Handling
Powered Vessels
SECOND EDITION
Larry Lawrance

A study course for Master Class IV, Master Class V (USL Code Syllabus) & Yachtmaster (AYF and FTC)
HANDLING POWERED VESSELS

BY

COMMANDER L.C. LAWRANCE

SECOND EDITION
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Telephone: 08 6212 9789
Email: sectorcapability.ip@dtwd.wa.gov.au
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Publisher’s Note

These study notes have been specially written to meet the syllabus requirements of the U.S.L. Code for Master Class IV and Master Class V Nautical Knowledge (Ship Handling).

The various techniques described are directed at the type and size of vessel commonly used in the Australian charter boat and fishing industries and the larger power yachts in private ownership.

In this regard, it fully covers the syllabus requirements for the Australian Yachting Federation Yachtmaster’s Certificate in power boat handling.

Disclaimer

No advice expressed or implied in these pages, should be misconstrued or otherwise lead to any danger to persons or property. A certain amount of experience and guidance is required prior to this training and nothing in this book invokes any departure from any country’s laws, the Collision Regulations (IRPCS) or the good practices of seamen.

It strives to provide and confirm mariners’ confidence in their knowledge to do their own safe and effective manoeuvre planning and competent execution. It uses plain but traditional language to best and practically equip the mariner. It is a great sharing of knowledge with relevance for most mariners.
Ship handling is the control of your vessel under varying circumstances and, whether your vessel is a six-metre pleasure craft or a 90-metre trawler, the general principles are the same.

It falls into three distinct categories:

1. **Berthing**  This is the operation that everybody sees, carried out in the full glare of publicity under the critical eyes of the shore-side ‘experts’.

   The skipper who makes a smart and seamanlike job of approaching and berthing gains an instant (if undeserved) reputation as a highly competent seaman. His crew shares in the satisfaction and will forgive him anything.

   But that same crew will feel embarrassed and uncomfortable if the boss makes a thorough mess of the job and few of his other qualities will rate for much thereafter.

2. **Tight Manoeuvring**  This can range from anything between passing a tow line in difficult conditions at sea to turning short in a dangerously narrow fairway.

   It may mean making that instantaneous correct decision that will avoid a collision.

   It could involve the delicate job of edging the ship into just the right position on a slip-way cradle or on to the blocks in a dry dock.

   There are a thousand variations and no two occasions will be the same. In most of them, the efficiency of your crew – and this inevitably comes back to how well you have trained them – can well determine the difference between success and failure.

   And remember this – failure at sea can have horrific consequences. It may just involve some scarring of the paintwork. Under slightly different circumstances, it may easily mean total disaster involving loss of life or loss of the ship.

3. **Excessive Sea and Weather Conditions**  This can be the ultimate test of your ability as a ship handler as these are the occasions when decisions must be the right ones and the penalty for failure is not just loss of face but loss of life.

   All of these situations have one thing in common. They demand a partnership, or sensitivity between skipper and ship. You must know everything there is to know about her capabilities – stopping power, turning circle, reaction to power and rudder, effect of the wind on hull and superstructure, the time delays that are unavoidable between giving an order, seeing it carried out and then waiting for the result of that order to take effect.

   This is no more clearly demonstrated than in the situation of an emergency ‘Full Astern’ on the bridge of a large vessel proceeding at full speed.

   The order must be given and the bridge telegraph run to ‘Full Astern’. There is probably a delay as the engineer hears the telegraph bell, recognises its importance, moves to the engine control position and shuts down the power.

   There is a further delay while the engine and shaft stop turning before stern power is applied. There is a further time lag as the engine builds up to full revolutions and finally – the greatest delay of all – as the reversed propeller begins to take effect and take the way off the vessel.
All of these must be allowed for by the officer in charge who knows there is no way of stopping the ship quickly. The officer’s actions are only going to be effective if, during the handling of the vessel, the officer is thinking ahead at all times and keeping the ship within the limits of her stopping and turning ability.

This means paying due regard to the visibility, navigational dangers and the proximity of other vessels.

This does not only apply to big vessels. The principle is just as valid in a 10-metre yacht. It is only the application and the time factor that are different.

As a result, when we talk about the various effects of wind, tide, propeller and rudder action and turning and stopping in the chapters that follow, never forget they apply just as equally to you as they do to the master of a 10,000-tonne liner.

The big ship that we have just been referring to is at the far end of the scale and its very size and complexity bring in extra factors that will not have to be pursued under the limits set by the title of this manual.

It should always be your aim, when confronting or conferring on a difficult situation, that a more difficult or dangerous situation is not the consequence of your action.

The following chapters are set out to give the background knowledge that is essential to practical operation. The application of that knowledge can only be achieved by going out and putting it into practice.

In the process, you will develop the judgement so necessary to good ship handling and, at the same time, find that affinity between yourself and your ship that is the indefinable but essential ingredient of good ship handling.

Note: “SHIP” is a short and objective generic term that embraces all vessels upon navigable waterways.

Good manoeuvre planning will spare your crew relationships and the vessel from extreme stresses. Every stress placed upon the vessel’s hull and machinery shortens its life and has a subsequent effect on safety.

The self-assessment questions should be attempted immediately after you have studied the respective chapter. Do not consider your study of the chapter finished until you have completed the questions.
Chapter 1  Propellers

1.1 The Screw Propeller

Its Origin and Operation

A propeller, or to give it its more correct title – screw propeller – is really exactly what the name suggests – a device to wind its way through the water in the same way as a wood screw turns its way into a block of wood.

The first propeller was designed on these lines, the angle of the thread (or pitch) determining how far it would advance through the water when rotated.

It is not a big step forward to convert that original screw into the familiar three-blade or four-blade screw propeller that must be quite familiar to everyone who has had anything at all to do with boats.

Fig. 1.1 Early screw propeller

Diameter and Pitch

The size of a propeller is defined by its diameter and pitch.

The diameter is easy to understand. It is the diameter of the circle inscribed by the tips of the blades as shown in Figure 1.2.

The pitch, on the other hand, does not refer to any measurement or to the angle of the blades but is the theoretical distance the propeller would advance in one revolution if rotated in a semi-solid substance.

Thus, if the propeller shown in Figure 1.3 was described as 1.3 metres diameter and 1.1 metres pitch it would theoretically advance through the water 1.1 metres for every revolution.

Of course, we all realise that, in water, this does not happen. The vessel does not leap forward 1.1 metres with the first turn of the screw. There is a percentage of slip which will be at its greatest when the ship is at rest and which will decrease as she gathers way through the water.

Fig. 1.2

Fig. 1.3 Propeller pitch

The efficiency of the propeller can be gauged by the level of slip and this can be calculated by a very simple and logical mathematical calculation.

Calculating Propeller Slip

Take this example:

• A 250-tonne vessel has a propeller pitch of 1.2 m.
• At full power, the diesel main engines produce 1850 revolutions per minute. The gear box has a 5:1 reduction which means that the shaft is turning at one-fifth of the speed of the engines.

• When steaming at 1850 revolutions in calm water, the ship’s speed is accurately measured at 9.5 knots.

• When trawling (towing two heavy nets astern) its speed, at 1850 engine revolutions per minute is 3.8 knots.

What is the propeller slip in both cases?

Here’s how it is done.

At engine revolutions of 1850 per minute, the propeller is turning at one-fifth of that speed:

\[ \frac{1850}{5} = 370 \text{ revolutions per minute} \]

With a propeller pitch of 1.2 metres, the ship will theoretically move forward 1.2 metres for every revolution, or \( 370 \times 1.2 \text{ m per minute} \).

If we multiply this by 60, we will get the theoretical advance per hour.

\[ 370 \times 1.2 \times 60 \text{ m per hour} = 26,640 \text{ metres per hour (or 26.64 km/h)} \]

However, ship’s speeds are given in nautical miles per hour (knots). As there are 1853 metres in a nautical mile, if we divide this 26,640 metres per hour by 1853 we get the theoretical speed of the ship in knots.

\[ \frac{26,640}{1853} = 14.38 \text{ knots} \]

This is, of course, only the theoretical speed. The actual speed achieved at 1850 revolutions is 9.5 knots as measured by the patent log or timed over a measured nautical mile.

The difference between the two – 4.88 knots – is the loss due to slip. To put it a different way – it is losing 4.88 knots out of a theoretical maximum of 14.38 knots due to propeller slip.

This can be converted to a percentage of loss:

\[ \frac{4.88}{14.38} \times 100 = 33.9\% \]

Therefore, the propeller slip is 33.9% and (by subtracting this from 100) the propeller is 66.1% efficient.

When trawling, the net reduces the speed to 3.8 knots. The speed loss by slip is now \( 14.38 - 3.8 = 10.58 \text{ knots} \).

The percentage of slip is therefore \( \frac{10.50}{14.38} = 73.6\% \).

If you give it a little thought, you will also see how slip is affected, not only by the pitch, but by the diameter and the blade area. In other words, the amount of working area of the propeller which arrives at the conclusion – the greater the working area, the less slip.
So, ideally, a vessel designed for towing would have a very large, slow revving propeller finely pitched to equate the optimum speed of the tow which might be in the vicinity of a maximum of three to four knots. Excellent. Slip has been reduced to a negligible 5%.

But what happens when the tow is slipped to go about other business? That propeller has been pitched to give a maximum speed of just over four knots – far too slow to get to the next job in an acceptable time period.

There is yet another very important factor that will decide the diameter of the propeller and that is the physical space available. You cannot swing a three-metre propeller unless you can design the stern of the vessel to accommodate it.

What happens is some sort of compromise size which will give the vessel a good towing capability and an acceptable speed when running free.

The advent of reliable variable pitch propellers has added a new approach to this problem and that will be discussed at the appropriate time.

On the other end of the scale is the high speed vessel which, to achieve the required speeds, must look at high revving propellers.

Such a vessel would be expected to have poor towing capability, in comparison with the one we have just been discussing, and would have small propellers with a large pitch.
The cruising propeller has medium diameter and medium blade area to reduce drag at medium rpm with the aim of versatile all round performance ie towing, manoeuvring, power astern, able to handle sea state and wind, an acceptable level of slip and good economy. Propellers are a bit of a black art even to the experts. It is common practice with new vessels to trial a range of propellers to find the most efficient.

Shaft calculations for different alloys, size and wear require expert calculation and application of manufacturers recommendations.

Propellers and rudders increase their efficiency to transmit energy greatly the deeper they are placed in the water. This is due to water pressure increasing with depth. A submarine submerged has virtually zero propeller slip. This factor also contributes to them avoiding detection.

