapter 3

Propellers

The propeller transmits the power from the engine to create propulsion.



Pitch and Diameter

Propellers ('props') are measured by their pitch and diameter.

- Diameter is the actual diameter of the propeller and blades and usually increases with engine size.
- Pitch is the theoretical distance the craft will travel for one rotation of the propeller. The actual distance travelled will be less due to slippage.
- Both pitch and diameter are generally measured in inches. However, some metric dimensions are now being used.

Types of Propeller

- Aluminium is the most common material for outdrive and outboard propellers. It is cost effective but can be easily damaged if it comes into contact with hard objects. However, the blades can usually be repaired fairly cheaply by a specialist.
- Stainless-steel propellers are far stronger and can withstand more abuse, but are more expensive. The extra strength allows the blades to be thinner than their aluminium equivalents, which improves performance. However, should the propeller strike a hard object, the force can be transmitted through into the gearbox and may cause damage.
- Bronze props are commonly found on shaft-drive craft such as ski boats.
- Surface-piercing props are the domain of race boats and high-performance craft, and are designed for top-end speed. Optimum performance is achieved when only the lower half of the propeller is in the water.

How Many Blades?

- Three blades – Offer good top speed but less low-down punch for acceleration.
- Four blades – Offer very good low-end acceleration, good for pulling skiers or working in rough conditions, but at the slight expense of top-end speed.
- Duoprops have two contra-rotating props on one shaft and usually two three-bladed propellers. This allows greater performance and the elimination of propwalk.

Choosing a Propeller

Finding the best propeller for your boat depends on your boating needs. Most people will be more than happy with the prop that is fitted to the boat as standard. Sometimes, because of how you use the boat, it may be worth changing the prop to increase efficiency. If you are constantly pulling skiers, choose a prop that gives you more torque at low power. If you were solely focused on speed, you should choose a prop that may be slow to get onto the plane but achieves a higher top speed.

For some boaters, choosing and changing a propeller to optimise performance becomes a pastime in itself, but for most the prop originally fitted by the engine manufacturer is satisfactory.

Changing the engine and/or propeller can significantly alter the handling characteristics of a small powerboat. If in doubt about the right choice you should refer to the manufacturer's guidelines or seek advice from a suitably competent person.

Propeller Problems

Ventilation When air from the surface or exhaust gases are drawn onto the blades of a rotating propeller it may fail to grip, and may rotate rapidly with a sudden increase in revs and loss of speed. Ventilation can occur in rougher aerated water, on turns where the propeller is close to the surface or as the propeller leaves the water when the craft is at speed. Ventilation can give rise to cavitation.

Cavitation Cavitation occurs when the pressure at the blades of the propeller drops, allowing water on the blades to boil and creating minute air bubbles. These bubbles contain considerable energy and, as they break down, can literally eat away at the blades' surfaces. Stainless-steel props, being far stronger, can withstand this attack better, and are less susceptible as the blades are thinner.

Chapter 4

Safety and Planning

Safety is a matter of common sense and state of mind. Once you decide to go afloat there are a number of things to consider, such as the type of boat, how to handle it and how to plan and execute trips safely. As the Skipper of a powerboat you are responsible for the safety of your crew and boat. Having a great time on the water starts with good preparation and planning. This includes preparing the boat, ensuring the weather is suitable, briefing your crew and checking that you have appropriate equipment for your intended passage.

We all have a responsibility to other water users to ensure we operate the boat sensibly and in harmony with others. Keep wash to a minimum around other craft, stay well clear of moored vessels, sailboats and canoes, and stay to the correct side in narrow channels.

The Skipper's Responsibilities

Whether you are new to boating or a highly qualified and experienced boater, as a Skipper you have a legal responsibility for the safety and well-being of your crew and to other water users. You also need to ensure they enjoy themselves too!

It is essential that you take responsibility for planning places to go that are realistic for the boat and crew. Good Skippers are calm and communicate clearly what they want, ensuring before any task is undertaken that the crew know what is expected. Good Skippers do not panic if things don't go as planned, and err on the side of caution, always realising that their crew's safety is their primary concern. They are considerate to their crew and other water users and appreciate they are learning every time they go afloat.

Before departure, ensure that you are aware of any non-swimmers and understand any medical conditions that members of your crew may have. Know where their medication is kept and how it is administered. Attending a basic first aid course is a sensible precaution for a Skipper.

Planning your Day

Weather

Weather is discussed in more depth in chapter 18. The key issue is: should you go to sea in the first place? Use various sources of information to understand the conditions you will face. Take into account the experience of yourself, your crew, and the capabilities of your boat. If you are in any doubt, do not go. Making this decision is not always easy, but as Skipper you are responsible for everyone's safety.

Where to go

This is governed by many factors, but make sure you choose an area suitable for your boating needs and level of experience. If you are trailing a boat, check if a launch site a few miles further on may provide easier and safer launching and more sheltered sea conditions. Contact local marinas, chandlers and tourist centres for advice.

Many harbours and ports have their own local bylaws covering:

- Speed limits and quiet areas.
- Approved water-ski and jet-ski areas.
- Local collision regulations.

These can be obtained from harbour offices, almanacs and marinas.

Personal Equipment

Whether it is sunny or not, ensure you take adequate protection from the sun, including long-sleeved shirts and hats, especially in sunny climates. Wind chill from spray, rain, or wet clothing can rapidly cool a person. Consider taking waterproof clothing, gloves, dry suits and helmets. Children get cold very quickly, so plan your trips accordingly.

Other personal kit can include sun cream (high protection factor); medication (and instructions); water; snacks; warm clothing; personal buoyancy; suitable footwear; sunglasses; sun hat, and towel.

Boat Equipment

You do not need to spend a fortune equipping a boat. It is more important to have the correct safety gear than the latest electronic equipment. Cost-effective purchases can be made at chandlers, online, or at local boat jumbles. The equipment carried depends on the intended area of use. It is vitally important that both you and the crew know how to operate the safety equipment. Ensure the equipment is stored in dry, accessible places and consider marking lockers containing important items so that everything can be found easily.

Some items will depend on the area and particular use of the boat. Items to consider include the following:

Boat equipment: Anchor with warp (rope) and chain; radar reflector; killcord and a spare; tool kit and engine spares; compass; mobile phone; flares; fire extinguisher(s); a fire blanket; lifejackets or buoyancy aids; bilge pump or bailer; charts; watch or clock; first-aid kit; GPS; hull repair kit (e.g. wooden bungs) or tube repair kit; paddles or auxiliary outboard; mooring warps and fenders; throw line; water; navigation lights; horn; relevant shapes; VHF radio (fixed or hand-held); knife, almanac.

Extra equipment for longer offshore passages: EPIRB (a distress transmitter using satellites for the boat); PLB (Personal Locator Beacon – for the individual); hand-held VHF; depth sounder; lifebuoys with lights; chartplotter; tablet loaded with chart system; hand bearing compass; binoculars, liferaft.

Killcord

Most powerboats have an engine cut-out device called a killcord. One end is attached to a kill switch or, in the case of a small outboard, to the engine itself, and the other end is attached around the helm's leg. In the case of small tiller-controlled craft, attachment should be around the leg unless this is impractical, in which case it should be attached around a strap on the lifejacket/buoyancy aid. NEVER attach around a wrist as this can easily come off.

If the helm falls out of the boat, the engine cuts out. Runaway powerboats have caused serious injury and death. Test your killcord to ensure it works. Spare killcords should be carried so the boat can be restarted and driven back to the person in the water.

A sticker at the helm position will remind all helm to attach the killcord.

It is recommended to use only killcords from your engine manufacturer.

Check the killcord prior to each use for signs of stress, wear, rusty components, and loss of elasticity. Also, make sure that the kill switch is functioning well and is in good condition. The killcord to kill-switch connection should activate under approximately 15kg (30lb) breakstrain. If your killcord disconnects too easily or it is difficult to pull out, change it for a new one from the engine manufacturer. There are lots of cheaply made copies which appear to fit but, before using an non-original-equipment-manufacturer killcord, compare it to the manufacturer's one for the size of aperture and thickness to make sure that no additional strain is placed on the kill switch.

Lifejackets and Buoyancy Aids

A lifejacket is designed to turn an unconscious casualty in the water face-up, keeping their head out of the water. A buoyancy aid will keep a person afloat but will not turn them face-up.

Lifejackets

Most adult lifejackets are gas-inflation models and are comfortable to wear and easy to store. Inflation is by a small gas canister and is activated manually or automatically when in contact with the water. Lifejackets are good all-round performers and excellent for children and anyone less confident in water. Children should only use gas-inflation lifejackets if they can swim and are confident in the water. For younger or less-confident youngsters, permanent buoyancy lifejackets should be worn.

Auto v. manual gas inflation: A person entering the water unconscious is unable to inflate a manual gas-inflation lifejacket, therefore automatic lifejackets are generally preferable. Take care to store automatic lifejackets in a dry area as some will inflate accidentally if the mechanism gets very damp.

Crotch straps, which are properly adjusted, should always be used to ensure the lifejacket doesn't ride up round a person's head when they are in the water.

When choosing a lifejacket or buoyancy aid, visit a chandlery and try them on as all will fit slightly differently and comfort is important. Consider buying more expensive, well-fitted lifejackets for regular boaters, and cheaper but equally effective versions for guests.

Regularly check your lifejacket to ensure it will work when needed. Checks include:

- Ensuring it hasn't been activated – particularly if others may have used the lifejacket since you last did – are the 'green' indicators there?
- Is the gas cylinder tight in the mechanism? If possible, remove it to ensure it has not been used.
- Does the light work?

The manufacturer will supply you with detailed maintenance procedures. Other safety checks could include:

- Is there abrasion damage to the inflatable chamber?
- Checking the gas cylinder for signs of corrosion.
- Are the trigger mechanism and cylinder in date?

Consider a full service by a chandler/the manufacturer on at least an annual basis.

Buoyancy Aids

These provide buoyancy but will not turn an unconscious casualty upright or provide as much support as a lifejacket.
They are designed for watersports such as dinghy sailing, windsurfing, kayaking, and water-skiing. Often worn by powerboat drivers overseeing a race or training while on safety-boat duty, they are useful in smaller boats where having both lifejackets and buoyancy aids is impractical.

Buoyancy aids used in water-skiing and wakeboarding should protect the kidney area.

Safety Briefing

Once ready to go afloat, give your crew a safety briefing covering the following:

- Use of lifejackets.
- Location and use of flares.
- Use of VHF – how to send a Mayday message.
- Location of first aid kit.
- Location and use of fire extinguishers.
- Engine-starting procedures and killcord use.
- What the plan for the day is, including rough timings.
- Basic boat handling – so that they can get back to you if you go overboard.
- Deployment of liferaft (if fitted).
- Anchoring.
- To ask if anything you say is unclear.

Before departure, go through the basics of tying up. Take the time to practise tying up and coming alongside. Explain well in advance what you are doing.

Good communication with your crew will keep them informed and involved and will help them enjoy the experience more. This will only be achieved if they know what they are supposed to do.

Once out at sea do remember that, even though you may love going fast, your crew may not be so confident and they could become frightened. You know what you are going to do – your crew don't, so throttle back and introduce them slowly to your pastime.

Tip – Make sure you know your responsibilities under SOLAS V – see chapter 23.

Summoning Assistance

If a problem arises you should know what action to take and how to deal with it. Your first consideration is: are you, the crew or boat in immediate danger? If yes, call for assistance immediately.

The most common methods for raising the alarm when there is grave and imminent danger are:

- A VHF radio.
- Flares.
- Arm signals, sound horn, mobile phone.

If your predicament is less serious than a distress situation, then the Coastguard will still assist you if you call with a 'DSC Urgency Announcement' followed by a Pan-Pan call on Channel 16. A 'Pan-Pan' call indicates you require assistance but there is no immediate danger to life. It is also used if a person onboard requires medical attention or advice.

VHF Radio

How you raise the alarm using VHF depends on whether your radio is equipped with Digital Selective Calling (DSC). This initially allows some messages, including a distress, to broadcast automatically through digital means rather than by voice. A DSC radio should receive position information from a chartplotter/GNSS (Global Navigation Satellite System) unit. At the touch of a button, the craft's identity and position are sent out in a fraction of a second.

DSC-equipped VHF Radio

There are two steps to making the call:

- Sending the digital distress alert.
- Making a follow-up voice distress (Mayday) call.

Sending the digital distress alert:

- Lift the cover on the red 'Distress' button and press the red button for five seconds. Some sets need you to press the red button momentarily before you do this.
- A digital alert is broadcast to all DSC-equipped craft, including the local Coastguard station.
- The alert will include your MMSI – if you have programmed it into the radio – your position and the time. The MMSI is a unique number identifying your craft.

Making a Follow-up Voice Distress Call

Mayday, Mayday, Mayday
This is Fleetwood, Fleetwood, Fleetwood
Call sign ZNOO5, MMSI 234001234
Mayday Fleetwood
Call sign ZNOO5, MMSI 234001234

My position is 50° 30'.5N, 001° 57'.5W, approximately five miles south of Anvil Point.
Have hit submerged object and am sinking
Immediate assistance required
I am a powerboat with four persons onboard
Abandoning to the liferaft
Over.

- You should immediately receive a digital reply from the Coastguard, followed by a voice reply on Channel 16.
- No other stations should use Channel 16 while the Coastguard is 'casualty working'.

Non-DSC-equipped VHF Radio

Follow the procedure outlined above for the voice distress call via Channel 16 but without the digital element of the process.

Pan-Pan Calls

If your predicament is less serious than a distress situation then the Coastguard will still assist you if you call with 'DSC Urgency Alert' followed by a Pan-Pan call on Channel 16. A 'Pan-Pan' call indicates you require assistance but there is no immediate danger to life. It is also used if a person onboard requires medical attention or advice.

It is an offence to use a VHF radio without a Short Range Certificate Operator's Licence, except in an emergency. Contact the RYA, or your national boating authority, for details of VHF courses.

Electronic Distress Beacons

An increasing number of boaters undertaking coastal passages are carrying electronic distress beacons – an EPIRB. These allow the Skipper to signal distress by pressing a button which identifies the vessel and its position to the Coastguard. Another version (a Personal Locator Beacon – PLB) can be attached to a lifejacket.

Mobile Phone

A mobile phone can be useful in some situations. In an emergency, calling the emergency services and asking for the Coastguard will connect you to the local Coastguard operations room. Programme in the phone numbers of local organisations and friends who could offer assistance. Remember, mobile phones are not usually waterproof and reception depends on cell coverage, which can be patchy at sea. A text message may have a better chance of getting through.

Tip – When stating your position, quote the position as a 'lat and long' taken from your chartplotter, e.g. 50° 30'.5N, 001° 57'.5W. Also explain it in simple terms, such as "approximately five miles south of Anvil Point". More craft will then know where you are and be able to offer assistance.

What3Words Download this app, as emergency services in many countries accept it as a way for you to describe your position accurately if a 'lat/long' is not available to you.

Flares

Flares remain an essential item of safety equipment. There are many makes available and all have slightly different firing mechanisms, so ensure that you know how to fire those you have onboard. It is good practice to carry only one make of flare to prevent confusion should you need to deploy them.

Only dispose of flares at approved centres. Contact the coastguard for details.

Recommended Number to Carry	Inshore	Sheltered Waters
	Within 10 miles of shore day or night	Small craft in harbours, estuaries, close inshore and inland. Daylight only
Red parachute flare The most effective long-range flare. Projects a bright flare to about 300m. Do not use near helicopters! 	2	0
Red hand-held flare Indicates precise position of craft. Use when close to other craft or land. 	4	2
Orange hand-held smoke Use in daylight. Useful for attracting helicopter or lifeboat attention. 	2	2

Tip – Flares have an expiry date 3–4 years from manufacture. Ensure your flares are in date.

Stow flares in a waterproof box. Place foam at the bottom and around the sides to soften impact on the flares. A pair of gardening gloves will help protect hands when handling them.

View videos on the internet to see flares being set off.

Laser Flares

A newer method to seek assistance is the laser flare. These emit a powerful light which can attract attention, although what they mean may not always be understood by those seeing them and they are not particularly effective during daylight. As technology develops, additional methods of seeking assistance will become available, so keep abreast of developments through the boating media.

Operating as a Commercial Skipper

Skippers may choose to use their qualifications and experience to helm craft commercially. Whether they do so helming a small dory in support of construction, doing film work on an inland river, or are employed on a superyacht transferring guests from the yacht to a restaurant in a tender with twin 250hp outboards, they are responsible for the safety of their own craft, their passengers and other water users.

Operating as a commercial Skipper requires you to:

- Understand the responsibilities of a commercial Skipper and the licensing requirements of the vessel that you are in charge of.
- Ensure that you have the capability and experience to helm the type of craft you are being asked to, in the location and conditions that you face.
- Produce effective pilotage plans for the task being undertaken, using whatever methods are most relevant.
- Conduct safety briefs addressing all of the relevant areas for the passage being undertaken and passengers being carried. What is required may vary considerably between a helm and crew transferring guests in a superyacht tender in warm climates and a Skipper helming a workboat in a cold and challenging coastal location.
- Assertively manage passengers embarking and disembarking, and being prepared to insist on the wearing of lifejackets when necessary.
- Be able to deal with more challenging passengers or situations in a professional but firm way.

It is vital that the commercial Skipper always remembers that it is they, rather than the owner of the craft or captain of the mother ship, that are totally responsible for the safety and care of the persons they have onboard.

Carbon Monoxide

All cooking and heating appliances can produce carbon monoxide if not properly ventilated. Exhaust fumes from machinery may also accumulate in enclosed space, and even in open cockpits if stationary or travelling at low speed. Carbon monoxide is colourless, odourless, and poisoning can be deadly. The first signs are headaches, tiredness, sickness, and dizziness. It is recommended that you fit a carbon monoxide detector and test it regularly. To ensure adequate ventilation throughout the cabin, make sure that any ventilators are clear of obstructions.

Chapter 5

Launch and Recovery

Unless the boat is kept in a marina berth or on a 'drystack', launching and recovery by trailer will be a key aspect of where to go afloat. The decision on which slipway to use depends on the type of boat, the needs and interests of your crew, and security for the vehicle and trailer while you are afloat.

Launching

Go to any public slipway and you will see plenty of examples of safe and easy launches alongside some dangerous and stressful ones. The difference is good planning and preparation.

Planning

- Where will you launch? Some slipways are public and free, but many are privately owned and a fee must be paid.
- Check if there are local bylaws to consider. Some areas allow only certain types or sizes of boats.
- In some areas a permit is required to use a boat.
- Some slipways are suitable only for smaller craft, while others have a walkway or dock alongside, making launching easier. Others end abruptly, leaving the trailer wheels stuck in the mud at low water.
- Ensure your tow vehicle will cope. Rear-wheel-drive vehicles may struggle on a slippery slope, while front-wheel drives suffer from wheel spin if the weight of the trailer is excessive. Choose the slipway and launch method which suits your vehicle.
- Check the local tide tables in advance to ensure you have enough water for launching and recovery.
- Are conditions safe for launching? Strong winds, especially if they are blowing onshore, can make a launch very difficult and dangerous.

Preparation

- On arrival, park well away from the slip.
- Remove the tailboard, straps and boat cover.
- Insert the bung and check the hull for damage in transit.
- Load the boat with equipment and supplies.

After a long journey, let the wheel bearings cool for minutes before launching. Immersing hot wheel be earlier may create a vacuum as the bearings rapidly This draws in water and washes out the grease from bearings.

Launching

How far the trailer is reversed into the water depen the gradient of the slipway, the size and weight of t and how easy it is to launch from the trailer. The rea boat needs to float so that it can be reversed or pus off the trailer. Car wheels are best kept well away fr water.

- Manoeuvre the trailer to the top of the slipway. Keep vehicle windows open to aid communication and in case the vehicle rolls into the water, allowing escape.
- Reverse down the slipway if possible, only partially submerging the trailer's wheels (to preserve the bearings and brakes), then push the boat off the trailer or hop into the boat and reverse it away.

If the gradient of the slipway is shallow (which prevents you launching with the trailer attached to the car) use a rope or metal extension bar to enable the trailer to be reversed further into the water.

- At the top of the slipway, chock the wheels, put the handbrake on, lower the jockey wheel and then disconnect the trailer.
- Connect a long line between the trailer and the tow hook using bow lines.
- Drive the car forwards to take up the slack in the line. Remove the handbrake and slowly reverse down the slipway while an assistant keeps the trailer in line.
- An assistant may need to enter the water to ease the boat off.

Tip – Launching with a rope between the vehicle and trailer can be useful to keep the tow vehicle's wheels clear of the lower slippery part of the slipway and the water.

Danger – To prevent the boat sliding off the trailer when backing down the slipway, ensure the winch strap remains attached to the boat, along with an additional safety chain or line between the boat and trailer. Avoid standing behind a trailer on a slipway in case it breaks free.

Preparation

- On arrival, park well away from the slip.
- Remove the tailboard, straps and boat cover.
- Insert the bung and check the hull for damage in transit.
- Load the boat with equipment and supplies.

After a long journey, let the wheel bearings cool for 45 minutes before launching. Immersing hot wheel bearings earlier may create a vacuum as the bearings rapidly cool. This draws in water and washes out the grease from the bearings.

Launching

How far the trailer is reversed into the water depends on the gradient of the slipway, the size and weight of the boat, and how easy it is to launch from the trailer. The rear of the boat needs to float so that it can be reversed or pushed off the trailer. Car wheels are best kept well away from sea water.

- Manoeuvre the trailer to the top of the slipway. Keep vehicle windows open to aid communication and in case the vehicle rolls into the water, allowing escape.
- Reverse down the slipway if possible, only partially submerging the trailer's wheels (to preserve the bearings and brakes), then push the boat off the trailer or hop into the boat and reverse it away.

If the gradient of the slipway is shallow (which prevents you launching with the trailer attached to the car) use a rope or metal extension bar to enable the trailer to be reversed further into the water.

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Tip – Launching with a rope between the vehicle and trailer can be useful to keep the tow vehicle's wheels clear of the lower slippery part of the slipway and the water.

Danger – To prevent the boat sliding off the trailer when backing down the slipway, ensure the winch strap remains attached to the boat, along with an additional safety chain or line between the boat and trailer. Avoid standing behind a trailer on a slipway in case it breaks free.

Recovery

In many instances it is possible to stop the boat while drifting towards the slip, jump out when the water is shallow enough and hold the boat until the trailer comes into the water. On other occasions, especially where the slip is steep, it is best to drive the boat onto the trailer.

Driving onto a Trailer

This technique requires careful throttle control and more care is required than with a manual recovery. The helm needs to line up the approach, compensating for wind and stream, arriving so that the forward 'V' of the hull aligns centrally on the trailer.

- Ease the trailer into the water so that it is partially submerged and allows the boat to drive onto it.
- Trim the engine up so that the prop does not ground on approach. Ensure that cooling water is still circulating.
- Drive the boat onto the trailer, compensating for wind and stream.
- For safety reasons you should get out of the boat when it is towed out of the water.
- When the boat is on the trailer, attach the winch strap to the forward D-ring and a line from the boat to the trailer.
- If a rope or bar was used, chock the wheels and reattach the vehicle to the trailer.
- Ideally, flush the engine cooling system with fresh water and give the boat and trailer a hose down.

If your engine does not have a dedicated flushing point, use a hose attached to muffs to direct fresh water to the intake. Start the engine and run in neutral for three to four minutes. Check your engine manual for 'care after use' details.

Danger – If launching or recovering with the trailer detached from the tow vehicle, ensure the trailer is well in the water before pushing the boat off or winching it on. The nose of the trailer can be forced rapidly skywards as the weight transfers to the rear.

Serious injury can occur when boats roll-off trailers with the winch strap attached and the winch handle rotating rapidly. Use the safety lock and a secondary line to prevent this happening. Never grab a winch handle if it is spinning.

Before Towing

- Ensure the boat is fully secure on the trailer.
- Use tie-down straps on the D-rings on the transom to hold the rear of the boat to the trailer.
- Attach ratchet strap or line from D-ring on bow to trailer to prevent bow lifting or moving forward/backwards.
- Use a safety chain between the vehicle and the trailer as the two may become detached – except for braked trailers.

Tip – Steep slipways and heavy boats can cause serious harm, so take things slowly. Plan what you are going to do and double check everything before you start. Remember: a good launch is one that is slow, controlled and safe.

Chapter 6

Boat Handling

Being able to helm a powerboat safely and with confidence starts with an understanding of the way a boat handles and how the elements of wind and stream affect its behaviour. Experience and practice will build your level of confidence. This section will show you how to get the most from your boat in a variety of situations.

The Basics

A powerboat is moved forwards or backwards by the rotation of the propeller, which pushes or pulls the boat through the water. Increase the throttle and the boat will move more, as the prop turns faster. Engaging forward gear creates forward effort from thrust coming from the prop or drive unit. Engaging neutral stops the thrust; however, you may still be moving forwards due to momentum. Engaging reverse (astern) rotates the propeller in the opposite direction to stop the boat or move it astern. The steering wheel diverts the water flow from the propeller by turning the outboard, outdrive or rudder, and turns the boat.

When engaging either ahead or astern a positive move of the throttle is needed to get to a position where the engine is fully in gear, rather than not quite in and crunching the gears. Correctly selecting this 'just in gear' position each and every time may take a little practice, but is key for smooth and safe boating. A common mistake is to engage too much ahead or astern. Almost all close-quarters manoeuvres in all conditions will only need the throttle to be 'just in gear' and, even when aiming to move ahead faster, the throttle should be engaged, steering adjusted to the correct direction then further throttle added as required.

On a craft with an outboard or outdrive arrangement, where the propeller is pointing when the thrust is engaged will make a considerable difference to how the boat reacts. For example, if there is a need to turn to the left (port) from an almost stationary position, if the steering is turned hard to the left before the gear is engaged the bow of the craft will be pushed instantaneously round, whereas if the steering is pointing ahead, the gear engaged, and the wheel is then turned to the left, the turn will be far wider/slower.

Generally we want the steering turned before engaging gear to maximise the effect of the thrust – 'steer then gear'.

When undertaking slow-speed, close-quarters boat handling, the throttle should spend plenty of time in the neutral position, adding ahead or astern thrust as required. Too much time in gear creates momentum which is often unnecessary.

The Effects of Wind and Stream

Wind

Wind obviously has a major effect on every craft. However, there are two key ways every craft is affected.

When static in the water all craft will be blown downwind. How quickly they start to move and then how quickly they are blown downwind will vary according to:

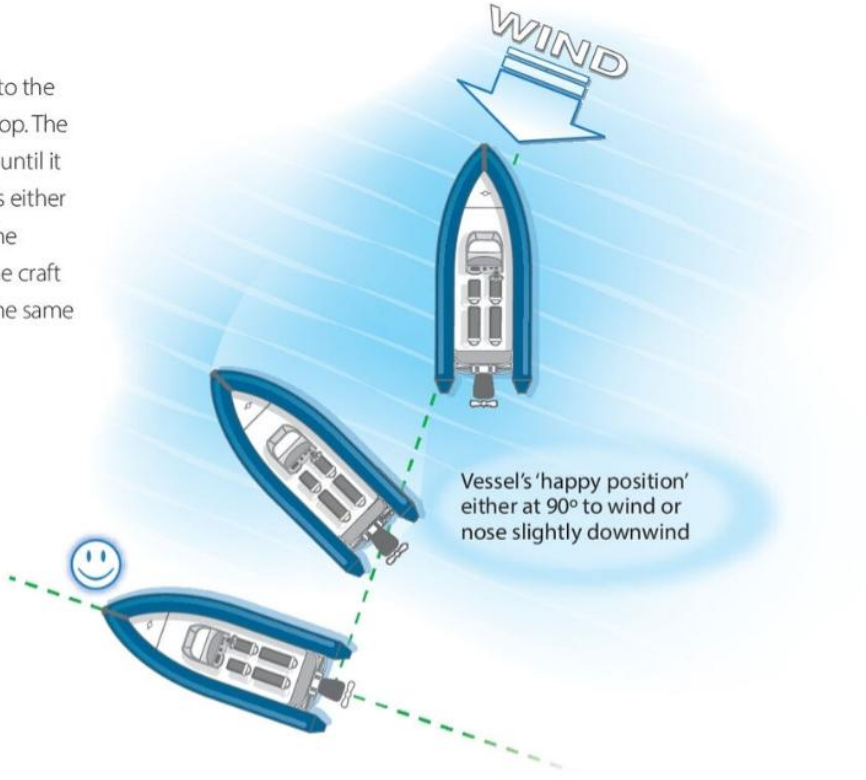
i) How heavy they are – heavier craft will initially take a little longer to get going.

ii) Their shape/size – craft with high topsides have more surface area for the wind to push against than craft with lower topsides (this is known as 'windage').

iii) Craft with larger hulls will tend to move more slowly, as the hull moving through the water acts as a brake.

Whatever direction your craft is pointing relative to the wind, the vessel will only be 'happy' when it is lying roughly at right angles to the wind.

A craft that stops with its bow into the wind will initially just slow to a stop. The wind will then push on the bow until it reaches a point where the craft is either exactly or roughly 'beam on' to the wind. The wind will then push the craft downwind at this angle. This is the same for all powerboats.



This characteristic is not necessarily an issue, but it is important for the Skipper to understand how the craft reacts to wind so that he/she can compensate for, or utilise, its effects.

With careful use of the steering and gears, the Skipper can position the craft facing into the wind and overcome the wind's desire to push the craft downwind.

Irrespective of whether a craft's bow or stern points into wind, the vessel will rotate to lie beam on. How quickly this happens varies from vessel to vessel and for some craft they rotate as quickly from the stern-to-wind position as they do from the bow-to-wind position. Generally, maintaining the craft's position by holding the stern into the wind requires less input than doing so for bow-to-wind.

Craft vary in shape, size and weight distribution, so, while the broad principles will always apply, the speed at which a craft rotates or is blown downwind will vary. Understanding the specific characteristics of your own craft is important.

A Skipper needs to know where the wind is blowing from before he/she undertakes any manoeuvre.

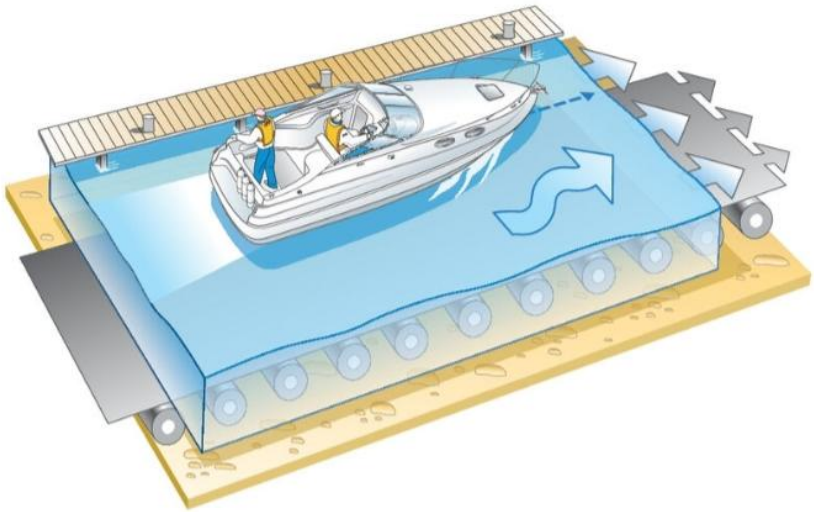
You can assess the wind direction by looking at:

- Flags around the dock.
- Wind indicators at the top of yacht masts.
- Wind ruffling the surface of the water.
- A flag or wind indicator fixed to your boat.

Stream

Streams are caused by tide, natural river flow or local movement of water such as that occurring around locks. Streams have a similar effect to stepping onto a conveyor belt, moving you bodily in one direction.

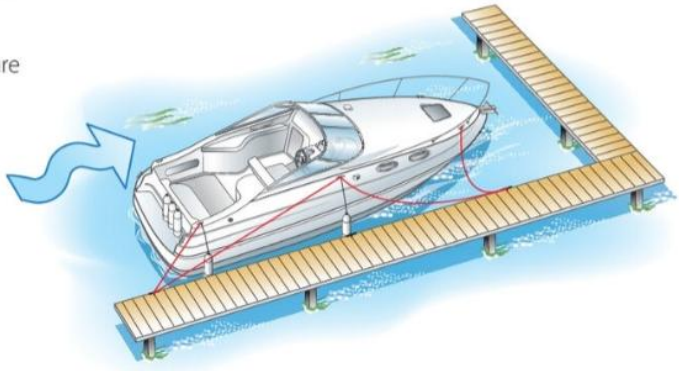
If you motor in the same direction as the stream the boat travels quicker past the shore and reaches its destination faster. If motoring against the stream the boat will take longer to reach its destination. Even though you may be travelling through the water at the same speed, your speed over ground will be less.



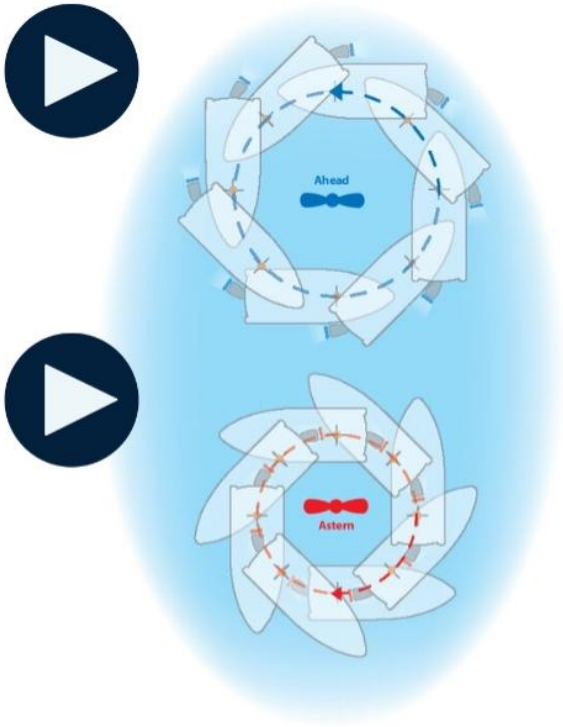
When coming alongside, a boat pointing into the stream is slower over the ground, retaining good steerageway and allowing better control.

Stream can also push you into or away from danger. To assess the stream's direction, look for its signs:

- Bubbles or debris in the water flowing past a moored boat.
- A moored boat leaving a wake.
- Tight mooring lines, indicating pressure from one side.
- Weed on the pontoon floats flowing downstream.
- Water stacking up around piles and buoys.



If you are still unsure of stream direction, motor slowly across the water and look ahead at two points in line (a transit) to check for drift. It is worth noting that the stream can be stronger further from the shore, and that there is sometimes a reduction in its rate in a marina or dock. When both wind and stream are in opposition, assess which is the stronger by motoring slowly across the stream and gauging which way the boat is being pushed.



Pivot Points

In forward gear, when turning, boats pivot around a point approximately one-third of the craft's length back from the bow. In reverse, the pivot point moves towards a position roughly one-third forward of the stern and, in effect, the engine 'pulls' the craft around. The craft handles differently whether ahead or astern and these differences (when understood) can be used to good effect by the Skipper when handling at slow speed around a marina or pontoons.

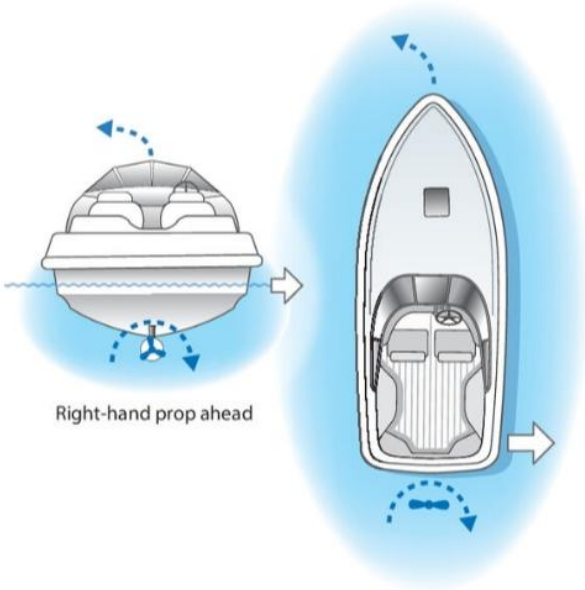
In close-quarters situations the skipper needs to be aware of where their craft pivots to avoid contact with other craft as the bow or stern swings out on a turn.

Propwalk

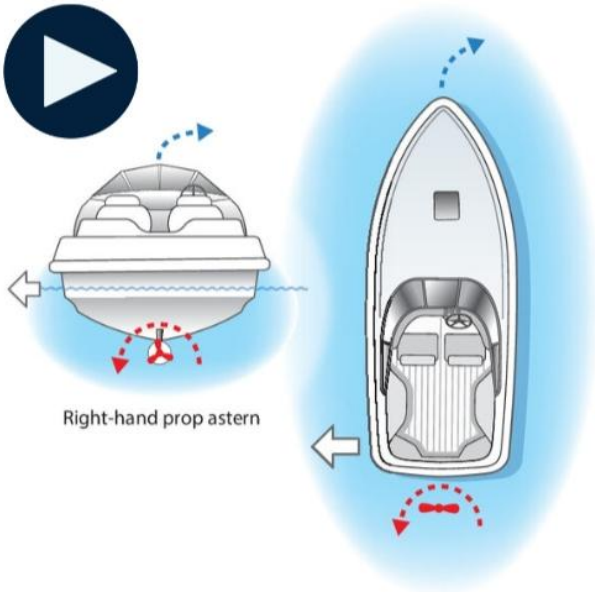
Propellers push the boat forward, but because of their rotation they also make the stern move to one side. This effect is called propwalk (or paddle-wheel effect) because of the tendency of the prop to 'walk' the stern to one side. It is most evident when going astern. All boats have propwalk, and prop and hull design dictate its effect on the handling characteristics of the boat. Propwalk is most pronounced on shaft-drive craft and is usually negligible/non-existent on outboard or outdrive craft.

Going astern on a craft that is affected by propwalk, a 'right-handed prop' will move the stern to the left (port). Countering this movement to port can be very difficult on some craft, particularly where the need is to get the stern moving to starboard. The stern on some craft will start to be able to move to starboard once there is some rearward momentum (and there is water flow across the rudder), while others simply refuse to let you turn the stern that way. Faced with such a situation there may be a need to go to neutral, turn the steering to the left (port), go ahead to push the stern to starboard, reposition the steering and then go astern again. On a particularly stubborn craft it may be necessary to repeat this many times to get the boat going backward to where you need it.

As we will see later, propwalk can be harnessed to great effect when handling in close-quarters situations.



Right-hand prop ahead



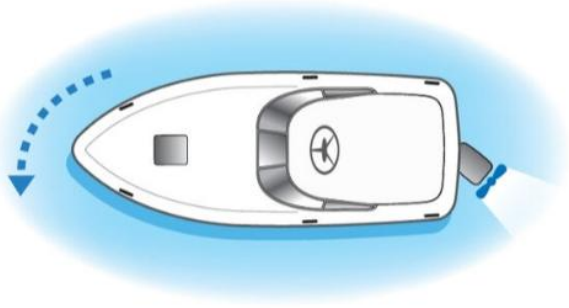
Right-hand prop astern

Tip – Check for propwalk while tied alongside. Ensure the rudder is straight, engage astern gear and observe which side the wash comes out from under the hull. Wash to starboard suggests a kick to port in astern. It is useful to establish which way a single-shaft-drive boat kicks before manoeuvring out of the berth.

Turning Principles

Craft will turn differently according to what type they are, how much windage they have, how heavy they are, the type of drive system they are fitted with and whether they have one or two engines. Irrespective of the specifics of any particular craft, there are some common considerations for a Skipper ahead of commencing a turn.

- Where is the wind blowing from? Consider how this will affect the craft as it undertakes the turn. In light of the predicted effect, which way should the boat be turned? Don't forget that the wind at water level may differ from what is being 'seen' through typical indicators like flags or masthead wind vanes, which are much higher and may be in clear air.
- Is stream likely to affect the turn? Will it push the craft towards danger/other craft?
- Is the space for the turn suitable? Is depth an issue? It may be safer to put the bow towards a shallower area rather than risk the props.
- Are there any other craft around that you will impede by turning, or may impede the manoeuvre?



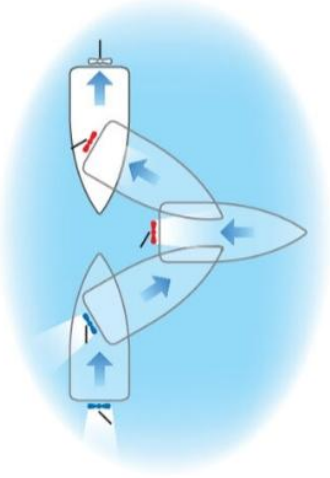
When turning a vessel with twin engines, the 'outer' engine will create a tighter turn due to its greater 'leverage'.

When undertaking the turn, always consider where the drive system or rudder is pointing before engaging thrust – is it set up for best effect ('steer then gear')? Only use 'just in gear' throttle movements. A lot of throttle is almost always unnecessary and is likely to create excess momentum that may need to be removed. Get into the habit of going into and out of gear a number of times rather than leaving the throttle in gear for prolonged periods. Doing so means that you only add what momentum you need.

Turning a Single-shaft-driven Craft

A single-shaft-drive craft can be turned by applying alternate ahead and astern throttle movements with the wheel turned fully to one side (usually to starboard). With the wheel hard over, the rudder deflects the thrust of water, immediately creating turn. By going to neutral and then astern in quick succession, the thrust creates turn rather than forward momentum. Most single-shaft-drive craft kick the stern to port when astern is engaged, hence the likelihood that the turn will be to starboard. By alternating between ahead and astern with the wheel hard over a tight turn is usually possible. With shaft-drive craft, leaving the throttle in gear for just 1–2 seconds when ahead/astern usually works best.

- Position the boat in the centre of the space. Start too close to one side and the stern may be in danger of clipping the pontoon/another craft.
- Approach slowly. Speed carried into a turn makes the turning circle larger.
- Turn in the direction that the astern propwalk will aid.
- With the wheel hard over, engage ahead. Engage neutral.
- When the rate of turn slows or space ahead is limited, go astern. Changes in rudder position are ineffective as there is insufficient space to gain steerageway. Momentum and propwalk are now turning the boat.
- Once the correct direction is achieved, straighten the wheel. Select ahead.



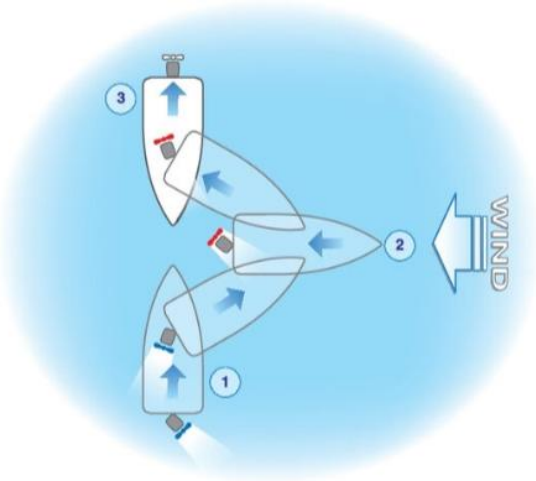
Turning a Single-outdrive or Outboard-driven Craft

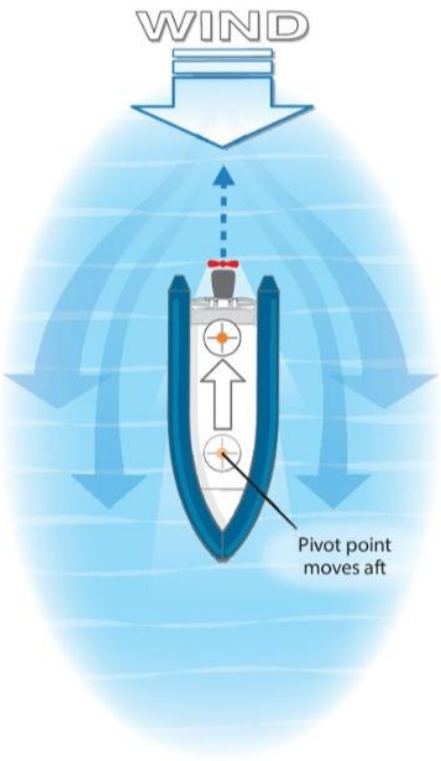
Turning with an outdrive/outboard requires regular use of the wheel, because the position of the wheel directs the thrust from the prop. To achieve the tightest turn the wheel should be turned to the required position while in neutral. Ahead or astern is then engaged, creating a tight turn using the minimum of space – 'steer then gear'. A well-executed turn can be achieved roughly within the craft's own length.

1. Motor slowly to the start position. Stop or have very little forward momentum. In this example, the wheel is hard to starboard. Engage ahead for 1–2 seconds once or twice until craft comes to roughly 90°. If the turn is still occurring and there is space, let it do so while remaining in neutral. Remember, being in gear will create momentum and take up space, so being in neutral can really benefit the turn. Go to neutral.
2. Wheel hard to port. Astern once or twice for a second or two. Remember the bow may be pushed downwind very quickly in stronger winds. Keep a good look out for other craft. Again, if the turn is happening in neutral, let it.
3. Straighten wheel, engage ahead, head in required direction.

In summary: neutral; turn wheel; ahead; neutral; turn wheel; astern; neutral, turn wheel. Repeat as necessary. Don't forget that the turn doesn't need to occur in three steps and may take many more.

As referred to previously, the pivot point of the craft moves according to whether ahead or astern is engaged. The wind can also have a significant effect on the bow, so care needs to be taken when turning to ensure that, when turning going ahead, the stern doesn't swing too close to other craft (like a skid in a car), and that when the wind catches the bow that there is room for it to swing into.





In the above example the craft is shown turning into the wind. This is generally preferable as the wind will help the turn by pushing the bow to its natural 'happy' position. The turn can also be made with the bow being turned downwind first, or the stern being reversed into the wind as the first stage of the turn.

Remember:

- The wind may help the turn but may blow you towards other craft, so leave enough space.
- Wheel first – then power.
- The pivot point moves aft in astern.
- Some boats are very light at the bow and you will lose the bow very quickly in a strong wind.
- A bowthruster may help the turn but may not be strong enough to push the bow through the wind.
- Holding the craft stern to wind is a very stable position.

Tip – The golden rule when handling a craft at close-quarters is to turn the wheel before applying throttle (thrust). This technique – 'steer then gear' – ensures that the required turn is immediate.

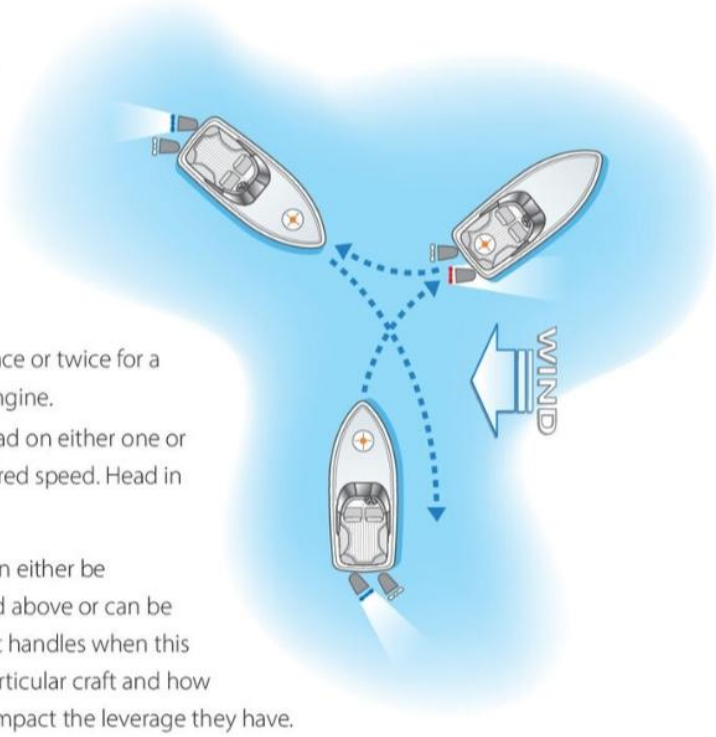
Tip – It will go wrong from time to time. If it does: 1) Neutral 2) Think 3) Move away from the risk – often by reversing away 4) Don't power out of a problem 5) If you are going to hit something, do it slowly and keep hands/arms/fingers/legs clear – it's only a boat and it's insured!

Turning a Twin-outdrive or Twin-outboard-driven Craft

Key principles:

- Use only one engine in gear at any time – this reduces momentum and maximises turning effect.
- If turning to port, use the starboard engine and vice-versa. Doing so utilises the leverage effect of each outdrive/outboard being offset from the centre line of the craft.
- The same principles apply as for a single-engine installation in terms of undertaking the turn, so they are not repeated below.

1. Motor slowly to the start position. Stop or have very little forward momentum. In this example, the wheel is hard to starboard. Engage ahead on the port engine for 1–2 seconds once or twice until the craft comes to roughly 90°. Go to neutral.
2. Turn wheel hard to port. Astern once or twice for a second or two on the starboard engine.
3. Straighten the wheel, engage ahead on either one or both engines depending on required speed. Head in required direction.

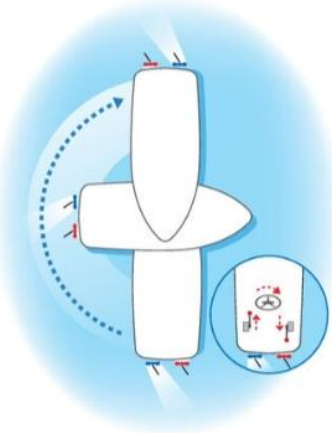


A twin-outdrive/outboard-drive craft can either be manoeuvred using the method outlined above or can be driven as if it has twin shafts. How well it handles when this approach is used will depend on the particular craft and how far apart the drive units are, as this will impact the leverage they have.

When learning to helm a twin-outdrive/outboard craft it is recommended you use the methods outlined above to turn/manoeuvre. As your competence develops you may use an amalgam of these methods and those described below for shaft-drive craft.

Turning a Twin-shaft-drive Craft

Twin-shaft-drive ('screw') boats are very manoeuvrable because each propeller is positioned to make the most of the pivot point. A tight turn is achieved using both throttles simultaneously. Using port engine ahead and starboard engine astern twists the boat around in her own length. Using both engines combined with the wheel to starboard creates the smallest turn as the rudder diverts the prop wash from the port engine. It may be easier to start by using one engine at a time, then moving on to simultaneous use.

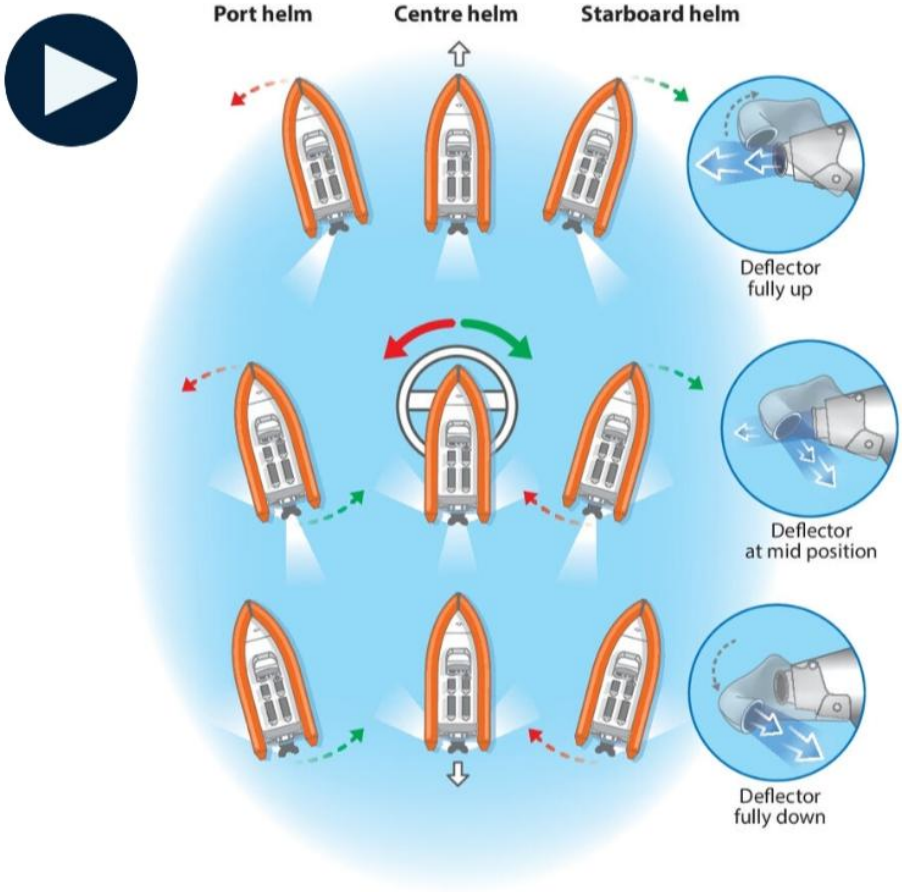


Tip – On twin-engine boats, resist the urge to push the throttles further apart to deal with an issue. For example, when turning using each engine against the other, go to neutral on the engine in forward gear rather than increasing revs on the astern engine to reduce forward momentum.

Handling a Jet-drive Craft

Jet-drives are increasingly popular on leisure craft and are used widely in the commercial world.

At slow speeds the techniques needed to manoeuvre the vessel are different to both shaft-drive and outboard/outdrive arrangements. Instead of using forward and reverse, the drive is left permanently in forward and the boat is propelled by a jet of water directed backwards in much the same way as a propeller does, e.g. steer to the left and the boat turns to the left. To go astern, though, another lever is used to position a 'deflector' (referred to as a 'bucket') in the path of this jet of water. The shape of the deflector and the direction the water is deflected typically means that if your helm is to the left (to port) then the rear of the craft goes to the right (starboard). The deflector can be positioned at any point between fully ahead and fully astern, making a jet-driven boat highly manoeuvrable.



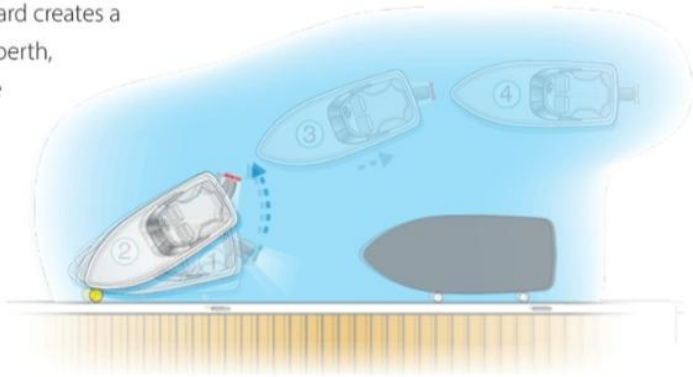
Chapter 7

Leaving and Coming Alongside

Leaving a Pontoon or Berth

Coming away from a pontoon is a relatively simple manoeuvre. If the route ahead is clear and there is no wind or stream, then for small boats a good push off the pontoon and driving away forward can do the trick. However, larger craft require you to drive it off.

Coming away in reverse is often the best way to leave a berth, as reversing pulls the craft away from the pontoon. In contrast, moving away in forward creates a danger of impacting the stern against the berth, particularly if there is any wind pushing the craft onto the berth.



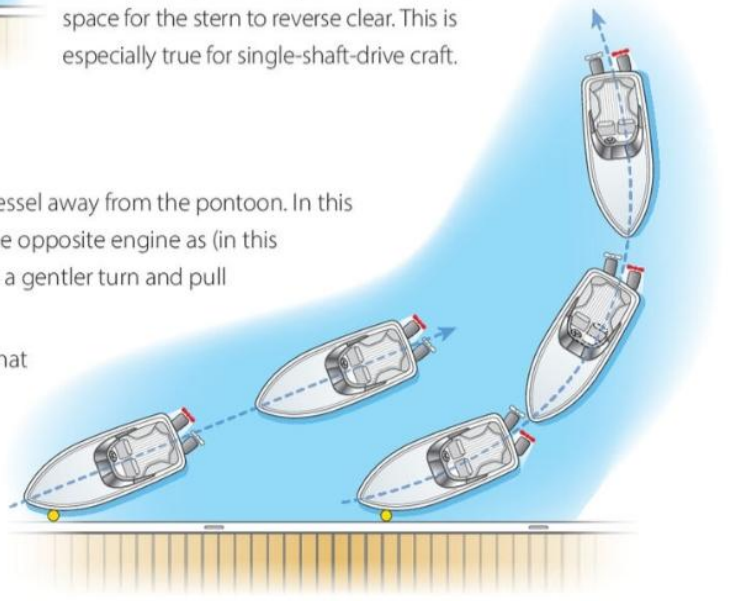
- Steer away from the pontoon.
- Engage reverse.
- As the stern comes away, straighten up the wheel.
- Once well clear, move off ahead.

As boats are more curved at the bow than the stern it is sometimes possible to fender the bow area well and motor gently towards the pontoon for a second to push the stern away from the pontoon. This creates space for the stern to reverse clear. This is especially true for single-shaft-drive craft.

Twin Outdrives

Either engine can be used to pull the vessel away from the pontoon. In this situation there is a case for not using the opposite engine as (in this instance) using the port engine creates a gentler turn and pull away from the berth.

Before engaging gear, think through what you want and need to achieve and choose whichever side works best – perhaps even one side initially, then the other.



Twin Shafts

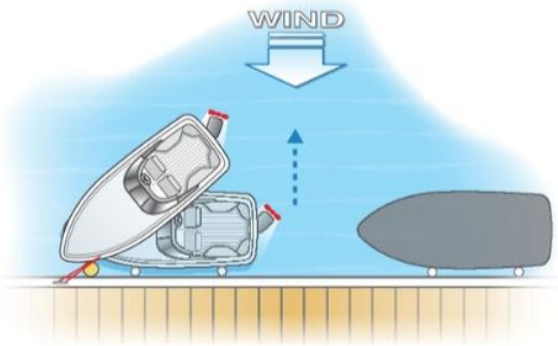
Again, think through what you want to achieve before engaging gear. In this case, protect the bow with fenders and go astern on the prop nearest the pontoon. This starts to pull the stern out. Then, go into and out of gear ahead on the port engine to rotate the bow in towards the pontoon. Once the desired exit angle is achieved, if needs be, go astern on both engines to reverse into clear water or use one engine at a time in astern to limit momentum.

Using a Line to Assist Leaving a Berth

If the wind or stream is pushing the boat onto the pontoon, or if the berth is restricted, motoring against a line can allow the stern to get into clear water for an easy exit.

Reversing on a Bow Line

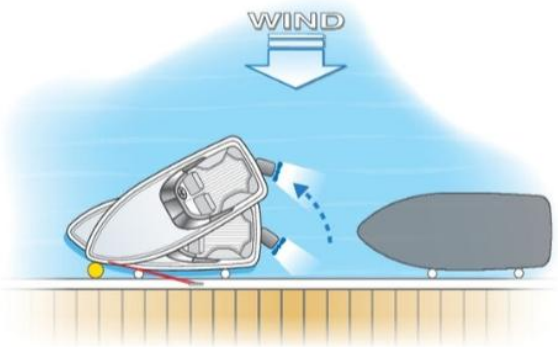
- Rig up a bow slip line.
- Fender the bow well.
- Steer away from the dock.
- Engage astern.
- The stern starts to pivot away from the pontoon into clear water.
- Engage neutral.
- Slip the bow line and reverse away.



This works well for all craft except for single shaft drive, where (in this example) the propwalk will usually try to pull the stern to port. With twin-shaft and outdrive craft using the engine nearest the pontoon will work best, and with outdrive craft the engine furthest from the pontoon will work too, but the turn will be less pronounced.

Bow Spring Line

- Rig a bow spring line and fender the bow area.
- Motor forwards to bring the bow in and the stern away from the pontoon.
- Engage neutral.
- Slip the spring and reverse away.



This technique works well for all craft but assumes it is easy to get to the bow to manage the spring line. On RIBs, while the technique works, real care needs to be taken to ensure the tube is not damaged on the pontoon.

Coming Alongside

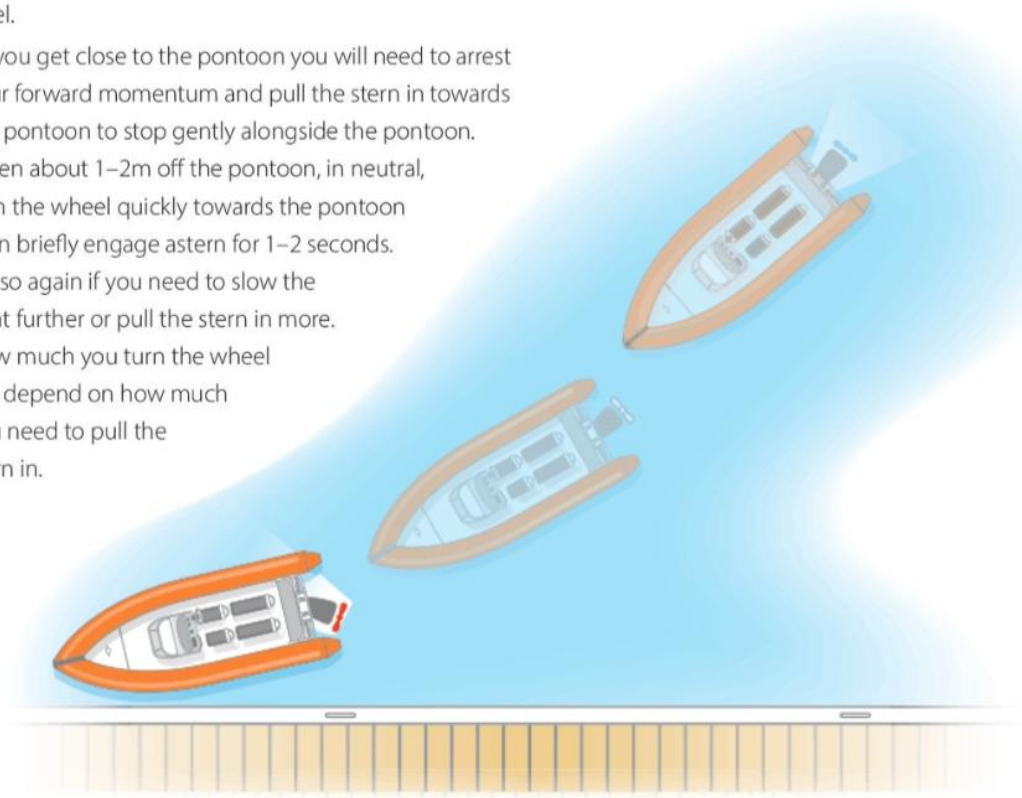
Close-quarters manoeuvring among pontoons, jetties, harbour walls and other boats can be far easier if you adopt the approach of Plan, Approach, Manoeuvre, Escape – 'PAME'. Before approaching:

- **Plan** – Consider wind, stream, depth, other craft – determine approach direction
- **Approach** – Position the vessel for approach
- **Manoeuvre** – Approach slowly, keeping a good lookout. Adjust approach as necessary
- **Escape** – Always have an escape route in mind as the manoeuvre proceeds

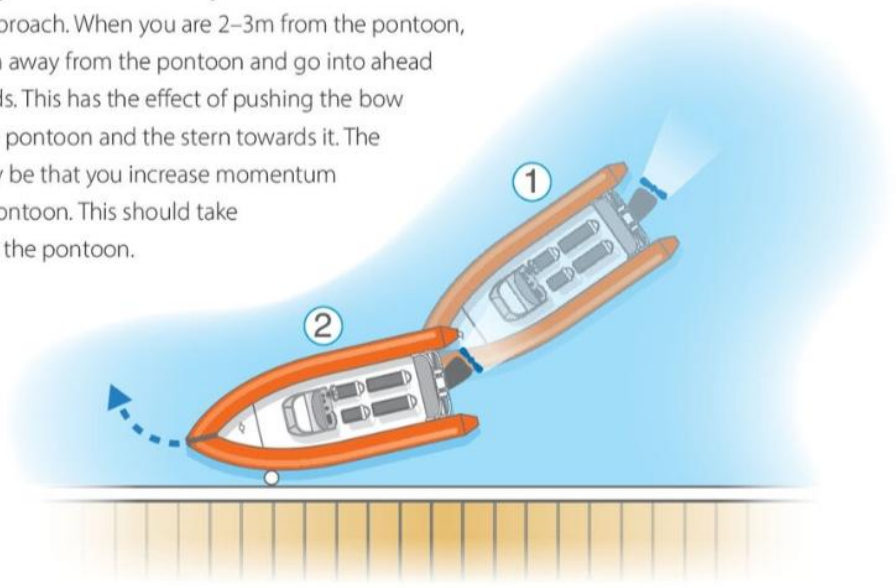
Approaching the pontoon, the challenge is to have enough momentum to carry the boat onto the berth and give you control as you approach, versus having too much, in which case you will need to remove this momentum or you risk hitting the pontoon. Like anything, this takes practice.

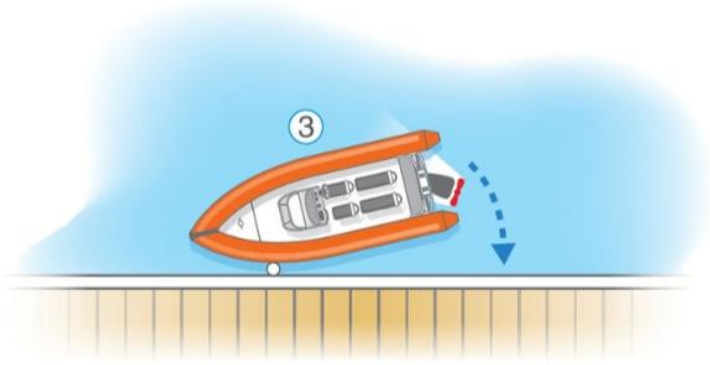
The process of approaching can be broken down into distinct steps:

1. Your start position will be as far off the pontoon as practical to allow you to adjust your approach as you start towards it. Start at least 4–6 boat lengths from your target point, ideally with an approach angle of 30°–40°. Approach while alternating between ahead and neutral to keep your momentum at the right level.
2. As you get close to the pontoon you will need to arrest your forward momentum and pull the stern in towards the pontoon to stop gently alongside the pontoon. When about 1–2m off the pontoon, in neutral, turn the wheel quickly towards the pontoon then briefly engage astern for 1–2 seconds. Do so again if you need to slow the boat further or pull the stern in more. How much you turn the wheel will depend on how much you need to pull the stern in.



3. If the angle of the boat to the pontoon is much over 40° then 'turning in and going astern' will most likely stop the boat but then pull the bow away from the pontoon rather than drift perfectly alongside. In this scenario you will need to add an extra step to the approach. When you are 2–3m from the pontoon, in neutral, turn away from the pontoon and go into ahead for 1–2 seconds. This has the effect of pushing the bow away from the pontoon and the stern towards it. The downside may be that you increase momentum towards the pontoon. This should take you parallel to the pontoon.





Rapidly straighten the wheel then apply astern for 1–2 seconds to arrest the forward momentum. Do so again if you need to.

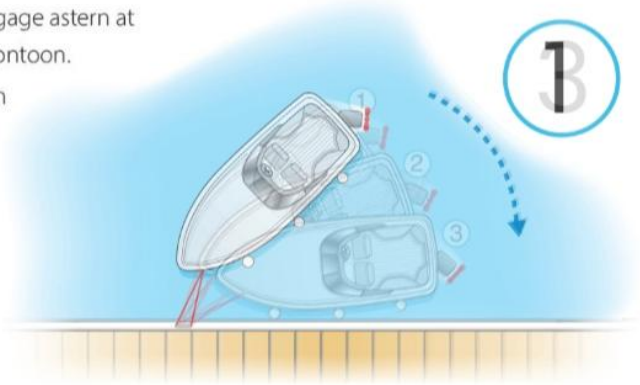
These two methods – 'turning towards the pontoon and going astern' and 'turning away and going ahead' are the key elements of being able to position a boat alongside a pontoon just where you want it.

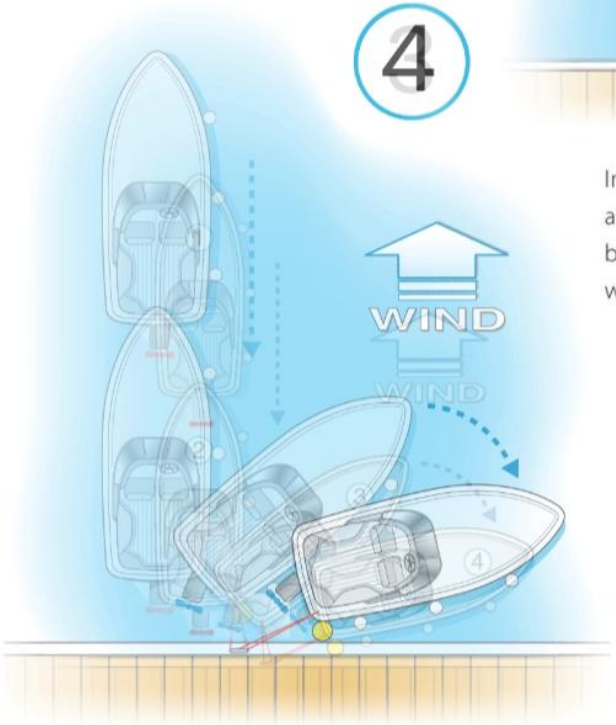
Safety Tip – Remember that when coming alongside a berth your objective is to do so safely. Accept that you might not always do it perfectly – no-one does! Never let your crew jump onto pontoons from the boat. Teach them to lasso cleats from the safety of the boat (see chapter 14).

Wind or Stream off Pontoon

Just as we have used lines to help us leave a berth, we can also use them to help us get alongside. These techniques are especially useful if the wind or stream is blowing the boat away from the pontoon.

1. With a person at the bow (if safe), approach the pontoon slowly using neutral, ahead, neutral etc. Have a line ready to lasso the desired cleat with one end secured to a deck cleat. The person at the bow signals when they feel they can successfully lasso the cleat. Stop the craft and keep it in neutral. Secure the end of the line to the cleat, leaving enough line from the cleat to the pontoon so the craft is not constrained as it swings round. Never engage ahead or astern until the person at the bow indicates the line is secure and their hands are clear.
2. Turn the wheel towards the pontoon. Engage astern at tickover to bring the stern towards the pontoon.
3. When close enough, the crew in the stern area lassoes the cleat and secures.





In certain circumstances, and particularly in craft that are affected significantly by the wind or have poor bow access, it can be easier to let the stern seek the wind and reverse towards the pontoon.

1. Fender the stern well and watch out for bathing platforms (if fitted). Watch for lines in the water.
2. From within the safety of the cockpit area, the crew lassoes the stern cleat with the stern line, leaving 1–2m of line between the stern and the pontoon.
3. Steer towards the pontoon and engage forward at tick-over speed. The boat is then 'driven' alongside the pontoon.

Twin-engine Craft

The same principles apply and the approach can be bow or stern towards the pontoon. Once a line is on, the engines can be used one ahead and the other astern to rotate the craft alongside the pontoon. The attached line secures the craft and then it pivots about this point as load comes onto the line. Once alongside, lines can then be deployed from the unsecured end.

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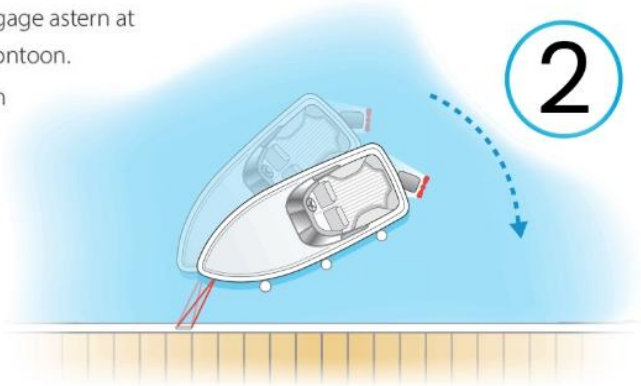

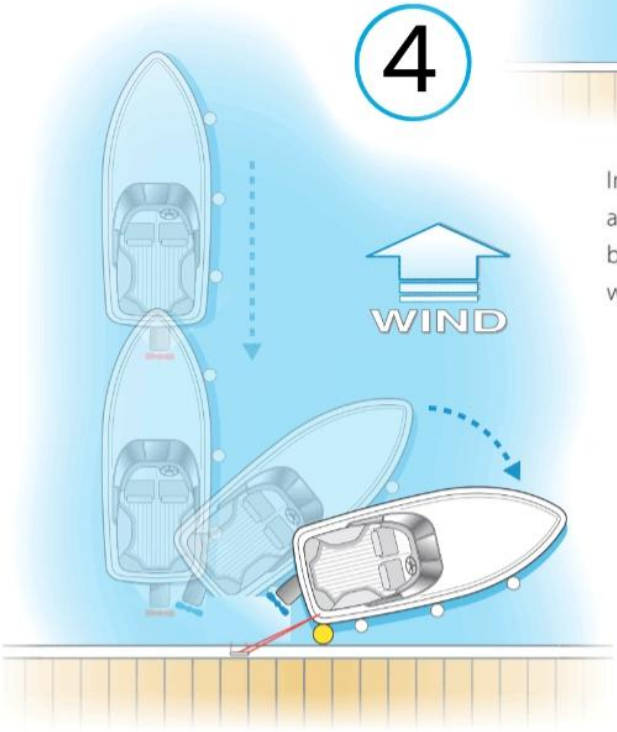

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1. Fender the stern well and watch out for bathing platforms (if fitted). Watch for lines in the water.
2. From within the safety of the cockpit area, the crew lassoes the stern cleat with the stern line, leaving 1–2m of line between the stern and the pontoon.
3. Steer towards the pontoon and engage forward at tick-over speed. The boat is then 'driven' alongside the pontoon.

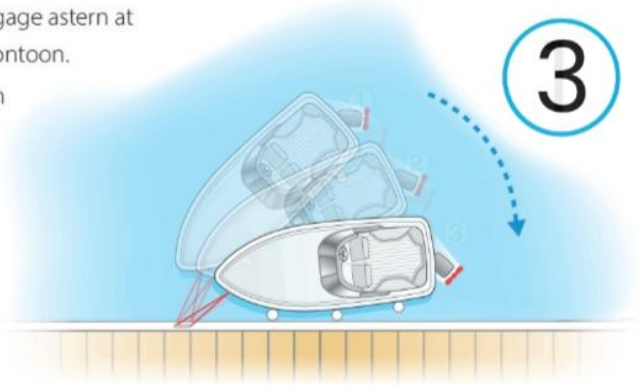
Twin-engine Craft

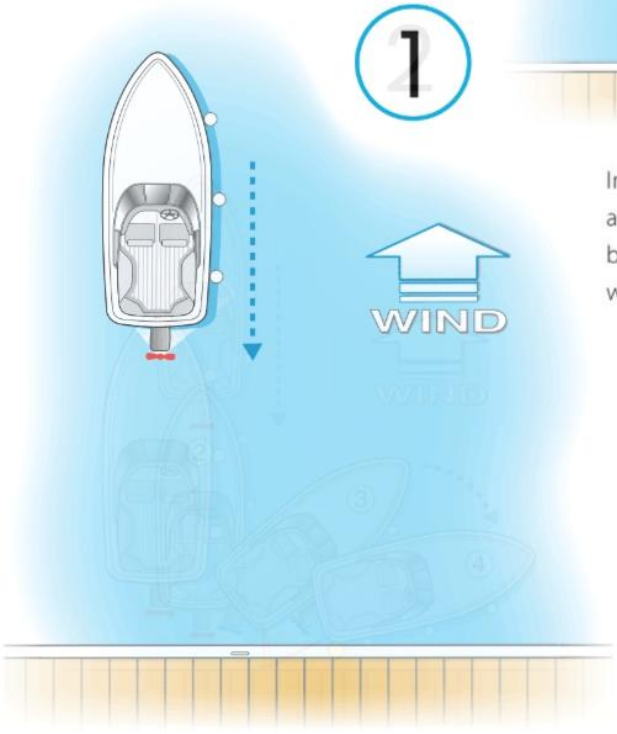
The same principles apply and the approach can be bow or stern towards the pontoon. Once a line is on, the engines can be used one ahead and the other astern to rotate the craft alongside the pontoon. The attached line secures the craft and then it pivots about this point as load comes onto the line. Once alongside, lines can then be deployed from the unsecured end.

Wind or Stream off Pontoon

Just as we have used lines to help us leave a berth, we can also use them to help us get alongside. These techniques are especially useful if the wind or stream is blowing the boat away from the pontoon.

1. With a person at the bow (if safe), approach the pontoon slowly using neutral, ahead, neutral etc. Have a line ready to lasso the desired cleat with one end secured to a deck cleat. The person at the bow signals when they feel they can successfully lasso the cleat. Stop the craft and keep it in neutral. Secure the end of the line to the cleat, leaving enough line from the cleat to the pontoon so the craft is not constrained as it swings round. Never engage ahead or astern until the person at the bow indicates the line is secure and their hands are clear.
2. Turn the wheel towards the pontoon. Engage astern at tickover to bring the stern towards the pontoon.
3. When close enough, the crew in the stern area lassoes the cleat and secures.





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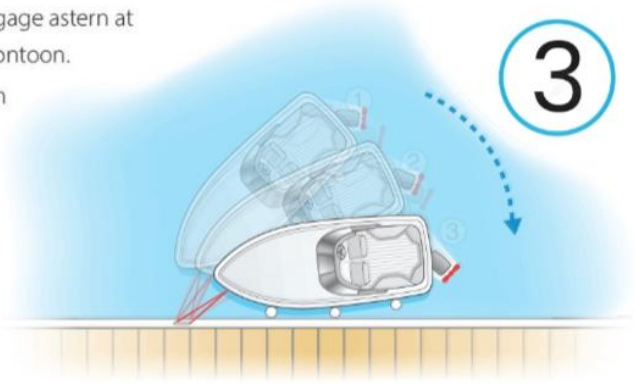

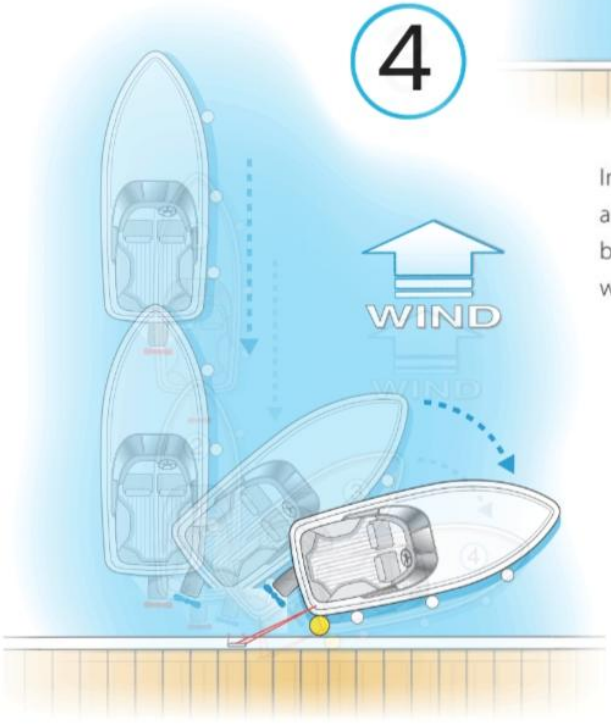

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Mooring in a Marina

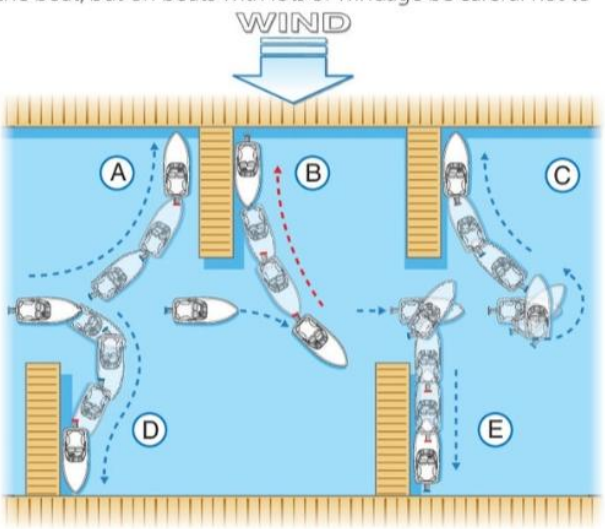
Coming into a marina berth requires extra care because there are moored boats and vessels moving around.