When a propeller turns in low pressure cavitation occurs. This situation is most commonly created by a vessel’s stern being raised close to or just above the water’s surface.

1.2 Propeller Action

Effect of Propeller Action in Manoeuvring

If you placed a long, flat board in the water and fixed a revolving paddle wheel at one end, the board would pivot continuously in a circle (refer Figure 1.6).

![Vessel’s propeller moving in an anti-clockwise direction looking from behind the propeller the stern will pay off to port.](image)

*Fig. 1.6 Paddle wheel effect or transverse thrust*

A ship’s propeller has much the same effect although to a lesser degree.

A *right-handed* propeller (one that turns clockwise when viewed from astern) is, in addition to its forward propelling effect, going to wind the stern of the ship to the *right*. In more seamanlike terms, it will cause the head to pay off to port and the stern to swing to starboard.

![Right-handed propeller action](image)

*Fig. 1.7 Right-handed propeller action*
If you were to revolve the same screw in the opposite direction (apply stern power) it would cause the stern to swing the opposite way – to port.

This *paddle wheel effect*, or transverse thrust as it is also called, is not particularly noticeable when making way, as the forward movement of the vessel and the compensating effect of the rudder tend to cancel it out.

It is called the paddle wheel effect because the propeller after being engaged wheels, or walks, the stern in the direction that the propeller is turning. The effect is increased because of the greater water pressure, created by depth, at the bottom edge of the propeller.

It will be most noticeable when first putting the engines ahead with the vessel stopped in the water.

Owners of small planing vessels fitted with high powered outboard motors will often experience this as a permanent list when the vessel is travelling at high speed. In this case, the propeller is attempting to ‘climb out’ of the water and the usual solution is to fit trim tabs at the stern to counteract it.

However, it is when the propeller is going *astern* that the main transverse thrust is felt.

Here, the sideways motion can be as great as the tendency to move astern. The rudder will have no effect, as you will see shortly, as its design is to operate in the propeller wash and the water pressures contributed to by the movement of the vessel.

Let’s revise what we have just covered:

- With a *right*-handed, single screw going *ahead* the stern of the vessel is going to move to *starboard* – and the bow, of course, will pay off to port.
- A high-speed outboard, instead of winding sideways, winds *up*, and to the *right* giving the boat a list to port.
- With the same engine going *astern* the stern of the vessel will move to the *left* (to port), the bow paying off to starboard.

**One very important final point:** The performances we have been looking at in this chapter are for *single screw, right-handed propellers with orthodox rudders*. If your propeller happened to be *left-handed*, you must, of course, reverse all the above rules.

There are also many other specialised types of propeller propulsion such as twin screws, kort nozzles, variable pitch propellers, bow thrusters, and outboard motor and outdrive units. These are covered in later chapters.

### 1.3 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. The size of a propeller is defined by its diameter and pitch. **True / False**

2. A propeller’s pitch describes (tick ✓ correct answer):
   - (a) its frequency range
   - (b) the angle of the blades
   - (c) the theoretical distance it advances in one revolution
3. The efficiency of a propeller is measured in (tick ✓ correct answer):
   (a) speed
   (b) percentage of slip
   (c) fuel economy

4. From the list of items below, circle the four things you need to determine propeller slip in calm wind and water:
   • vessel tonnage  • main engine RPM
   • condition of loading  • reduction ratio
   • growth on hull  • propeller pitch
   • speed made good  • hull type
   • diameter of propeller  • propeller design

5. Marine growth on a vessel’s hull will: increase / decrease / have NIL effect on propeller slip. (Circle correct answer.)

6. Steaming against the tide will: increase / decrease / have NIL effect on propeller slip. (Circle correct answer.)

7. A strong wind from astern will: increase / decrease / have NIL effect on propeller slip. (Circle correct answer.)

8. A mild cross sea will: increase / decrease / have NIL effect on propeller slip. (Circle correct answer.)

9. On a right hand propeller when viewed from astern, you would expect to see it turning in a clockwise direction when going: ahead or astern. (Circle correct answer.)

10. With a right handed, single screw going ahead the stern of the vessel should move to ________________, and the bow of course will pay off to ________________.

11. If your vessel had a left handed propeller, how would you expect it to react compared with a vessel with a right handed propeller?

12. Propellers that are deeper have a better grip on the water and are generally more efficient due to increased pressure of the water on them.

   True / False

13. What do you understand cavitation to be?
Chapter 2  Rudder Action, Simple Berthing in 
Calm Conditions

2.1 The Principle of a Ship's Rudder

There are many ways in which a powered vessel can be steered but we will keep it simple for the moment and deal only with what might be described as the ‘orthodox rudder’.

In its simplest form, it is a hinged plate set vertically in the line of the propeller wash and controlled by a hand tiller.

Provided the propeller thrust or the speed of the vessel is not too great, there is no difficulty in pushing it one way or the other to control the direction of the vessel’s heading.

If it is desired to steer from a position some distance from the stern, this is easily rigged up with wires and pulleys, a certain mechanical advantage being gained from the diameter of the wheel. (See Figure 2.1.)

As the wheel gets bigger, so the thrust on the rudder and the effort required to control it increase in proportion. The sailing ships of the last century are a typical case in point, the very large wheel rigged on the wire and pulley arrangement often requiring four men to control it in excessive weather conditions.

So the next step up is some form of mechanical gearing or hydraulic system. When even this is insufficient it becomes necessary to have a special steering engine remotely controlled by some form of servo mechanism from the wheelhouse.

Whichever way it works, the end result is turning that rudder one way or the other.

The next important factor is the area of the rudder and, in general terms, one could say ‘the larger the rudder the greater will be its effectiveness’.

But once again we come up against the eternal compromise.

If you fit a very large rudder to a high speed vessel (to give it good control at slow speed) you will probably not have enough power available to turn it against the enormous water pressures resulting from that high speed.

In addition, a large rudder area will set up massive vibrations at high speed and cause cavitations which will affect the performance of the screw.

Fig. 2.2 (a) Tug rudder          (b) High speed rudder

Note that the tug shows a post, usually known as an aperture post, running down from the hull to the heel of the keel between the rudder and the screw. Most tugs with conventional gear, both old and new, have this:
(1) for strength
(2) to protect the rudder from being damaged by flotsam
(3) to prevent the rudder from turning around and on to the propeller after chain/hydraulic failure or stock/pintle breakage
(4) to stop the propeller from winding the propeller shaft out of the hull in the case of a broken shaft or coupling. They often have an aperture which allows the shaft to be drawn through them once the propeller has been removed.

It is rare to see a tug rudder with no lead or balance portion on the rudder due to the strength of water diverted by them. The exception is where the leading edge of the rudder is recessed into the rudder post, or attached to it by pintles.

The rudder of a high speed vessel will be very small. At high speed it will be very effective but this effectiveness will deteriorate at slower speed and may be totally ineffective when engines are stopped and the vessel is only moving slowly through the water under its own momentum.

A slow speed tug, on the other hand, can afford to have a very large rudder and will be a delight to manoeuvre at any speed within its capacity.

### 2.2 Rudder Design

Size apart, the rudder must also be designed to create a minimum of disturbance. Where this starts to become a critical factor you will find the rudder being built in a hydrofoil shape. (Figure 2.3.)

The next point to take into account is some way of relieving the weight on the rudder as far as possible.

There are two reasons for this. The first is the amount of power needed to control the rudder (be it by mechanical means or through a steering engine) and the second is the physical strain on the rudder assembly itself, particularly the rudder post which is subjected to enormous torque.

Trawlers, tugs, work boats and yachts all have large rudders and the greatest loads will be placed upon them when moving astern (particularly into a sea), and manoeuvring ahead with the helm hard over.

Consider a tiller-steered yacht with a deep dagger rudder mounted at or near the transom going astern under power. If you try to make a sharp turn with too much stern way the rudder blade will be forced flat against the hull, slamming it hard over (even if you’re holding on tightly). The result will be that you whack yourself or someone near you with the tiller, damage the lock stops, break off the rudder blade or severely damage it.

Smaller vessels with direct mechanical and chain steering have been known to break off helmsmen’s arms when operated negligently astern.

Another rarely considered load for rudders, particularly with large slow turning propellers is the compression dynamic (pulse) applied and released every time a propeller blade passes adjacent to the rudder’s leading edge. This fatigue, though modest, is shortening the life of the shaft at the bearings all the time while steaming. Rolling around in the berth has a similar effect.

The forces on rudders described above are overcome by extending the forward, or leading, edge of the rudder blade so that the thrust on the trailing edge is partly counter-balanced by the opposite thrust on the extended leading edge.

This is known as a **balanced rudder**. (Figure 2.4.)
So you now have a further ingredient built into the way your vessel will perform when manoeuvring – the size of the rudder and its probable effectiveness at high and low speeds and the effort required to apply the desired amount of rudder under differing circumstances.

At the conclusion of the last chapter, we stressed the importance of ascertaining the direction of rotation of the screw before taking charge of a strange vessel for the first time.

To this we can now add considerations of the rudder size, ease of rudder control and its location in regards to propeller wash.

### 2.3 Making a Simple Approach

It is now time to put these varied bits of knowledge together and see how it works out when making a simple approach to a jetty in ideal conditions – no wind or tide, just calm water and a clear berth.

We have a single-screw vessel with a slow revving right-handed propeller and a large rudder. She is some 200 tonnes so will carry her way some distance with engines stopped.

The above facts tell us several vital things about the way the ship can be expected to behave.

- Since it is a slow revving propeller the transverse thrust will be very significant and, when the engines are put astern (and the propeller rotates anti-clockwise) it will wind her stern to port.

If we are going to use this characteristic to assist our manoeuvre, we will need to berth Port side to.

- The large rudder will give her steerageway at slow speeds so we can expect her to be controllable with engines stopped and the ship just ghosting through the water.

- Being single screw, this very large rudder will be set directly in the propeller wash, so a short burst of power with the rudder hard over can be expected to swing her rapidly without significantly affecting the forward speed.

We now make our approach and, since everything is in our favour, we line the ship up at about 40° to our selected berth and sufficiently far off to make it a controlled approach, both as to speed and course.

Your engines are turning over at ‘Slow Ahead’ to give you an approach speed of about three knots. (Figure 2.5.)

At position 2 (in Figure 2.6) engines are stopped.