If you are visiting, call the marina office on your VHF to establish which side to put your fenders out. 'Starboard side to' means your lines and fenders will be placed on the right if you enter the berth facing forwards.

Assess the effects of wind and stream on the berth you are going to. If necessary, go and look at the berth before deciding on exactly how you are going to approach it. Brief your crew on what you want them to do. Ensure the lines and fenders are ready and that the crew will not leap onto pontoons. Plan an approach that allows minimum speed into the berth and, if necessary, plan to go past a berth, then turn and approach it from a more favourable direction to make the approach easier.

With limited wind or stream you will aim to come in as slowly as possible. When there is lots of wind or stream, though, you may need to be prepared to use lines or to come into the berth slightly faster to overcome the effects on the boat. You can decide all of this in your initial assessment.

Consider these marina berths:



A Approaching into the wind will naturally slow the boat, but on boats with lots of windage be careful not to lose control of the bow. The momentum of the boat will help it slide sideways alongside the berth.

B As the stern seeks the wind in astern, this boat reverses easily into the berth.

C The turning momentum will tend to slide the boat away from the berth. Consider going beyond the berth, turning and approaching from other direction.

D The wind will push the craft into the berth, so care is needed not to overshoot. Put a stern line on early.

E Reversing in stern first with the bow into the wind may be very tricky, as the wind will try to push the bow so the vessel is lying beam-on to the wind. A bowthruster would make things easier if fitted.

Tip – Rather than performing one sweeping movement into the berth, stop short, position the boat, then drive in using the minimum amount of speed necessary.

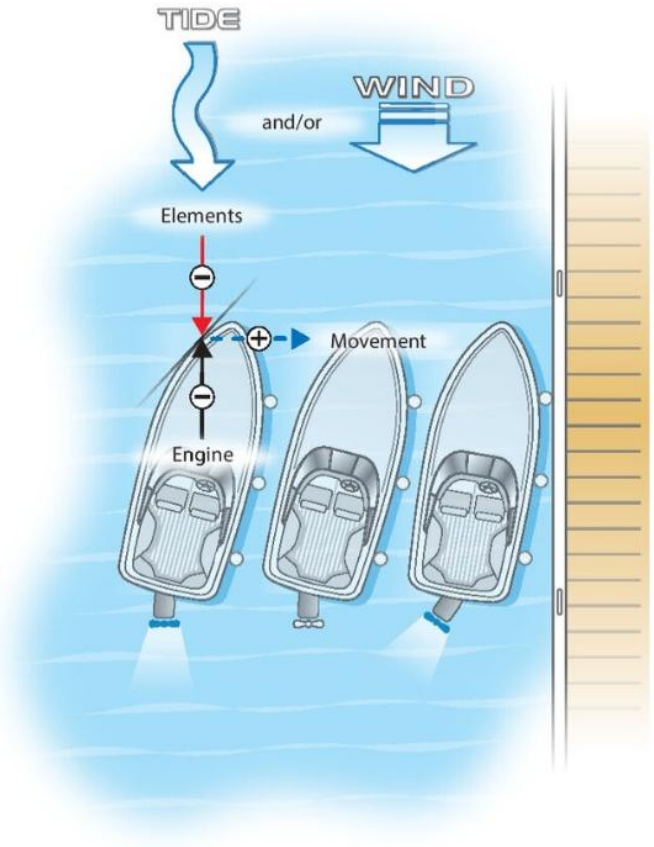
Tip – On many boats, rigging a line to the midships cleat so that either the crew or helm can slip it over a cleat when entering a berth can make it easier to bring the boat alongside.

Using a Bowthruster

Do not hesitate to use a bowthruster if you need it. Ensure it is switched on and works before you approach a berth. Use small amounts of thrust to compensate for the effect of wind on the bow of the craft. Practise your handling to ensure you are not overly reliant on it.

Mooring in Wind and Stream – Ferry Gliding

It is possible to drift a boat sideways by steering into the elements, using gentle throttle, and turning the boat slightly so that the wind or stream is pushing on one side of the bow, thus enabling you to 'crab' in that direction. This is called ferry gliding and it can be used to come alongside pontoons or other boats in a slow, controlled manner.

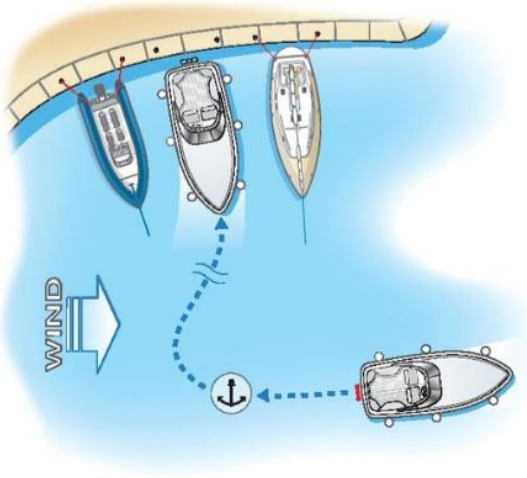


Stern-to and Bows-to Mooring

Mooring in many locations is often stern- or bows-to the quay. Powerboats usually moor stern-to the quay for ease of access to the shore. Stern lines are used to stay close to the quay, while the anchor or a line attached to weights or chains on the seabed holds the boat away. A passerelle or wooden plank, carried by the boat, is used to go ashore.

Holding off Using an Anchor – the Approach

- Rig up fenders on both sides and a large fender on the stern. Rig stern lines from both quarters.
- Prepare to drop the anchor.
- Reverse towards the wind.
- When four boat lengths away from the quay, drop the anchor and ease out chain/rope.
- One boat length from the quay, stop easing the chain/rope so that the anchor digs in. Be ready to let out more chain/rope if required.
- Connect the windward stern line to the shore, followed by the leeward stern line.
- Once positioned the correct distance from the quay, take the strain up on the chain/rope.



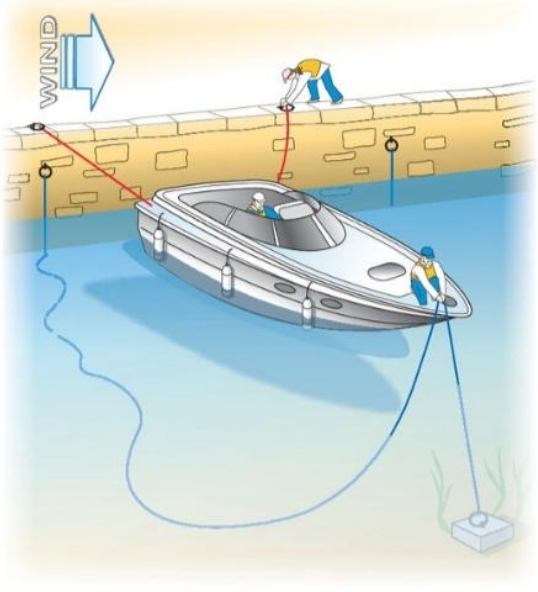
Holding off Using Pre-installed Chains or Weights

Lazy lines are used in tight harbours and marinas where it is unsuitable to drop the anchor because it may become fouled. Instead of an anchor holding the bow away, the bow is connected to a heavy bow line, which is attached to a concrete block or chains. The bow line is also attached to a lighter line, which is led to the quayside for ease of retrieval.

The Approach

- Rig up fenders either side and at the stern.
- Rig two stern lines.
- Reverse towards the quay.
- Connect windward stern line to quay.
- Pick up lazy line, lead to bow and tie off.
- Connect second stern line.
- Adjust bow and stern lines.

It is possible to hold the craft in position once the upwind stern line is attached by going into ahead on the opposite engine.



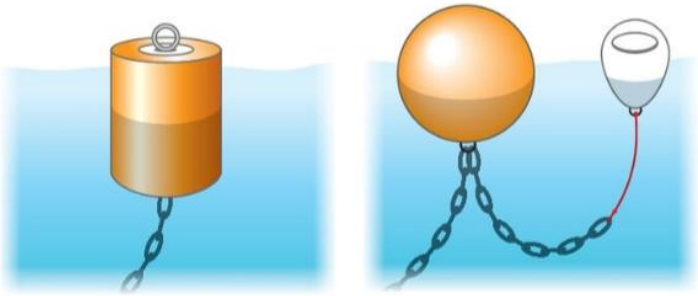
Tip – If it is safe to do so, have a crew member forward with a roving fender ready to fend off from craft adjacent to you.

In very windy conditions or a difficult berth consider dropping a crew member off to tend lines for you, or, if short-handed, call the marina for assistance.

Mooring Buoys

Mooring buoys are laid by individuals and harbour authorities for permanent moorings and visitors. Most visitors' buoys have markings and in some areas their position is noted on a chart or pilot book.

Buoys vary. Some have obvious rings on top and others have chain loops hanging from below attached via a line to the pick-up buoy. Never tie off to the pick-up buoy.



Before picking up a mooring buoy:

- Choose a buoy that looks strong enough for your boat. Ensure it isn't just attached to a lobster pot!
- Check there is sufficient depth now and for the duration of your stay.
- Ensure it will give shelter from the present and forecast wind.
- Determine whether you need to contact anyone for permission to use the buoy or to pay for its use – a harbour guide may help, or there may be a phone number on the buoy.
- It is acceptable to use someone's mooring for a short stay as long as you are ready to leave immediately should they return, and your craft is not too large for the mooring buoy to risk causing damage.

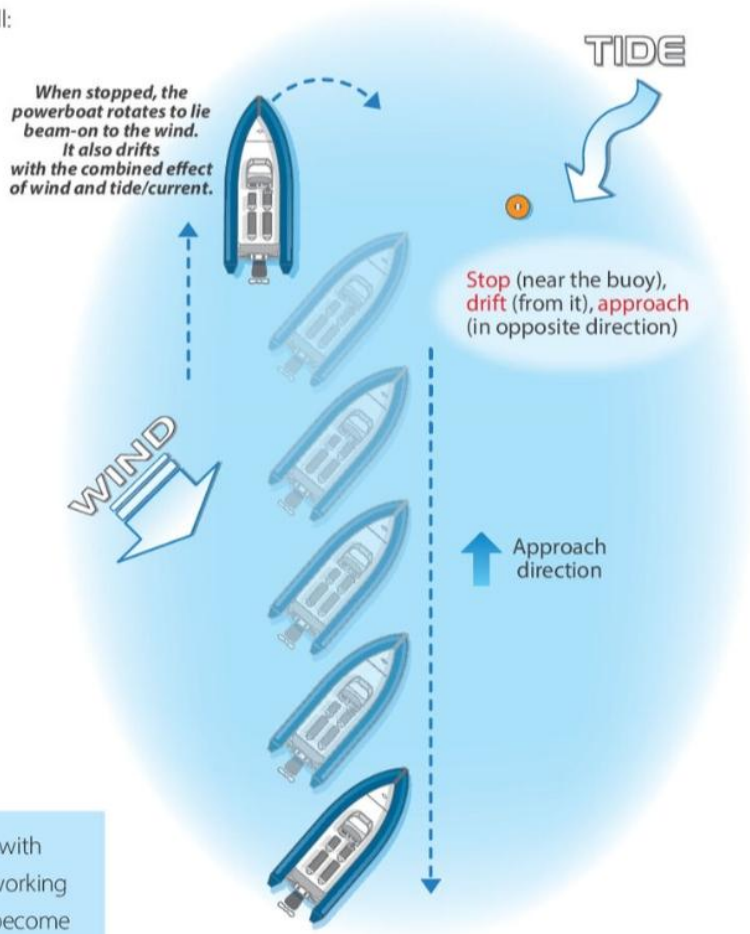
Determining Direction of Approach to the Mooring Buoy

The direction from which to approach the buoy will be determined by the effect of both wind and stream on your craft. The best method is to approach into the combined effect of wind and stream so that these forces act as a brake, giving you better control. To keep it really simple you can decide what your approach direction should be by:

1. If there are no other craft on nearby moorings, drive up near the mooring buoy and stop. Your boat will rotate to lie side-on to the wind but will then drift due to wind and stream. Your approach direction is the opposite of your drift direction.
2. Another option is to copy the direction other craft similar to your own are pointing on nearby moorings. They indicate your approach direction. Be careful to ensure that they are not also tethered at the stern (a 'trot mooring') or are sitting on the seabed.

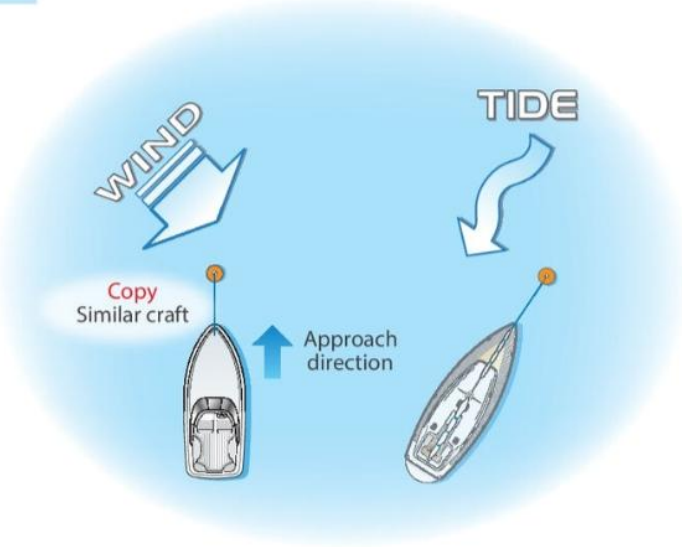
To help you remember this, just recall:

'Stop, drift, approach, or copy'



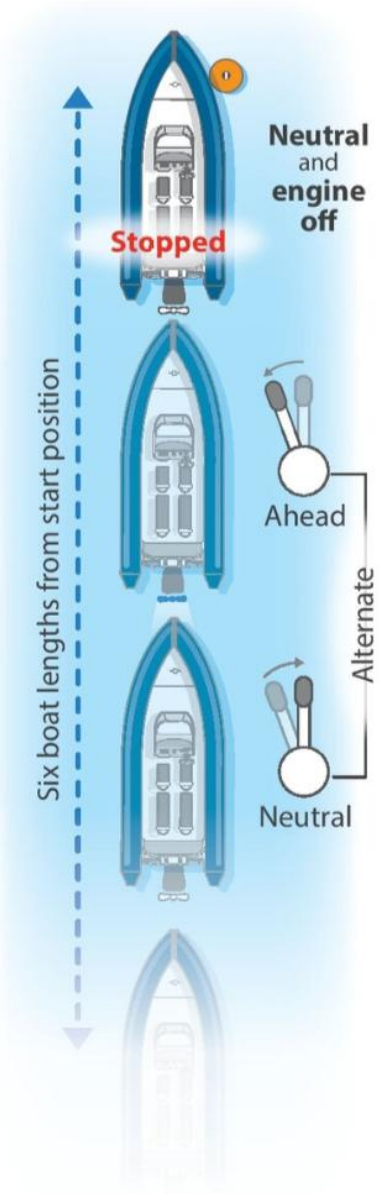
As you become more comfortable with your assessment of the elements, working out the direction of approach will become second nature.

Note: Remember when you are choosing which craft to 'copy' that powerboats and sailing boats in the same area may point in very different directions. With no keel, powerboats can be blown across the surface of the water, overriding the effect of stream, whereas the keels underneath sail boats will tend to be more influenced by stream as the water flows past them.

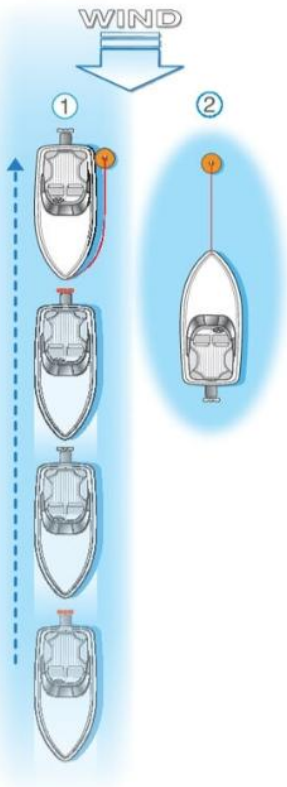


Approaching the Mooring Buoy

- Position your craft six boat lengths from the mooring buoy to approach from a direction as determined above. Stop dead in the water and have no forward momentum. Six boat lengths gives you time and space to correct your positioning as you approach.
- Alternate between neutral and tick over ahead to maintain forward movement, while making sure the approach is slow and controlled. The challenge is to have enough momentum to retain control and prevent the wind pushing the bow away while ensuring you are not going too fast.
- Look sideways at buoys and other craft to judge your approach speed.
- As you get close, ensure that you are slightly offset from the buoy so that it will touch on the port or starboard bow and not get lost directly under the front of the boat.
- Your aim is to be a boat length short with a minimum of momentum so that a final in-gear ahead pushes the craft up to the buoy. Your aim is to stop alongside the buoy without the aid of astern.
- If you are going too fast as you reach the buoy, using astern is an option to arrest momentum, but try to practise to make this unnecessary the next time. If you overshoot, make sure you are in neutral to avoid snagging a line in the prop.
- Depending on the buoy, you will either secure to a ring on the top or to a strong loop – never secure a line to the 'pick-up' buoy as it is not designed to take load and the line from it to the main loop will often be very weak.



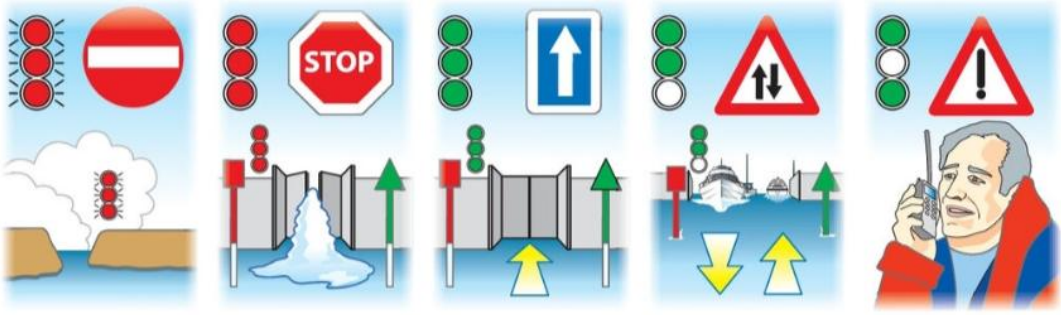
- With some craft it is difficult or dangerous to pick up a mooring buoy from the bow. Consider approaching stern first to the buoy. Ensure that you are offset to one side to keep the prop clear of lines around the buoy.
- Rig a line from a forward cleat back to the cockpit area.
- Reverse up to the buoy.
- Tie off as described above.
- The vessel will then swing round. Be careful to ensure the line doesn't pass under the craft and snag the prop.
- For a short stay in light wind, rigging a single line from a stern cleat to the buoy or from both stern cleats in a V-shape works well.



Tip – If you are moored to someone else's mooring buoy, a crew member must stay with the boat and be prepared to move it should the owners return.

Locks

In tidal waters, locks are found at the entrances to marinas, harbour basins and rivers that would otherwise dry out at low water. These locks are usually controlled by a lockmaster and entry is often controlled by a traffic-light system.



On inland waterways a series of locks allowing a vessel to climb or descend an incline is often found. At the entrance to marinas or harbours they are usually single locks with many vessels seeking to enter or leave.

Consult an almanac for instructions or call the lockmaster by VHF or mobile phone for permission to enter. Assess the effect of wind or stream across the entrance of the lock and rig fenders on both sides as a precaution. Some locks have pontoons to tie onto that rise or fall with the water level, while others require you to slip lines around a riser bar or bollard.

Chapter 8

Anchoring

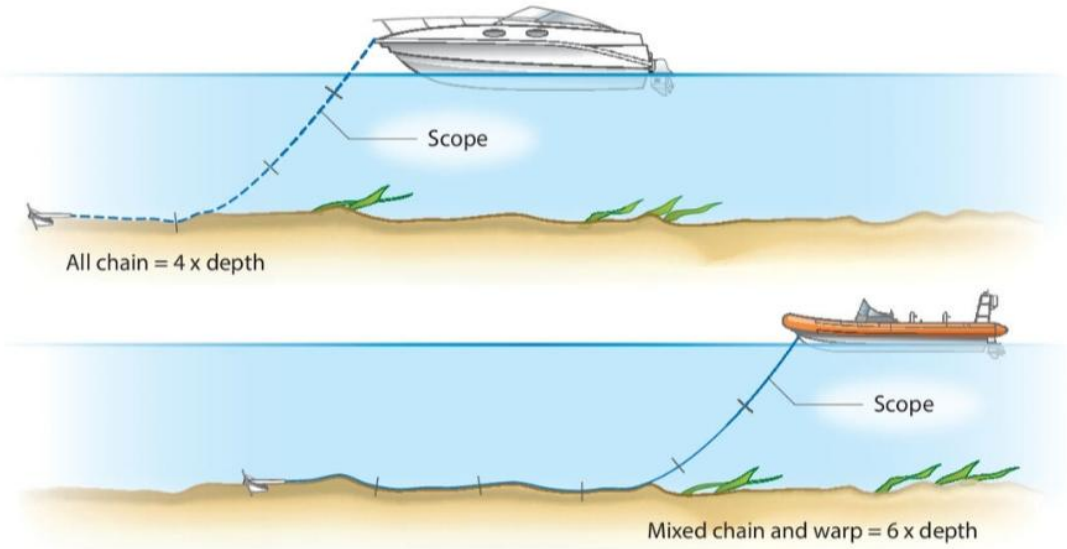
Anchoring allows you to stop for lunch or overnight in quiet and pleasant surroundings away from the crowds. It is also the first course of action if the engine fails in shallow water because it stops the boat and allows the problem to be resolved.

When anchoring:

- Look for a sheltered anchorage. Consider likely weather changes during your intended stay as a great anchorage with one wind direction could become highly dangerous if the wind swings round.
- Are conditions suitable for anchoring? Sitting at anchor in bumpy conditions can be quite unpleasant.
- Ensure that there is likely to be enough space between your craft and other vessels. Remember that vessels react differently to changes in wind and stream so you need to allow space for yours (and others) to swing without getting too close to each other.
- Keep clear of main channels or underwater obstructions, e.g. cables.
- Assess the area. Check the sea bed. Will your anchor hold? Do you have enough anchor line? Plan your approach to the point at which you plan to deploy the anchor. Your direction of approach will be the same as if you were approaching a mooring buoy (see chapter 7). Remember – 'Stop, drift, approach, or copy'.

- Before starting your approach, prepare the anchor and anchor line. Ensure it is not snagged and make sure that it is tied on. Brief the crew clearly to ensure that they know exactly what you need them to do.
- Determine the depth at the time the anchor will be deployed but also for the duration of stay, as a rising or falling tide may necessitate more line being deployed.

How much Anchor Line needs to be Deployed?



'Scope' is the overall amount of anchor line put out. For larger craft with only chain, it is recommended that the length of chain deployed is four times the calculated depth. Smaller craft will not be able to carry chain only due to its weight, so will have a length of chain from the anchor to then join with rope (also known as 'warp'). As a minimum, small craft should have about four metres of chain between the anchor and the rope. The benefit of the chain is:

- The extra weight adds to the ability of the anchor to hold.
- The chain reduces the chances of the 'chafing' of a rope line
- The weight of the chain ensures that the pull on the anchor is horizontal, which is how it is designed to hold best.

The amount of rope/chain that is carried will vary according to the likely depths in the area that you boat. For smaller craft operating closer to shore or in shallower estuaries, 30m is often the norm, although carrying an extra 100m line that doubles as both an extension for your anchor line and a tow line is sensible.

Larger craft carrying only chain or a mix of chain/rope may be fitted with a windlass. This is an electric motor to raise/lower the anchor and line.

The chain and line should be attached by means of shackles. The pins on the shackles should be secured with cable ties or wire. For anchor line passing through a windlass, the chain will need to be a precise size and the line spliced to the chain.

Deploying the Anchor

As already determined, choose a suitable target point to deploy the anchor. Use the same boat-driving techniques as for a mooring buoy to approach this position. When at the chosen spot:

- Crew ease anchor over bow and slowly towards seabed. Do not just drop anchor, chain and line, or it will not get the chance to dig in. Ensure crew don't run the chain against the hull or tube and cause damage.
- Measure out how much is being deployed through either a rough estimate or having marked the line with a code – marker pens or cable ties work well.
- As the anchor touches the seabed, let the craft drift back and ease out the line. Keep easing the line out until the required amount is deployed.
- Secure the line to the craft. On RIBs, be careful to protect the tube from the line chafing.
- Go astern briefly as it may help the anchor dig in.

An Alternative Anchoring Technique for Small Craft

Small craft with difficult access to the bow area can be challenging or sometimes dangerous to anchor. Consider this method as an alternative:

- The anchor and rope/chain will probably be in the cockpit area in a box.
- Using the bow line attached to the forward cleat (or ideally a line attached to the bow D-ring) tie off the line to a point on the anchor line twice as long as the painter line.
- Deploy the anchor from the cockpit area in the manner described above. As the load comes onto the line, continue to ease out the line and the load will transfer to run along the painter line through the anchor line. You will be left with the end of the anchor line that is not under load to secure in the cockpit area. This 'lazy line' can be used to recover the anchor later from the cockpit area.

This method turns the craft side-on to the wind when deploying and recovering the anchor, so always consider the conditions before anchoring.

This technique works well for any small craft, such as small cabin boats with poor access to the bow, but also RIBs, as it eliminates the need for a line under load to be run over the tubes.

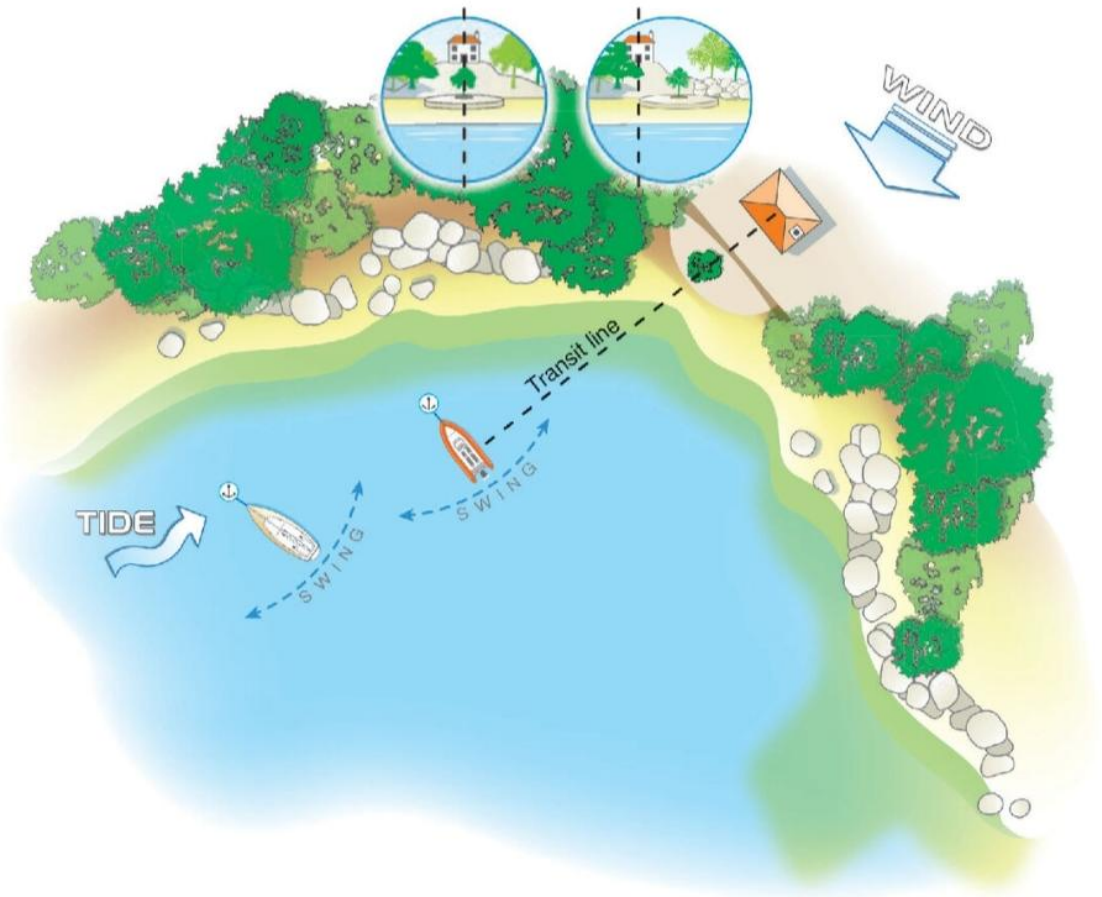
The black line is the anchor line. The white line is the bow line and is tied to the anchor line. The load of the anchor is transferred to the bow line through the knot.

Is the Anchor Secure?

Once anchored, there is a need to ensure that the anchor has dug in and is not dragging along the seabed. To check this:

- Identify a transit (two objects that line up – e.g. a tree and a building) from the side of the craft. If these remain in line, all is well. If they don't, the craft is probably dragging.
- Use a hand bearing compass to take a bearing from the side of the craft to an object. If this changes appreciably you are probably dragging.
- Set the 'anchor watch' feature on your chartplotter. This usually works well, but ensure the acceptable drift distance is reasonable for the area that you are anchored in – for example, there is no point setting a distance of 100m if at 40m you will be ashore. Equally, setting five metres may mean the alarm trips too often as the craft moves around.

You can also feel the anchor line. If it is vibrating then it is probably dragging the anchor over the seabed.



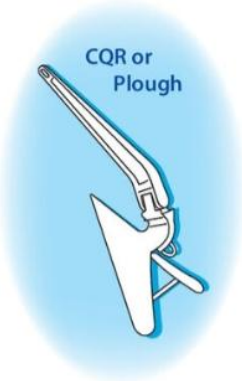
Raising the Anchor

- Assess how much strain is on the anchor line due to wind or stream. Plan your exit from the anchorage. Communicate the plan to your crew.
- Undertake pre-start checks, bearing in mind the craft may have been switched off for a while. Start the craft and let it warm up.
- If necessary, reduce the strain on the line to enable the crew to lift the anchor. Aim to move forward one metre, raise line, then another one metre, and so on. Clear communication from the crew at the bow is important to prevent overrunning the line, and making sure you are heading in the correct direction towards the anchor. Hand signals are useful.

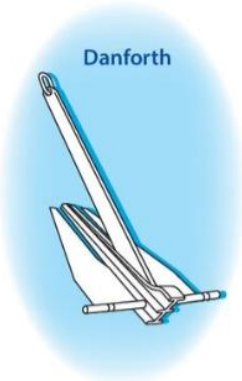
Get the anchor onboard – avoid dragging the chain over the hull or tubes. If possible, immediately stow and secure the anchor but it may be necessary to motor gently into clear water away from other craft before doing so.

Types of Anchor

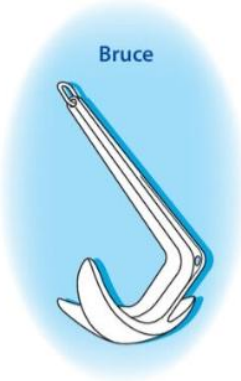
There are various types of anchor. Which you choose depends on your cruising ground. Some anchors have good holding in mud and sand, while others are designed to pierce weed and get in between rocks.



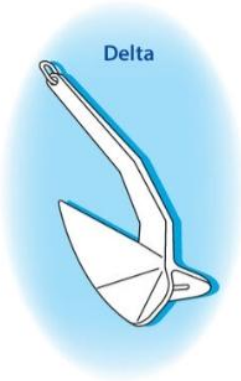
A strong anchor with good holding power.



A flat anchor with good holding. Always lies flat.



A good anchor with excellent holding.



Almost a fixed version of the Plough (without the hinge). Often used by craft with electric anchor winches, as it resets itself well into the bow roller.

Awkward to stow and heavier than other anchors of similar holding power.

All of these anchors have good holding in a variety of surfaces. The one best suited to your needs is dependent on your boat type, the area you will be anchoring in, and how easy each will be to stow.

Tip – Visit a chandlery to get advice on the size and type of anchor to carry in your craft. They will also advise on suitable amounts of chain/rope.

Chapter 9

Travelling at Speed

Travelling at speed in a boat can be great fun. However, there is a real responsibility on the Skipper to ensure that going fast is safe for everyone onboard and other water users. At speed, ensure that your crew has a good seating position, a firm grip, and know what you are going to do before you do it.

Avoid situations which involve rapid changes in direction. Take early action in potential collision situations and remember, if in doubt, slow down, reducing the closing speeds of vessels. Keep a good lookout for other craft, and keep a watch for and predict the effect of waves or the wash from other vessels. By keeping alert and assessing situations early you can make higher-speed driving safe and fun.

Safety – You must wear your killcord correctly at all times when a craft is under way, and especially at speed.

Travelling at Planing Speeds

Planing is where a craft's power and hull design allow the craft to get up onto and run along on the surface of the water. A displacement craft will never be able to plane, and its speed is limited by its hull design and power, while a semi-displacement craft will almost, but not quite, plane.

Before accelerating, ensure that the outdrive unit/outboard is fully 'trimmed in/down' – or to the neutral position depending on the craft – as this helps the craft get onto the plane. Ensure steering is pointing dead ahead.

As the throttle is pushed forward, a powerboat begins to move from being a displacement boat at low speed and starts to climb on top of her bow wave and get on the plane.

Once on the plane, less hull surface is in contact with the water and there is less friction, so the craft will tend to accelerate. Speed can be maintained with less power and the throttle may need to be reduced to decrease the acceleration.

Executing Manoeuvres at Planing Speeds

Undertaking any manoeuvre at speed increases risk, and it is critical that the Skipper prepares their craft and communicates exactly what their intentions are.

Crew should be seated in appropriate seats with good handholds. Seats and deck area ahead of the helm position are susceptible to greater vertical movement and place crew at risk of impact injury. Generally, crew should not travel in these areas except at slow speed in very calm conditions. Care should also be taken to position crew to balance the craft, as (for example) crew in the bow area may have the effect of lifting the stern slightly, making it more susceptible to 'skidding out' on a turn.

Any turn should follow a strict process:

- Observe all around for other craft.
- Communicate intentions to crew – confirm they are aware of and happy with your intentions.
- Set up the craft for the turn – trim and speed. Plan the rate of the turn.
- Final observation all around the craft.
- Execute turn, keeping a good lookout and being prepared to adjust throttle/steering if required.

Turns through 180 Degrees

Approaching the turn, 'trim in' to lower the bow and help the craft track around the impending turn. Reduce speed and follow the process outlined above. The diameter of the turn should be wide, so that you do not lose speed in the turn. If necessary, adjust the throttle to remain on the plane. Coming out of the turn, straighten up, communicate to crew, increase power steadily and adjust trim as necessary.

Tight Turns

There is no reason to undertake sharp, high-speed turns. Such turns risk the stern of the vessel 'skidding out', and increase the risk of catching a wave unexpectedly with the effect of ejecting the crew and Skipper from the craft – known as 'hooking'.

To execute a tight turn, slow down to come off the plane. Observe all around, communicate to crew and then turn at a slow speed.

Gradual Turns

Gradual turns to the right or left can usually be made at reasonable speeds, as long as they are steady and controlled and conditions are suitable. Ensure you follow the observe, communicate, manoeuvre process as outlined.

Reducing Speed

Any reduction in speed should be steady and controlled. Communicate your intentions to the crew and then steadily reduce speed to come to a stop. Be aware of stern wave, which may catch the craft and give it a slight push from behind just at the final stage. If a craft stops too quickly this effect could be quite profound, and on smaller craft swamp the stern.

Stepped Hulls

'Non-standard' hull designs may react in a different way to 'standard' hulls, and care should be taken to learn from the owner's manual or the manufacturer how these differences may impact the boat's handling. With stepped hulls, care may need to be taken not to trim in too much before a turn and not to reduce power suddenly in the turn, or there is a risk that the craft may 'hook'.

Balance – 'Trimming your Boat'

You can trim your boat in two ways, fore and aft – raising and lowering the bow, and from side to side, levelling the boat if it is leaning to one side.

Trim is adjusted for a variety of reasons:

1. To balance the boat better.
2. To adjust the boat's 'angle of attack' to waves.
3. To improve performance when on the plane.

There are two mechanisms that can be used to adjust the trim of a craft. These are outdrive/outboard trim, and trim tabs.

Don't forget that where you position people and kit in the boat will affect the trim of the boat too.

Outdrive/Outboard Trim

Leg in to start to keep the prop in the water and help the boat get on the plane.

On the plane, ease the leg out to achieve the best speed. Ease out too much and the prop may draw in air from the surface, making it spin faster but losing grip on the water, thereby slowing the boat. Ease the leg out by the correct amount and the revs increase slightly without the throttle being adjusted. As a result, the speed increases.

Trim may need constant adjustment. If crew move around the boat or there is a change in sea conditions or speed, you need to check the trim. Fuel use makes the boat lighter – you may need to trim differently when tanks are full or half-empty.

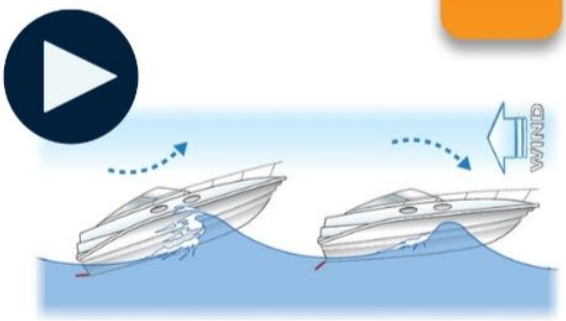
Tip – Even when trim gauges are fitted they can be unreliable. Practise in various conditions to get the best trim. When there are no gauges, use time increments to know whether the leg is up, down or centred. While in port, count how long the tabs take to rise, lower and centre. When trimmed correctly the revs rise slightly and the helm feels lighter without pull to either side.

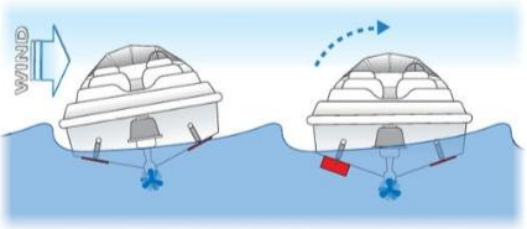
Trim Tabs

Trim tabs are either flat plates or vertical blades fitted either side of the boat and attached to the transom. They are used to trim or level the boat, both fore and aft and side to side.

Trim tabs are controlled upwards and downwards by either a hydraulic or electric ram system on the transom.