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**Fig. 2.5** Vessel on aproach course. Engines slow ahead. Speed about three knots. Rudder amidships.
This is where your own judgement must be the only guide. You will have judged this point on the basis that the ship is moving sufficiently fast through the water to reach the berth before she loses steerageway, but not so fast that she will be difficult or impossible to stop in time.

Until you know your ship, it is always better to err on the side of caution. If you find that you have stopped too soon it is very easy to give a short touch ahead on the engines. On the other hand, if you are moving too fast and have to apply stern power the stern will immediately swing to port and spoil your approach.

At position 3 (in Figure 2.7) you are a ship’s length or so from the berth and still moving ahead with your original momentum.

This is the moment to put the wheel over to starboard. (At the slow speed at which you are moving you may need to put it hard over to get any effect.)

It is probably obvious to you that, at this close range, there is no hope of the helm bringing the ship round parallel to the wharf. All it will do is to start her swinging to starboard.

The ‘angled off’ position so close to the berth (we may have the bow no more than three metres or so from the jetty at this stage) is quite deliberate.

This is the point at which we apply stern power and this means as much as you need – even up to full power – to stop the vessel.

If you have done it well, the bow will stop before it touches the wharf while, at the same time, the transverse thrust of your reversed propeller will gently drop the stern in to port and alongside.

Make sure you stop engines before you gather sternway. The inward swing will continue after they are stopped. (Figure 2.8.)

Engines astern – stern power will stop vessel while the transverse thrust of the screw will bring the stern alongside at the same time.
Fig. 2.8 Engines astern. Stern power will stop vessel while the paddle wheel effect of the screw will bring the stern alongside at the same time.

This is the theory and, surprisingly perhaps, the way it will work out in practice in the greater percentage of cases. But theory on its own is never enough and, if you hope to be a ship handler, you must now go out and put it into practice.

Choose yourself a clear berth and a still day. Make a few practice approaches, gauging the effects of rudder and propeller as they apply to your vessel and, most importantly, the distance the vessel will carry her way with engines stopped.

In this practice period, if you find you are approaching too fast, go astern in plenty of time and get out and make a new approach. Until you are thoroughly conversant with your vessel and what it will do it is usually much quicker (and safer) to start all over again than to try and sort your way out of a ‘bodged’ approach.

Of course, no ship handler ever built a reputation on maneouvring under such perfect conditions. Wind is going to play a vital part in the operation and tidal currents even more so.

If these problems are combined with having to bring this same ship starboard side to you have a totally different ball game. That propeller thrust that dropped you alongside so sweetly is now going to work the wrong way and throw your stern away from the wharf at the last moment as you go astern to take the way off her.

There are, of course, ways of overcoming these and untold other problems designed to make sure that life isn’t easy for the ship handler but we will meet these one at a time as we proceed.

2.4 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. Complete the following sentence: The larger the rudder, the greater will be its

2. What problems would you encounter if you fitted a very large rudder to a high speed vessel?

3. A badly chosen rudder can cause high drag. True / False

4. Generally, high speed vessels have small rudders. True / False

5. Most rudders are placed in the accelerated flow of water from the propeller. True / False

6. The deeper the rudder is, the greater the pressures upon it and consequently the more efficient it can be. True / False
7. Hydrofoil (wing) section rudders generally (tick ✓ correct answer):
   (a) create less disturbance or turbulence
   (b) create less drag (loss of energy)
   (c) are easier to steer.
   (d) all of the above

8. The very considerable forces that a rudder can generate, compounded by the leverage exerted by the length of the rudder (if there is no bottom bearing) are (tick ✓ correct answer):
   (a) dissipated by the ambient water sliding across the exposed face of the rudder
   (b) transmitted into the hull of the vessel

9. Less energy is required to move a balanced rudder. True / False

10. Transverse thrust can be expected to be greater from large slow revving propellers. True / False

11. With the helm amidships, operating a single right handed screw astern, you would expect the vessel’s stern to move to port and the bow to move to starboard. True / False

12. Most propellers are right handed and when walking on board for the first time it is safe to presume that is the case, particularly if someone tells you so. True / False

13. With the rudder amidships on a vessel with a single right handed screw, when engaging ahead the stern can be expected to move a little to starboard. True / False

14. Do you agree that, where practical, a vessel with a single right handed screw should berth port side to? Yes / No

15. Describe the condition: ‘Slow ahead’.

16. While refining your boat handling skills, is it better to (tick ✓ correct answer):
   (a) err on the side of caution, or
   (b) keep your hull speed up to enhance steering responses?

17. Should full helm and significant throttle application be necessary with every manoeuvre or adjustment of your vessel’s position? Yes / No
Chapter 3  Wind and Tide

3.1 Wind Effect

*Windage* is the effect of the wind on the hull and superstructure of a vessel. A vessel with the hull well out of the water and a high superstructure will obviously have a very significant windage. If, on the other hand, the draught is commensurately deep, giving her a good grip of the water, the effects will be considerably reduced.

If most of the draught is aft, the bow will tend to fall off with the wind. She will be very difficult to bring head to wind at slow speed.

Even so, almost any vessel, if allowed to drift freely in a strong wind, will lie across the wind.

Another significant fact is that most vessels under stern power, if given enough sea room, will tend to haul their sterns to the wind and ‘hang’ there on the propeller stern to wind.

All these facts are obviously going to be of great importance to the ship handler both in the close manoeuvring needed to put the ship safely alongside a berth and in the handling of the vessel at sea under heavy weather conditions or when passing a tow.

*Fig. 3.1*
### 3.2 Effect of Tide

The direction and strength of the tidal flow is a particularly vital factor in close manoeuvring up to a stationary object such as a jetty or buoy as, in this case, the whole body of water is moving and the ship will be carried bodily in that direction quite independently of her actual course and speed *through* the water.

In coastal navigation, one can establish this movement (referred to as set and drift) and make a mathematical plotting calculation to counteract it.

In manoeuvring, you simply do not have time for this. On your way in from seaward you would have taken note of the tidal movement by the wash created as it washed past buoys and beacons and the way in which navigation buoys were leaning with the direction of flow.

If the direction of flow is *across* your line of approach to the berth, you must use your judgement by making an up-tide allowance which can be varied or modified on the way in but is designed to keep the intended berth or buoy *on a steady bearing*, even though the ship’s head is pointing some considerable distance away from your intended line of approach.

Alternatively, the tide may be right behind you. This means that your approach is at a much greater actual speed than you would wish.

Remember, you still need some way through the water to maintain control of your vessel. If this minimum handling speed was three knots and the speed of the tide was also three knots, you will be approaching the jetty at an actual speed of six knots and will require a lot of sternpower to stop when you finally arrive.

This brings us to the third alternative, where the vessel is stemming the tide on the approach course. If we use the same example as above, the three-knot vessel stemming the three-knot tide would, in fact, be standing still – but under full power and rudder control.

This must surely be the ideal balance. A little more head power will move the ship ahead at a controlled speed and she can be stopped at any time simply by reducing power.

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*Putting them both together*  

**THE EASY WAY OR THE HARD WAY?**

The first fact that should emerge from the above is that there is an *easy way* and a *hard way* to berth a vessel when the tide is running more or less parallel to the berth or when you are coming to a buoy.

In fact, I could go further and call them the *dangerous* and the *safe* ways of carrying out the same operation.

All this means is that, assuming you have a choice, *always make the tide work for you*, and this, of course, means *stemming* the tide on your approach wherever possible.

The same rule goes for the wind. It is far better to make the wind work for you whenever the circumstances allow than simply to charge in without giving it a little thought beforehand and making a difficult (and possibly dangerous) operation of what could have been a simple, uncomplicated manoeuvre.
Well ahead of your approach to your berth you should make your wind and tide observations, have your deck lines, fenders and boat hook ready.

Be warned that on bays adjoining large waterways (like Sydney Harbour) the tidal flow can be expected to backwater and the wind may sheer around significant headlands, buildings and ships.

Also, when manoeuvring in shallow water a sudden application of power can cause the stern to dip. This has the potential to bump bottom, damage the gear (rudder, propeller, shaft and skeg) and to stir up mud, sand and sea life to the detriment of your machinery reliant upon raw water suction.

### 3.3 Turning in a Strong Wind

**Turning Short in a Fairway in Windy Conditions**

‘Turning short’ infers that you have little room in which to execute the manoeuvre. A little further on we will look at the way in which an anchor is used in these circumstances, but for the moment we will treat it as a problem that has to be managed with engines and rudder alone.

The ship is heading East, the wind is from the North and your problem is to swing her through 180° so that the bow is facing West. (See Figure 3.3.)

In addition to the wind direction, several other factors must be taken into account, all of which we have already looked at in the preceding notes.
They are:

- direction of rotation of the screw
- windage forward or aft
- trim of the vessel
- amount of sea room available
- direction and speed of tide.

For the moment, we will avoid complications and leave out any tidal effect but note that there is always shallow water to leeward (South) and some five or six ship’s lengths of clear water to the North. Let us also assume for the first example that the vessel has a high forecastle and is in light trim forward.

This means that her bow will tend to fall off to starboard.

Any attempt to drive her round to port under full port helm is doomed to failure before you even start. The high windage forward is going to fight your attempts to bring the bow round before you run out of water to the North.

In other words, ‘You are attempting to fight the wind instead of making it work for you’.

Figure 3.4 Vessel with high windage forward attempting to turn up-wind.

The question you are faced with is: How can the wind be used to advantage?

Figure 3.5 shows the four steps. By going astern, five factors immediately start to work in your favour.

1. The reversed propeller thrust starts to pull the stern to port.

2. The wind, acting on the high windage area forward, blows the bow to starboard. To be precise we say, “The vast difference in air pressure on either side of the vessel cause by the wind blowing onto the port side, causes the bow to move towards the centre of the low and pays off to starboard.

3. The ship obeys the rules and brings her stern up into the wind.

4. Now, unless the wind is very strong, the propeller thrust, with its transverse thrust, is going to carry the stern at least a small way across the wind direction.

5. With engines stopped, she will quite quickly fall off beam-on to the wind and your manoeuvre is completed.
As an alternative to the last step, you could go ahead under full port helm and, even with your large turning circle, could expect to comfortably bring her around clear of the shallow water to the South.

![Diagram showing wind to assist the manoeuvre]

**Fig. 3.5 Using the wind to assist the manoeuvre**

The vital step in that whole operation was at position 4, where you succeeded in getting the stern across the wind, so let us see how you would go about it if the ship was facing West and you had to carry out the same 180° turn.

In this case, the propeller action is against the direction in which you wish to swing the ship so, while she will almost certainly bring the stern up to the wind (albeit more slowly), it is highly improbable that you will get the stern across the wind as before.