- Tabs down – raises the stern which in turn depresses the bow ('bow down').
- Tabs up – lowers the stern, which in turn raises the bow ('bow up'). However, raising the tabs will not have quite the same effect as trimming up an outdrive leg/outboard, as once the tabs are raised to be level or above the bottom of the hull they have no impact. In practice, therefore, tabs work well to depress the bow but cannot raise it.
- One tab down – raises one side of the boat. This is useful to compensate for loading irregularities or a beam sea.





Gauges are not always fitted to advise you of the position of the trim tabs. Additionally, it is not always clear from the gauges whether references to 'Up/Down' mean that the bow is moved up/down or the trim tabs are. While alongside, look at the position of the tabs, adjust tab position and compare how this relates to the switch/gauge. Count how long it takes to move the tabs from one extreme to the other. You can adjust the tabs in increments of seconds to know roughly what their position is.

It is good practice when starting up a boat with trim tabs to get into the habit of adjusting the trim tabs to their uppermost position so that they have no impact. They can then be introduced as necessary.

Other benefits of trim tabs and sometimes outdrive/outboard trim are:

- They may be helpful to get a craft onto the plane. While adjusting trim should not be necessary to help a craft get onto the plane, with some, tabs/trimming down to lift the stern makes a positive difference.
- Improving slow-speed tracking in marinas. Lowering the bow engages more of the hull in the water at the front, making the bow less susceptible to being blown off course. The disadvantage is increased drag and the risk of damaging the tabs if going astern.
- Trim tabs (or individual leg trim if there is a twin outdrive/outboard arrangement) can be used to steer the craft if there are steering issues.

Experiment with your trim tabs and leg trim in varying conditions and at different speeds to see what works best.

Tip – If you have trim tabs and the ability to trim the drive leg, then try to keep it simple. Use power trim for fore-and-aft trim and trim tabs for side-to-side trim.

Chapter 10

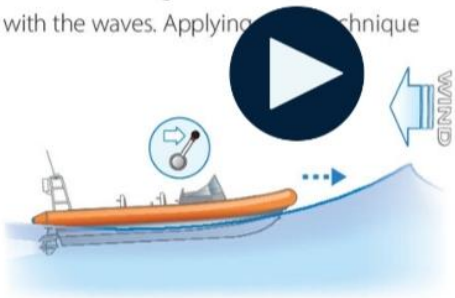
Challenging Conditions

Every boater at some stage faces conditions beyond what they usually experience. As Skipper, keeping you, your crew and your boat safe is essential, so understanding how to deal with these more challenging conditions a little bit better is beneficial.

While boating in rougher conditions can be great fun, it is the responsibility of the Skipper to ensure that the boat, crew and they themselves are set up and capable of dealing with the conditions likely to be faced. A Skipper should not knowingly set out into conditions that place the craft at risk and may necessitate assistance from the rescue services. Rougher conditions will give rise to significant shock loads both on the craft and the crew, and major injuries have occurred because a Skipper has failed to adjust how the craft is being driven to the conditions. A good Skipper knows when to stay ashore and when to change a plan.

In rougher conditions try to match your speed and direction to waves through careful control of the throttles and steering. Jumping from wave to wave or ploughing through them can be great fun, but you, the crew and the boat will find it very wearing. Make sure that everyone has good handholds and seating positions, and that the helm is wearing the killcord.

Waves are generally generated by wind and come from the same direction. Driving into the wind therefore means driving into the waves. Driving downwind, the boat drives with the waves. Applying [illegible]chnique will improve safety and comfort.



Driving Upwind

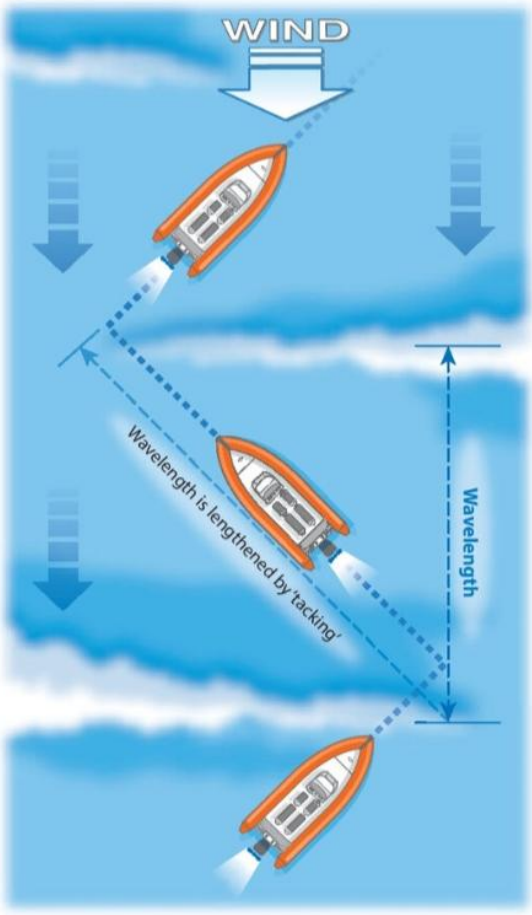
Driving upwind usually entails trimming down and driving up the face of the wave.

Ease off at the top of the wave to ensure you do not take off.

Accelerate down the back of the wave, speeding up to raise the bow as the trough is reached, then drive up the wave towards the next crest.

The ride may then become smooth and good progress made. Progress is achieved by throttling on and off as you move over the wave. Trimming down ensures that the 'V' of the hull is used to slice into the approaching wave, while applying more throttle lifts the bow in the trough to drive up the approaching wave and prevent the bow driving straight into it. This removes the need for trimming up and down to achieve the same effect.

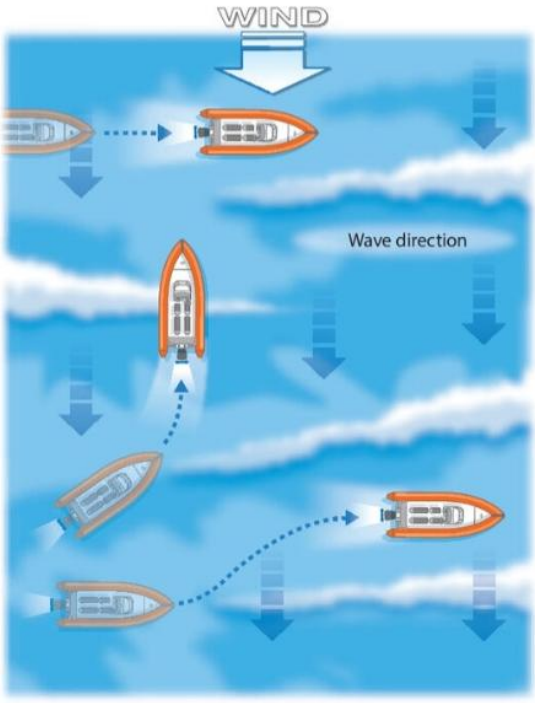
Tip – Upwind – This can be summed up as: when the bow is rising, throttle back; when the bow is falling, throttle up.



Whether this proves to be a comfortable ride depends to a large extent on the 'wavelength' (the distance between the wave crests). Shorter wavelengths can make it very difficult, as there is little time between wave crests for the helm to adjust the throttle settings. In this case, you might find it easier to drive at 30°–45° to the wave front. This increases the 'apparent wavelength' and can allow you to increase your speed and smooth your journey. You will then need to zigzag towards your destination but, while longer in distance, this method can be less stressful and may be quicker.

Beam Seas

Large breaking waves taken on the beam have the potential to capsize a boat. You should usually keep a fair speed, constantly watch for breaking waves, and then steer a path behind or in front of and away from them as conditions dictate. The speed and power of your boat is important. If you get caught on the downwind side of a breaking wave, turn into the wave and power on to climb up it, or turn away from the wave and try to outrun it.

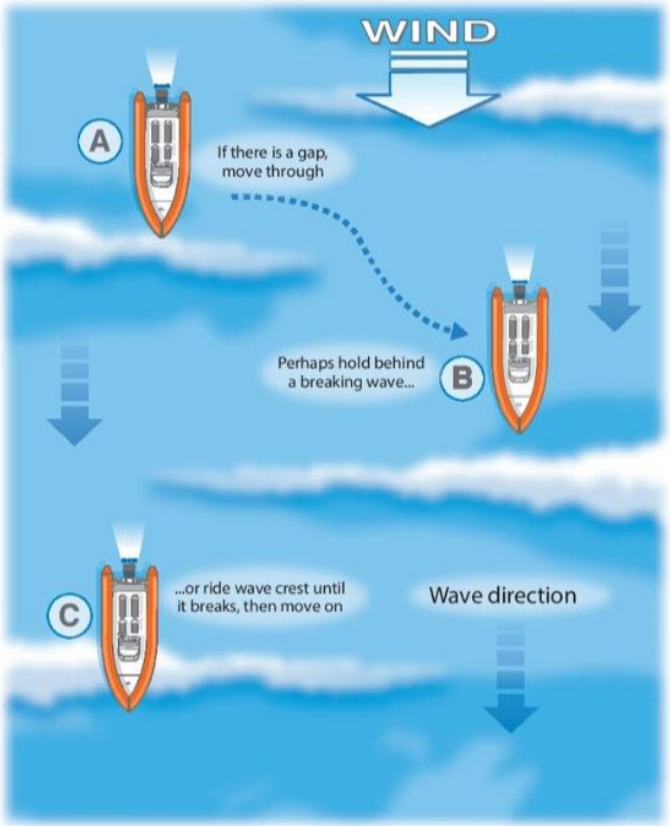


Power in Reserve

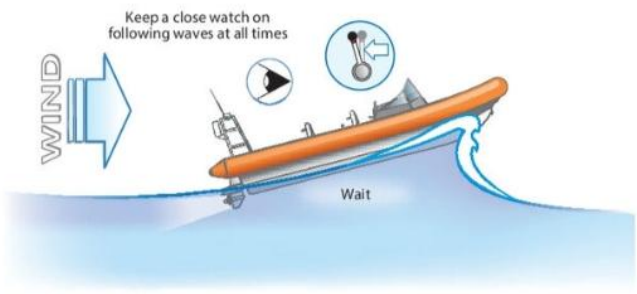
In rougher conditions, always have power in reserve to ensure you can move faster, or you risk not being able to power away from a danger.

Driving Downwind

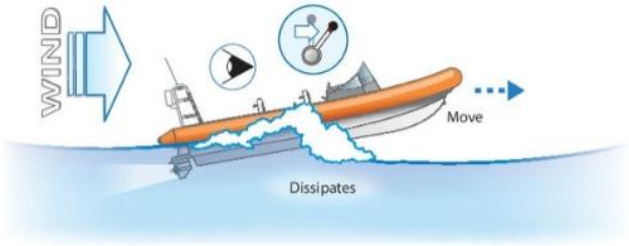
One of the most dangerous conditions for a sportsboat is a 'following sea' (the craft is running in the direction of the wind). If a breaking wave catches the vessel, the confused water catches the prop, reducing its ability to bite. The following wave may then turn the craft side-on to the waves, making a capsize almost inevitable with the next wave. To avoid this, match the boat's speed to that of the waves.



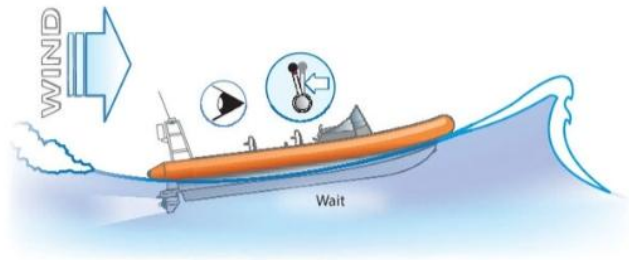
Driving too fast in a following sea can be highly dangerous. Speed tends to be too high because the sea looks flatter ahead and the wind is behind you, so there is less wind in your face and possibly less spray. If you drive too fast in a following sea you risk driving over the wave in front of you, at which stage the bow drops down into the 'hole' in front of the wave and is likely to 'stuff' into the back of the next wave. The boat will immediately stop, with the Skipper and crew thrown forward in the boat, risking serious injury. It is possible that the next wave rotates the craft beam-on ('broaching') with the risk of being rolled by the next wave.



Trim up. Ride the wave roughly one-third back from the front of the wave.



As the wave breaks, or it is clear there is no 'hole' ahead, power forward towards the back of the next wave. Be aware that if the prop is caught in aerated water it may lose grip. Throttle back and regain grip, then move on.



Areas of clear, flatter water may give the opportunity to make faster progress for short periods.

In following seas keep a really good lookout behind as fast-moving waves may catch you from there and give rise to a broach.

The conditions you experience may be magnified or reduced by the combination of wind, stream and the local environment. Wind in the opposite direction to the stream ('wind against tide (or stream)') can create short, sharp and unpleasant seas when driving upwind, yet markedly different conditions if driving downwind. Short, sharp seas can be difficult to deal with, as the helm has little time between each wave to recover and plan how to deal with the next one.

Harbour Bar

When a large sea is found at the entrance to a harbour, the conditions can get even livelier and generally should not be attempted. As the depth of water near land reduces, the waves grow in height, break earlier and more violently and the change in conditions can be dramatic.

Water-freeing Arrangements

Open vessels such as dories and RIBs are susceptible to taking large amounts of water onboard in rough conditions. If you have a craft like this then ensure that the arrangements to remove this water rapidly are adequate. As crew move to one side of a vessel then water onboard will move to that side, potentially leading to a rapid loss of stability and perhaps the capsize of the vessel.

Chapter 11

Man Overboard

A person falling overboard ('MOB') is potentially a life-threatening situation and an immediate call to the rescue services for assistance is recommended. Being in contact with the rescue services early gives support for the possible medical issues that can arise after someone has entered the water unexpectedly.

If someone goes overboard:

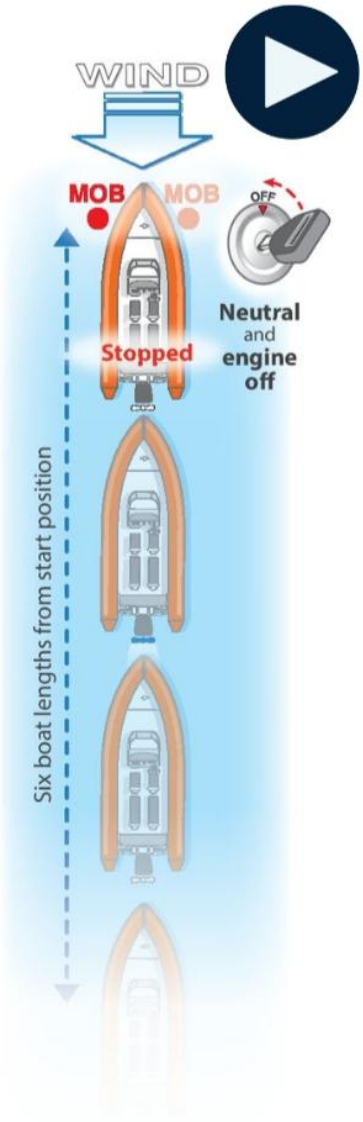
- Alert crew by shouting 'man overboard'. Press MOB button on chartplotter.
- Instruct one person to point at the MOB at all times until they are alongside the boat.
- Slow down steadily in a straight line.
- Effect a slow, controlled turn back towards the MOB.
- Determine wind direction as this directly impacts where you approach the casualty from. Identify any nearby hazards that may affect the approach.
- If feasible, deploy a lifebuoy to the casualty.
- While this is occurring, task crew to make a DSC distress alert and Mayday call.

When MOB occurs at higher speeds, steadily slow down in a straight line. If travelling at slow speed and the casualty falls in at the bow area, consider turning towards the person to push the propeller away from them. Select neutral immediately.

Recovery

Return to and recovery of the MOB is the most important element. Make sure you know which recovery method best suits your boat and crew. Muscles lose their strength very quickly in cold water, so do not expect much help from the MOB. Practise just in case you have to do it for real one day. Below are two methods to approach the casualty.

Tip – Forget tide/stream for an MOB approach as both you and they are drifting in it. Use the wind.



Method 1 – Into the Wind

- Position the craft six boat lengths directly downwind of the casualty.
- Alternate between ahead and neutral to keep speed to minimum, but with enough momentum to retain control of craft. Slightly offset to right or left so that the MOB will arrive just to the side of the craft.
- At one boat length short, a final application of ahead should move you into position alongside the MOB without the need for astern.
- Switch off the engine.*
- Grab hold of the MOB or deploy a throw line to them.
- Assist the MOB to an area of the boat where they can be recovered.

Advantages

- Suits smaller craft with low freeboards, such as RIBs and dories.
- Allows waves to be taken head on.

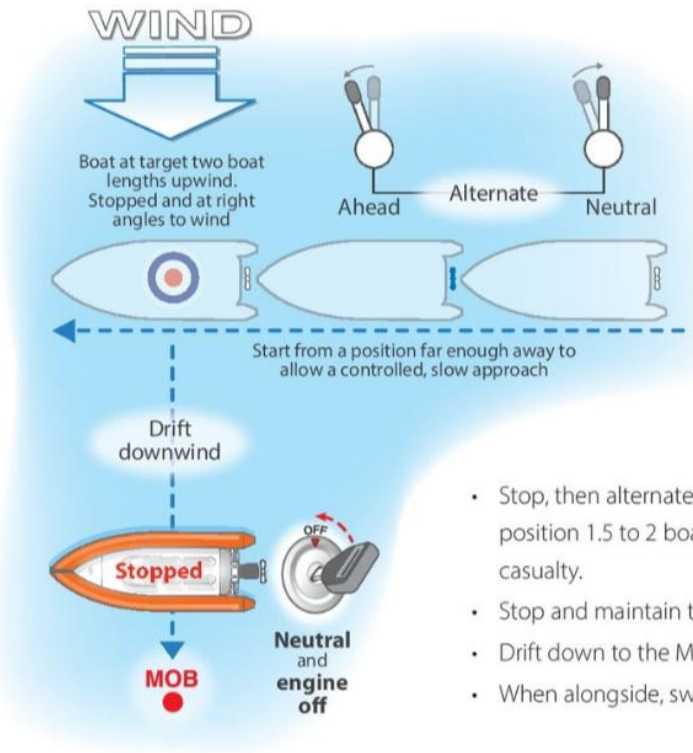
Disadvantages

- Can lose sight of MOB under the bow.
- In rougher conditions there is the risk of a falling bow impacting the MOB.
- Can be difficult if alone in a boat.
- The boat needs to be driven until alongside the casualty.

*When alongside the MOB, the engine should be switched off. As Skipper you may decide that, due to the sea conditions or where the recovery is occurring, you need to keep the engine on. This is a decision only the Skipper can make at the time.

Method 2 – Drift-down Approach

Drive to a position a number of boat lengths to one side and two boat lengths upwind of the MOB.



- Stop, then alternate ahead and neutral to a position 1.5 to 2 boat lengths directly upwind of casualty.
- Stop and maintain the boat at 90° to the wind.
- Drift down to the MOB.
- When alongside, switch off engine.*

Advantages

- Suits vessels with a high bow, where sight will be lost of the MOB using method 1 and where getting hold of them at the bow area is difficult/impossible.
- Greater target and collection area – the whole side of the vessel.
- Provides some shelter to the MOB.
- Allows the MOB to be quickly positioned to the recovery area, where the freeboard is lowest.
- Once directly upwind of MOB, the only need is to keep beam-on to the wind, allowing communication with rescue services, deployment of throwlines and lifebuoys etc.
- Works well in rougher conditions up to the point where waves are breaking, when being beam-on may be too dangerous.

Disadvantages

- Can be uncomfortable beam-on to sea.
- Smaller craft and RIBs with tubes clear of the water may be blown onto/over MOB.

*When alongside the MOB, the engine should be switched off. As Skipper you may decide that, due to the sea conditions or where the recovery is occurring, you need to keep the engine on. This is a decision only the Skipper can make at the time.

Causes and Prevention

An MOB is a life-threatening situation. A good Skipper managing their craft assertively can minimise the chances of an incident occurring.

- At slow speeds, sharp throttle movements can catch people unawares. Brief crew before speeding up and ensure they hold on.
- Don't let your crew leap off the boat onto the pontoon. Teach them how to use the lasso technique.
- At higher speed, ensure crew are seated and holding on. Beware of sudden wheel movements.
- Young children need full-time supervision.
- The procedure for dealing with an MOB should form part of the safety briefing. Ensure all crew know how to issue distress signals or calls and deploy life-saving appliances.

Recovery of Man Overboard

The easiest way to recover a person into a craft will vary considerably between vessels. Methods include:

RIBs	Sportsboats
• Deploy boarding ladder. • Use line to create step. • Deflate tube to reduce freeboard. • Use outboard/outdrive (in calm conditions) as a step and the 'A' frame as a handhold.	• Deploy boarding ladder. • Deploy dinghy or liferaft (if carried) at stern. • Use line in area of swim platform to create step. • Use outboard/outdrive (in calm conditions) as step.

Aftercare of Casualty

It is always wise to seek specialist advice when a person has unexpectedly entered the water. Contact the Coastguard for assistance.

Chapter 12

Helicopter Rescue

If you or your crew require emergency evacuation a helicopter may be sent to your assistance. It is most likely that a helicopter crew will seek to undertake a 'high-line' transfer, but helicopter procedures do differ from country to country.

- Before the helicopter arrives prepare your boat for its arrival and secure all loose items.

- The helicopter pilot will make contact by VHF and brief what will happen. Lifts from small craft are usually undertaken with the boat static, but with larger craft you may be given a heading and speed. Typically this will be into wind at about 10 knots.

- If asked to steer a course it is important to keep to it without deviating, but do not assume that the pilot is aware of any shallow areas – you are the Skipper and are in charge.

- A weighted line is lowered. Let it earth in the water to release any static. Do not attach it to the boat. Gather the line in to guide the winch person to the boat. Gloves are useful.

- Coil the line; a bucket is useful.

- The winch person will land on deck, unhook and assess the situation. They will direct you as necessary.

- If the casualty needs to be removed from the boat the winch person will take the casualty off. You will use the weighted line to control their swing. Do not let it snag on anything.

Chapter 13

Towing on the Water

Good seamanship dictates that, where possible and safe, you should come to the aid of a boater in distress or needing assistance. Often this amounts to a request for a tow from a stricken powerboat or yacht. However, the safety of your own crew takes priority, so only undertake a tow if you and your craft are capable of doing so.

There are two ways of setting up a tow:

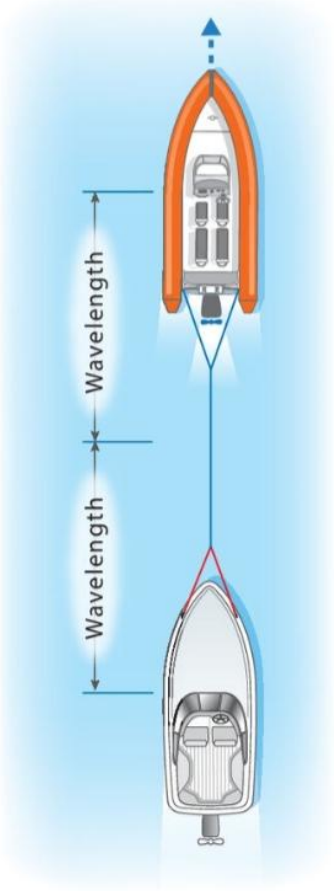
Long tow: The towed craft is attached to your own by a long line. This is suitable in areas of open water away from other craft.

Alongside tow: When you are close to other craft (perhaps entering a marina) or on a confined river, where greater control of the towed craft is required.

Long Tow

- Use the longest line practical, as it acts as a shock absorber between tug and tow and reduces the strain on fittings.
- Form a short bridle around your transom. Doing this utilises the strongest points, spreads the load and centres the pull.
- The disabled vessel should either tie the tug's line to their D-ring on the bow, if fitted, or onto a bridle led from their two forward cleats.
- The length of the line should allow the vessels to be twice the distance between wave crests or troughs. This ensures that both boats ride the waves together and reduces snatching.
- Snatching can be reduced by hanging a weight, such as an anchor, from the centre of the towline.
- The Skipper of the towed craft can steer to help the tug.
- If the towed craft is veering around as it is being towed, ask the Skipper to move the weight aft or drag warps, etc. to give the stern drag and stability.
- Stay clear of main shipping lanes and channels.

The speed of the tow will be determined by the sea state and the power of the towing craft. Maintaining a low speed of 5–8 knots is best and reduces strain on both craft.

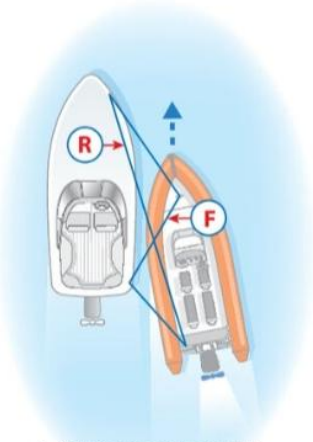


Alongside (or 'side') tow

The key to a successful side tow is correctly setting up the position of the craft relative to each other and ensuring that suitable lines are rigged between them.

Key points:

- Fender the boats well.
- The rudder or engine of the towing vessel should be set well behind the stern of the towed craft.
- The towed craft should be angled slightly into the towing vessel.
- The spring line between the bow of the towing vessel and the stern of the disabled craft takes virtually all of the strain when towing forward. The spring from the rear of the towing vessel to the bow of the disabled craft does so when towing in reverse.



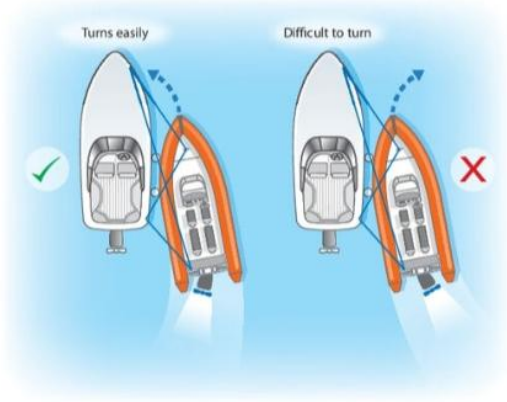
- Towing vessel 'angled in'
- Towing vessel well astern
- Spring 'F' takes load in forward.
- Spring 'R' in astern.

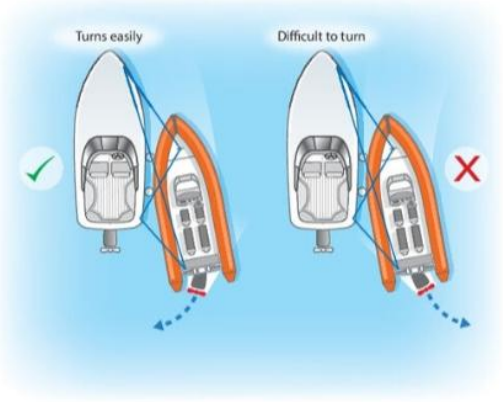
Being Towed

If you need a tow, ensure:

- The tow craft is capable of the tow – a four-metre speedboat might be keen to practise towing on your eight-metre cruiser, but is it safe?
- Agree the terms of the tow prior to accepting assistance.

Manoeuvring





The two tied vessels have distinct handling characteristics. Once you understand these, precise towing is quite straightforward. Think of the set-up as a twin-engine craft with only one engine working. The outside engine on the turn has the greatest leverage.

Turns easily = small turning circle.
Difficult to turn = large turning circle.

Chapter 14

Knots and Ropework

You do not need to know how to tie a large number of knots, but make sure you can tie a few knots well.

Bowline (pronounced 'bow-lyn')

This is probably the most useful knot to be able to tie, and has a variety of uses:

- The loop can easily be draped over a bollard, tow ball or cleat.
- Two bowlines can be easily tied together joining two lines.

It cannot be untied under load but is easy to undo.

Round Turn and Two Half-hitches

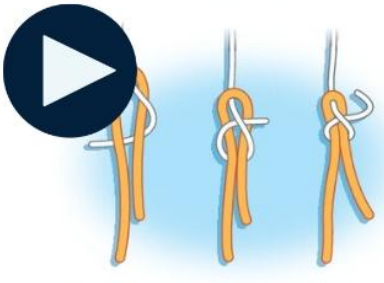
This is useful for tasks such as tying to a mooring buoy or ring. It is also very useful for tying fenders onto rails, and tying covers down tightly.

One of the key benefits of the knot is that once the turn is on, the knot can be tied and untied while under load.

Clove Hitch

Generally used for tying fenders on (as it is easy to raise and lower the fender height) for shorter periods, as it may come loose if the load is intermittent. For longer periods, use a round turn and two half-hitches. A clove hitch is also good for securing to bollards.

This knot should only be used under low loads, as it can jam and be hard to undo.



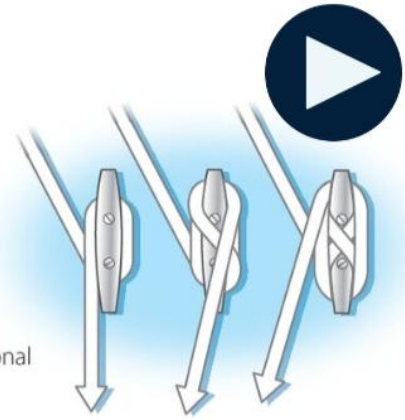
Sheet Bend

A useful knot to join two lines together – for example to extend a mooring line.

Threading the smaller rope (in the image) through a second or third time creates a safe knot less likely to come undone.

Safety – Never wrap a line around your hand as it could cause injury if the line comes under load.

Taking a Turn and Tying to a Cleat

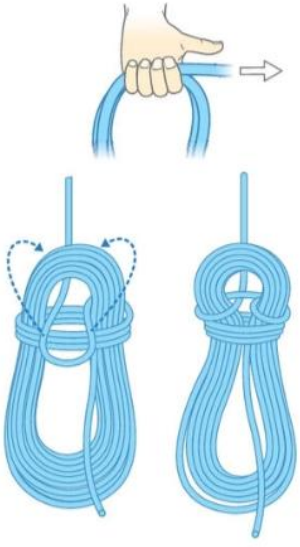


Because ropes (also known as 'warps') can be under a large load, keep hands/fingers well clear of the cleat.

Take a full turn around the cleat as this takes the load while still allowing the warp to be eased or taken in.

After the turn, apply one or two figures of eight around the cleat. If you wish, you can then apply a locking turn. Additional line should be neatly stowed alongside or around the cleat.

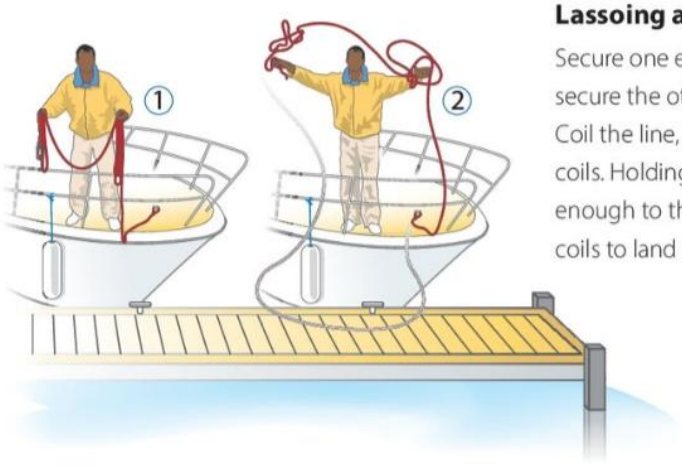
Coiling and Stowing a Line



Open your left palm and lay equal-sized coils into it. As each coil is laid, turn the line clockwise between your thumb and forefinger. This has the effect of creating neat coils. Finish off by wrapping the line around the coil. There are different ways of then securing the coil. A common method is to thread the end through the top coil, allowing the line to be hung from a rail. Whichever method you use on your craft, ensure all lines are stowed in the same way to ensure rapid deployment when necessary.

Throwing a Rope

Coil the line as described above. Separate the single coil into two smaller coils. Ensure that the end of the line is secured, and then throw the coil. Allow the other coil to play out from an open palm.



Lassoing a Cleat

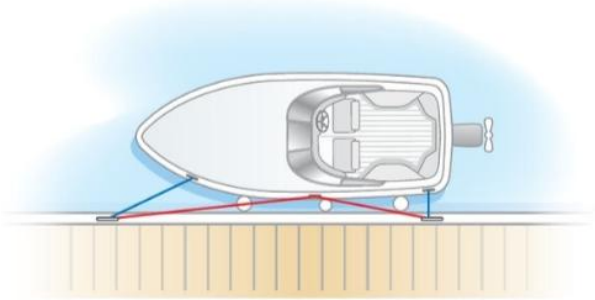
Secure one end of the line to the cleat onboard and secure the other end by standing on it or holding it. Coil the line, then separate the coils into two smaller coils. Holding one coil in each hand, when close enough to the cleat you intend lassoing throw both coils to land either side of it.

Most ropes are available in a variety of colours. Chandlers can insert loops into the ends of lines to assist with mooring, or to attach lines permanently to fenders should you wish.

Types of Rope

	**3-strand polyester** Many versions of polyester come 'pre-stretched'. These are not very good for anchoring or mooring. Polyester is hard wearing.
	**3-strand nylon** Has excellent stretch properties, is good for mooring, anchor lines and towing.
	**Dockline** A nylon line with a harder-wearing polyester cover that is generally used for mooring.
	**Anchorplait** High elasticity and ease of coiling into an anchor locker make this an excellent choice for anchor lines. Is also used for mooring lines.

What Lines Should You Carry?



The lines a craft should carry will vary, depending on whether it moors regularly in a particular location or needs to be able to moor in various locations and against harbour walls in tidal locations. Often two lines each the length of the craft are suitable as bow and stern lines, while a line twice the length of the craft works well as a spring line. If mooring in locations with larger tidal ranges and not alongside a berth that rises and falls with the tide, then bow and stern lines twice the length of the vessel make sense, with a couple of spare lines twice the length of the craft.

A chandler will guide you in terms of the diameter of line you need for your craft, but for powerboats it will tend to be 10–12mm with thinner lines for fender lines. See chapter 8 for advice on the length of anchor lines. As a guide, these will tend to be 12–14mm in diameter. A spare long line to double as a tow line or an extension for the anchor line is always a wise investment.

Chapter 15

Collision Regulations

How craft avoid each other at sea is covered by the International Regulations for Preventing Collisions at Sea ('IRPCS') – also known as the Collision Regulations, or Colregs. Irrespective of whether you are new to boating or highly experienced, these rules apply to you as Skipper of a craft and you have a responsibility to understand and apply them.

A Skipper has a legal responsibility to follow these rules. Most are common sense. For example:

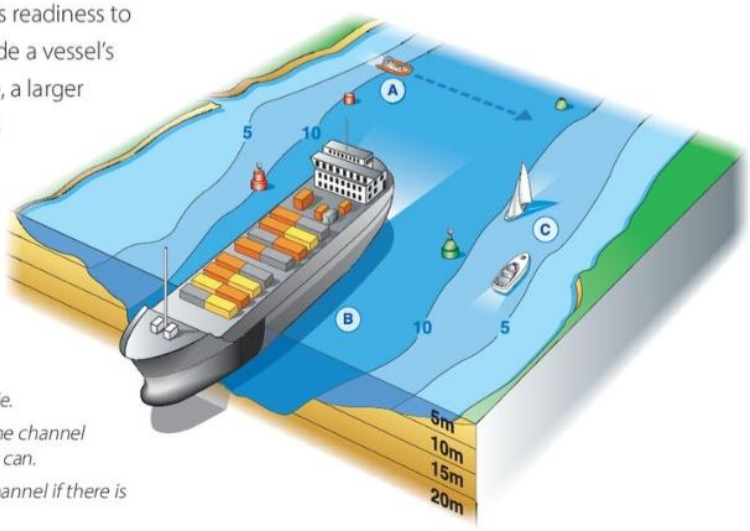
- You have a responsibility to follow the rules.
- You must keep a good lookout.
- You must avoid a collision by taking clear and obvious actions.
- Always use a safe speed.

Because powerboats are very manoeuvrable, they usually give way to all other types of craft (e.g. sailing boats, rowing boats, fishing vessels, vessels restricted in their ability to manoeuvre or not under command).

The first question is 'Does a risk of collision exist?' If there is a risk, then both Skippers have responsibilities. One is deemed the 'stand on' vessel and the other the 'give way' vessel. If both obey the rules this works well. However, there is no absolute right and wrong, and you both have a duty to avoid a close-quarters situation or a collision.

Common Sense

A four-metre powerboat and a supertanker at sea are governed by these rules. However, discretion is the better part of valour. Common sense dictates that it is far better to keep well clear of a potential collision situation than test the larger craft's readiness to give way. Other factors may impede a vessel's ability to manoeuvre. For example, a larger vessel might be constrained by its draught in a narrow channel and unable to turn, or a vessel may be restricted in its ability to manoeuvre, towing, trawling or dredging.



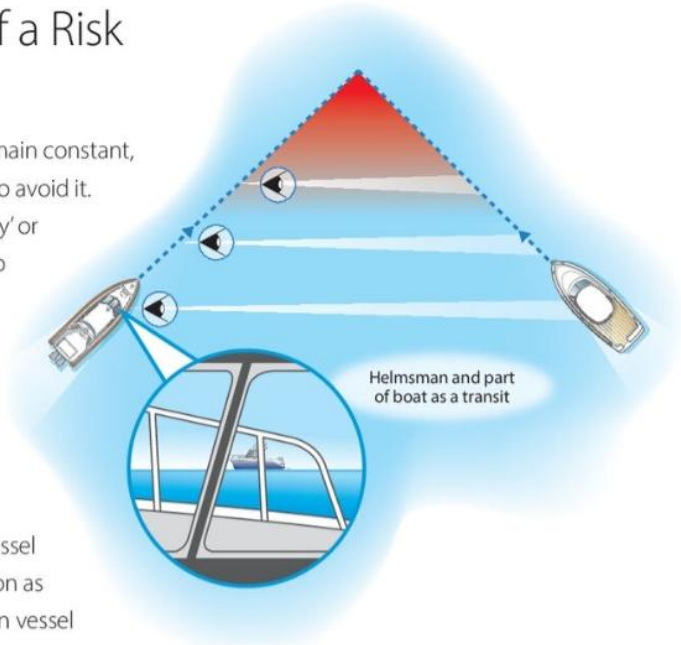
A – The RIB is crossing the channel at right angles to cross as quickly as possible.

B – The large craft can only navigate in the channel and will stay as far to the right as it safely can.

C – Smaller craft can keep outside the channel if there is enough depth.

How Can You Predict if a Risk of Collision Exists?

If relative bearings between two vessels remain constant, a collision will occur unless action is taken to avoid it. Irrespective of whether you are the 'give way' or 'stand on' vessel, you have a responsibility to avoid each other and must take every precaution to avoid a collision.



Stand-on v. Give-way

Stand-on vessel: The vessel that initially should maintain its course and speed but keep a very close watch on the give-way vessel to ensure that it is applying the rules. As soon as it becomes obvious that it isn't, the stand-on vessel must take action to avoid the collision.

Give-way vessel: The vessel that the rules dictate should manoeuvre to keep well clear of the stand-on vessel.

In the collision regulations there is no such thing as 'right of way'. Ultimately all craft must take action to avoid a collision at all costs.

Who Gives Way to Whom?