This problem can usually be overcome by a short burst of power ahead with the wheel hard over to port. Once the stern is across the wind you have achieved your objective.

![Diagram showing completion of the same manoeuvre against the screw rotation]

**Fig. 3.6 Completing the same manoeuvre against the screw rotation**

These two examples are given solely to show how to make the wind work for instead of against you.

No two sets of circumstances will ever be the same and it will always be necessary to weigh up all the factors.

**Allowing for the Tide**

The method of turning just outlined would be most hazardous if there was a strong tide, unless you had a lot of searoom to play with but there could well be occasions where, with the wind directly opposite to the tide you could find one balancing out the other, as far as your drift was concerned, with the final result of allowing you to make a full power turn that might otherwise be impossible.
3.4 Berthing in a Tideway

It is in your approach to a wharf that the tide will have the greatest effect and this has already been discussed in some detail already.

To bring it down to practicalities, we will go back to that very first manoeuvre we looked at – a simple approach to a jetty where you have a clear berth, calm water and no wind. Only this time we will add a two-knot current running parallel to the berth. The vessel has a right-handed screw as before so your first thought is to come port side to.

However, this will mean berthing down tide and we have already discussed the problems associated with that course of action. So the decision must be for a starboard side to berthing. We are not going to have any problem stopping the vessel – the tide will do that for us, so the disadvantage of the stern throwing away from the berth when stern power is applied need not be taken into account.

Fig. 3.7 Berthing in a tideway

Referring to Figure 3.7 you will see that the first thing that had to be done was to swing the ship so that the approach could be made with her bow stemming the tide. (The way in which you swing in a confined space under these conditions is discussed a little further on when we look at the use of anchors in manoeuvring.)

Once again we have chosen an approach angle of about 40° but this time the tide will not allow us to hold that course so a suitable allowance must be made to keep the bearing of the berth at the correct angle.

We are also going to have to use revs for about five knots to achieve that desirable approach speed of around three knots.

This is not quite as easy as it sounds. Most of us get used to judging the speed of our own ships automatically (and probably quite unconsciously) by the speed at which she is moving through the water.

When you are stemming a tide you must forget all about that and watch her relative movement to the shore line that you are approaching.

If the tide is strong enough you may not even stop engines at any time during the approach and can virtually drive her alongside the berth as if you were parking your car.
Once alongside you will also probably have to keep those engines going ahead until the head rope and back spring are secured.

Figure 3.7 sets out the probable sequence of engine and rudder movements. You should particularly notice that I said probable. Very few manoeuvres of this nature work out precisely as you have planned them and, once again, different ships and different weather conditions will call for different tactics.

All one can do in a teaching situation is to give the general rules. From that point onwards it is your own judgement that will be the deciding factor.

You will have noticed that we have been looking at each of the manoeuvring characteristics of vessels and the effects of outside influences one at a time and then progressively adding them to those that have gone before.

Your mooring lines and anchor are a vital part of these operations and these are the next points that we will be looking at.

## 3.5 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. How will a vessel that is not anchored or moored, lie to the wind?

2. On most vessels, is the bow or stern most affected by the wind?

3. You need to turn your vessel within a small area. However, there is a strong wind blowing and you suspect that you will not be able to get your bow through the wind. What action would you take?

4. In coming alongside while stemming the tide, how can you best estimate your speed made good (over the ground)?
Chapter 4 Mooring Lines

4.1 Standard Mooring Lines

Figure 4.1 (below) shows the universally accepted method of securing mooring lines on a vessel, be it a small pleasure craft or an ocean-going liner.

Depending on the size of the vessel, the lines shown may be doubled up (or even trebled) and the springs may be steel wire rope or specially made up warps of nylon or coir rope designed to stretch instead of break if the ship is surging alongside the berth.

Fig. 4.1 Mooring lines

The head and stern lines are designed to hold the vessel in forward and aft, the springs prevent (or control) forward or backward movement and the breast ropes are short lines whose sole purpose is to keep the vessel close in to the berth. With the vessel floating against a fixed wharf, they must have the length and elasticity to handle chop, surge and tide. When securing to floating wharf they need only be long enough to handle ambient surges, vessel wash and weather driven sea states.

However, it is not sufficient to know what mooring lines to rig. Where and how to place them and in what way they should be secured aboard your vessel are of equal importance.

If you were berthing in an area such as Fremantle, which has a very small tidal range, and your deck was more or less level with the decking of the jetty, all the lines could be quite short and be left unattended for an indefinite time.

On the other hand, if you were berthing in Broome (WA) for example, where the tidal range is quite often nine metres or more, special precautions need to be taken if the lines are to be protected from snapping as the tide falls or, as can happen in a small vessel, leave her hanging, suspended by her mooring lines.

If you were to set up short head and stern lines and two short springs as in Figure 4.1 with your deck level with the jetty at high tide, as the tide fell you would be adjusting them every 15 minutes or so and, by half tide, they would be leading almost vertically and becoming more so with every passing minute.

This can be minimised by making these lines as long as possible so that they still have a significant lead forward and aft as the vessel drops below wharf level. (Figure 4.2.)

The same technique must be used in non-tidal areas where the decking of the jetty is well above deck level.
It must be immediately obvious that the breast ropes are not only useless under these conditions but can become a real liability.

![Fig. 4.2 Setting mooring lines for a big tidal range](image)

To some degree, you can make the stern rope do the job of holding her in close enough by securing it to the *outboard* bitts as in Figure 4.2 so that it achieves a better lead.

Your vessel’s lines for coming alongside and docking should be about the same length as the ship. They should have a spliced eye at one end which is big enough to fit over a man’s shoulders but not so large that it prevents you from tying off really short when trying to line up the gangway.

When coming alongside, send the eye ends of your lines ashore to be dropped over pins. If you can’t flick them off from on board, use slip lines. Where possible, do not have crew leaping on and off. A deckhand who is a good shot with a line is a blessing which makes the whole boat look good.

Make sure that an agreed system of communication between you and your crew is in place. For instance, crossed wrists held upright is both the order to make fast and the acknowledgement that you have made fast. Raising both arms extended is the order to ‘let go’.

### 4.2 Securing Mooring Lines

#### Correct Procedures to Prevent Jaming

Few people, unfortunately, secure mooring lines correctly, either at the wharf bollard or the inboard end on their own vessel.

The price of the former is unpleasantness with other users of the berth who cannot get their lines clear from a bollard being shared by two or more vessels. Failure to watch the latter can mean jambed lines which have pulled too tight to be undone and have to be cut to release them.

These mistakes cost time, money and unnecessary friction with crews of other boats.

First, let us look at the shore-side securing of mooring lines.

All your lines should have a spliced soft eye in one end that is large enough to drop easily over a wharf bollard. If you are using a line that is not spliced in this way, tie a large bowline in the end before passing it ashore.

*Never tie-off your lines to a shore bollard.*

Your next concern is what to do if somebody else’s line (or lines) are already on the bollard that you want to use.

If you just drop the eye of your line on top of theirs, your lines must be removed before they can get theirs clear.
If, on the other hand, you pass the eye of your line upward *through* the eye of their line/s before dropping it over the top of the bollard either of you can release your lines without interfering with the other.

![Fig. 4.3 Securing your mooring line to a shore bollard already occupied by another vessel’s lines. This practice is called ‘dipping the eye’.

Let us now look at the inboard securing of your own lines.

There are many varieties of fittings designed for this purpose. In larger vessels, the most common are *bitts* (pictured in Figure 4.4) and the method of securing is by a series of ‘figure 8’ turns between the two uprights.

![Fig. 4.4 Securing your mooring line to the bitts

However, if you want it to hold under strain, *always take one or two round turns around one of the uprights* before laying on the figure 8s.

**It is these turns that hold the vessel** and you can now complete the figure 8s up to the top of the uprights. It is at this point that there seems to be an overpowering determination by nearly everybody to finish it off with a half hitch.

If the rope is going to pull tightly enough to need that half hitch, it is going to jamb beyond your ability to undo it. If you have taken those couple of turns first it will never reach that stage.

Your main concern is to stop the rope falling off the bitts and this can be achieved by passing it a couple of times around the whole fitting. On a large vessel with heavy equipment the same result is arrived at by passing a light lashing a couple of times around the centre where the lines cross each other.

Both these methods are illustrated in Figure 4.4. The result is that these lines can *always* be released, no matter how heavy the weight on them and the turns you took in the first place mean that you still have it under control after the figure 8s have been removed.

Many small boats have cleats for securing and the same principle holds good – take a couple of full turns around the base of the cleat and then figure 8 the rest.

Once again, *don’t finish with a half hitch*. It is totally unnecessary. The round turns are taking the weight. The figure 8s are holding the round turns in place. How much more security do you need.
Another common type of securing point is the Stag Horn bollard (Figure 4.6).

Once again we follow the same principle – a couple of round turns around the base, two or three diagonal turns followed by an equal number the opposite way. You can finish with a couple of loose turns around the base if you wish but **no half hitches**.

One of the strongest securing points that can be built into a small vessel is a Samson post – a strong post that passes through the deck and butts into the keel or some other solid part of the hull.

There is really only one safe way of securing to a samson post. First the inevitable two full turns around the post. Next, pass the bight of the rope under the standing part and drop the loop so formed over the post. You do this two or three times. It will never slip. It will never jamb. You can always undo it and keep the line under control no matter how much weight there is on it.

This is an excellent way of securing your anchor line in a small boat, regardless of the type of fitting you have on the foredeck.

You will notice that all these methods of securing have several things in common – an important factor as we move to the next step of seeing just how those mooring lines can be used to assist in manoeuvring.

1. They all rely on that oldest method of securing or controlling a rope – one or more round turns.
2. Those round turns are held in place by a number of easily removed Figure 8s or loops.
3. They won’t come undone of their own accord and can always be released without effort, no matter how great the weight.

4. The line can be kept under full control while being released.

As we proceed we will see how these lines are also used in both assisting the vessel alongside and in getting her away from the berth under various conditions of wind and tide.

### 4.3 Marking and Using a Heaving Line

A heaving line is a light line of about 30 metres in length that can be thrown between ship and ship and shore and used as a messenger to pass across the heavier mooring lines and wires.

In the days before synthetic rope, heaving lines were traditionally made from used signal halyards which were soft Italian hemp which did not readily kink.

Probably the best of the easily obtainable ropes available today is soft laid 8 mm silver rope. The inboard end should have a soft eye that can fit easily over the thrower’s wrist or attached to the eye of a hawser.

![Fig. 4.8 The heaving line](image)

The other end has a ‘monkey’s fist’ spliced to it to help carry the rope further. Using a bolt or other heavy weight in lieu of the monkey’s fist is extremely dangerous to the recipient at the other end.

The line should be prepared for throwing by coiling it carefully in a fairly small coil having first placed the loop over your left wrist or tied it to the line to be passed.

These loops are then carefully ‘halved’ (although, in practice, it is best to have only something nearer one-third in your throwing hand until you achieve a reasonable proficiency).

Throw with the right arm straight, allowing the coils in the left hand to follow cleanly.
4.4 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. What are some materials that spring lines can be made from?

2. What precaution should you take when handling a line under strain?

3. Name the standard (set) mooring lines:
   1. 
   2. 
   3. 
   4. 
   5. 
   6. 

4. What lines should not be run in places with high tide ranges?

5. What splice should be in the shore end of your deck lines?

6. The size of the eye should be big enough to be easily flicked from any
   or .

7. What knot would you use to make a quick eye in a mooring line?

8. What is ‘dipping the eye’?
9. Draw a pair of bits:

10. State whether the following are true or false.
   (a) Bollards are generally on the shore side only. True / False
   (b) Cleats might be on wharves and on board. True / False
   (c) Bits, pins and post are generally only on board. True / False

11. How many turns around one of the bits should you take before winding on figure eights?

12. Is the principle the same for bollards, pins, cleats and posts? Yes / No

13. Are half hitches necessary to hold a line on a deck fitting? Yes / No

14. What makes a Samson Post so strong?

15. How should you secure to a Samson Post?

16. Describe a heaving line.

17. What is a heaving line used for?
Chapter 5 Using Springs for Berthing and Leaving a Berth

It is important at this stage, to take a brief look at what we have covered. Firstly, we had the action of the propeller – both forward and reverse thrust – and transverse thrust (most noticeable when applying stern power) which significantly walks the stern in the same direction that the propeller is turning. With a RH propeller going astern we know that is to port.

Next came the rudder which, for all practical purposes, only has any real effect when the vessel is making headway through the water or the forward propeller thrust is acting upon it.

With these two very important factors understood we could then make a confident approach to a berth in calm conditions provided always that we berthed the vessel on that side to which the reversed propeller thrust pushed her. In other words, with a right-handed propeller we chose, when possible, a port-side-to berth.

Next we took into account the wind and tide choosing, where possible, to make these two factors assist rather than complicate the manoeuvre.

It is now time to look at ways and means of overcoming the problems when these ideal conditions cannot be met and one way is in the judicious use of the mooring lines just referred to.

5.1 Berthing

Berthing Starboard Side to With a Right-Handed Screw

To start with, we will take our vessel with its orthodox right-handed screw and attempt to berth it in calm conditions starboard side to.

Figure 5.1(a) shows the vessel approaching at an angle of about 40° as previously. At the appropriate distance off the berth, she has stopped engines (1) and is carrying her way. At (2) the wheel is put hard over to port. If this does not swing her fast enough, we may give her a touch of head power (3).

The object of the exercise is to bring her parallel to, and then past parallel to the wharf before applying stern power.

When stern power is applied (4), the stern will swing in to the wharf from that last small burst of power. This will partially counteract the tendency of the reversed propeller which is going to try to throw her away from the wharf. This is unlikely to be wholly successful and you will probably stop in a bow-in situation as in Figure 5.1(a).

If you have judged this last manoeuvre correctly, the bow will be close enough at this moment for a crew member to jump ashore with a line. Don’t let the crew member follow natural instincts and take the bow line.

Securing the bow line at this moment will be of no help to you. In fact, it will actively hinder your chances of getting alongside. The ship will probably drift further out from the wharf and that bow line will only ensure that you finish up hanging at 90° to the berth. (Securing the stern line first will have a similar result.)
What you should have done was to have a forward spring led up to the bow, clear of all obstructions along the ship’s side, and *this* is the line taken ashore.

Here is the sequence that takes you from that point in Figure 5.1(b) to alongside position in Figure 5.1(c).

**Step 1**  The line (made fast somewhere forward of the waste) is taken ashore over the bow by the wharf jumper and back to a wharf bollard well down the wharf.

**Step 2**  Shorten up the line and take several turns around the bitts or cleat, keeping the line ‘in hand’ rather than turning it up. It is not rigged as a fore spring.

**Step 3**  Put the helm over to port and the engines slow ahead. You will find that you have total control and can pivot the vessel any way you wish. If you have applied too much power and the line is in danger of parting, it can be surged around the bitts and still kept under control. Since you will be watching for this anyway, you will have time to reduce power before it reaches a dangerous stage.

**Step 4**  The vessel is now alongside and can be held there by keeping the engines turning slowly ahead while you get the other lines ashore.

There are many other occasions when a spring can be used in this way, a common situation being when you have to berth with a strong off-shore wind.

This may not affect your approach to any significant degree, but once alongside you will find the ship blowing bodily off the wharf before you have time to get head and stern ropes secured.

This is overcome by making the first line to go over a fore spring. Don’t worry about any other lines. She will then probably blow off and hang on this spring (see Figure 5.2).
You are now back in the position as in the last manoeuvre and, by going slowly ahead on your engines, can steer her gently alongside.

Always remember that there will be considerable strain on a spring that is used in this way, particularly when you are springing the vessel in against a strong wind. Both the line and its securing point aboard your vessel need to be fairly substantial.

**Using a Berthing Party**

For larger vessels there are occasions when the only safe way to getting alongside is to have somebody there to take that first, all-important line.

You rarely have the luxury of someone ashore to take your lines when you come alongside. You can occasionally get the wharf ‘loungers’ and anglers to take a line and put it over a bollard. If there is another fishing vessel at the berth and you can get him on your radio he will often assist in this way.

You can, of course, put your dinghy in the water but it is often possible to nose the ship in at right angles to the wharf and drop your crew member on the wharf over the bow. You then back off and make your pre-planned approach.

It would be timely, at this stage, to point out that all the manoeuvres that we have discussed so far have been planned in advance.

This point cannot be over-stressed.

Well before you settle on your final approach, decide what you are going to do and let your crew know. This means:

- Which side-to so that they can get the lines ready.
- Which line or lines you want to go ashore first. If it is to be a spring, tell them where you want it secured aboard.
- If fenders will be required at some especially vital position, tell them where.
- Make sure the wharf-jumper knows what is required.
- Any special problems that you can foresee.

The best laid plans will often need to be modified or totally changed when something unforeseen occurs on the way in. This is an acceptable part of the operation, but you will be surprised just how often things will go exactly to plan if you take the trouble of anticipating the problems in advance and deciding on their solution.

**5.2 Leaving a Berth**

How often have you seen vessels leave a berth simply by casting off all lines and going ahead with the helm hard over as if they were driving a motor car away from the curb.
The big difference between the two situations, of course, is that the car, being
steered by its front wheels, will move the whole vehicle cleanly away from the
curb. The average vessel, on the other hand, pivots on a point about one-third of
the distance back from the bow so that the stern swings much further than the
bow.

You may get away with this sort of manoeuvre, only because the after section of
the vessel usually tapers inwards and does allow the stern to throw off a short
distance. However, it will be at the expense of damaged paintwork, guard rails torn
off and even hull damage as she bumps and scrapes her way along the berth.

The correct way is to get your bow or stern well clear of the berth before you start
to move ahead or astern.

In a small vessel this can be done by ‘bearing off’ – pushing the bow or stern clear
with a spar or boat hook. If you use an oar for this purpose, reverse it and push
with the loom, not with the more easily damaged blade.

If the wind is blowing off-shore, let it work for you. All you have to do under
these circumstances is to let all lines go and she will blow bodily off or hold onto
the stern line and let the bow blow out far enough for you to steam ahead with
safety. (Figure 5.3)

![Fig. 5.3 Using the wind to assist in leaving a berth](image)

Too many people go through elaborate and totally unnecessary manoeuvres when
wind or tide will do the job without any effort on the part of the skipper or crew.

However, not only might the wind not be in a helpful direction, it may be actively
holding you against the wharf. This is where you can once again use your springs
to advantage.

It is usually easier to spring the stern clear of the wharf than the bow. In Figure 5.4
you will see how, if you take the fore spring well forward and steam slowly ahead
with the rudder hard over, you can, if you wish, bring her as far out as is needed –
even up to 90°.

![Fig. 5.4 Using a spring to push the stern clear](image)

You should ensure that you have a good fender placed between the bow and the
wharf to take the weight of the vessel as she pushes hard into the wharf. It is
always better to have such a fender ‘in hand’ than to secure it and find out too late
that it is not in the right position.
Having sprung the stern out sufficiently far to make a clean stern get-away, let go your spring and go out astern. If the wind is blowing on to the berth use full power astern. This is no time for quiet manoeuvring. You must get out fast before you blow back into the wharf.

In Figure 5.5 you will see how the same manoeuvre is performed using a back (or after) spring to throw the bow clear. To get the most effect from this spring it must be secured right aft.

By going astern on your engines you will pull the stern in to the wharf and throw the bow outwards. However, this method will rarely work with a hard onshore wind and, at best, will only throw the bow a short distance clear of the berth.

When the bow is as far out as it will go, stop engines and let go aft. Now go slow ahead with your rudder amidships. Don’t attempt to steer away from the berth until your stern is fully clear. The sure result of doing this will be to swing the stern into collision with the wharf.

**Fig. 5.5 Using a back spring to spring the bow clear**

We have now added another factor to our list of manoeuvring skills – using springs and engines to assist the ship alongside and to get her cleanly away from the berth.

**Power Warping**

Skippers of fishing vessels should not forget that they have their fishing winches and anchor windlass, both of which usually have a warping drum. Provided you have one line ashore, don’t forget that it is a simple matter to take it to the winch and physically pull the vessel alongside.

**5.3 Self-assessment Questions**

1. You are coming alongside in your 15-metre single screw ferry and plan to embark your passengers. What line will you want ashore first? How will you hold your vessel alongside while your passengers board?
2. After embarking, how could you use the line that you first put ashore to help you leave the wharf? Explain all helm and engine movements, and instructions to your deckhand.

3. What information would you include in briefing your deck crew for coming alongside?
Chapter 6 Anchors and Anchoring

6.1 The Anchor

A vessel’s anchor is a vital part of her safety equipment. Knowledge of its use, capabilities and limitations is therefore essential to every practical seaman.