Powerboats are more manoeuvrable than most other craft so are deemed to be the 'give-way' vessel to:

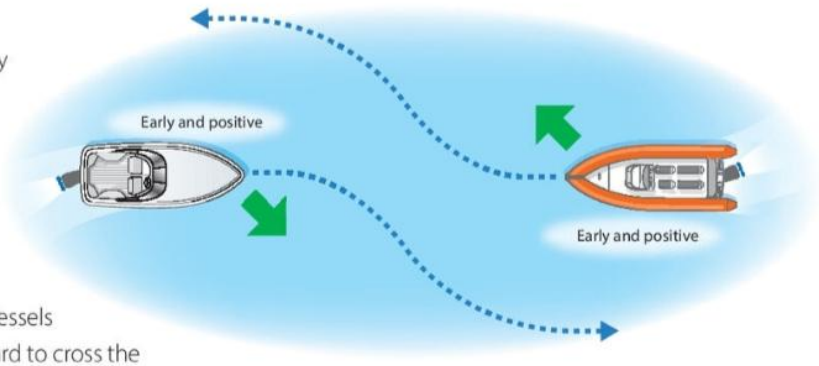
- Anything small, such as a rowing boat, a kayak etc.
- Sailing craft under sail alone. This includes windsurfers and sailing dinghies.
- Power-driven craft constrained by their draught – generally a large vessel in a narrow channel with shallow water either side.
- Power-driven craft restricted in their ability to manoeuvre – a vessel either towing another craft or engaged in an activity like dredging.
- Power-driven craft engaged in fishing or trawling.
- A vessel 'not under command', lacking the ability in some way to control its movements properly.

The regulations allow you to alter your speed or course to avoid collision, but, where sufficient sea room exists, an alteration of course is the preferred option.

Power v. Power

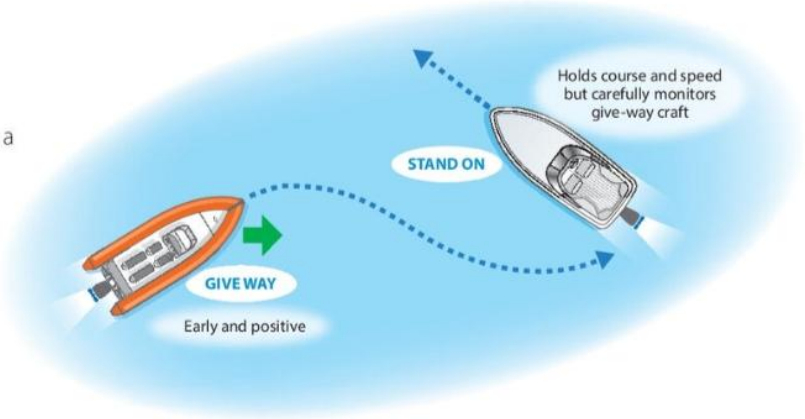
In a powerboat many of our interactions will be with other power-driven craft.

Head-on



Both vessels must make an early and obvious turn to starboard to ensure the vessels pass well clear of each other. If craft are heading towards each other but will clearly pass 'starboard to starboard' then no risk of collision exists. Vessels should avoid turning to starboard to cross the path of the other vessel (creating a risk of collision) to then avoid it.

Crossing Situation



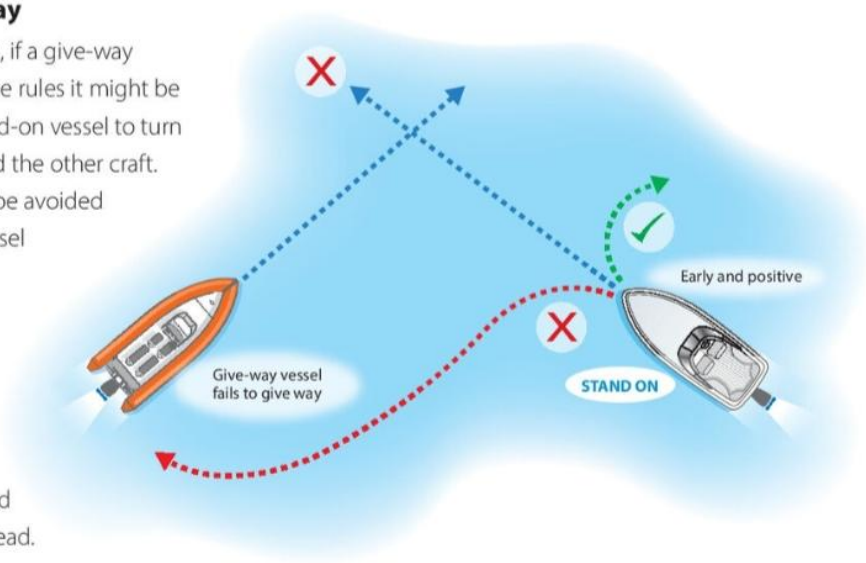
Give-way or Stand-on?

- You are the give-way vessel in a crossing situation if you see the other craft approaching from the starboard (right) side. If it is approaching from port (the left) then you are the stand-on vessel.
- At night you would see red (give-way) or green (stand-on) aspect lights.

The stand-on vessel should hold its course and speed (but continue to monitor carefully what action the other vessel is taking), while the give-way vessel should alter its course, and probably speed, to pass well clear of the other vessel.

Failure to Give-way

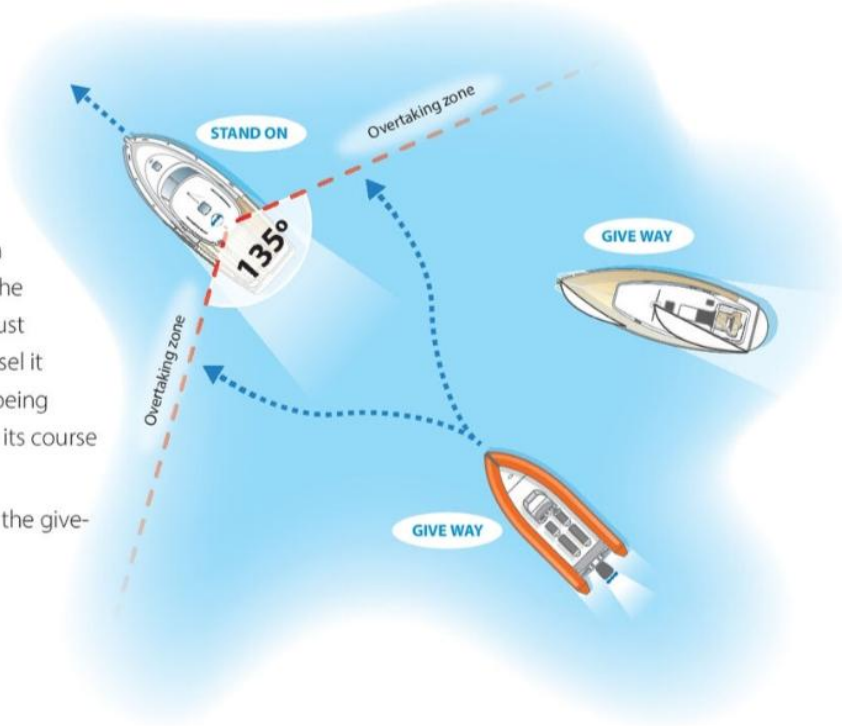
In a crossing situation, if a give-way vessel fails to apply the rules it might be tempting for the stand-on vessel to turn to port to pass behind the other craft. Turns to port should be avoided as, if the give-way vessel belatedly applies the rules and turns to starboard, the risk of a collision is considerable.
The stand-on vessel should slow down and turn to starboard instead.



Overtaking

An overtaking vessel (one which falls within an arc of 135° at the rear of the craft being overtaken) must keep well clear of the vessel it is overtaking. The vessel being overtaken must maintain its course and speed.

All vessels overtaking are the give-way vessel, even if they are vessels under sail.



Giving Way to Vessels Under Sail

- Powerboats, unless being overtaken, must give way to vessels under sail.
- Keep well clear of sailing vessels as they may make large adjustments to their course as they 'tack' or 'gybe'. Remember, your wash can seriously disturb smaller craft.
- A yacht sailing with the assistance of its engine is 'motor sailing' and should display a cone with the point facing downwards in the rigging. The yacht is then classed as a power-driven vessel under the rules.

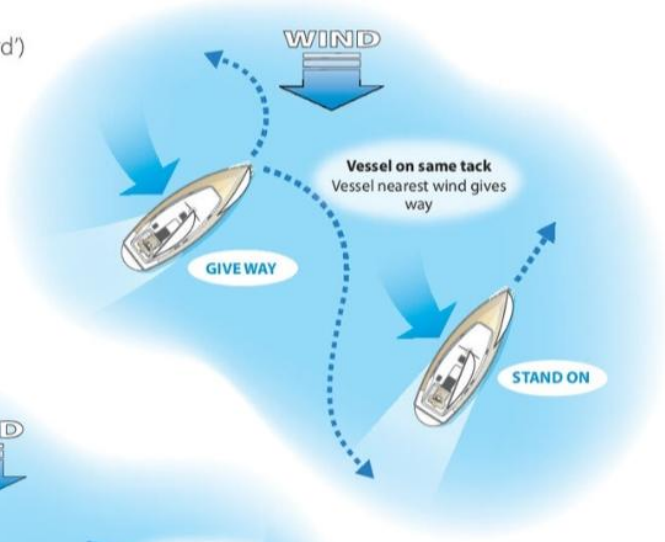
Knowing under what circumstances sailing vessels give way to each other can help you decide what action to take when you are approaching them.

Sailing vessels cannot sail directly into wind and therefore use a zig-zag course (tack) upwind.

Whether a sailing vessel is the give-way or stand-on vessel is determined by which 'tack' it is on. The tack a yacht is on is indicated by looking at its sails, and by which side of the yacht the wind is blowing into. If the wind is blowing into the sails over the port side of the craft then it is on 'port tack'. If the wind is blowing over the starboard side into the sails it is 'starboard tack'.

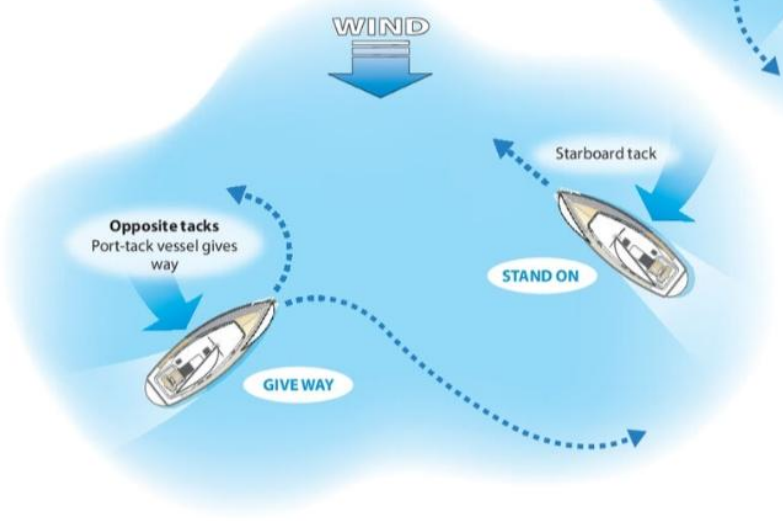
Yachts on the Same Tack

The yacht nearest the wind ('to windward') gives way.



Yachts on Different Tacks

A yacht on port tack gives way to yacht on starboard tack.



Restricted Visibility

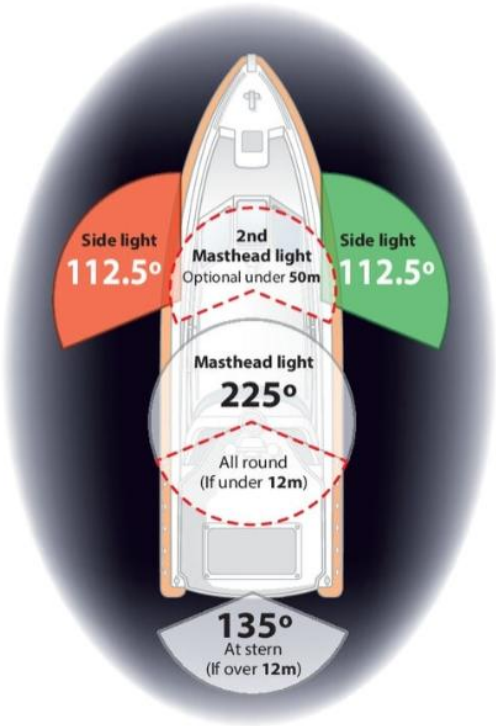
The rules, as described for the interaction between vessels, relate to craft 'in sight of each other'. If one or both vessels are in an area of restricted visibility (typically fog) then these rules cease to apply and another rule comes into play. This rule is known as 'Conduct of vessels in restricted visibility'.

Smaller powerboats operating without radar should avoid being afloat when there is any chance of restricted visibility. If caught out, then generally they should ensure all crew are wearing lifejackets, sound the appropriate sound signals, share lookout and listening duties to detect other craft, operate at minimum speed, make for shallow water away from large craft, and anchor until visibility improves.

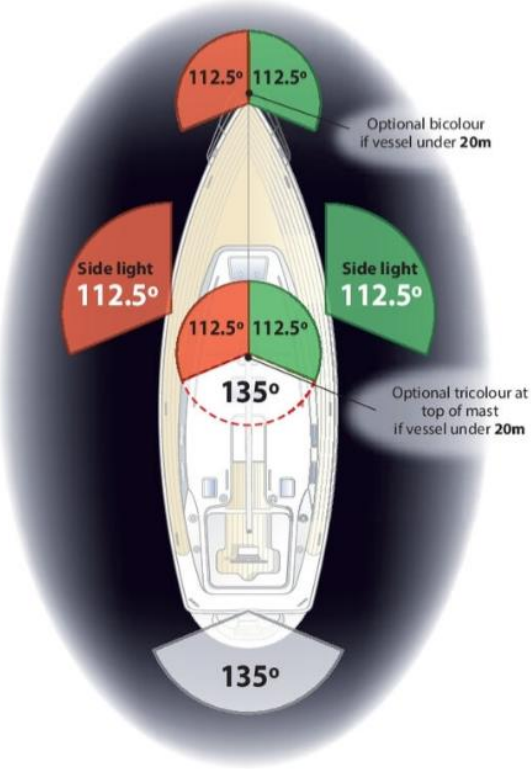
It is a requirement of the rules to use radar if fitted, so it is sensible to attend a course to learn how to make best use of it.

Lights, Shapes and Sounds

At night, vessels display navigation lights to indicate the type of vessel, and the position of the lights helps indicate the vessel's direction. By day, shapes are hoisted to indicate what the vessel is doing.



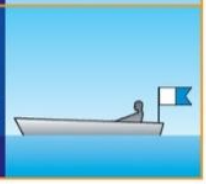
Power-driven craft

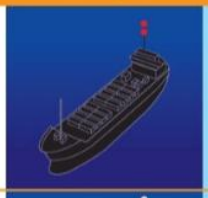
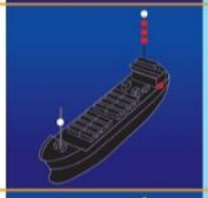
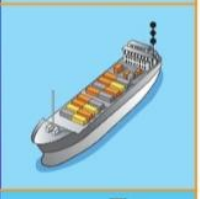


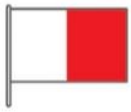
Vessel under sail

Fog signals

— One long blast (4–6 seconds) ∘ One short blast (one second)

	At night	By day
A vessel under seven metres and seven knots. A single white light could also be a vessel at anchor or a vessel seen from astern.		
A powered vessel under 50m shows port and starboard lights and either a white masthead light and a white stern light or, if under 12m, a single all-round white light. Fog — every two minutes.		
A powered craft probably over 50m displays two masthead white lights – the forward one lower than the one at the stern – a white stern light and its port and starboard lights. Fog — every two minutes.		
A yacht under sail either shows a tricolour, or port and starboard lights plus a white stern light. If the engine is used, it becomes a power vessel and must display the appropriate lights. Its day shape when motor sailing is a cone pointing downward. Fog — ∘ ∘ every two minutes.	 	
At anchor, for vessels under 50m only one white light is required. The day shape is a black ball. A vessel over 50m at anchor displays two white lights, with the stern one lower than the bow one. In fog at anchor: <100m Rapid ringing of bell for five seconds every minute. >100m Bell rung forward, gong aft for five seconds every minute.	 	 
Code flag A indicates a vessel engaged in diving operations – keep well clear. At night 'restricted in ability to manoeuvre' lights might be shown.		

	At night	By day
A vessel 'not under command', (perhaps a vessel adrift with no means of propulsion) displays two all-round red lights at night or two balls in daylight. Fog — ∘ ∘ every two minutes.		
If constrained by draught the vessel displays additionally three all-round vertical red lights or a cylinder during the day. Fog — ∘ ∘ every two minutes.		
A vessel 'restricted in ability to manoeuvre' shows an additional all-round red-white-red combination of lights at night and ball-diamond-ball in daylight. Fog — ∘ ∘ every two minutes.		
A vessel engaged in fishing (but not trawling) displays an additional all-round red light above its all-round white. Two cones apex together by day. Fog — ∘ ∘ every two minutes.		
A vessel trawling displays an additional all-round green light above its all-round white. Two cones apex together by day. Fog — ∘ ∘ every two minutes.		
A vessel involved in dredging shows 'restricted in its ability to manoeuvre', plus two all-round vertical reds to show which side its gear is out and two all-round vertical greens showing the side that is safe to pass. In daylight, diamonds indicate the safe side and balls indicate the side not to pass.		
A vessel towing displays an additional white masthead light if the tow is less than 200m, or two additional white masthead lights if it is greater than 200m. By day diamonds are shown if the tow is greater than 200m. Fog — ∘ ∘ every two minutes for both types.	   	

	At night	By day
A flashing orange light is seen on vessels that travel in non-displacement mode – examples include hovercraft or very fast passenger ferries.		
A pilot vessel displays an all-round white over red plus its aspect lights and displays a red and white flag in daylight.		
A minesweeper shows three all-round green lights in a triangular pattern at night or three balls in daylight. Fog — ∘ ∘ every two minutes.		

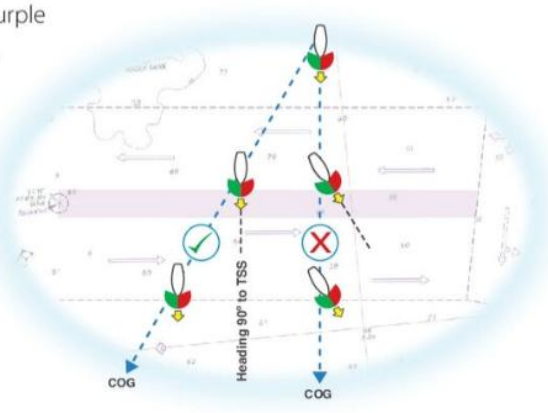
Sounds can be used to indicate what a vessel is about to do. You should have the equipment onboard to make them.

One short blast	○	I am turning to starboard.
Two short blasts	○○	I am turning to port.
Three short blasts	○○○	My engines are going astern – this does not necessarily mean the craft is going backwards.
Five or more short blasts	○○○○○	I don't understand your intentions – perhaps better known as "What on earth are you doing?"

Traffic Separation and Precautionary Areas

Traffic separation schemes are denoted on a chart by purple shaded areas. Arrows on the chart denote the direction of the shipping lane. Traffic separation schemes separate large vessels in areas of heavy traffic. Always keep your vessel at right angles to the scheme so that you show the correct aspect to oncoming traffic.

Some areas with regular large-vessel movements require smaller craft to obey additional rules – particularly about keeping clear. A chart or almanac details these rules.



Chapter 16

Buoyage

Buoyage is generally found close to shore in harbours and estuaries and exists to alert you to safe routes and dangers. To understand how buoyage impacts your boating you should always consult a chart, as buoys marking a channel do not necessarily mean there is enough water for you to transit the channel at any state of tide.

There are two types of buoyage system in operation around the world – IALA A and IALA B. The only difference is that the colours of the lateral/channel buoys are reversed for IALA B. All other buoys are the same. Some countries occasionally use buoyage in different ways, so consulting a chart will help you understand how they are being used.

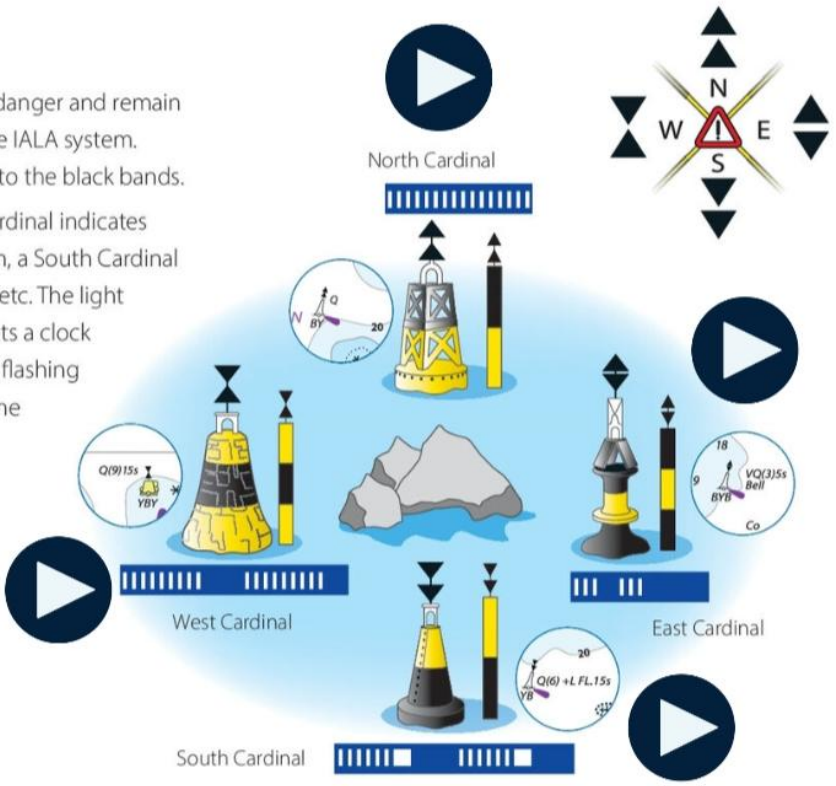
IALA A is used in Europe, Russia, India, Australia, and New Zealand.

IALA B is used in the USA, South America and parts of the Caribbean, South-east Asia, and Canada.

Cardinals

Cardinal marks warn of danger and remain constant throughout the IALA system. The cones always point to the black bands.

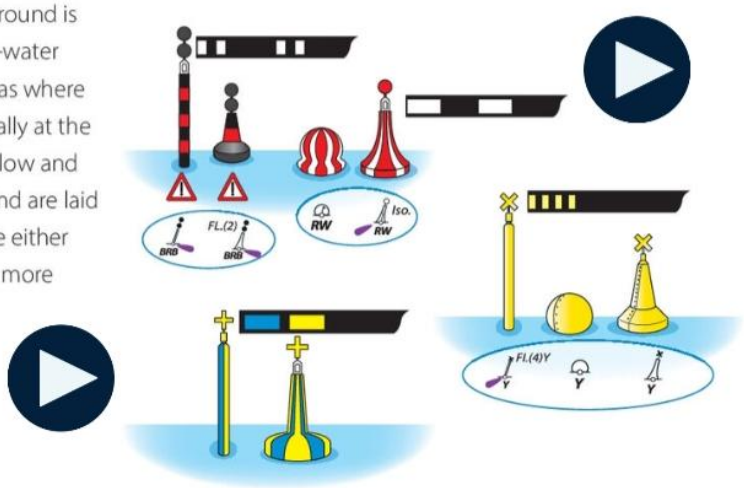
For example, a North Cardinal indicates safe water is to the north, a South Cardinal safe water to the south, etc. The light sequence at night reflects a clock face, but with the south flashing 6 short + 1 long, while the north is quick flashing continuous rather than 12 flashes.



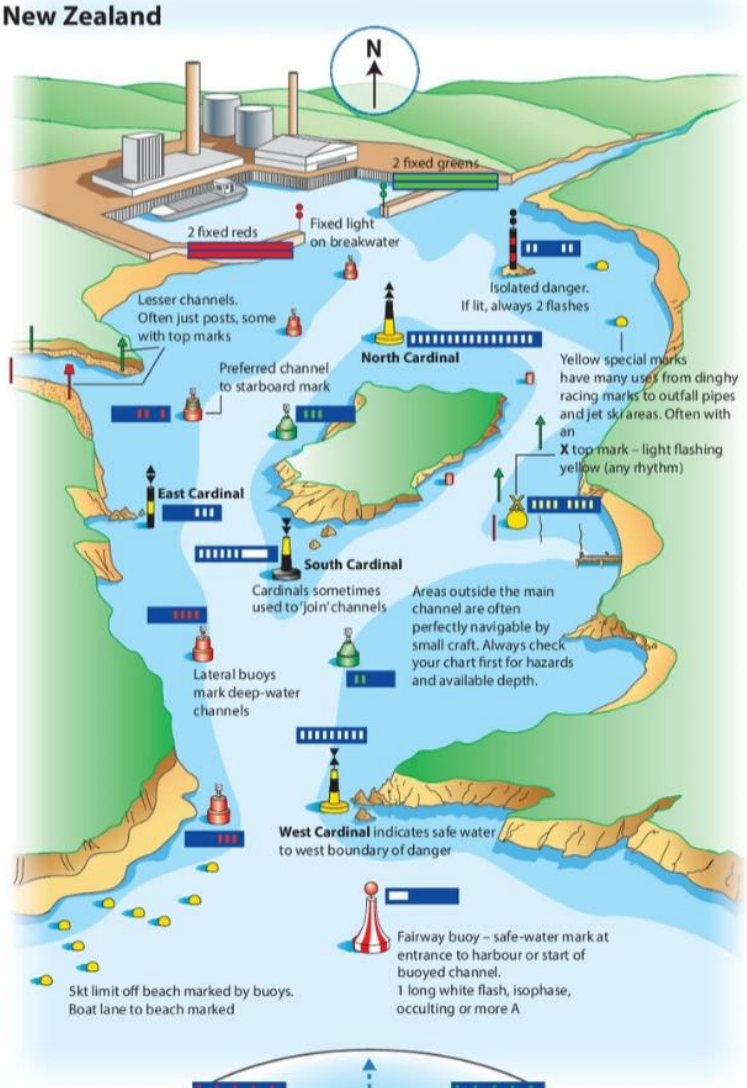
Cardinal marks may be floating buoys or beacons/posts. Beacons/posts may or may not have top marks. A chart will show you whether the buoy is relevant to your size of craft, as it may be safe to pass the 'dangerous' side of the buoy depending on the state of the tide and draught of your craft.

Other Buoyage

Special Marks (yellow) can be used for a variety of reasons, such as marking water-skiing areas, prohibited zones, racing marks, sewage outfalls and even wrecks. Isolated Danger buoys (black and red) typically mark areas of shallow water where all around is deep water, while Fairway or Safe-water Marks (white and red) identify areas where all around is deeper water – typically at the end of channels. Wreck Marks (yellow and blue) are a recent development and are laid temporarily to mark wrecks before either the wreck is lifted or marked on a more permanent basis.



IALA A Buoyage: Europe, Russia, India, Australia, and New Zealand



Lateral or Channel Marks

These are used to mark channels and may be large floating buoys (generally aimed at big ships), smaller floating buoys (for smaller channels/craft) or coloured posts with or without shaped top marks.

Lateral marks will flash the same colour as the buoy with any flash sequence except 2 + 1.

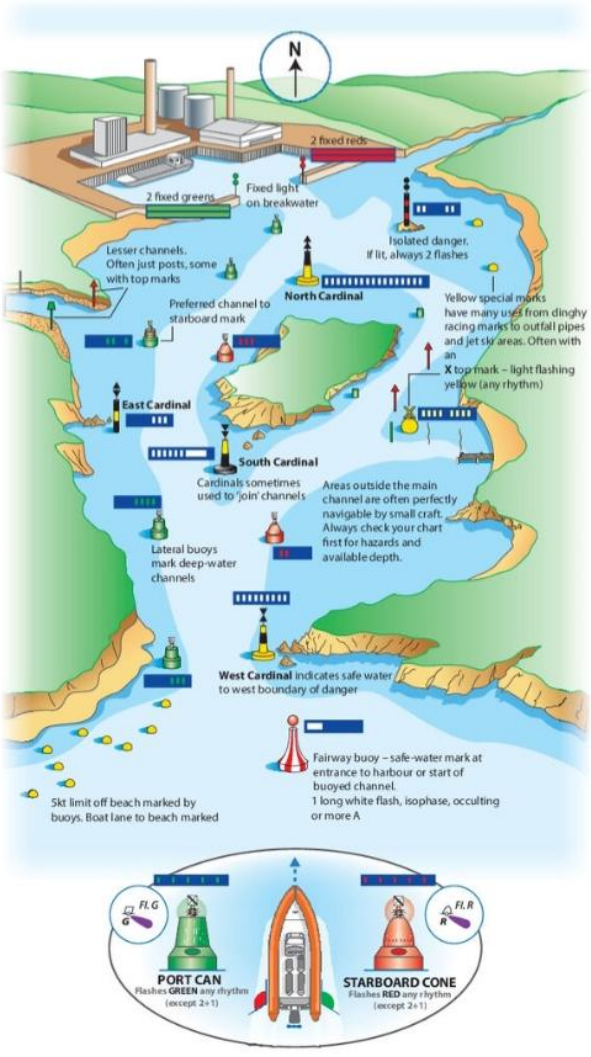
In IALA A regions, when entering a harbour the red 'cans' will be to your port side while the green 'cones' will be to your starboard side.

Preferred Channel Marks

When entering a harbour a split in a channel might be marked by a cardinal or a preferred channel mark.

The colour of the band at the centre of the buoy indicates which the preferred channel is. Green band = preferred channel to starboard. These marks may be buoys or posts and, if lit, will flash a sequence of 2 + 1 flashes.

IALA B Buoyage: USA, South America and parts of the Caribbean, South-east Asia, and Canada



Chapter 17

Navigation

Navigation is the planning and execution of a passage between two points. Being able to create a safe, effective plan, using either an electronic chartplotter, paper-based charts, or both, relies on an understanding of these charts, the information they contain, their limitations and the variety of navigation techniques that can be used.

Charts

Charts are the nautical equivalent of road maps. They contain a wealth of valuable information and are an essential item for all craft.

The vast majority of powerboaters have access to some form of electronic chart, whether it's on their multi-function display (often referred to as an 'MFD' or a 'chartplotter') or a tablet/smartphone. While the charts these systems display all derive from approved charts created by a country's hydrographic office, they are not, at this stage, guaranteed to be accurate in the way paper charts are – although errors are getting less and less frequent.

Understanding the limitations of these unapproved electronic charts is a key factor in planning and executing safe passages and so keeping those on your boat safe.

Whether you choose to navigate with an electronic chart or a paper version it's important that you understand the information a chart contains, the likely accuracy of what you are looking at, and how to ensure that the chart you are using stays up to date, reflecting the movement of sandbanks, relocation of buoys, or opening of new marinas.

For close inshore boating a few miles from your launch site in a fairly straightforward boating location, you are likely to need just a chart of the area and a source of tidal information.

Moving further afield or boating in a more challenging location will require you to have a more in-depth understanding of navigation techniques, greater chart coverage, and an almanac covering the relevant location.

Chartplotters increasingly contain a huge amount of the information needed to plan a passage, including: the charts for the area, tidal height and stream information, an almanac, useful information including links to facts about ports and marinas, satellite overlays, and even weather reports. Make sure you spend time to understand your chartplotter and the wealth of data it contains.

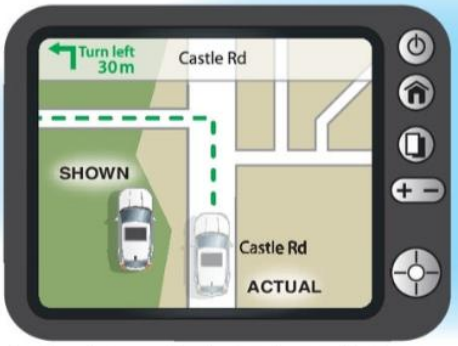
One chartplotter or two?

In the days of it just being paper charts, we were likely just to carry a single one for the area we were navigating. Today, it makes sense to build in a level of redundancy/back-up to what we do. Having a chartplotter but also a tablet/smartphone loaded with one or two charting systems, tidal apps, and weather apps gives you that comfort that, if you lose one system, others will be there for you.

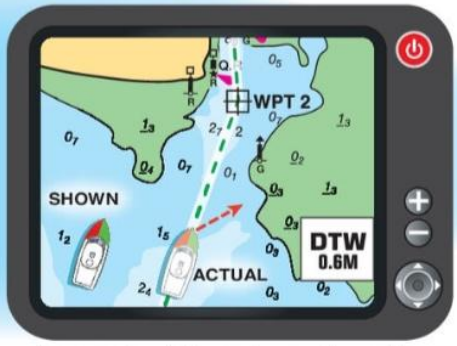
Position accuracy

How accurate is the chartplotter and how often is what it is telling you incorrect? You have probably been in a car and navigated with a 'sat nav' system. Do so often enough and there will be times when the image on the screen shows your vehicle driving along a non-existent road, through the building next to you or across an adjacent field. When driving we immediately see this as an error and ignore it because we have some clear reference points that show it is an error, so we don't correct our position.

Assuming errors occur in these systems afloat as much as they do ashore (and with smartphones/tablets undertaking multiple roles they are likely to be more susceptible to errors than dedicated units) then unless we are adjacent to clear reference points (e.g. a buoy) then we are at risk of compensating incorrectly for an error and driving into danger unnecessarily.



Position shown easily dismissed as satellite inaccuracy



Error easy to misinterpret as genuine position. May create a turn to starboard and into danger

The solution to these possible errors is relatively simple and there is no suggestion that you shouldn't use your chartplotter to navigate with. There is, though, a need to understand the possibility of errors and so adopt robust navigational techniques where, if there was a GNSS* error, it could create a real danger.

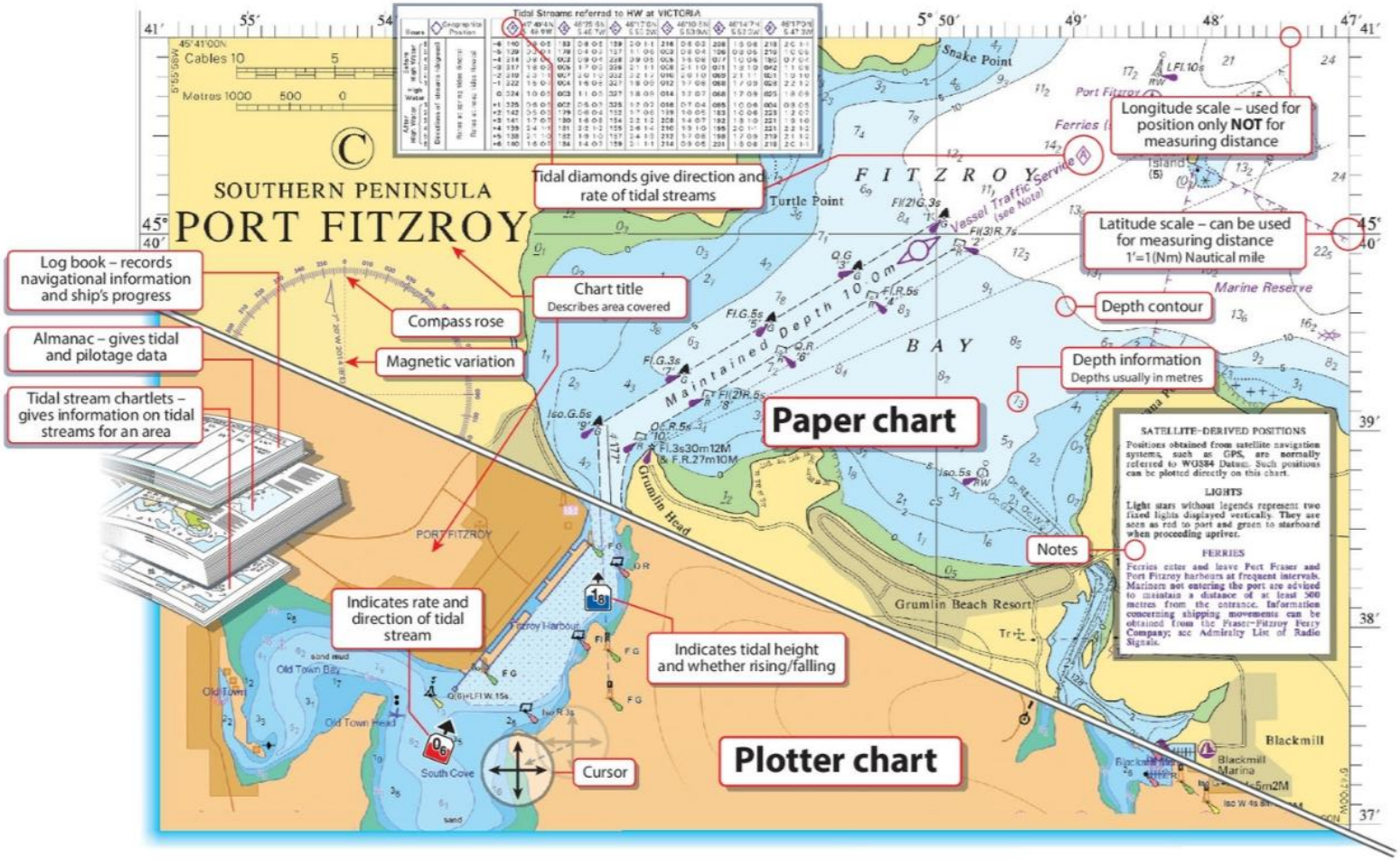
Chart Accuracy

All charts are produced from the same base data, but whereas the local hydrographic office has a legal responsibility to get their charts accurate, electronic charts are not governed by the same rules so there is a chance (albeit reducing as time goes on) of it not accurately representing all depths, features, and the position of hazards. This is why, when you switch your chartplotter on, you agree that you will not use it for navigation!

A chart is only accurate on the day that it is printed or loaded into a chartplotter. Regular updates are issued by the chart maker and are available for paper charts via the manufacturer's website or for electronic charts by downloading the update to an SD card or by linking the chartplotter to your smartphone's hotspot.

Charts contain lots of information, as shown in the illustration opposite.

Note: GNSS stands for Global Navigation Satellite System. GPS is one type of GNSS.


Log book – records navigational information and ship's progress
Almanac – gives tidal and pilotage data
Tidal stream chartlets – gives information on tidal streams for an area
Tidal diamonds give direction and rate of tidal streams
Chart title
Describes area covered
Compass rose
Magnetic variation
Paper chart
Longitude scale – used for position only NOT for measuring distance
Latitude scale – can be used for measuring distance
1'=1(Nm) Nautical mile
Depth contour
Depth information
Depths usually in metres
Notes
Indicates rate and direction of tidal stream
Indicates tidal height and whether rising/falling
Cursor
Plotter chart
SOUTHERN PENINSULA
PORT FITZROY
FITZROY
BAY
Snake Point
Turtle Point
Grumlin Head
Grumlin Beach Resort
Blackmill
Blackmill Marina
Old Town Bay
Old Town Head
South Cove
Fitzroy Harbour
Marine Reserve
Vessel Traffic Service (see Note)
Maintained Depth 10 0m
Fl.3s30m12M & F.R.27m10M
SATELLITE-DERIVED POSITIONS
LIGHTS
FERRIES

Passage Planning and Pilotage

Passage planning: The preparation of a plan that helps you navigate safely between two areas and normally relates to passages at sea.

Pilotage: Inshore navigation using buoyage, depth, lights, transits and other techniques to manoeuvre your craft safely along the coast and into or out of a harbour or marina.

Where you are going will define what will be in your plan and how you record it. A Skipper undertaking a passage needs to consider a variety of factors:

Weather

- What is it doing now and how will it change over the duration of the passage?
- How will it affect your passage (e.g. wind against stream)?
- Can you regularly update weather information during the journey?

The Route

- Ensure you have charts of a suitable scale for the route and harbours that will, or may be, entered.
- Create the route and document headings, waypoints, distances, times, speeds, depths etc.
- Record dangerous, key or useful features on route.

Tidal Heights and Streams

- Is there enough water to enter and exit the harbour and undertake the passage?
- When should the passage commence to avoid unfavourable conditions (e.g. wind against stream) and to ensure safe entry to the destination port?