An anchor is much more that just a temporary mooring to hold the vessel stationary for a short or extended period and, before we go any further it is worth listing its many functions.

1. As just discussed, its most common use is as a temporary ‘mooring’ for whatever purpose you have in mind. However, let me place great stress on the word temporary.

   No sea-borne anchor was ever designed to hold any vessel for an indefinite period in varying weather conditions. Good seamanship demands that there should be an anchor watch aboard any vessel at anchor. This implies that, where practical, the vessel could be got underway or other measure taken if circumstances required it.

2. The anchor can be vital to the ship’s safety in the event of an engine failure in restricted waters, on a lee short or in a busy fairway.

   A similar situation arises when steaming in such waters and visibility closes right down. Unless you have radar, it could be often considered irresponsible to continue steaming and the only alternative may be to anchor.

3. An anchor can be used as an emergency ‘brake’ in the event of an engine failure or other unexpected emergency when making a berthing approach.

4. When manoeuvring in restricted waters with a strong wind or tide, the anchor is invaluable in assisting to turn the vessel short around, holding her in a tideway while you edge sideways into a berth or even acting as an off-shore mooring line to hold her clear of a berth that is not strong enough to support her whole weight or where there is insufficient length to get the whole length of the vessel alongside.

5. Lastly, you should remember that your chain cable, if carried, is the best tow line that you have on board and this use of the cable will be discussed in detail when we look at the problems of towing and being towed.

6.2 Types of Anchors

Anchors come in so many different forms that it is pointless to try to discuss them all. For the present, we will restrict ourselves to the most commonly used types found in Australian pleasure and commercial fishing vessels. These are shown in Figure 6.1.

The weight of an anchor, while significant, is by no means the deciding factor in its holding capacity.

There is a saying that a ship is anchored mainly by her cable, its length and weight being the main deciding factor as to whether it holds or drags.

The anchor itself must be strong enough and heavy enough to bury itself in the bottom so that the flukes take a firm grip and it is obvious that certain types of bottom will give a firmer hold than others.
For example, deep weed banks are amongst the worst holding ground as the anchor will simply pull whole sections of the bottom with it. At the other end of the scale, firm mud or sand into which the anchor can sink, will provide an excellent hold.

Coral and rocky outcrops are wholly unsatisfactory. If the anchor lodges itself under a ledge of some substance it will certainly hold but may well be difficult or impossible to recover.

On the other hand, it may be under some light outcrop which will appear to be holding firmly but may break away when subjected to any strain.

A very hard, smooth bottom will not hold at all as the flukes will simply slide across the bottom. Soft mud can be quite a secure holding ground but requires vast lengths of cable so that the whole lot can sink well below the surface of the mud.

### 6.3 Choosing a Suitable Anchor

Your choice of the right anchor for your vessel will usually turn out to be something of a compromise. It must be of manageable size and weight (keeping in mind the method by which you will let it go and recover it) while, at the same time, it must be capable of holding the vessel in strong winds and tides.

It must also be capable of being securely stowed when not required but be ready for use at short notice should the occasion demand.

Sailing ships of the last century hauled their anchors aboard on a special ‘catting’ davit and stowed the cable away below decks when they put to sea.

Such a vessel would not expect to touch land again for many months and the time and effort required to get the anchor ready for letting go at the end of a voyage was not considered an unreasonable preparation for such an important occasion.

The type of anchor used was somewhat similar to the Admiralty pattern anchor pictured in Figure 6.2 but with a fixed stock and was a heavy and awkward thing to handle.

Such an anchor has very good holding qualities and, with its long arm, digs the fluke deeply into the bottom, the right-angled stock ensuring that it lies the correct way.

The stock of the Admiralty anchor pictured here is held in place by a pin which, when removed, allows the stock to fold back along the shank so that the anchor can be stowed flat on deck or passed through a hatchway to be stowed below.
It is still used by many small vessels but has lost favour with larger vessels (except as a kedge anchor) because of the difficulty of handling it. Even so, it is still possibly the best holding anchor of them all, particularly when used with rope cable.

The stockless (or dreadnought) anchor is the type most favoured by larger vessels and is so designed that the shank will pass through a hawse pipe and stow nearly in position under the bow.

Such an anchor is almost invariably worked with chain cable. Wire cable issued in a few isolated instances, particularly in the squid fleet where provision is made to break the wire cable at deck level so that it can be used to stream the heavy sea anchors (drogues) that are an essential part of the squid jigging operation.

**Windlasses**

Chain cable of any size requires a windlass to handle it. These are either electrically or hydraulically operated, the links of the cable passing over a notched wheel (called a *gypsy*) which grips it and feeds it down through the spurling (or navel) pipe into the chain locker.

Figure 6.3 shows a typical ship’s windlass which, except for size, is much the same in a 20-metre trawler as it is in the biggest ocean-going vessels. Yachts and small commercial vessels using chain cable will have a windlass similar to the smaller version shown.
Anchor windlasses will differ from ship to ship but they will all have a similar operating procedure. You should look for the following features in Figure 6.3 and locate the corresponding ones in your own vessel.

1. First of all, please note that it is not a *winch*. A winch is a similar type of winding gear which stows the warp or cable on a revolving drum.

2. Most vessels fitted with this equipment will have two anchors and the windless is designed to handle both.

   As a result, the motor is usually in the centre driving a central axle which can be clutched to either or both gypsies.

3. When de-clutched, the gypsy is free to revolve, allowing the anchor and cable to run free. Each gypsy is controlled by a separate brake.

4. There is a warping drum on the outboard side of each of the gypsies. These revolve directly with the main driving axle whenever the windlass motor is operating. They can be used independently for hauling lines and warps simply by de-clutching both gypsies.

5. When the anchors are fully hove home into the hawse pipes some form of additional stopper is usually applied to the cable.

   This has the dual role of acting as a preventer against the anchor being let go unintentionally and, when the rigging screw which forms a part of it is fully tightened up, hauls the anchor tight into the hawse pipe preventing any movement in rough weather.

   This stopper may be in the form of a ‘devil’s claw’ which grips over one of the links of the cable or by a Senhouse Slip, both of which are pictured in Figure 6.4 below.

6. In a well-designed forecastle area the cable will be self-stowing, flaking itself down automatically in the cable locker. However, in many vessels this does not work as well as it should, tending to pile up and needing one hand in the locker, when weighing, to see that it is stowed correctly.

   As one grades down from larger to smaller vessels, it is common to see hand-operated windlasses (see Figure 6.3(b)).

   These usually have a ratchet and pawl arrangement to hold the cable from running back when being hauled in. The brake is usually a foot pedal and the gypsy is freed for letting go by lifting the pawl while controlling the cable with the lifting handle and the brake.

![Fig. 6.4](image-url)

(a) Devil's claw  
(b) Blake slip, the common name of which is the Senhouse slip
As the boat gets smaller, rope replaces the chain cable. This can still be handled on a small electric windlass which would simply have a warping drum, the rope being backed up by hand and flaked down, usually through an open deck hatch.

In most cases, however, it will be hauled up by hand and this is where the weight of the anchor has to be kept within the physical limits of the crew.

It may have been with this in mind that the Danforth anchor was first conceived (see Figure 6.1).

The Danforth anchor has much greater holding power for its weight than a similar sized stockless anchor and is probably the most widely used of all in small vessels.

It has found favour in many large ships but, in general, is not as easy to stow and handle as the stockless. Because of its longer flukes and lighter construction it is more easily damaged than the heavy cast stockless and most of the models built for small vessels are galvanised, pressed steel construction.

It can be easily and neatly showed on deck in a small vessel in specially designed chocks.

The CQR anchor (Figure 6.1) is also called the plowshare anchor. It has very good holding power but is very difficult to stow and is usually left on deck with the shank lying in the bow roller and the sharp end of the plowshare outboard.

It makes a wicked weapon if you nudge your bow against another vessel and such contact will usually drive it back and pierce your ship’s side just below deck line.

**Weight and Length of Cable**

We have already referred to the weight of chain cable and it is essential when using rope cable that at least a couple of fathoms of chain be incorporated between the anchor and the rope cable to provide that essential weight necessary to keep the anchor flat on the bottom.

Figure 6.5 shows how an anchor holds and why it is so essential to have that extra weight.

It also makes it clear why sufficient cable must be veered to prevent the anchor breaking out.

It is generally accepted that the minimum length of cable needed when anchoring is four times the depth of water. However, in strong winds or tideways and in poor holding ground you may need considerably more than this and should never forget to take into account the increased depth you may find yourself in at high tide when anchoring in areas with a high tidal range.

### 6.4 Choice of a Safe Anchorage

Whatever the type of vessel, the anchoring procedures are basically the same, the only real difference being the navigational limitations imposed by the size of the vessel.
Depth of Water

In a small vessel especially there is a great temptation to get as close inshore as possible and you must be the best judge of what is a safe depth below your keel.

Just remember that two metres under your keel is safe if you anchor at low tide.

If the operation is carried out at high tide you may well find yourself on the bottom six hours later.

Another point that is often overlooked is the effect of a swell which can occur in calm water and, while not affecting the safety of the anchorage, will effectively reduce the depth of water by half the height of the swell.

Even worse, it means that you will hit the bottom heavily with each successive trough with probable serious damage to the hull.

Deep water presents its own problems. To begin with, you may not have enough cable to allow for that four or more times the depth.

A second very important consideration, if using chain cable, is the weight of that cable when hanging straight down in deep water.

Your windlass only has a limited lifting power and you may well find that it is incapable of lifting the combined weight of anchor and cable from a depth of, say, 40 or 50 metres.

In fact, if you let go your anchor in this sort of depth, it is unlikely that the brake would be capable of stopping the outward run and it would probably continue out to its full length, tearing out the deck clench in the cable locker and be lost forever.

You would not be the first (or, indeed, the last) to lose an anchor and cable in this way.

Nature of the Bottom

You should choose mud, sand or clay and avoid rock and coral where possible. The heavily weeded bottom common in Cockburn Sound and Rottnest Island in Western Australia is very poor holding ground as most local yachtspeople have found out to their cost at one time or another.

The type of bottom may be shown by the appropriate symbol on the chart. The Pilot Manual will also usually give the nature of the bottom in recommended anchorages.

In most cases, you will have to judge it for yourself by making a reasonable assumption from the nature of the shoreline and your echo sounder trace. In using the echo sounder in this way you can broadly say that a smooth or level bottom is probably good holding ground. A rough, uneven bottom is usually rock or coral.