Pilotage

- Plan harbour entry or exit. Note important features such as marks and lights.
- Repeat for ports of refuge.

There are many ways to record a passage plan and a Skipper must make a judgement call as to what approach best suits the passage being made. A short trip to a local bay is technically a passage but does not necessarily require a written plan if thought has gone into the passage. A 15-mile trip along the coast, though, would benefit from a fairly detailed (but simply presented) document addressing all of the above.

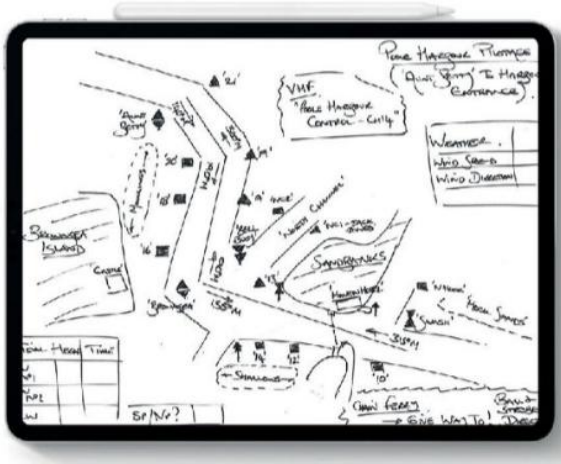
Tip – A responsible Skipper ensures that someone knows where they intend going and when they should be there. The preferred method for doing this in many locations is via an app like RYA SafeTrx – www.safetrx.rya.org.uk

Pilotage

In smaller craft most passages occur in congested inshore waters where there are numerous hazards, but also plenty of visual references to help you keep your boat on its intended route.

The best way to do this is to study a chart and almanac to create a pilotage plan containing the key details of your route.

The pilotage plan can be saved as an image in your tablet/smartphone and used alongside the chartplotter. The pilotage plan acts to confirm the information that the chartplotter is presenting, but when navigating a more challenging area the use of (for example) transits or back bearings is more accurate than relying on the chartplotter alone. Adopting an integrated multi-layered approach to navigation is really important.



Navigating using a Chartplotter

Chartplotters have become the centrepiece of most boaters' navigation 'toolbox'.

Used effectively, chartplotters can be the primary means of navigation. However, they should be used as one of a set of navigation tools and not in isolation, and their limitations need to be understood by those using them.

The GNSS receiver within a chartplotter calculates its position by reference to a number of satellites that orbit the Earth. Chartplotters come in many forms, from small hand-held units to the large, permanently fixed sets built into many boats. They are typically accurate to between 10m and 15m and, because they know where you are and where you were, they can calculate the boat's speed and course over the ground.

Chartplotters have evolved hugely and come in a variety of sizes. They can be operated by means of physical buttons, using touch-screen controls or even from a smartphone/tablet app.

Key points when using a chartplotter unit include:

- If you need to view a chart, enter information, or adjust settings, then either get your crew to do it or stop the boat in a safe place. Do not try to drive and use the plotter as you won't be keeping a good lookout.
- Invest time to read the manual to get the most from the unit. Manuals can be downloaded to smartphones, tablets, or on to the plotter to read aboard.
- Unless your screen is very large then you will need to 'scroll out' to see the big picture or 'scroll in' to see detail. Make sure you do this as the layers of detail appear/disappear as you scroll in/out.
- Electronics do fail – generally when you can least afford them to! A single chartplotter should never be your sole means of navigation and must be part of a robust multi-layered approach. Back it up with navigation apps on smartphones/tablets and pilotage plans.
- Don't forget to update the charts regularly (at least annually) using the methods previously outlined.

The electronic charts within these units are either stored on a dedicated card or are stored in the internal memory.

Handheld GPS units are available as mini chartplotters or just displaying basic data such as the unit's latitude and longitude. These basic units act as a great backup and are really useful for some of the position-fixing techniques outlined.

Navigating using Waypoints and Routes

A waypoint is a location that you have chosen on a chart. Some waypoints are used individually to mark a destination, while others are used as a series linked together to form a route

Tablets and Smartphones as Chartplotters

There is a wide variety of navigation apps available for smartphones/tablets. Some of these apps are the same as found on chartplotters, and some products are solely for use on these devices. Most have free trial periods, so download a few and compare the features they offer. Tablets/smartphones can be used to plan passages and allow these routes to be transferred to the chartplotter in a reasonably simple way either via syncing or uploading via an SD card. Some of the main issues with using a smartphone or tablet as a chartplotter are the difficulty in verifying the accuracy of the chart, the quality of a fix, and the ability to plot a position independent of a GNSS signal.

Navigating using Routes and Waypoints

A 'route' marks the track between two points that you plan your vessel to take. A route comprises a series of waypoints. A 'waypoint' is a point that you or the chartplotter's system has chosen on a chart and invariably marks a point at which the course to be followed changes.

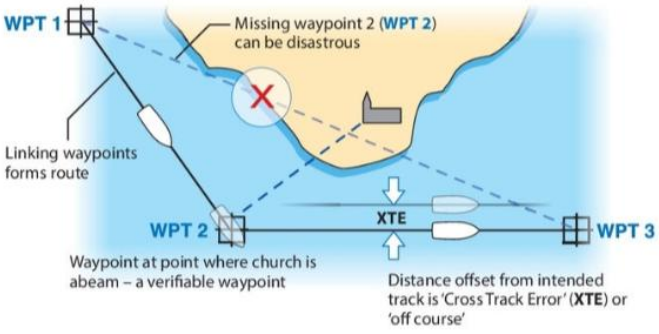
Routes are usually entered into a chartplotter or navigation app in one of two ways: 1) using a 'drag and drop' approach to place waypoints as the desired positions, or 2) by choosing the start and finish point and allowing the plotter/app to determine the waypoint positions/route – known as 'autorouting'.

There are advantages and disadvantages to both 'drag and drop' and 'autorouting'.

'Drag and drop'	'Autorouting'
+ Allows user to place waypoints in desired locations + Allows user to limit the number of waypoints in a route + Provokes more thought in the user as they construct the route	+ Is simple and quick - Quality of the route chosen is dependent on the quality of the software constructing it - May create a route with too many waypoints

Irrespective of which method is chosen to create the initial route, it is essential that the user carefully reviews the one chosen. The user should:

- Scroll in to view the route closely and 'walk' the route to check for the presence of hazards such as shallower water, buoys, and rocks.
- Move waypoints to create safe distance from hazards and also to create 'verifiable waypoints'. A verifiable waypoint is one that can be referenced against another feature, e.g. placed at a turn point when the headland is directly to our port side. This gives a check to ensure you are where you think you should be.



Some navigation apps and chartplotters allow you to view and follow your route in 3D mode as you 'walk' along it to check it. This can be a highly effective way to help you visualise the route you will be following.

Executing the Passage

Setting up your chartplotter screen and then monitoring it is a key aspect of safely executing a passage.

Some tips for when navigating a route:

1. There is usually no need to stay exactly on the track between two waypoints, and doing so generally requires continuous course corrections. Determine an acceptable 'cross track error/off course' (e.g. 0.5 miles) and keep within that 'lane'.
2. Note the required course, then steer it and get a crew member to monitor the chartplotter and inform you of (occasional) required course changes. This approach keeps your head up and focused on looking out for other craft or obstructions in the water (e.g. lobster pots).

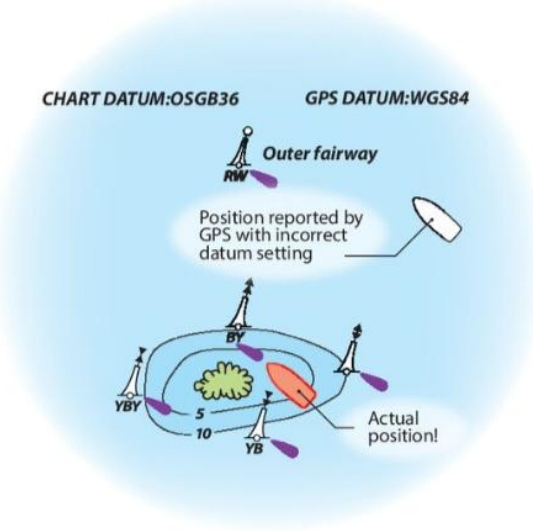
Don't forget that you still need to consider recording your position as you navigate your route. An effective way to do this is to ensure that your plotter screen is configured to show latitude/longitude, course over ground, and speed over ground and then take a photo every six to 12 minutes. Doing so gives a record of when you were at certain points in the event of a plotter failure.

Geodetic Datums

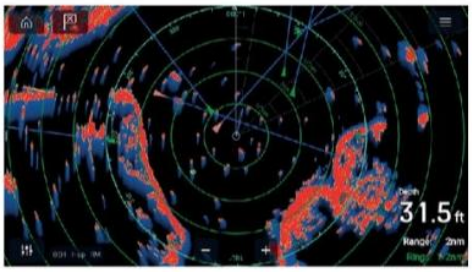
Over time, different assumptions have been made about the position of the centre of the earth by charting authorities across the world. This affects the position of the lines of latitude and longitude, with each assumption being given a different code or name. These are geodetic datums.
The most current/accurate datum is known as World Geodetic Survey 1984, which is abbreviated to 'WGS84'. This is the default datum used in chartplotters/GPS units and newer charts.

Why does this matter? A chartplotter may contain as many as 200 such datums. Selecting the incorrect datum will alter the latitude/longitude position displayed. In the event of an issue afloat, you may state your position incorrectly, delaying response getting to you. Also, when entering a position, if the position is derived from a datum different to the one being used by the plotter this will introduce an error. With some datums, the difference to WGS84 is considerable.

How to avoid this While electronic charts are invariably drawn to WGS84, it's worth checking the settings on your plotter regularly to ensure the geodetic datum hasn't inadvertently been adjusted. This is especially true on craft where multiple users use the system or in situations where paper charts drawn to older datums are being used, necessitating a different geodetic datum being selected.



Radar



Radar is an extremely valuable aid to collision avoidance and navigation. Radar works by sending out radio waves that rebound off a solid object and back to the radar. These radio echoes are then displayed on a screen. The size and strength of the echo depends on what is reflected. A tanker will give a better echo than a small wooden sailing boat, while a vertical cliff will give a better echo than a gently shelving beach.

Radar is a valuable addition to a boat if it is likely to be undertaking reasonable passages and may be exposed to operating in restricted visibility or at night. While at first glance radar seems quite straightforward, understanding how best to use it for collision avoidance and navigation is best dealt with by undertaking some training.

Collision avoidance: The radar can be set up to detect targets automatically and calculate whether they present a risk of collision. Newer radar antennas even colour code the targets red/green to flag those that present a risk of collision.

Navigation: The radar can be set up to aid navigation along a coast by maintaining a certain distance offshore and as a means to enable position fixing when on passage. Radar images can be overlayed over a chart, aiding the understanding of where the craft is and giving good situational awareness.

Radars now operate very effectively running in fully automatic mode. However, to get the most from a radar display, there is a need to understand when to rely on the auto settings and when to adjust the setup manually. It is also important to be able to interpret the information that the display is presenting. The ability to interpret what you see on your radar grows with experience. Practise in good conditions before you use the system for real.

Whether a vessel returns a target on a radar screen is dependent on its size and the material it's constructed from. Smaller leisure boats rarely present a good radar target to other vessels. To increase a small boat's echo, radar reflectors are placed as high as possible to amplify the signal returned. Even if radar is fitted, a reflector is still required.

When referring to a 'chartplotter', we are actually referring to the device better called a 'multi-function display' (or 'MFD'). MFDs are exactly what their name suggests and operate as a chartplotter, a radar, a depth sounder, or even as a means to watch streaming services. By connecting a radar antenna to the MFD, the MFD then can operate as a chartplotter and radar display. Add a sounder/transducer and depth becomes available.

Navigation Techniques and Terminology

Despite the move to electronic charts it's beneficial to have a good, in-depth understanding of the variety of terms, methods, and items of equipment that are involved in navigation. While much of the terminology and methods would appear at first glance to link to the use of paper charts, the underlying knowledge is helpful in making full use of electronic charts.

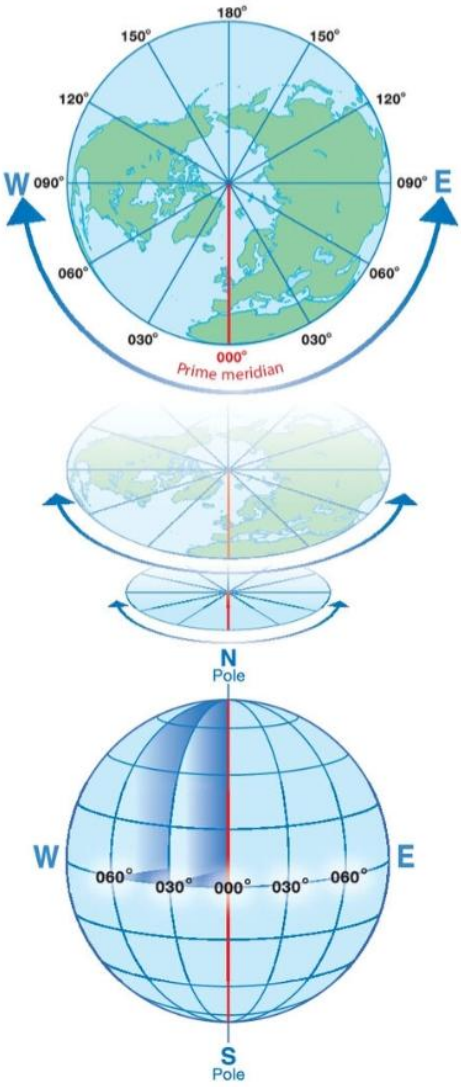
Latitude & Longitude

As early explorers started to create maps of the world, they soon needed to be able to define a precise position on the Earth's surface. To do this, two sets of imaginary lines were 'drawn' on the Earth. One set of these lines runs north–south between the poles and they are called meridians of longitude. The other set runs horizontally around the Earth and they are called parallels of latitude.

Longitude

Lines of longitude effectively divide the Earth into segments. Positions are referred to as either east or west of the Greenwich Meridian – the 000° line (e.g. 030°W).

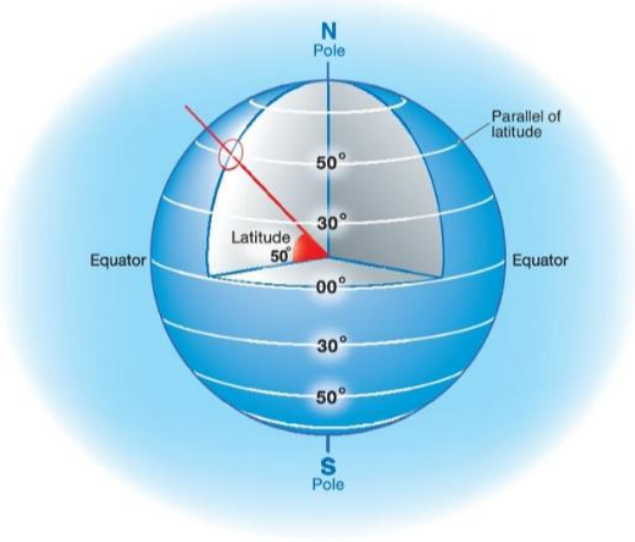
Looking down at the North Pole, the red line represents the 000° line of the Greenwich Meridian. The maximum values of longitude are 180°W or E.



Latitude

The parallel lines of latitude 'slice' the Earth into layers. Any one of these lines of latitude can be defined by its angle relative to the equator – north or south. In this example it is 50°N. The maximum values of latitude are 90°N or S.

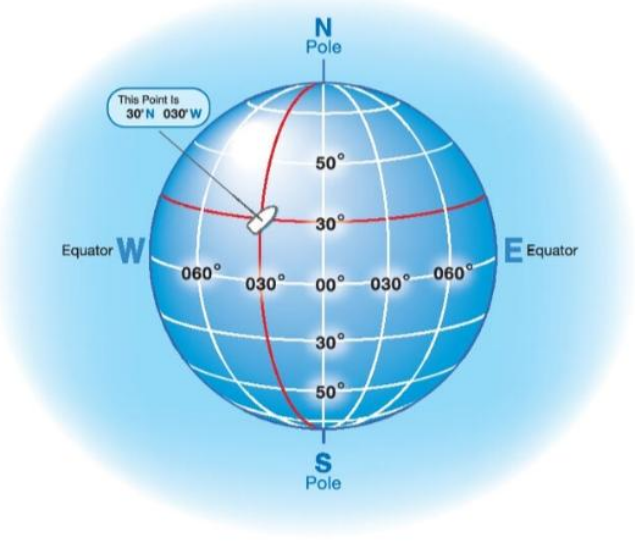
Therefore, precise positions on the Earth's surface can be referred to by a line of latitude and a line of longitude.



A basic position can be defined as such:

30° 00'.0N, 030° 00'.0W

Each degree can be divided into fractions of a degree. A degree consists of 60 minutes, and each minute consists of 60 seconds. Seconds are now usually expressed as decimals, so 002° 42' 30"W becomes 002° 42'.5W.

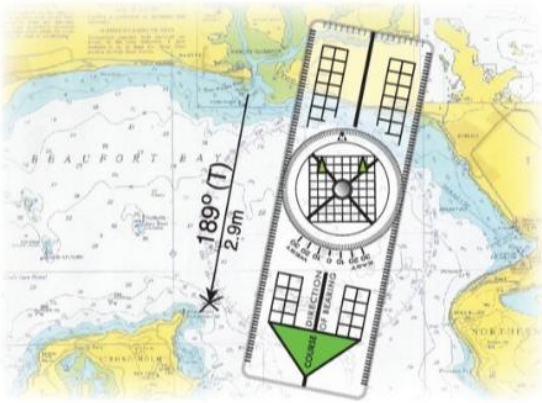


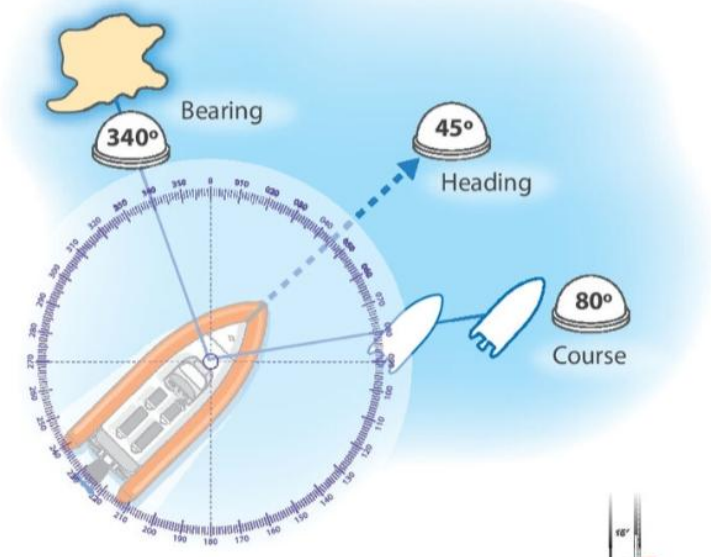
Rarely, though, does a craft sit perfectly on such a precise position. For example, a more typical position might be 53° 42'.5N, 001° 02'.5W. If relaying this position verbally you would say "Five three degrees four two decimal five minutes north, Zero zero one degrees zero two decimal five minutes west." Such clarity makes it easier for the other person to hear the position correctly. In a distress situation this could be critical.

There are a variety of key principles that need to be understood to be able to navigate safely and effectively.

Range and Bearing on a Chart

On a paper chart you can use a plotting instrument to measure the bearing on a chart from one object to another. This could be used to navigate between these two points or describe the position of one object relative to the other. If using this type of plotting, rotate the centre to align the green arrows north, and read off the bearing. Chartplotters and chart apps generally allow you to use a cursor to determine a bearing and distance.

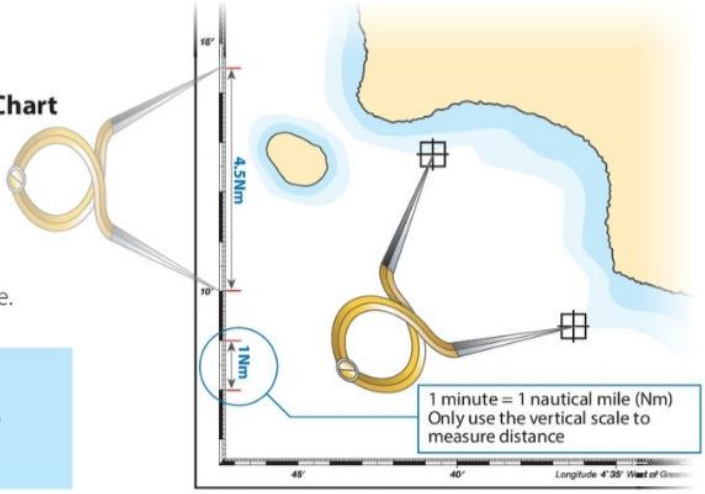




The difference between terms is important. In this example the powerboat's heading is 045°, the course over ground of the craft is 080° and the bearing of the rock to port is 340°.

Measuring Distance on a Paper Chart

When measuring distance, always take the dividers to the 'latitude' scale on the side of the chart. On some charts there will also be a scale which makes it easy to measure distance.



Tip – Understanding Distance:
One minute of latitude = One sea mile
One nautical mile = 1,852 metres

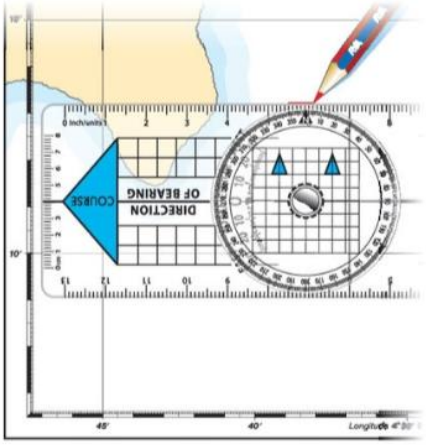
Measuring Distance and Bearing on a Chartplotter

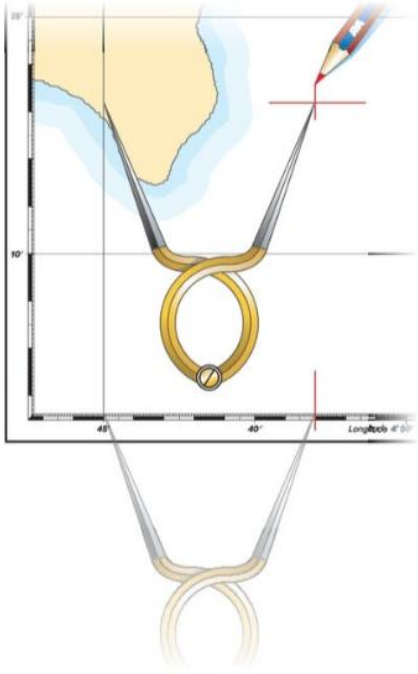
Chartplotters and apps provide various ways to measure bearings and distance. Try a few to see which you prefer.

Plotting a Position

To plot a position on a chart from a latitude and longitude:

- Mark off the latitude by marking a line from the vertical scale in the area you expect it to intersect the meridian of longitude.





- Ma gitude from the horizontal scale at the t ttom of the chart.
- Where the lines intersect is the position.

Tip – When plotting you can use either a plotter or dividers. A plotter is easier on a small powerboat.

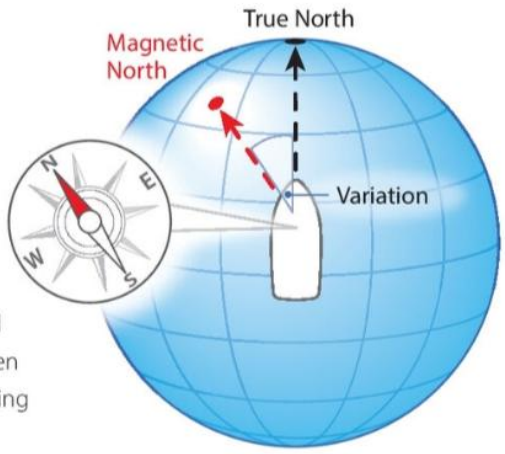
Tip – Your thumb and forefinger make a great set of dividers, while the side of your hand when laid on a chart is not bad as a plotting tool. Sometimes a quick approach works well in a small boat.

Variation

Using a compass on a boat means that you need to understand two key principles.

A compass points to Magnetic North rather than to the North Pole. On a chart, the vertical lines point to True North.

This difference between True and Magnetic North is called variation. When transferring bearings from a chart to use on a compass they need to be converted from True to Magnetic. Likewise, when reading bearings from a compass, they need converting before plotting on a chart.



Adjusting for Variation

True to Magnetic: Add variation if west, subtract if east.

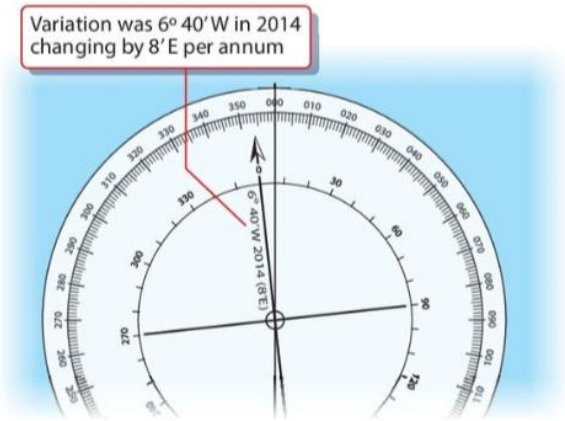
For example:

If True (T) course = 107° and Variation (V) = 4°W

then Magnetic (M) = 107°T + 4°W = 111°M

Magnetic to True: Subtract variation if west, add if east.

True = 111°M – 4°W (V) = 107°T



Variation can vary greatly between different boating areas, and changes over time. It is calculated and recorded on charts.

In the example shown, what would the variation be in 2016 – two years after the variation shown in the compass rose was calculated?

Variation is shown as changing by 8'E per annum. In two years (2014–2016) this amounts to 2 x 8'E = 16'E. Variation was 6°40'W, so will have reduced by 16'E. The updated variation is 6°24'W. In practice this is pretty much 6°.

Tip – The steering compasses in small craft will usually be graduated in 5° or 10° increments. In some areas variation may only be 2°–3° which, when considered alongside the accuracy of a steering compass, may mean it can be largely ignored. Large variations cannot be ignored.

Deviation

Deviation is the error caused by some metal items (or electronic fields) onboard affecting the compass reading. The error varies as the heading changes. To properly allow for deviation, a deviation card detailing the error at each heading is required.

The simplest way to create a deviation card is to compare the reading from the steering compass with the reading from a hand bearing compass, which is held well clear of any possible interference. Do this for various headings and then plot the errors to create your own deviation card. Alternatively, a compass adjuster can swing the compass and create a card for you or correct the errors.

Adjusting for Deviation

Magnetic to Compass:

Add deviation if west, subtract if east.

Compass to Magnetic:

Subtract deviation if west, add if east.

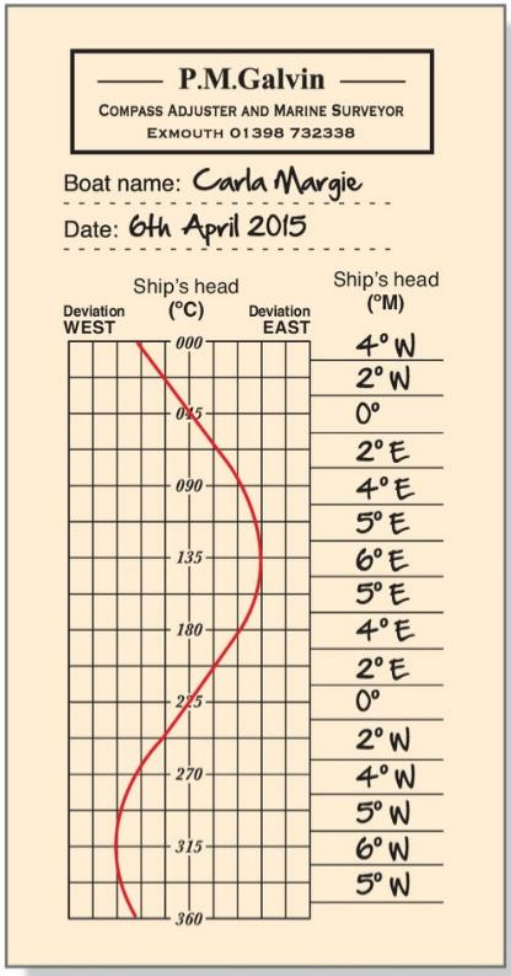
In the example from the previous page, when the Magnetic heading is 111°M, the deviation table shows a deviation of about 5°E at this heading. Using C = M - easterly deviation gives 111°M - 5°E = 106°C.

The compass heading (C) will be 106°C.

Tip – Remembering all these adjustments is not easy. In your boating area, variation will probably always be either W or E, so just remember one of the equations e.g., 'M = T + west variation'.

Tip – 'Cadbury's Dairy Milk Very Tasty' is a way of remembering the sequence, which is:

°C $\xrightarrow{\text{Dev}}$ °M $\xrightarrow{\text{Var}}$ °T



The Compass

A compass allows you to:

- Steer on a particular heading.
- Take bearings of known objects and plot your position.
- Monitor the bearing of another craft to assess the risk of collision with it.

It is an essential item of safety and navigational kit. There are a variety of types of compass:

Traditional Steering Compass

- Should be mounted so that you can easily see it from the helm position.
- Ensure that the model you buy suits your boat.
- The compass consists of a card floating in liquid (to dampen its movement), attached to a magnet.

Compass on a Chartplotter

On most chartplotters the display can be configured to show a compass display. Typically, the compass display only works when the boat is moving as it is actually showing 'course over ground'.

More expensive units may have a fluxgate compass either inbuilt or as an external sensor. Having a fluxgate module means the compass display will work irrespective of boat movement with the compass displaying all of the time.

Fluxgate Compass

- Electronic variant of the traditional compass. Increasingly found in handheld devices – plotters, smartphones, and watches.
- Carefully follow the instructions to avoid creating errors during use.
- Some craft are fitted with hidden fluxgate modules that are able to pass steering information to other devices such as autopilots.

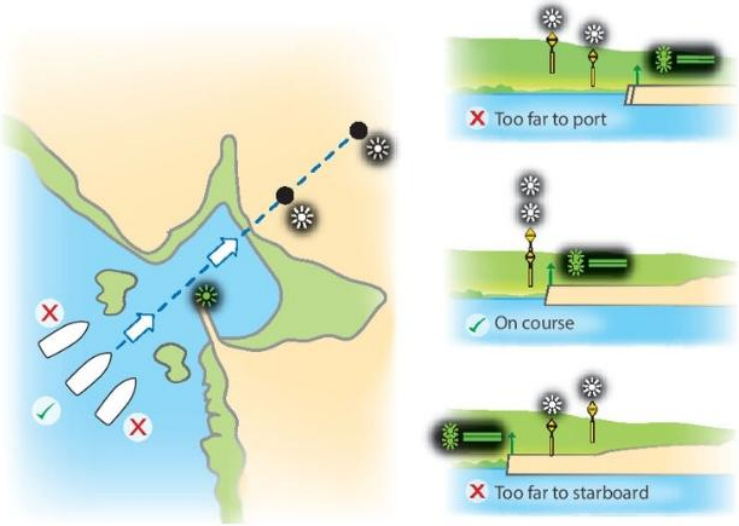
Hand Bearing Compass: An essential item for good pilotage. Can be used:

- To take bearings, back bearings, three-point fixes etc.
- To take relative bearings in potential collision situations.
- To check the main steering compass.

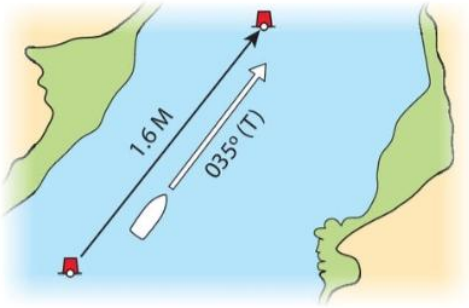
Pilotage Techniques

There are various techniques that can be used for pilotage.

Transits: Line up two charted objects to keep you on your intended track.

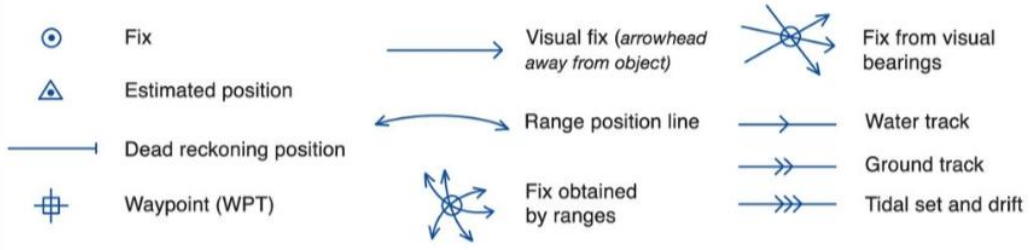


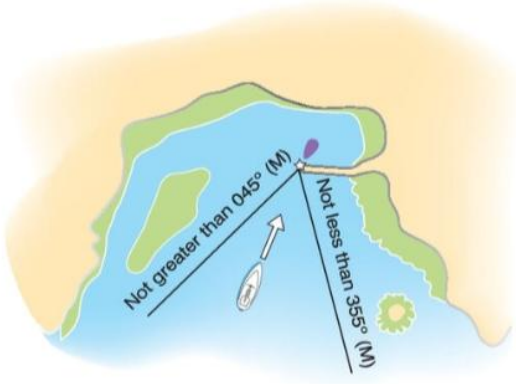
Bearing and distance: Know the heading and distance between charted objects, then steer to this heading. Keeping a certain speed gives a predicted time for the leg, but be careful as small errors in heading can lead to large errors in position, even over fairly short legs. Use in conjunction with one of the other techniques detailed here.



Symbols for Plotting on Charts

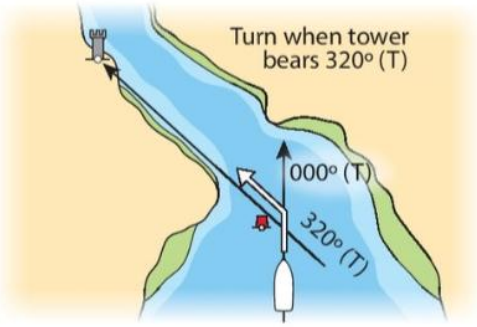
We use plotting symbols on the chart to make it easy to follow.





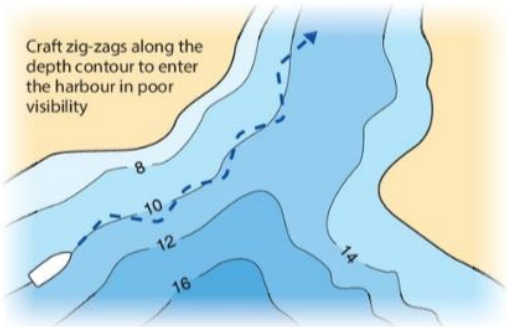
Clearing Lines and Bearings: Use clearing lines or clearing bearings to define areas of safety and danger. These are easy to use afloat once calculated.

Back Bearings: Calculate bearings to known objects, allowing you to steer away from a known object on a heading, checking the back bearing to ensure you remain on the track you want.



Turning Points: Calculate turning points by reference to bearings to known objects, or transits between two points.

Depth and Contour Lines: Knowing what you expect to see on your depth gauge gives you a good indication of whether you are in the area you expect to be. Calculate expected depth on contour lines and use these to navigate along or fix position.



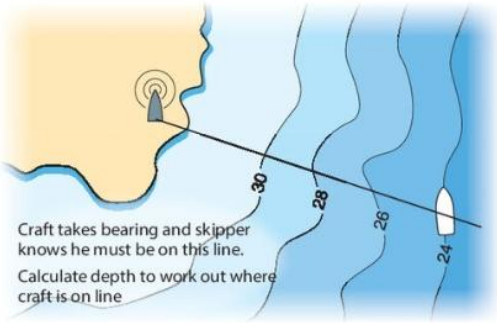
Chartplotter Routes and Waypoints: See page 101. You can create routes, and use various techniques to help you navigate along your intended track.

Fixing your Position

Understanding the techniques that have been used for years on paper charts and can be used for pilotage and when on passage is useful, as a good Skipper knows at all times where they are and regularly records their position.

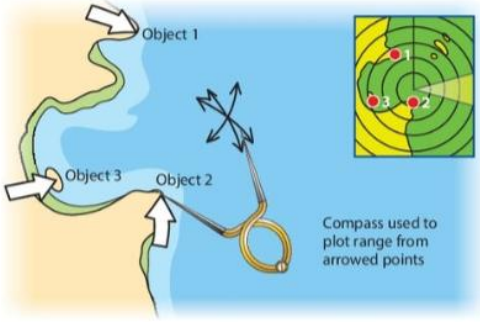
Visually: Keep it simple. If you are near a charted object then you know exactly where you are. Be sure it is the one you think it is!

Bearing and Contours: As you cross a contour line, take a bearing to a charted object. A transit and a contour line would be even more accurate.



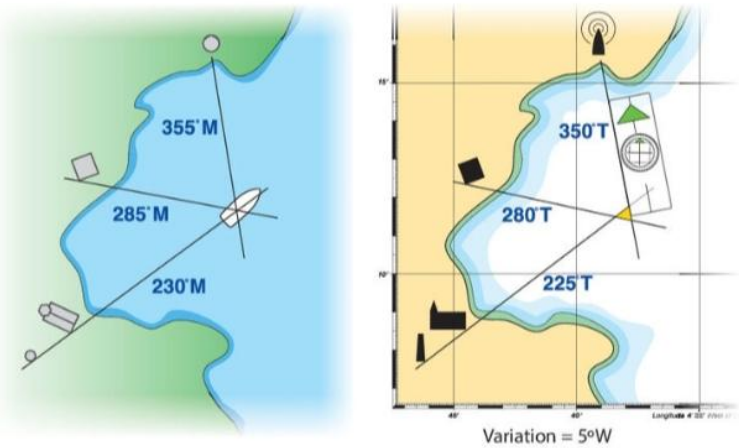
Transit and Bearing: Ideally, choose an object at roughly right angles to the transit for the best fix.

Radar Ranges: Use the Variable Range Marker ring to select two or three charted objects for a very precise fix.



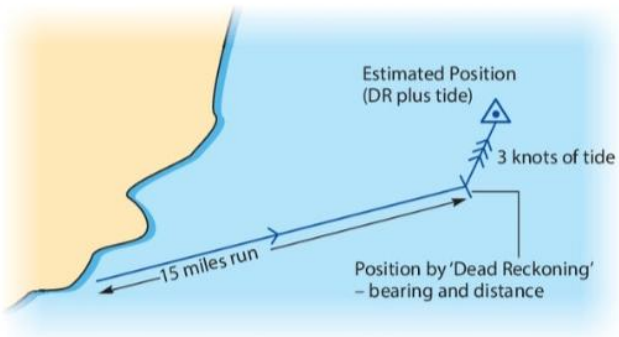
Three-point Fix

- Look for easily identifiable positions on the chart and ashore.
- Ensure they are 50°–100° apart to achieve a good cut.
- Note down the bearings, vessel heading and speed.
- Convert the bearings to 'True' and plot them.
- Where they cross is your position – mark time and log on the chart.
- Double check this by other means – depth or a good look around.
- A 'cocked hat' is where you have a triangle of intersection.
- The position is historical and refers to a particular time and log reading.



Estimated position: The same principles can be used to estimate where you are or where you will end up. The terms used are 'Dead Reckoning' (DR) and 'Estimated Position' (EP).

For example, a craft achieves 15 knots on a heading of 080°T. Plot the line on a chart depicting the water track. The point on the line that the craft has reached after a certain period of time is its position – this is Dead Reckoning. It may not be very accurate as it ignores stream. Add in the tidal vector for the same time period for a far more accurate estimate – your Estimated Position. This can be repeated for different speeds, headings and tidal streams to represent your journey.

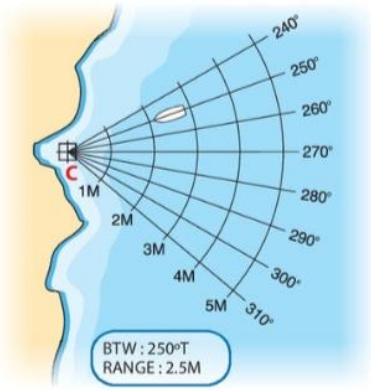


Using a Chartplotter to Record Position

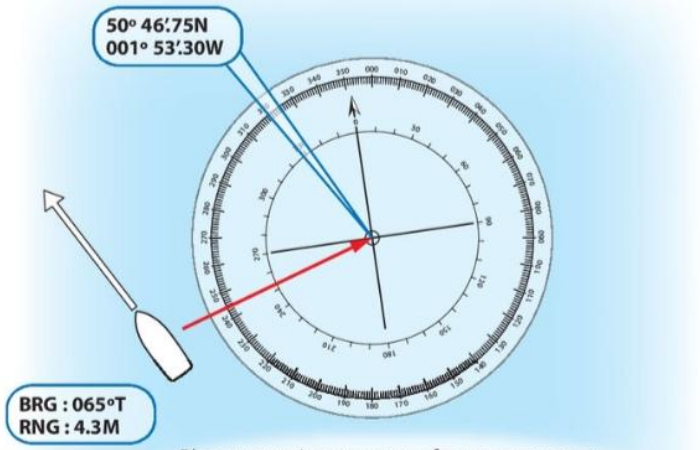
A variety of techniques have evolved to enable you to utilise a satellite-derived position on your chartplotter and plot a position onto a paper chart. These techniques allow you to fix position onto a chart easily when afloat in a small craft.

Latitude & Longitude: At its simplest, the chartplotter can be configured to display a latitude and longitude. Options are either to plot the lat/long on a chart or use the GNSS-based techniques discussed below. If using a chartplotter, then it may be that the image shown on the plotter allows you to transfer a position to a chart.

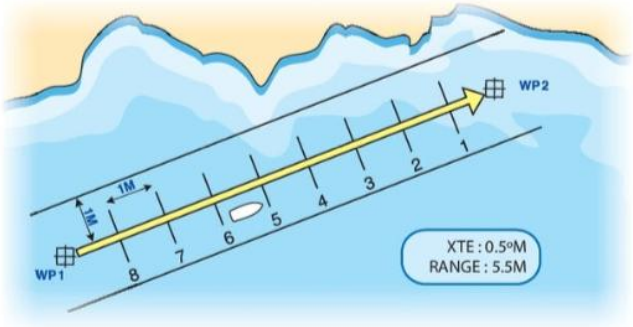
Waypoint Web: Plot a waypoint on the chart – 'C'. From the waypoint, draw a series of lines at different bearings and use compasses to draw arcs of distance from the waypoint. Then, as you head towards that waypoint, it is easy to read off the distance and bearing of the waypoint and plot your position on the 'web'. This technique is very useful at night or in rougher conditions, and works equally well whether you are navigating towards waypoint C or simply across the area covered by the web.



Compass Rose Waypoint: An adaptation of this is to use a compass rose on a chart. Enter a waypoint at the centre of the compass rose. Select 'goto' that waypoint. The chartplotter will then tell you the bearing and distance to that waypoint. You can now plot your position easily and accurately onto the chart, using the compass rose to help you plot. Check to ensure the chartplotter is configured to give the bearing in True, or remember to adjust for variation.



Waypoint Ladder: If you are navigating over longer distances then you use a route between the start and the destination in your chartplotter. Plot the route on a paper chart and mark off 0.5-mile or one-mile intervals, counting away from the destination. Draw lines parallel to the intended track at 0.25-mile, 0.5-mile, or one-mile intervals, depending on what you decide is an acceptable distance to err from this track. Configure the chartplotter to show 'Distance to Waypoint' (DTW) and 'Cross Track Error/Off Course' (XTE). Use these regularly to plot position.



Tip – Whatever technique you use to record your position, do so regularly (intervals of six or 12 minutes – depending on your speed – will be about right) and note course, speed and time.

Coastal Navigation

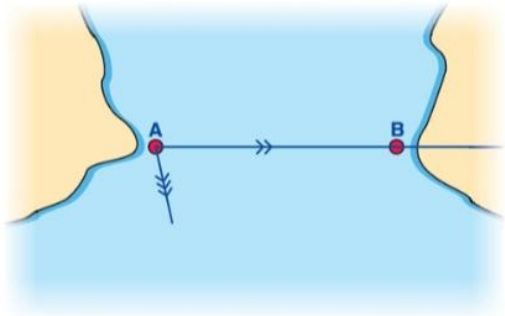
In a boat navigating along a coast the stream will usually be either behind the craft speeding it up or against it slowing it down. If there is a need to navigate a stretch of water where the stream acts on the beam of the craft then it will push the craft off course, unless the heading of the boat is adjusted to steer into the stream.

Usually a Skipper will just estimate how much to alter the heading to ensure the target is reached. However, there are times when calculating what the heading should be to compensate for stream makes real sense. Examples include:

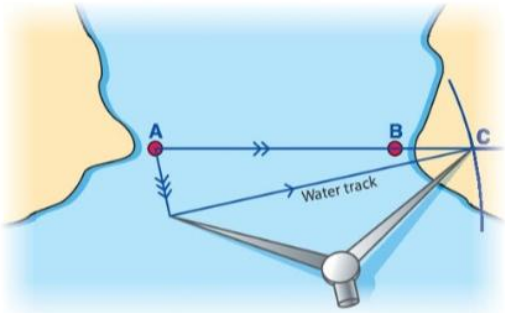
- Passages over longer distances. Rather than heading A to B and 'fighting' the stream, allowing stream to push you off the A to B line and then back on later as the direction of stream changes may cost less in fuel.
- Passages in more limited visibility where the destination is not always visible.

To calculate, allowing for a cross stream and finding what the revised heading (the 'course to steer') should be:

- Draw a line from A through B and beyond.
- This is the Ground Track (two arrows denote Ground Track).
- From A, plot the Tidal Vector (three arrows). In this case the tidal rate is 170°T 1.3 knots, so plot 1.3M.

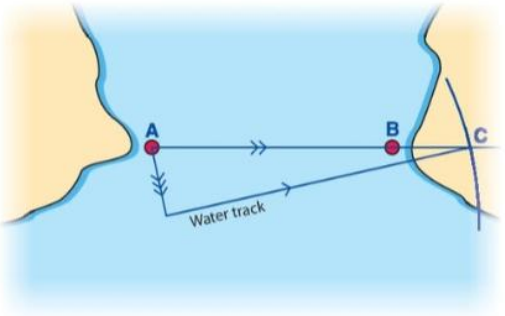


- Open the dividers to the distance the craft would travel in one hour.
- This craft at five knots would travel five miles in one hour.
- Mark off where the dividers intersect the line A–B, making point C.
- Join these two points. This is the water track (one arrow).



Note – A common mistake is to join the end of the tidal vector and point B, instead of using dividers to measure distance travelled in one hour.

- Read the angle of the water track.
- This is the 'Course to Steer'.
- This will need adjusting for variation and deviation to give compass.
- The distance A–C is the actual distance the craft will travel in one hour.
- This is the 'Speed over Ground'.

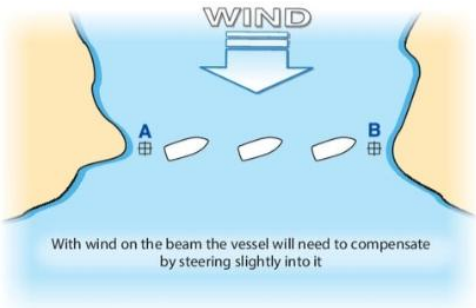


In this example the size of the vector diagram fits comfortably onto the chart. The diagram can be plotted over a 30-minute period rather than an hour, as shown, if that fits better, e.g. plot a half-hour ground track, a half-hour tidal vector, and so on.

Tip – If you are undertaking a long passage, the rate and direction of the tide will often vary. In this case you can undertake a series of these calculations for each hour of the journey – do not assume that the tide direction and rate will remain constant during the passage.

Leeway

Leeway is the effect the wind has on a craft. At speed, powerboats are affected by the wind far less than yachts or slower motorboats. High-sided craft in windy conditions may need to adjust for leeway. If the wind is blowing on your beam, assume that you need to adjust by 5° or 10° by altering your heading to steer more into the wind. If the wind increases you may need to allow for more leeway.



With wind on the beam the vessel will need to compensate by steering slightly into it

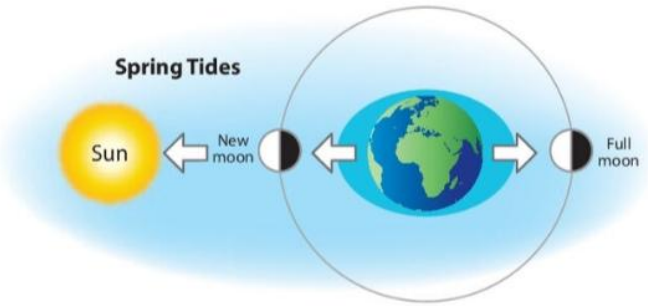
Tides and Tidal Streams

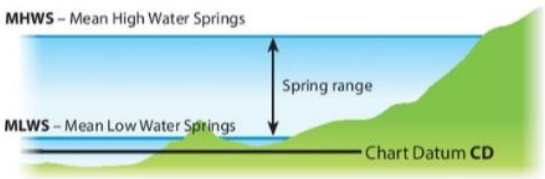
Understanding a little about the causes of tides, the source of tidal information, and how it impacts upon your boating is critical for safe navigation.

The gravitational effects of the Moon and Sun on the Earth cause tides.

Spring Tides

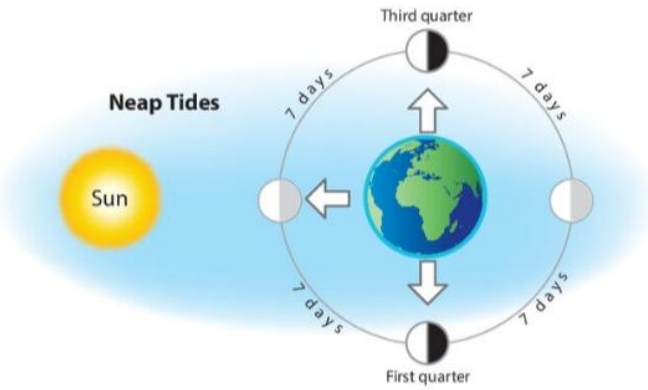
When the Earth is in line with the Moon and Sun, high tides are at their highest and low tides at their lowest.

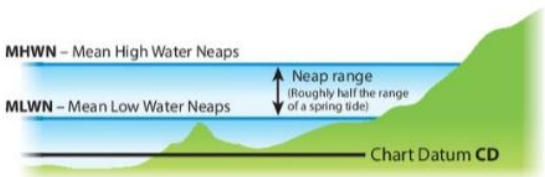




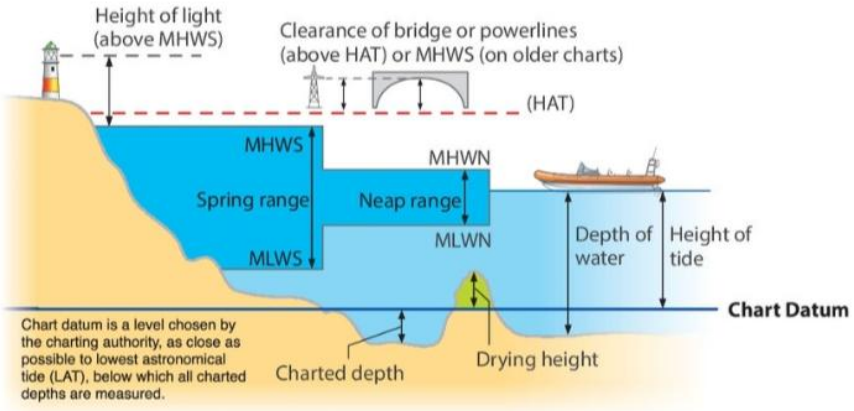
Neap Tides

When the Earth, Moon and Sun are not in alignment, high and low tides are smaller than spring tides.





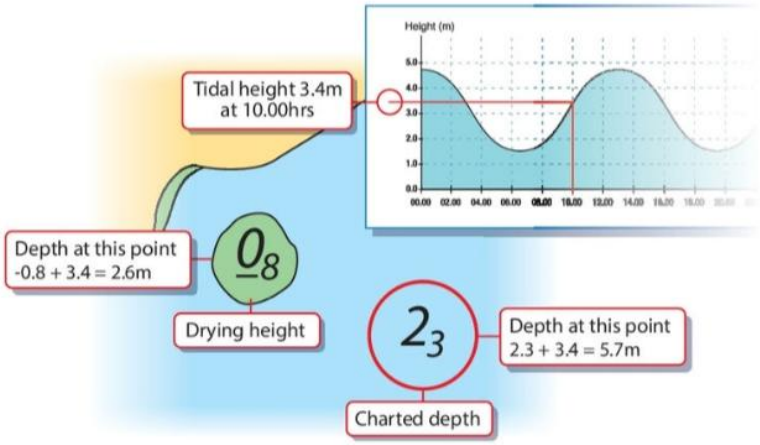
In most places high tides follow low tides on a rough six-hour cycle (i.e., two highs and two lows per day). Springs and neaps alternate on a seven-day cycle.



Note: Highest Astronomical Tide ('HAT') is replacing MHWS as the reference level for clearances – e.g. bridges and overhead electrical cables – as this represents the 'worst case' high tide and therefore the least clearance. Many charts though still reference these clearances to MHWS. Be careful to check the chart.

Charts are drawn to the lowest-possible tide ever likely to be experienced at that point – the Lowest Astronomical Tide. This level is known as Chart Datum. Below this level Charted Depths are measured, and above are Drying Heights.

The height of tide is added to these figures to calculate the depth of water at that point.



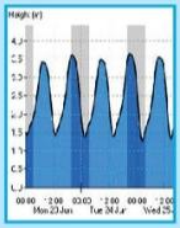
The number 2_3 represents a 'charted depth' of 2.3m and is the minimum depth that will be experienced at that point when the tide is at its very lowest – Lowest Astronomical Tide ('LAT'). The tidal height at 10 a.m. is 3.4m, therefore the depth at that time at that point should be 2.3 + 3.4 = 5.7m.

$\underline{0}_8$ represents a 'drying height' of 0.8m above the LAT level (i.e. the seabed will be exposed). Taking the tidal height of 3.4m we will have 2.6m of water at that point (-0.8m + 3.4m).

Weather can affect tidal heights, with high pressure pushing the water lower and low pressure letting it rise higher. Combined with wind direction, such effects can have a dramatic effect on the sea levels experienced on a particular day.

Sources of Tidal Data

Tidal information is available from a variety of sources:



Usually free on the internet within a seven-day period – charges may apply for a longer term

Plenty of apps are available for phones, tablets and computers

Local tidal booklets show tidal curves or data

Chartplotters usually show tidal curves and may show tidal stream too

Almanacs give times and heights of high and low water for major ports. Use the tidal curve to calculate tidal heights between these times

Tip – It's very easy to pick the wrong day or forget the correction for summertime, so when you have gathered your tidal information always double check. Is the level of tide that you see on arrival at your launch site or marina the same as what you expected to see?

Tidal Streams

Knowing the rate and direction of flow at a given time is important because:

- You can make your passage with the stream rather than push against it to give a faster passage.
- You can time your passage to avoid a dangerous situation, such as where wind is opposing stream, making rougher water.

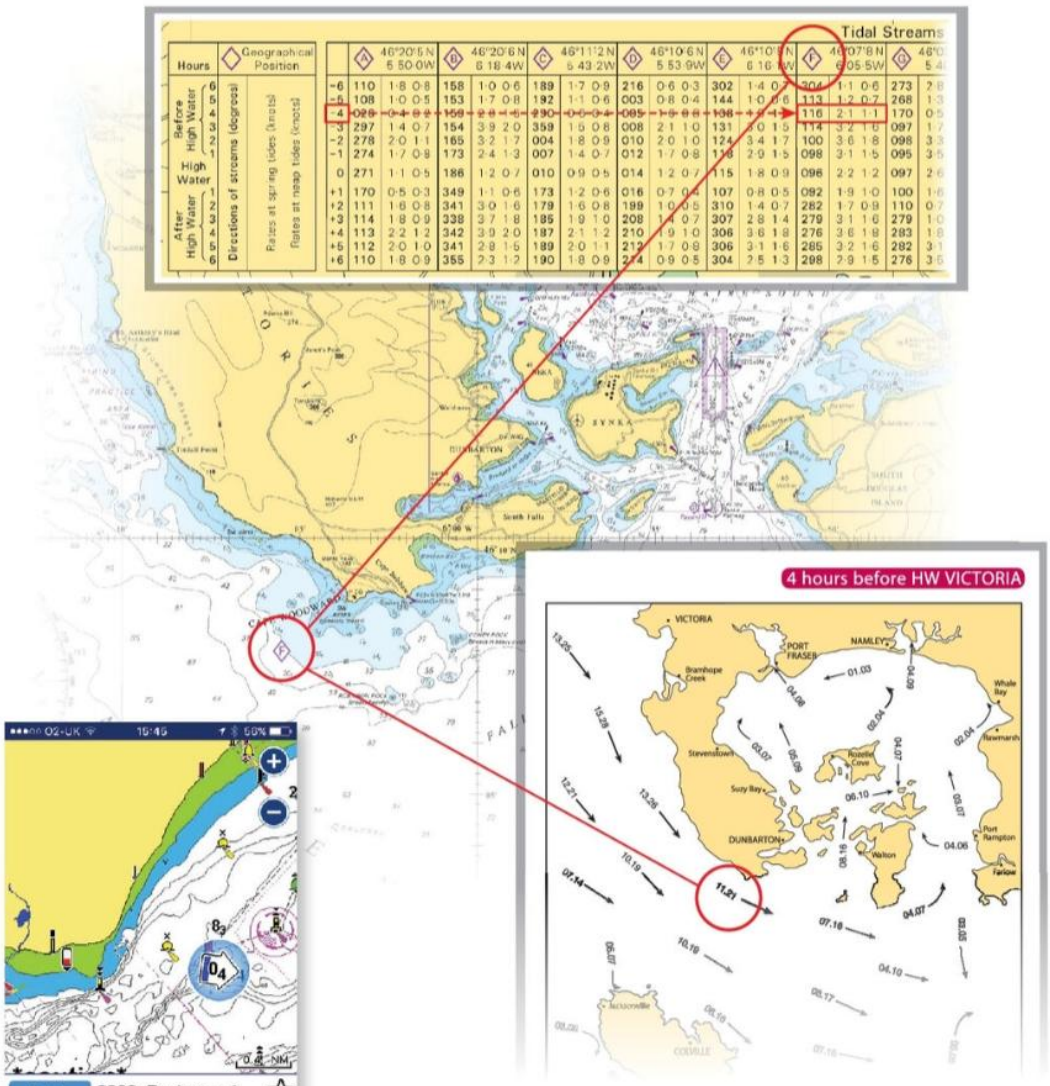
Tidal stream data is available from various sources:

Chartplotters/navigation apps: Tidal-stream data is available by means of arrows superimposed on the chart. You can usually scroll forwards to determine the rate and direction of stream in the hours and days ahead.

Tidal stream charts: Tidal-stream maps are found in almanacs and tidal-stream atlases. These show the direction and rate of the tide at hourly intervals before and after high water. The figures '11.21' (shown on the tidal-stream atlas example on the opposite page) mean that the rate at neaps is 1.1 knots, while at springs it is 2.1 knots. The direction of the arrow gives the direction of flow. If between springs and neaps, it is usual to interpolate to achieve the correct figure.

Tidal Diamonds

Tidal diamonds are found on charts. The figures which relate to these diamonds are found elsewhere on the chart and show the rate and direction of the tide at springs and neaps.



Courtesy of Navionics.com

Apps available on smartphones and tablets can represent tidal flow in a very clear way.

Tip – When the direction of a tide is quoted (e.g. 090°), this is the direction the tide flows towards.

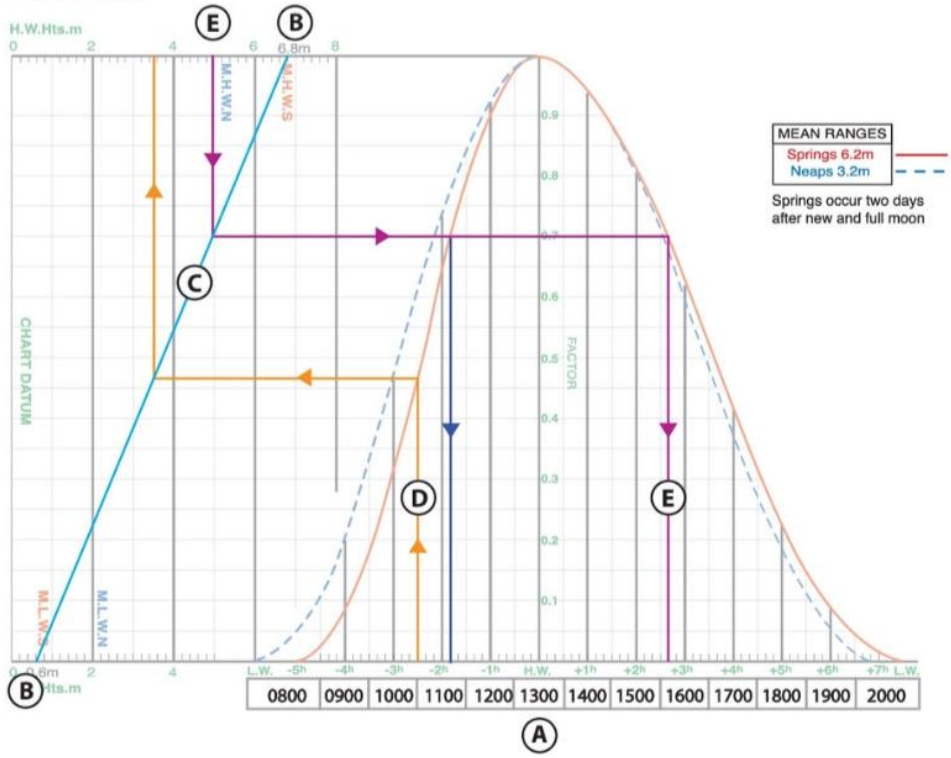
Tidal Curves

With the advent of free online tidal information and apps on tablets/smartphones it has never been easier to get tidal data for any location that you may go boating. There may be times, though, when knowing how to use the tidal information that you find in an almanac and being able to create a tidal curve for the day becomes critical, and is certainly useful for those going further afield, where internet access may become challenging.

If you want to know the tidal height between the times of high and low water you can use a tidal curve to calculate the tidal height at any time.

A tidal curve shows how the tide varies between high and low water. They are found in almanacs for major boating locations.

To use a tidal curve:



- Find the tidal data from the almanac for the day concerned. The almanac will tell you which 'Standard port' and curve to use for your location.
- Adjust high water time to Daylight Saving Time (if required) and enter it in box (A).
- In this example HW is at 1300 DST (Daylight Saving Time).
- Fill in the remaining boxes in one-hour increments either side of HW.
- Mark the HW and LW tidal heights onto the graph (B) and connect them with a line (C).
- Calculate the 'tidal range' (the difference in height between HW and LW) by subtracting the LW height from the HW height. A small box on the curve indicates which curve line to use. In this example 6.8m - 0.6m = 6.2m range. 6.2m range = springs, therefore the solid curve line (red) is used.

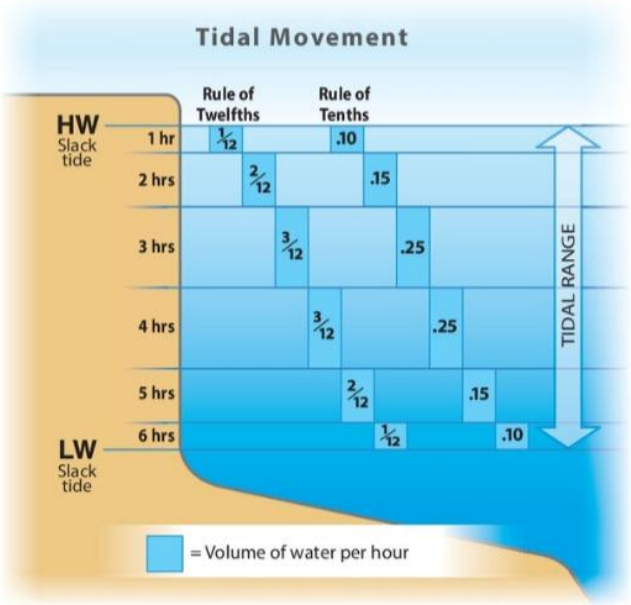
You can now use the curve to calculate the tidal heights from the curve.

Example:

- To find the tidal height at 1030hrs, draw a vertical line (D) from the 1030hrs time until it intersects the curve. Then run the line to the diagonal depth line and up to read off the height. It reads as 3.6m.
- To find when the tidal height will be 5.0m, draw a vertical line from the tidal height scale (E) down to the diagonal line, then across to the curve.
- The two points either side (where it bisects the curve) will give you the times when the height is 5.0m. Between these times, the tide is in excess of this height. The times read as between about 1110hrs and 1540hrs.

The Rule of Twelfths (or Tenths)

This technique evolved to give Skippers the ability to approximate tidal heights at times between high and low water. The method only works in areas that have a regular tidal curve similar to the one shown on page 124.



As the image graphically shows, the majority of water flows in the middle two hours.

Example (using Rule of Twelfths): HW = 4.8m, LW = 1.2m. Therefore range is 3.6m. What is the tidal height four hours after HW?

Answer: The drop is ($^{1}/_{12} + {}^{2}/_{12} + {}^{3}/_{12} + {}^{3}/_{12}$) x $^{3.6}$m = $^{2.7}$m

Therefore the tidal height is 4.8m - 2.7m = 2.1m

Chapter 18

Weather

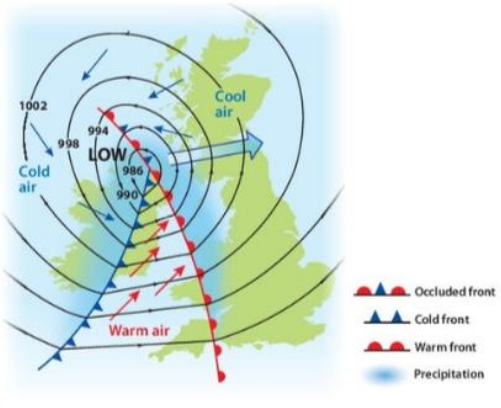
Weather plays a fundamental role in your decision whether to go to sea. Being able to assess the weather conditions you may encounter during the intended passage is a basic requirement of a Skipper. With experience, you will be able to read a weather forecast and make a judgement based on it.

Causes of Weather

The weather systems that we experience are caused by the movement of air created by the warming of the Earth. Hot air at the equator rises and is replaced by cooler air moving in from elsewhere.

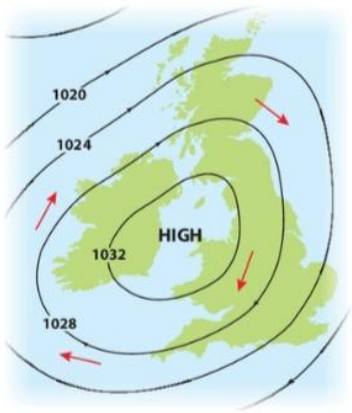
The irregular distribution of land and water masses creates a pattern of hot and cold areas, producing bands of high and low pressure like corridors around the Earth. The spinning of the Earth allows these highs and lows to move, collide and mix with each other, causing weather systems.

These weather systems give rise to areas of high and low pressure.



Depression or 'Low'

- Unsettled weather.
- Rainfall – often heavy.
- Strong winds pointing towards the centre – anticlockwise in the northern hemisphere, clockwise in the southern hemisphere.
- A general direction of travel from west to east.
- Closely spaced isobars.



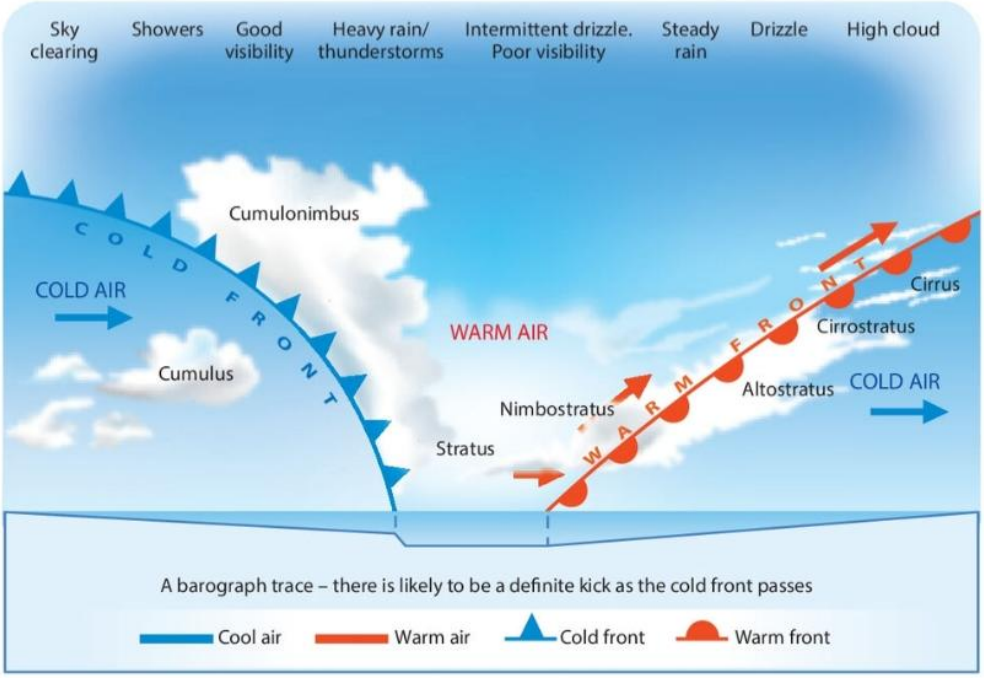
Anticyclone or 'High'

- Good settled weather.
- Clear skies.
- Light winds point away from the centre – clockwise in the northern hemisphere, anticlockwise in the southern hemisphere.
- Widely spaced isobars.

It is the 'depressions' or 'lows' that we need to be most careful and aware of when we go afloat.

The Progression of a Depression

The depression is passing from west to east; the warm front appears first, followed by the cold front.



Types of cloud in a depression				
Cumulus	Low cloud and rain	Altostratus thickening to nimbostratus	Cirrostratus	High cirrus cloud
As the cold front arrives the pressure can drop again. There may be heavy rain, strong winds and perhaps thunderstorms. The cloud is cumulus or cumulonimbus.	In the warm sector the barometer stops falling. The rain either ceases or eases, but the cloud base is low with poor visibility.	The cloud continues to thicken, becoming nimbostratus, and the cloud level has lowered. As the front approaches it begins to rain.	The cloud has thickened into cirrostratus and the barometer continues to fall. The wind direction 'backs' (moves anticlockwise), often from a south-westerly direction to southerly.	The high, thin cirrus clouds indicate the approach of a depression (12–24 hours away). The barometer starts to fall.

Tip – The way pressure is rising or falling can tell you much about the weather likely to follow. Rapidly falling or rising pressure indicates very unsettled weather ahead. A rise or fall of four millibars within three hours usually indicates strong winds, and a change of six millibars indicates a possible gale.

Sea Breezes

Sea breezes are caused by the flow of air from the sea to the land to fill the void created by the rising of hot air as it is warmed over land. Sea breezes occur in the afternoon on clear, hot, sunny days. They always blow onshore and their strength can be increased or decreased by the actual wind direction.

Early stages of a sea breeze developing. Heat rising over the land is creating the line of clouds.

Fog

Being caught in fog can be a very frightening and dangerous experience for a boater. The most common types of fog are caused by the cooling of the air to a point where moisture in the air condenses into droplets.

The three main types of fog are:

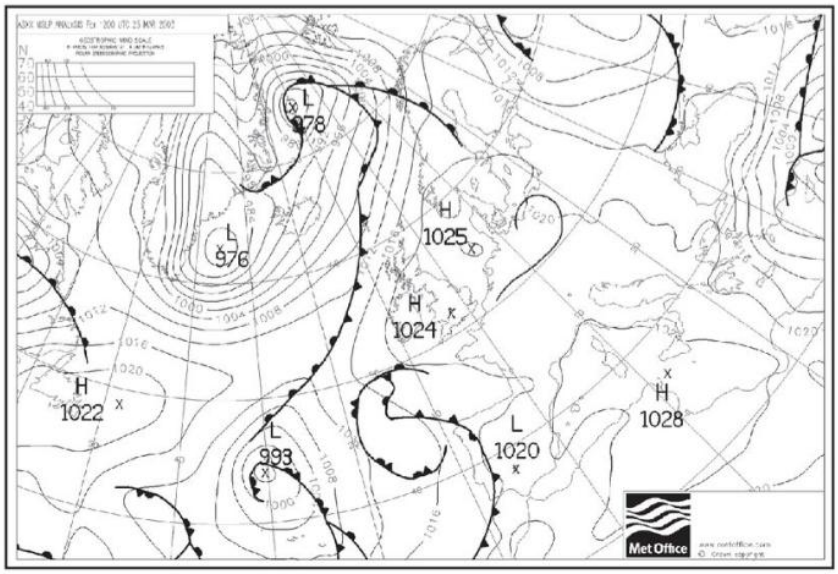
- **Radiation fog:** This tends to occur overnight and disperses rapidly as the ground warms. Caused by the rapidly cooling land where a warm, moist airstream exists.
- **Advection fog:** Caused by the passage of warm, moist air over the cold water. Requires a drier airstream to clear it – also known as 'sea fog'.
- **Frontal fog:** May occur at a warm front, and tends not to persist. Caused by warm air rising over cold air.

Interpreting Weather Information

As Skipper, you need to gather weather information and then make an informed decision whether it is safe to undertake the trip that you have planned. Make sure before you finally go afloat that you have assessed the most recent forecast.

On most weather websites you can view detailed national weather forecasts like the Shipping Forecast, more detailed local forecasts like the Inshore Waters Forecast, and the weather maps from which these forecasts are compiled. Particular words and phrases are used in some of these forecasts to indicate certain conditions and you need to understand this language to be able to interpret these forecasts properly.

Interpreting a Synoptic Chart



Courtesy of the Met Office

To interpret a synoptic chart you need to know:

- The lines on a weather chart join areas of equal pressure – these are called isobars.
- The closer these lines are together the greater the pressure gradient and the greater the wind speed.
- At the intersections of high- and low-pressure systems the rotation of the wind may combine to create wind speeds greater than implied by the isobar spacing. Adjacent low-pressure systems may create the opposite effect, with winds being lower than implied by the spacing.
- Synoptic charts often contain a wind-speed key (in the top left-hand corner of this map). At your latitude use the scale to estimate the wind speed from the isobar spacing.
- In the area shown on the map, depressions will tend to move north-easterly.

Sourcing Weather Forecasts

There is a wealth of sources of weather information available, both online and through more traditional sources. Deciding which ones are beneficial and present the information in a useful way is the main challenge facing boaters. A structured approach can help.

When boating close inshore and close to your launch site/marina a very simple local forecast will probably suffice. Short-term forecasts are very accurate, so choose a website/source that will show wind speed/direction, whether it will rain or not, and the temperature. National broadcasters' sites allowing you to specify precise locations often work very well and will show how the weather will change on an hour-by-hour basis.

If the predicted weather is stable and is appropriate for your trip then this will probably be enough. If the forecast raises any doubts, or if you are likely to be travelling further afield, then you will need

to explore more sources to build up an overall picture.

The sources you may choose to consider are:

- National meteorological services to give specialised marine forecasts, such as the inshore waters and shipping forecasts.
- Sites that show synoptic charts for the days or hours of interest.
- Websites aimed at water users such as surfers or windsurfers, as they are particularly interested in the wind direction/strength.
- Sources of current wind strength at areas close to where you will boat and from buoys out at sea.

Courtesy of PredictWind

These allow you to compare what is happening currently with forecasts to assess how accurate they are.

Build up your own suite of sources that allow you to compare and contrast between the forecast data, allowing for an informed decision.

Remember: if there is any doubt – don't go!

Other sources of weather forecasts include:

National and Local Radio: Many countries give a national shipping forecast that gives reasonable information, but many tend to be too generalised and lack specific local information. Local radio stations near boating areas often broadcast excellent local forecasts.

VHF: Coastguard stations usually broadcast regular weather forecasts on VHF. These forecasts often cover very specific areas and are extremely useful. Some areas of the world use VHF weather channels that continuously broadcast the current forecast.

Marinas and Harbour Masters: Can generally be relied upon to post copies of the inshore waters forecast alongside a weather chart for the day.

Newspapers and Television: Local TV stations often broadcast reasonable data. However, forecasts on the national news are usually too general. Local newspapers can be useful but may lack detail.

The Beaufort Scale

The Beaufort Scale is a definition of wind speeds and likely sea conditions and is referred to in all marine-related forecasts.

A Force 4 may be fairly easy to handle for one craft while being challenging or dangerous for another. Learning the scale is not important, but understanding what a particular wind strength is likely to mean for your craft is vital.

Force	Wind Speed	Description	Wave Height	Sea State
0	< 1 knot	Calm	0m	Mirror like
1	1–3 knots	Light air	Up to 0.1m	Ripples on the surface
2	4–6 knots	Light breeze	Up to 0.3m	Small wavelets with smooth crests
3	7–10 knots	Gentle breeze	Up to 0.9m	Large wavelets with crests starting to break
4	11–16 knots	Moderate breeze	Up to 1.5m	Small waves begin to form with white foam crests
5	17–21 knots	Fresh breeze	Up to 2.5m	Moderate waves and many white horses
6	22–27 knots	Strong breeze	Up to 4m	Large waves, spray and white foam crests
7	28–33 knots	Near gale	Up to 5.5m	Breaking waves, a heaped sea, lots of spray
8	34–40 knots	Gale	Up to 7.5m	Frequently breaking, moderately high waves
9	41–47 knots	Severe gale	Up to 10m	High waves, flying spray and breaking crests
10	48–55 knots	Storm	Up to 12.5m	Very high waves, almost totally white, with foam and spray
11	56–63 knots	Voilent storm	Up to 16m	Extensive foam, exceptionally high waves, visibility seriously affected
12	64 knots	Hurricane	16m +	Air filled with foam and spray, very poor visibility

Developing the skills needed to interpret forecasts and predict weather takes time. One of the best ways to develop your ability is to listen to and read forecasts. Develop an understanding of different weather systems and continually compare what you see and experience with the forecasts.

Chapter 19

Boating at Night and in Restricted Visibility

A quite straightforward area to cruise during the day takes on a very different outlook after dark. Boating at night is usually planned, but sometimes becomes necessary because of a delayed schedule or some other problem.