Protection from Weather

At first sight this is fairly basic but you should always remember that the perfect anchorage in a hard South Westerly wind chosen in the late afternoon can become a dangerous lee shore if the area is subject to land and sea breezes and a hard Easterly springs up during the night.

Basically, you are looking for protection from the sea and swell and though you will not be out of the wind, your close proximity to the lee of the land will ensure fairly calm sea conditions.
Sufficient Swinging Room

If the anchorage you have chosen is restricted in size or there are a lot of other vessels already there, you must make sure that a change of wind or tide will not swing you foul of other vessels or on to foul ground.

6.5 Coming to Anchor

Once you have decided upon your anchorage and are steaming inshore, the first task is to see that your anchor is cleared away and ready for letting go. This applies equally to the small vessel as it does to the larger and we will look at each separately before we go further.

Vessels with Chain Cable and Windlass

Before the anchor can be let go several things have to be done.

1. If you glance back at Figure 6.4 you will see that the cable is held fast by a stopper of some sort – a senhouse slip or a devil’s claw – and this must be released before anything can be done.

   Of the two, the senhouse slip is easier as it can be released with a sharp blow from a hammer. The devil’s claw will only come clear after you have eased back on the rigging screw.

2. When the anchor was hove home, the windlass was probably left in gear as an added safety measure and it must be de-clutched before the cable can run free.

   If it is a dog clutch, the two faces will be hard up against each other making it impossible to free the clutch. This is overcome by fitting the hand winding gear (usually a ‘T’ shaped bar which fits into the top of the gear housing) and, after making sure that the brake is full on, winding the cable out a few turns until the clutch faces are clear.

   Make sure you always remove the hand winding gear after use. Because of its high gearing it will revolve at enormous speed if the winch motor is started and can kill or maim anybody in its vicinity.

The anchor is now cleared away ready for letting go and is held only on the brake. It is often a good idea at this point to allow it to drop a short distance so that the shank is clear of the hawse pipe. This ensures that there will be no untoward problems when you are ready to drop it.
If you have a reversing windlass, the cable can be paid out this short distance under power, at which point the brake is applied and the windlass taken out of gear.

This is standard practice in all large vessels and one which can be applied with advantage in vessels of any size.

**Vessels with Rope Cable**

The type of vessel referred to here is visualised as the average small cruiser, sailing vessel or commercial lobster boat.

It probably has a Danforth anchor stowed in chocks on deck with the cable unshackled and stowed out of the way in a forward compartment opening onto the deck through a hatch.

1. First, bring the chain ‘tail’ of the cable on deck and shackle it to the anchor. This shackle should always be moused – locked with a short length of copper wire – to prevent it undoing with the movement of the cable across the bottom.

   The outboard end of the rope, where it joins the length of chain, should also be inspected regularly as it is subjected to a lot of chafing at this point. This shackle should also be moused.

2. The anchor is now manhandled forward and laid in a position where it can be dropped or pushed over the side. If your vessel has guard rails or bow rails forward make sure that the cable, before you shackle it on, leads first under and then over and back to the anchor.

   Hopefully, your rope will have been properly coiled down inside the hatch so that it will run free without kinking when you let the anchor go.

3. Make sure that the inboard end of the rope (the bitter end) is secured to some strong point.

Your anchor, of whatever type, is now cleared away ready for letting go and, if your timing is right, you should now be approaching your anchoring point.

On the way in you will have taken note of the direction of the wind and the tide (if any) and will make your final approach up-wind. In a strong tideway, disregard the wind and steam up-tide.

Just short of your selected spot, stop engines and take the way off the vessel by applying stern power, keeping the engines astern until the vessel has gathered slight sternway.

It is handy to remember that your ship is stopped in the water when the stern wash reaches a point about one-third back from the bow. (This is the usual position of the bridge or wheelhouse in the average vessel.) She is starting to move astern when that wash moves further forward.

This is the moment to *let go*. This order is always best given by a prearranged hand signal such as dropping the raised hand. It saves misunderstandings and overcomes communication problems in windy conditions.

On this order, the windlass brake is released (or the anchor lifted or pushed over the bow) and the cable allowed to run freely for a sufficient distance to allow the anchor to reach the bottom in a hurry.

It is now *checked* (not snubbed) and allowed to run more gently under control of the brake (or a turn around the forward samson post in the case of a rope) as the vessel moves astern.
Failure to control the cable at this point can result in it piling up on the bottom where it can foul the flukes of the anchor and effectively prevent it from holding.

This controlled veering continues until the required amount of cable has been paid out. At this point you apply the brake fully (or snub the rope cable at the samson post).

The vessel will continue to move astern, gradually straightening out the cable and come to a gentle halt (which you will learn to feel with experience) and then move gently forward again as the weight of the cable takes over.

This means that she has ‘got her cable’ – the anchor is holding and the trained crew will pass this information to the skipper.

If the anchor is dragging over rough ground you will hear this plainly through chain cable and the forward lead of the cable will come taut and then suddenly drop.

In soft mud you will get very little indication of dragging from the cable itself and can only check it for certain by watching the relative movement of shore bearings.

**Securing the Cable**

Once the ship ‘has her cable’ it can be secured.

It is good practice in a windlass fitted vessel to have her riding on the brake. The clutch should be engaged (but not taking any weight) and the devil’s claw may be loosely attached as an extra preventer.

In this situation, the anchor can be instantly weighed if required or, by throwing off the loosely attached devil’s claw and pulling the clutch free, can be allowed to run out if extra cable is required.

The rope fitted vessel will have secured its cable by the method shown in Figure 4.7.

There is a further precaution that must be taken when rope cable is used and that is to ensure that the rope is not chafing where it leads out over the bow, particularly in heavy weather.

This can be partly prevented by wrapping a ‘scotchman’ (strips of cloth) around the cable at the point of greatest wear but it is still good policy to ‘freshen the nip’ occasionally by veering a little extra line.

It is now, and only now that you can order ‘finished with main engines’ or, in the small boat context, go below and shut down the engine.

You have one final job to do before you are finished and that is to take bearings of some significant shore bearings (called ‘anchor bearings’) so that you can periodically check that you are not drifting.

These apparently lengthy procedures can be summarised in nine fairly simple steps.
Anchoring

1. Select suitable anchorage.
2. Clear away anchor ready for letting go.
3. Steam up wind/up tide to anchoring position.
4. Stop. Astern to get slight sternway on vessel.
5. Let go.
6. Controlled veering of cable to required length.
8. Take anchor bearings.
9. ‘Finished with engines’.

6.6 Marking the Cable

This is a matter that is often conveniently forgotten when discussing small ship anchoring procedures.

Large ocean-going vessels have their cable supplied in 15 fathom (27.5 metre) lengths or shackles. These shackles of cable are joined by a distinctive joining shackle which is often kept painted white for easier identification. At each joining, the studs on the links of cable on either side are marked at a distance corresponding to the number of that shackle.

For example, at the join between the third and fourth shackle – that is, when three shackles of cable have been veered, there is a piece of wire wrapped around the stud of the third link of the cable on either side of the joining shackle. (See Figure 6.6 showing a cable marked for two shackles.)

Commercial small-ship cable is usually supplied in one continuous length and does not, as a result, have this ready means of instantly checking how much cable has been veered at any given time.

Although it is rarely done, it is extremely good practice to mark your cable into 27-metre (or 15-fathom) lengths. This is quite simple to do by splicing a loop of brightly coloured poly rope through the cable at 27 metre intervals and even better if either the colour or the type of mark is instantly recognisable as the cable length it represents.

Thus, if you are coming to anchor in 25 to 30 metres of water you would know that you would require a minimum of four shackles in the water. Ten metres of water would demand 40 metres of cable, or about 1 1/2 shackles.

To most professional seamen the judging of the amount of cable to veer is invariably converted in his mind to ‘shackles of cable’ and it is a habit that could be adopted with considerable advantage by the masters and skippers of smaller vessels.

Laying Out a Second Anchor

When battening down to ride out a cyclone or exceptionally strong wind at anchor one often has to consider the advisability of a second anchor.

With two anchors out, unless great care is taken in their placement, there is always the danger of the two cables fouling and, under certain conditions, of the second anchor actually lifting the first and making both useless.

However, with proper care these risks can be minimised.

Firstly, if you are riding out a tropical revolving storm – cyclone, typhoon, hurricane – it is important to remember that the wind is going to swing through 180° as the
storm passes you. Which way it will swing will depend on which sector of the storm you find yourself and whether you are in the Northern or Southern hemisphere. If it passes right over the top of you it will simply stop blowing altogether from its first direction, give you a short period of calm and then blow with renewed force from the exact opposite direction.

The placement of that second anchor is therefore going to be decided on your appreciation of those factors. It must never be placed close to the first and the two cables, when both take the strain, should make an angle of 20° or more with each other. Figure 6.6 shows how this is done.

![Diagram of two anchors](image)

**Fig. 6.6 Laying out a second anchor**

In Figure 6.6 the vessel is lying to anchor ‘A’ in a northwesterly wind which you expect to veer to the East as the storm passes.

Firstly, don’t leave the placement of your second anchor too late. Once the full force of the storm has struck you possibly won’t be able to do anything about it.

![Diagram of anchor placement](image)

**Fig. 6.7 Section of studded cable with joining shackle**

Without hauling in on anchor ‘A’ steam up on a slack cable to position ‘B’. You may have to veer more cable on ‘A’ to do this, dragging the bight of the slack cable across the bottom.

At position ‘B’ let go your second anchor and allow the vessel to fall back on the wind, veering on ‘B’ and winding in an ‘A’ as necessary so that both finish up carrying an even strain.
6.7 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. A vessel’s anchor is a vital part of her ________________ equipment.

2. An anchor is only a temporary mooring?  True / False

3. Vessels laying to an anchor should stand an ________________ watch.

4. Would the anchor be useful to help manoeuvring in extreme circumstances? Yes / No

5. May the anchor’s chain (cable) be of use in a tow? Yes / No

6. Weight, design, type of bottom, presence of chain, amount of cable veered, are all considerations in evaluating an anchor’s holding potential in certain conditions. Can you think of two more critical considerations?

________________________________________________________________________

________________________________________________________________________

7. Name four common types of anchor.
   (a) ____________________________
   (b) ____________________________
   (c) ____________________________
   (d) ____________________________

8. Anchoring on weed beds gives bad holding. True / False

9. What are some of the problems associated with anchoring on coral?
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

10. When not in use anchors need to be securely ________________.

11. An anchor windlass differs from a winch, which stores its cable on a ________________.
12. Features of a windlass include:
   (a) a w ________________ drum for rope
   (b) a c ________________ for running out
   (c) a b ________________ for slowing and holding (not always).