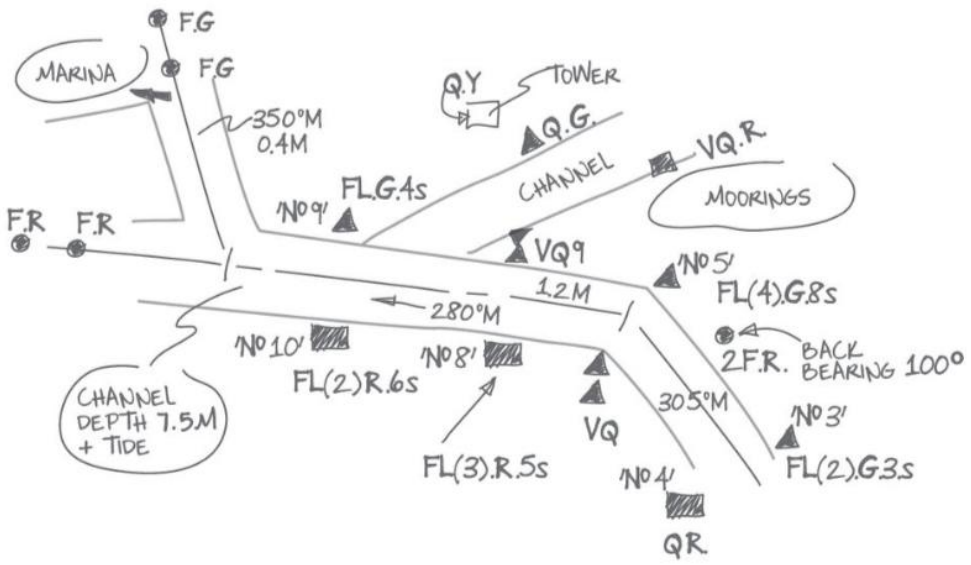
Chartplotters are an excellent resource at night and can give a really good indication of where you are relative to channels, buoyage and any dangers. Just like boating during the day, though, a chartplotter has limitations and should be used alongside a pilotage plan to enter a port or harbour.

To put a plan together for entry into a port or harbour study the relevant chart and almanac, noting the key features that are likely to be visible at night. These might include:

- Lit buoys – laterals, cardinals and other buoyage.
- Sectored, directional and leading lights.
- Lights on chimneys, radio masts, tall buildings.

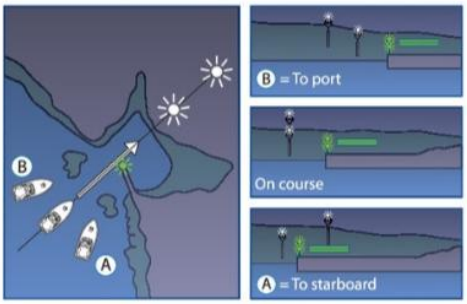
Use this information to draw up a pilotage plan similar to those used in daylight, ensuring the features you note are visible at night in some way. Note, too, the areas of danger – unlit marks, shallow areas, moorings. Do not use buildings or lights ashore unless you are 100 per cent sure they will be visible and identifiable at night.

A plan for a night passage could look something like this:



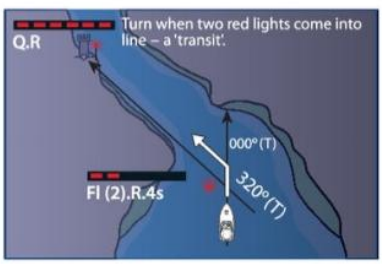
Pilotage techniques that work well during the day can be adapted to work at night too.

Transits: At night, when created for the purposes of navigation, these are referred to as 'leading lights'. If following a particular heading and two distant lights line up, you may be able to create an impromptu transit.

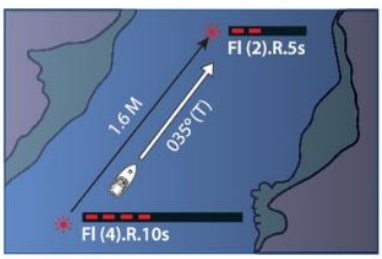


Clearing Lines: As with daylight hours, use these to identify areas of danger or safe water.

Back Bearings: Calculate bearings from very obvious lit objects – buoys, lights on chimneys, etc. Distinctive lights like a 'Quick Red' (QR) will be easier to use than one that flashes intermittently. Creating an impromptu back bearing to a very obvious light higher than your original intended target will work, even if the object does not appear on the chart.



Turning Points: Calculate turning points by referring to bearings to known objects, or use leading lights.



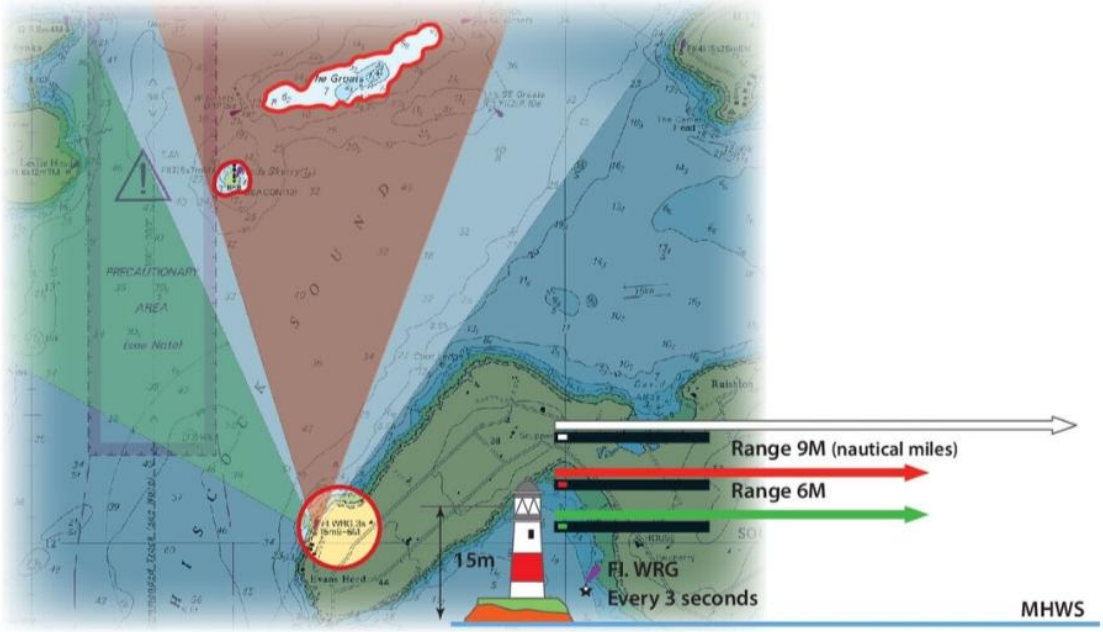
Bearing and Distance: This technique still works well at night, but bear in mind that small errors in heading can lead to large errors in position.

Waypoints and Routes: Works very well at all times, but back up with other techniques too.

Depth Sounder: Works equally well at night as during daylight.

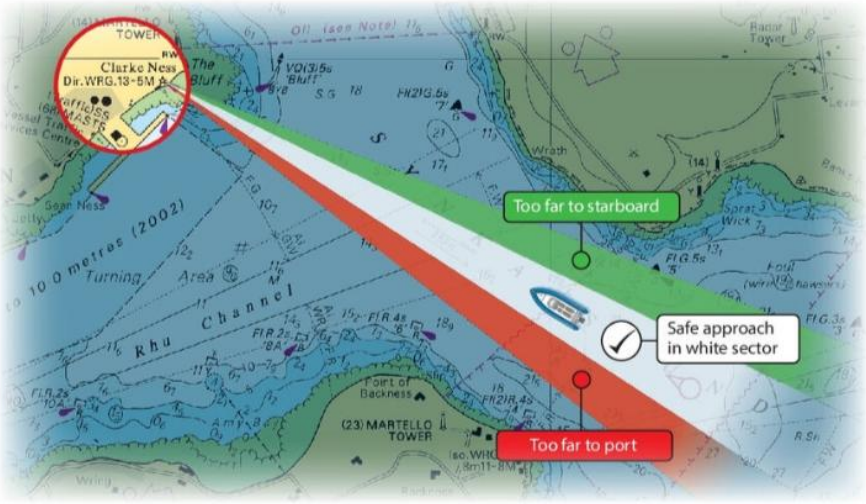
Sector Lights

Sectored lights identify the safer zones to approach from and those from where it is unsafe to do so. Light characteristics may vary to identify different elements of the sector, such as when used as a directional light. The red sector in the illustration below highlights a danger area.



Directional Lights

Directional lights assist passage into a harbour by identifying the safest approach. If you see red you need to come to starboard. If you see green you need to turn to port.



Remember:

- Wear lifejackets and ensure that they have lights fitted.
- Ensure you have warm clothing available – it can be far colder at night.
- Prepare the boat and crew. Dim the instrument and equipment lights to preserve night vision. Use red lights where possible or filters to preserve night vision.
- Have torches available for reading charts – ideally with red filters.
- Maintain a good lookout and be especially aware of lobster pot markers and unlit buoys.
- If on a passage, plan a watch system.
- Always have a plan 'B' – and an all-weather port of refuge available.
- When 'buoy hopping' at night, never drive directly at the buoy. Choose a point offset well to one side – staying away from hard objects always makes sense!
- Ensure you always know where you are and can plot the position on a chart using the techniques already identified and adapted for night use.

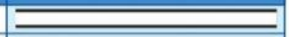
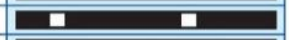
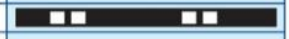
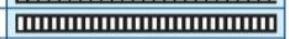
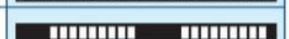
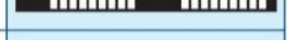
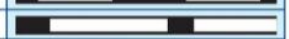
Position Fixing at Night

In addition to the position-fixing techniques already identified in chapter 17 (which can be adapted to work at night) you can also fix your position using the intersection of the lights from sectored lights and directional lights in combination with bearings, contours or transits.

A combination of the pilotage techniques identified can be used to find unlit marks at night safely if the need arises.

Light Sequences

Light symbols on a chart refer to the way in which the light on a buoy flashes. The commonest types are:

NAME	CHART SYMBOL	DESCRIPTION	VISUALLY
Fixed	F	Fixed light - always on	
Flashing	Fl	Flashing, off more than on	
Group flashing	Fl (2)	Flashing in groups	
Long flashing	LFl	Flashing, off more than on lasting 2 or more seconds	
Quick	Q	50–79 flashes per min	
Very quick	VQ	80–90 flashes per min	
Group quick	Q (9)	A group of quick flashes followed by a period off	
Interrupted quick	IQ	Similar to group quick but with no specified number of flashes	
Isophase	Iso	Equally on and off	
Occulting	Oc	More on than off	
Alternating	Al. WR	Colour changes	
Fixed and flashing	F Fl(2)	Fixed light with flashes at higher intensity	

Restricted Visibility

Boating in fog can be one of the most dangerous situations for a small craft.

If fog is predicted, going to sea is foolhardy and should be avoided. If you are already at sea when fog descends, the safe option is to turn back and return to port or, if that is not a safe option, make your way to a safe area away from shipping. Either way, as Skipper your first responsibility is to your crew, and your actions should reflect this.

Tip – It is good practice to pre-enter your chartplotter with waypoints and routes into harbours you will pass by to act as 'ports of refuge' in the event of a problem.

Whether or not you make a 'run for home' will be influenced by a variety of factors: where you are; your navigation skills; whether you possess a radar or chartplotter and the knowledge to competently use them, and how easy the entry is into the harbour. If you do decide to enter a harbour or marina, create a plan containing the information you will need to make a safe entry.

Chapter 20

Trailing your Boat

Trailing a boat can be a stressful, tiring experience or relatively straightforward – the difference is preparation.

Secure all equipment before trailing

Important points to remember:

- Ensure your tow vehicle is up to the job. The combined weight of the trailer and boat should not exceed the permissible towing limit for the vehicle.
- Ensure the vehicle is capable of pulling the trailer up the slipways you intend using.
- In most situations, if the combined weight of the boat and trailer exceeds 750kg, the trailer needs to be fitted with brakes.
- Regularly grease and oil the trailer as necessary. Ensure wheel bearings are regularly repacked with fresh grease to enhance their life.
- Ensure that the trailer is set up for the boat it is to carry. Ensure the rollers are well positioned and the transom of the boat, which carries the weight of the engine through to the trailer, is supported and does not overhang the rollers by more than about 50cm.
- When towing, secure the boat to the trailer securely. Use a ratchet strap through the D-rings on the transom to secure the stern to the trailer. Use further ratchet straps to secure the bow D-ring to the trailer, ensuring that, in addition to being tightly locked to the trailer, the boat cannot roll forward and ride over the winch post. Regularly check straps as you trail, as they may work loose or need adjusting due to slight movement of the boat. If the boat is loose, damage to the hull can occur as it impacts the trailer.
- Never immerse a trailer with hot wheel bearings into cold water, or the bearings will (over time) lose their grease and fail. Allow the bearings to cool for 45 minutes after a trip.
- For trailers/boats weighing less than 750kg it is usually necessary to fit a safety chain between the trailer and tow vehicle. Trailer/boat combinations around this weight usually require a 'break away' lanyard instead that engages the brakes if the trailer comes free.
- Carry a spare wheel and all the tools you will need to change it.

Going Overseas

One of the great advantages of a boat on a trailer is the freedom to go to different ports and overseas.

Rules and regulations change frequently, so contact the tourist and motoring authorities for the countries you intend trailing through. While each country's regulations vary slightly, there are some common requirements that you must adhere to, irrespective of where you are travelling to.

The Tow Vehicle

You should have:

- Original insurance documents and overseas car and trailer insurance documents.
- The original registration documents for the vehicle.
- A set of spare bulbs and a warning triangle.

The Boat

- The original sale documents should show tax has been paid.
- You need insurance documentation.
- Make sure the boat's insurance cover is extended both for trailing and its use and mooring at the intended destination.
- Flare transportation could cause problems, as some countries require a firearms certificate for certain types of flare.

The Crew

- A VHF certificate is recommended and is mandatory in some countries.
- Visas (if relevant) are required.
- Some countries require an International Certificate of Competence (ICC) and some require a higher qualification. On inland waterways in Europe the CEVNI qualification will be required.
- Contact the country's national boating authority for details of compulsory certification required.

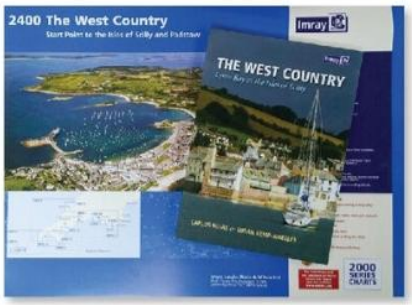
Chapter 21

Cruising in a Powerboat

Travelling further afield and exploring new areas in a powerboat can be a really enjoyable way to get afloat. Boating in areas that you are less familiar with or travelling greater distances will require more-advanced navigation skills and a better-prepared and possibly more-capable craft with more equipment.

Be realistic as you develop your skills and experience when planning where to go. A short trip into a new bay or harbour can be as enjoyable and challenging as a 20-mile trip along the coast. However, small powerboats need not be limited to short coastal passages, and trips of many hundreds of miles spread over a number of days are possible in well-prepared, capable craft. Longer trips in open craft tend to be undertaken in RIBs, but smaller sportsboats are also capable of passage-making in the right conditions.

Like any other aspect of boating, having an enjoyable and safe time afloat is all about planning and preparation. Really good ways to start to explore new areas and develop a better understanding of the demands of cruising are to join a club, cruise with a marina association, or join with boaters from a boating forum or social media site. The support that experienced boaters give can be invaluable.



Whatever type of powerboat you have, ensure that you have charts for the areas that you are interested in and create a rough plan. Decide whether you are going by water or will be trailing your craft, and identify marinas and boatyards where you can store your boat/trailer. Consult the relevant almanac, search websites for harbours and marinas and consider buying pilot guides, which can contain really useful information for visitors to an area. Make sure that you consider the people coming with you – a 20-mile coastal trip may be fun for you, but will others really enjoy it? Taking your boat up further into a harbour or up a river can be a simple but still challenging way to explore and find new and interesting cruising grounds.

Whatever plan you choose, make sure that you are clear where and when you will be able to refuel. In some locations, waterside petrol is impossible to find and carrying more than a few litres of petrol in cans may be technically impossible or even illegal. Diesel is easier to source but, in more remote locations, this may mean arranging a tanker to meet your boat. Speak to harbourmasters and post questions on boating forums for advice.

Never forget the 'thirds' rule – 1/3 to go out, 1/3 to come back, and 1/3 spare.

Where you decide to go will affect the extra equipment that you need to carry. A highly populated boating area that is new to you has different demands to boating in less-populated locations or overseas in areas where the rescue services are less well resourced than they may be where you usually go afloat.

You will need to think about carrying more spares while being more confident of fixing basic mechanical issues. Having an auxiliary engine makes real sense, as does boating in company with other craft. You may need better waterproofs than you usually wear, and for longer passages you may need a drysuit. Being able to issue distress calls in more remote areas may lead you to consider adding additional equipment such as more flares, a handheld VHF to supplement the fixed set, and perhaps an EPIRB when venturing even further afield.

You may decide that some additional training ahead of your trip would be a wise investment. Undertaking a specific course focusing on coastal cruising is an option, or you could spend time with an instructor just focussing on the specific plan you have created and the entry of waypoints and creation of routes in your chartplotter. Finding a mechanic to spend time with you addressing the key issues that arise may be money really well spent.

Whatever you decide to do, always make sure that you and all of those on board are safe, are going to enjoy the trip, and will want to do more cruising in the future.

Heading Afloat for the Day with Friends and Family

Many powerboaters get their first taste of helming on a friend's boat before they ever consider taking a training course or buying one. Before offering a friend the opportunity to have a go at helming your boat, run through the safety basics with them:

- What the killcord does, and how to wear it.
- The controls.
- How and when to do a 'life saver' shoulder check.
- Tell your passengers about changes of speed or direction.
- Make smooth changes in direction in an arc – not sharp ones.

Operating Powerboats Safely in a Group

It's fun to meet up and go boating with friends who also have powerboats or personal watercraft and can be a cracking day out. Just remember that, when boating in a group, it is easy to become distracted just at a time when there is a lot going on. Keep safety front of mind by focusing on:

- Keeping a very good all-round lookout using effective 'life saver' shoulder checks.
- Bearing in mind that things which approach from behind are easy to miss.
- Being sure to keep well clear of the stern of a fast, manoeuvrable vessel when crossing wakes.

Chapter 22

Buying and Owning a Boat

For most people, buying a boat is a considerable investment. Yet, in contrast to buying a house or car, the process can be very simple. However, you need to be aware of some of the pitfalls, especially when confirming ownership.

- Do your research – use website forums and social-media sites to learn other people's views and experiences. Build up background knowledge of the type of boat you want to buy.
- Make sure the boat is suitable for its intended use. Planning and forethought will prevent you investing in a boat that you quickly 'outgrow'.
- Check magazines for a boat test on the type you are interested in. Many sell back issues with relevant boat tests.
- Always seek proof of ownership via original invoices. As with a car, a good service history and receipts indicate a good ownership trail.
- If buying from a dealer, is it a brokerage boat or one of their own craft? If it is their boat you will have protection under the Consumer Protection Laws.
- Establish that no finance company has a charge or ownership right over the vessel.
- Invest in a hull and engine survey – damaged and worn engines can be extremely expensive to fix.
- A 'low mileage' boat is not always the best. A boat that has been well looked after and run regularly can be a very good buy.

Insurance

Once you have bought your boat, insure it. Most marinas and harbours stipulate that you must be insured to keep your boat there.

Storage

Smaller boats are often stored on trailers. Therefore, trailing from home becomes an option. Many boatyards offer 'store and slip' facilities. Storing your craft on a rack system where a forklift retrieves your boat and then launches it when required is increasingly popular. Keeping a boat out of the water removes the need for antifouling and allows it to dry out when not in use.

Larger boats are usually kept afloat in marinas or on moorings, although even boats up to 10m can be kept on racking systems.

Storage costs vary enormously. Popular marinas and storage sites are far more expensive than boatyards in less congested boating areas. Drying berths, buoys and pile moorings are all slightly cheaper than a marina but at the cost of convenience.

Boat Care

Boat care is largely a matter of common sense:

- Wash the boat after each outing to remove salt deposits.
- If possible, flush water through the engine water intakes to avoid salt crystallisation in the cooling pipes.
- Keep batteries charged through the winter (remove them if they are not being used).
- Grease battery terminals with petroleum jelly to ensure the electrical connections remain good.
- Spray the electrics with a water-repellent spray.
- Consider spraying other exposed parts with a silicone spray.

Service intervals for engines vary according to the manufacturer's recommendations. High-usage boats may need to be serviced more than once a year, whereas boats used less frequently benefit from an end-of-season service and winterisation if they are not to be used during the winter.

Chapter 23

SOLAS V

SOLAS V stands for 'Safety of Life at Sea Chapter V' and was created as a direct result of the RMS *Titanic* disaster. As far as smaller craft are concerned, it places a number of requirements on Skippers. The main requirements are detailed below.

- **Radar Reflector** – Regulation 19.2.1.7.

All ships shall have, if less than 150 gross registered tonnes and if practicable, a radar reflector or other means, to enable detection by ships navigating by radar at both 9 and 3 GHz.

'When practicable' means that if you can carry a radar reflector, you should. Both passive radar reflectors and active devices are available.

- **Life-saving Signals** – Regulation 29.

An illustrated table describing the life-saving signals shall be readily available to the officer of the watch on every ship to which this chapter applies. The signals shall be used by ships or persons in distress when communicating with life-saving stations, maritime rescue units and aircraft engaged in SAR ops.

Keeping this table onboard will mean that you comply with this regulation. The table can be found on pages 146–147.

- **Danger Messages** – Regulation 31.

Masters are to communicate information on navigational dangers. These include, for example, a dangerous derelict or other dangerous obstructions, tropical storms, winds of Force 10 or more for which no warning has been received. The form that information is sent is not obligatory and it can be transmitted in plain language or using the International Code of Signals. Contracting governments must promulgate any danger information received and messages must be free of charge to ships.

This regulation basically means that you, as Skipper, have a responsibility to pass on information about navigation dangers to the Coastguard by any means that you can.

- **Danger Messages** – Regulation 32.

This regulation deals with the kind of information required in danger messages. It also has examples of typical danger messages.

This regulation means that you should pass on sufficient information about any navigation dangers you experience or witness (for example: position, nature of danger, time seen/witnessed, any other useful information) to enable other shipping in the area to avoid it.

- **Distress Messages** – obligations and procedures – Regulation 33.

Masters are obliged to respond to distress messages from any source. Ships can be requisitioned by the master of a ship in distress or the Search and Rescue (SAR) authorities.

This regulation reinforces the duty of Skippers to respond to any distress messages they hear.However, be realistic in terms of what assistance you can give and discuss this with the Coastguard.

- **Safe Navigation and Avoidance of Dangerous Situations** – Regulation 34.

Voyage planning is required on all vessels that go to sea. 'Going to sea is defined as proceeding outside of categorized waters.'You can get more information about what constitutes categorised waters from the MCA.

MCA guidance notes say for 'small craft and pleasure vessels, the degree of voyage planning will be dependent on the size of vessel, its crew and the length of the voyage'. The MCA says that it 'expects all mariners to make a careful assessment of any proposed voyage taking into account all dangers to navigation, weather forecasts, tidal predictions and other relevant factors including the competence of the crew'.

Skippers should note that this regulation changes the status of passage planning on small boats from simply good practice to a requirement under UK law. While no written plan is required and there is no set format for a plan, Skippers may need to be prepared to justify the plan they have produced should an incident occur. Trips in favourable conditions in an area the Skipper is very familiar with, close to the point of departure, may not necessitate a written plan. However, a 20-mile passage along an exposed coastline, in more challenging conditions, with a tricky harbour entrance at the destination, is highly likely to justify one.

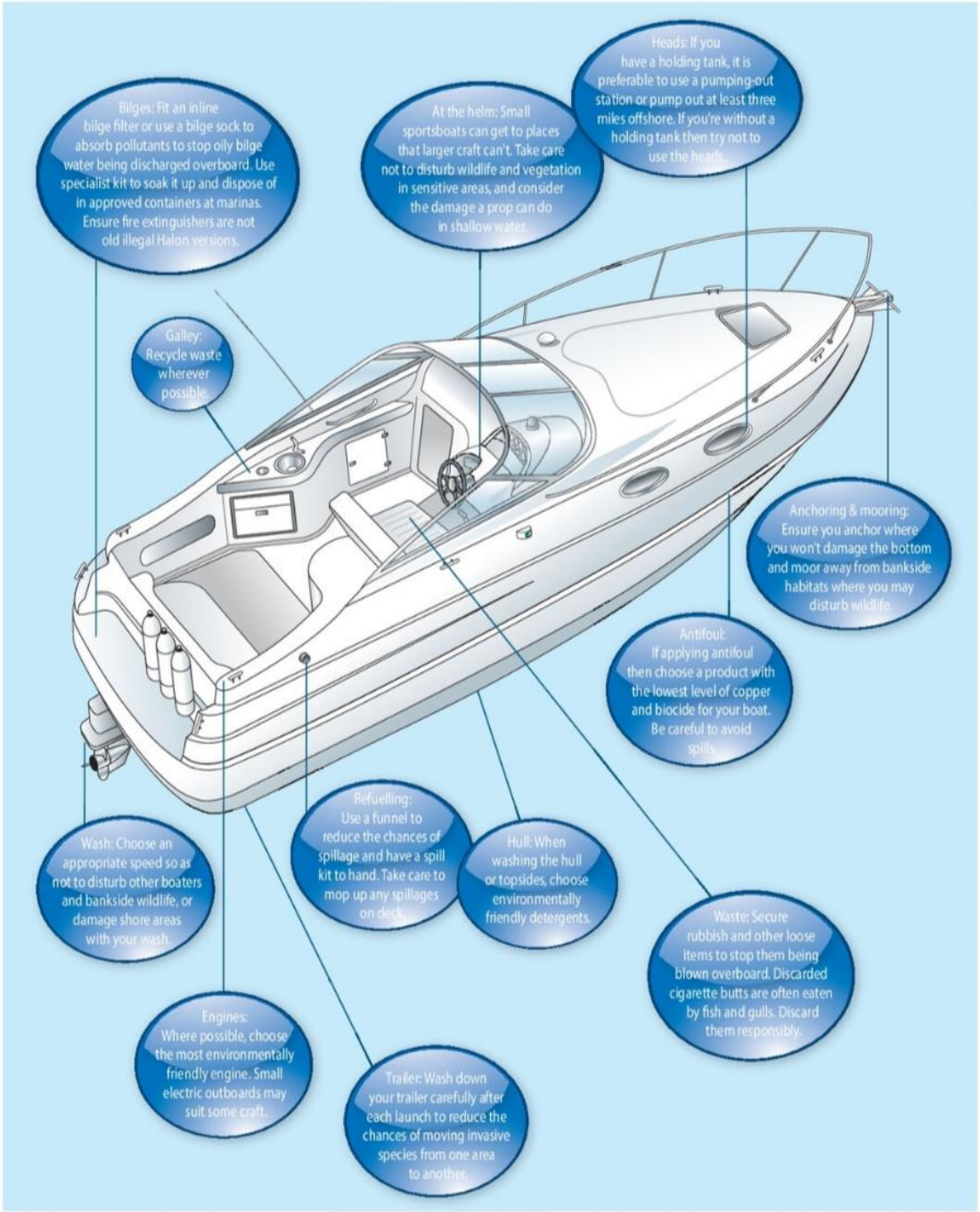
- **Misuse of Distress Signals** – Regulation 35.

'Distress signals only to be used for the proper purpose.'

This regulation reinforces the fact that distress signals have a life-saving role and should not be misused.

Chapter 24

Considering the Environment



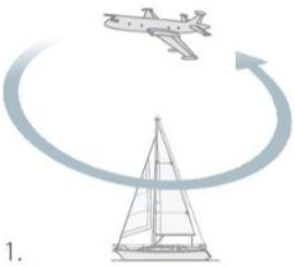
Chapter 25

Life-saving Signals

These are the signals used by ships, aircraft or persons in distress.

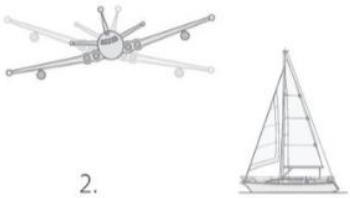
Air-to-surface direct signals

Sequence of three manoeuvres meaning 'Go in this direction'. May be used to show which way to go to assist another vessel or to indicate direction to a safe haven.



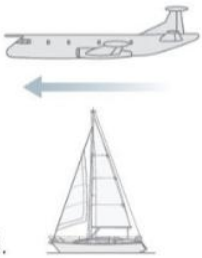
1.

Plane circles vessel at least once



2.

Plane crosses low, ahead of boat, rocking wings



3.

Plane flies over boat in the direction to go

'Your assistance is no longer required.'

Plane crosses low, astern of vessel, rocking wings

Air-to-surface replies: message understood

Dropping a message

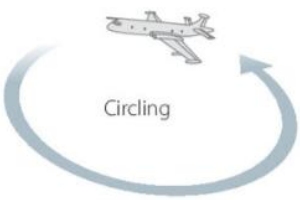
Rocking wings

Flashing landing lights on and off twice

Morse code by light: T or R

Air-to-surface replies: message not understood

Straight and level flight



Circling

Morse code by light: R P T

Search and rescue unit replies

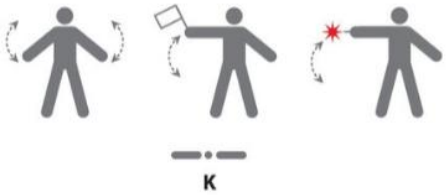
Orange smoke

Three white pocket flares

These indicate that you have been seen and assistance will be given as soon as possible.

Shore to ship signals

Safe to land here



Vertical waving of arms, white flag, light or flare

Morse code letter K

Landing here is dangerous with additional signals that indicate direction of safer landing place

Horizontal waving of light flag, light or flare

Go this way – Put one flag or flare on the ground and move in direction of safer landing area with the other

Surface-to-air signals

V

I require assistance

N

No or negative

W

I require medical assistance

C

Yes or affirmative

Surface-to-air replies

T

Message understood – I will comply

Change course to required direction

Morse code (T) by light, or code and answering pennant

N

I am unable to comply

Morse code (N) by light or code flag N

Glossary

Abeam	Directly to either the left (port) or right (starboard) of the centre of a boat. 'The pier is directly abeam to port of us.'
Aft	Towards the rear (or 'Stern') of a craft.
Beam sea	The term used when a boat is travelling at approximately 90° to the wind with waves approaching from one side of the boat.
Bearing	The angle from one object to another. 'The rock bears 078°M from us.'
Beaufort scale	A scale of wind strength.
Bow	The front of the boat.
Buoyancy aid	A type of Personal Floatation Device (PFD) that is used for sports like water-skiing, windsurfing etc.
Cardinal marks	A type of buoyage used to mark an area of interest.
Cathedral hull	A type of hull typically found on craft like dories.
Chine	The intersection between the vertical side of a boat's hull and the angled hull beneath.
Cleat	A T-shaped fitting used to attach mooring lines to. Found both on craft and pontoons.
Cone	The term applied to a shape used by sailing yachts. Also used to refer to a starboard lateral mark.
Course	The direction in which a craft is travelling over the ground. This could be different from the direction in which it is heading.
D-ring	An attachment point found on craft up to about 12m at the bow for towing or attaching a trailer winch strap.
Deep-V	A type of planing hull.
Deviation	The error induced in a compass due to the effect of metal objects and electric fields.
Displacement hull	A type of hull found on slower craft.
Dry suit	A suit worn for either watersports or in rougher weather that keeps the wearer fully dry.
DSC	Digital Selective Calling, the system used by VHF radios to send digital messages, including distress.
Fairlead	A fitting in the bow area through which lines can be fed.
Following sea	The term applied when a craft is heading with the wind, with the waves following the craft.
Freeboard	The height between the water level and the lowest part of the craft. In the case of a RIB this could be between the water level and the top of the tubes or the transom.
Give-way vessel	The vessel that is required by the IRPCS to initially take action to avoid a collision.
GNSS/GPS	Global Navigation Satellite System. A system used to define position and used in boat and vehicle satellite-navigation systems. Global Positioning System ('GPS') is one form of GNSS. Others are GLONASS, Galileo, and BeiDou. Newer chartplotters may use more than one system.

Head sea	When a craft is heading directly into the waves/wind.
Heading	The direction in which a craft is pointing.
IALA	International Association of Lighthouse Authorities.
IRPCS	International Regulations for Preventing Collisions at Sea – the 'Col Regs'.
Jet drive	A type of drive system using a water jet for propulsion.
Killcord	A critical item of safety equipment that, when attached correctly to the person driving a boat, kills the engine if they move away from the helm position.
Lateral marks	A type of buoyage system used to mark channels.
Leeward	The side of a boat furthest from the wind.
Lifejacket	A type of Personal Floatation Device ('PFD')
Lifting strake	Also known as running strakes, these are features on the hull of a planing boat that create lift and contribute to stability.
Making way	A vessel that is under way and is propelling itself through the water is making way.
Mayday	Where there is grave and imminent danger to a vehicle, vessel, aircraft or person and immediate assistance is required.
MMSI	Maritime Mobile Service Identify. The unique code programmed into a DSC radio to identify it.
MOB	Man overboard.
Neaps	A type of tide where the gravitational effect of the sun and moon is at its weakest, giving rise to less-pronounced high and low tides.
Outdrive	A type of drive system found with inboard engines. In effect it is the lower half of an outboard and is moved by the steering to direct thrust.
Painter	The mooring line found on craft up to about six metres, generally attached to the D-ring.
P.A.M.E.	Plan. Approach. Manoeuvre. Escape. The thought process to go through prior to undertaking any boating manoeuvre.
Pan-Pan	A VHF call made to request assistance where life is not immediately at risk.
PFD	Personal Flotation Device.
Pivot point	The point about which a craft rotates when the steering is turned and thrust applied – can vary between forward and reverse.
Planing hull	The type of hull found on most fast powerboats.
Plotter	A chartplotter, a system combining a GPS receiver and electronic charts that can show a craft's position and be used for navigation.
Port	When facing forward in a boat, the term applied to the left-hand side of the craft.
Propwalk	Also known as 'paddle wheel effect'. An effect typically found on shaft-driven boats where at the moment the throttle is engaged there is some sideways force before a forward force comes into effect.

Quarter	Found at the rear of the craft on either side.
RIB	A type of craft, 'Rigid Hull Inflatable Boat'. Also known as RHIB.
Route	A series of waypoints is joined together to form a route.
Scope	When referring to anchoring, the length of line and chain that has been deployed.
Semi-displacement hull	A type of hull.
Shaft drive	A type of drive system where the engine drives the propeller via a metal shaft.
SOLAS V	Safety of Life at Sea Chapter V.
Sponsons	Another name for the tubes on a RIB.
Spring	A line deployed when mooring to arrest forward or aft movement. Can be used to assist leaving a berth in more difficult conditions.
Springs	A tide where the combined gravitational effect of the sun and moon is at its greatest, leading to the highest high tides and the lowest low tides.
Stand-on vessel	In a potential collision situation, the vessel that initially is required to hold its course and speed.
Starboard	When facing forward on a craft, the right-hand side of the vessel.
'Steer then gear'	The term Skippers use to remind themselves to ensure the steering is pointing in the required direction before throttle is engaged.
Stern	The rear end of a craft.
Stern drive	Also known as an 'outdrive', a type of drive system akin to the lower half of an outboard that is attached to an inboard engine through the transom of a craft.
Stream	The term used to refer to the movement of tide or current.
Transom	The vertical surface at the rear of a craft that an outboard is attached to, or through which the stern drives attach to the engine.
Under way	When a vessel ceases to be tethered to a pontoon or the seabed through its anchor it is under way.
Variation	The difference between the position of Magnetic and True North.
VHF	A marine radio used for contacting other craft/stations and, if necessary, seeking assistance.
Warp	Another name for a rope.
Wash	The waves created by a boat's movement through the water.
Waypoint	When using a GPS unit or a chartplotter, a point input into the unit to navigate to.
Wetsuit	Worn for water sports such as water-skiing. Allows a layer of water between the wearer and the suit to create warmth.
Windage	The effect of wind on a craft.
Windward	The side of a boat nearest the wind.

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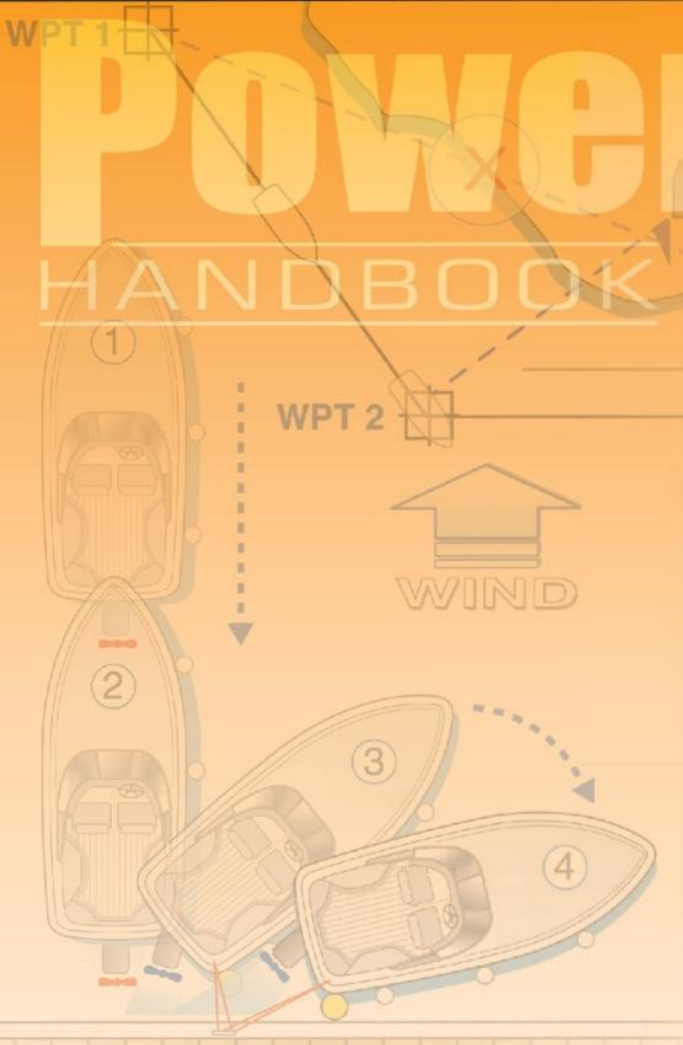
Powerboat HANDBOOK



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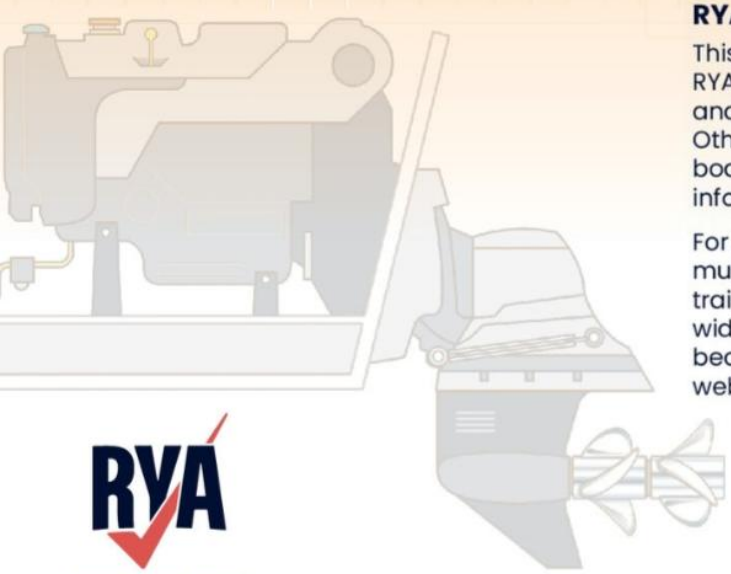

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