13. When de-clutched, the gypsy allows the ________________ to run.

14. Name two types of cable stoppers:
   1. 
   2. 

15. Stoppers are a vital part of the safety gear as:
   (a) they hold the cable bearing the ________________ securely.
   (b) they can be taken off the cable bearing the ________________ easily and without fouling.

16. How does chain complement the holding power of an anchor?

17. Show in a sketch, the angles of the stock, flukes and cable, a Danforth or Dreadnaught anchor, rigged with a couple of fathoms of chain attached to a rope line, holding in mud.

18. What is the rule of thumb ratio for depth of water/range of cable?
   Minimum ______________________________ times depth.

19. Should you always know the depth of water before letting go. Yes / No

20. Rock, sand and clay are better ________________ sites than coral, rock or weed beds.

21. Describe making ready the anchor for letting go.

________________________________________________________________________________________
22. Anchor shackles should always be __________________ ed.

23. Allowing for depth and underwater obstruction, how should you approach your proposed anchorage?

24. Describe the effect of the chain winding around the anchor flukes.

________________________________________________________________________

________________________________________________________________________

25. What is the best way to prevent it?

________________________________________________________________________

________________________________________________________________________

26. State some information you will be able to gather by the noise transmitted up the anchor cable.

________________________________________________________________________

27. With rope anchors, care must be taken to prevent __________________
at the point where it leaves the ship, and it must also be checked for inadvertent damage from anything on the bottom.

28. Checking bearings, transits and the GPS are a good way of telling if you are:

________________________________________________________________________

29. Ship’s anchor cable is usually marked at each 15 fathoms (27.5 m) shackle.  
   True / False

30. Do you agree that, when anchoring in 25–30 m of water, a minimum of about 4 shackles of cable will be required?  
   Yes / No

31. When laying to a second anchor, they should bear a maximum and at least 20 degrees apart and the cables should be kept apart, particularly with the coming and going of a TRS.  
   True / False
Chapter 7 Other Uses for Your Anchor

7.1 Anchoring Procedure

At the beginning of Chapter 6, we listed several of the additional uses for your anchor such as the situation where lack of visibility makes it dangerous to proceed in certain waters, the case of an engine breakdown in confined waters and as an emergency ‘brake’ if the vessel gets out of control in a tight corner, either through engine failure or for any other reason.

For this sort of action to be carried out in time to be of any use, it implies that the anchor should be cleared away and ready for immediate use if such a situation should arise.

This is standard practice in most large ships when entering harbour and is a procedure that could well be adopted by craft of any size.

The anchoring procedure in this case would be much the same as has already been described in the last chapter except that the anchor would probably be let go on these occasions with the vessel making headway and you would not expect to veer more cable than the absolute minimum needed to hold her under the immediate conditions prevailing.

7.2 Using an Anchor to Turn Vessel Short Around

An anchor can be of enormous assistance to swing the ship short in a wind or tideway when you are in a confined space and is probably best described by setting the scene for a really difficult berthing manoeuvre that involves this problem.

In Figure 7.1 the vessel is steaming into the very restricted area shown and is required to berth at the position shown.

Fig. 7.1 Berthing position
The wind is blowing in excess of 20 knots and the tide is flooding at about two or three knots. Your vessel has a right-handed screw and there are other ships moored ahead and astern of your chosen berth.

Mistakes could be expensive. There is no room for error at the southern end where shoal water awaits you and the space at the berth itself leaves no room for mistakes.

There may be temptation to try and place her port side-to in the berth.

There would be enormous risk in this course of action. Vessel ‘A’ is blocking your close approach up-wind and, if you cannot stop quickly enough, (remembering the wind and tide are both pushing you along) you will probably collide with vessel ‘B’.

Further, despite your right-handed screw, which will throw your stern the way you want it – towards the wharf – the strong wind may over-ride this and you could finish up bow in, at 90° to the berth.

If you did not collide with vessel ‘B’ you would probably finish up on the foul ground to the south.

This is not just a pessimistic outlook. These are the pros and cons that you MUST weigh up in your mind before you commit yourself past a point of no return.

You just might get away with a direct port-side-to approach. You probably won’t and a manoeuvre affecting not only the safety of your own vessel but that of others as well, can never be justified (except in dire emergency) when the odds are stacked so heavily against it.

If you think back to what was said right at the beginning – Make wind and tide work for you – the whole manoeuvre can be amazingly simple.

Follow the steps in Figure 7.2.

A ship’s length or so away from the wharf and just ahead of vessel ‘A’ put your wheel hard to port, go full astern and drop your port anchor.
As soon as the way is off the vessel she will drift rapidly sideways on wind and tide as you veer the anchor.

You are now lying a short distance off the berth with the anchor, at short stay, holding your head to wind and tide.

The next part makes it all look very simple. With the vessel still riding to her anchor, put your helm over to the starboard and steam ahead at very slow speed. This small amount of power is insufficient to overcome wind and tide, so the bow is still held by the anchor, but it does throw the stern out and head you in towards the berth. The cable will drag across the bottom as you go. (Figure 7.3)

By carefully judging the amount of power and rudder and easing out the cable if necessary, you can control the ship gently into her berth, with only inches to spare if necessary.

As soon as the bow is in position, put out a head rope and back spring (Figure 7.3 (ii)). This will allow you to drop her back exactly where you want her and to take your time in placing the rest of the mooring lines.

What about the anchor? Just slack off on the cable and allow it to lie on the bottom. You can recover it when you leave the berth, using it to haul your head clear when that time comes.

That manoeuvre just described involved a combination of hazards. The techniques employed can all be used separately or together and it is only really a matter of assessing beforehand what is the best way of going about the particular problem you are faced with.

### 7.3 Using Anchor as Off-Shore Mooring Line

Figure 7.4 shows two typical situations which often face trawler skippers in northern ports where jetty facilities are very limited and the only way to berth is three and four deep outside other vessels.

In Figure 7.4 (1) you find yourself fourth vessel out relying entirely on the strength of the lines on the inside ship. If there is a strong wind or tide parallel to the jetty the whole flotilla is going to be forced back, placing enormous strain on his head rope and spring.

On the other hand, if you had placed your anchor well out ahead of you and dropped back into your outside berth, the anchor will take most of the weight and your remaining lines are little more than breast ropes to hold you in.

Figure 7.4 (2) is a rough sketch of the jetty at Gove (NT). You have just arrived to take on fuel and stores and there are already three others alongside. The fuelling authority will not serve you over three other vessels.
On the other hand, there is a space alongside the dolphin on the western end of the jetty but your bow will have much too great an overhang to expect your mooring lines down aft to hold the ship with the prevailing onshore wind.

Figure 7.4 (2) shows how, by placing an anchor well up to the westward and a little way out from the line of the berth, you can back into the berth, veering your anchor as you go.

You will secure your standard quarter to the jetty, take another line from your port quarter to the vessel astern and pass a breast rope on to the dolphin.

The anchor windlass is now put in gear and the anchor cable hove taut.

Whenever you are third or fourth vessel out in a multiple bearing situation it is always wise to run out a head and stern line directly to the wharf as in Figure 7.4 (1) above.

### 7.4 Lying Alongside in a Big Surge

To those who have experienced it, there are few things more nerve wracking than lying alongside a berth with the ship constantly surging backwards and forwards to the limit of her springs in each direction.

Nothing will part strings quicker unless you rig special coir or nylon springs. Their elasticity will prevent them parting at each surge but will not prevent, or even dampen the movement.

This surging can be overcome to a very great degree by having an anchor laid out well ahead of the vessel so that you lie to this and have loose breast ropes to keep you from drifting too far out (see Figure 7.5).

At best, this can only be regarded as a fairly temporary remedy to embark or disembark people or stores. At the first opportunity you should get away from such a berth or go out to your anchor. It is very poor seamanship (and a guarantee of a sleepless night) to attempt to lie alongside overnight in such a berth.

![Fig. 7.5 Using an anchor to ease mooring lines in a big surge](image)

The effectiveness of this particular technique is guaranteed. It may be one of those little tips to tuck away in the back of your mind against that inevitable day when it could get you out of trouble.

### 7.5 Rigging a Kedge Anchor

A kedge anchor can be best defined as a small anchor laid out some distance from the vessel to move or hold the vessel. Such an anchor is often used to refloat a grounded vessel, to hold her against being driven further aground, to hold the stern from swinging with the wind or tide in a restricted anchorage, or possibly to haul yourself out of some difficult situation that is beyond the ship’s main power to accomplish.

Landing barges use a kedge anchor dropped astern as they near the beach. It prevents the stern from swinging into the beach in a cross-wind and gives them additional power astern when the time comes to refloat the vessel.
However, a kedge usually has to be taken away by boat. This is not as simple as it might first appear.

If the vessel is of any size – say a 27-metre trawler – the weight of the anchor you are going to lay out (if it is to be any use in hauling or holding a vessel of that size) is going to be much too great to be manhandled in or out of the average four-metre aluminium dinghy that is their usual tender.

However, such a dinghy does have sufficient buoyancy to support such an anchor provided it is slung under the boat.

Unless a separate anchor is carried for the purpose, you may have to use one of your bower anchors and this will mean lowering it clear of the hawse pipe, suspending it on a strong wire strop and undoing the anchor shackle.

The line you attach to the anchor must be strong enough to take the weight you are going to apply but it must also be light enough for the dinghy to be able to tow it out to the anchor site. Even though you coil the rope down and pay it out as you go out, the weight of the rope in the water will gradually sink it down and overcome the power of the dinghy motor.

The ideal line in these circumstances is floating ‘silver rope’. This is the type of line used, in lesser diameters, by fishermen for pots and yachtsmen for anchor warps and mooring lines.

### Lowering the Anchor to the Boat

The anchor is going to be slung beneath a fairly fragile aluminium hull so, unless you rig a ‘strong back’ (or spreader) across the gunwales, the weight will probably crush the boat.

![Diagram of lower strongback to anchor](image)

**Fig. 7.6**

Figure 7.6 shows how the anchor should be slung below the boat. Just how you get it there will depend on that lifting tackle you have available. The warping drum of the forward anchor windlass is ideal as you can run the warp down through the hawse pipe.
It would be advisable to secure the main rope to the eye of the anchor at this stage, leaving the rest of the line coiled down on deck.

The anchor can now be lowered gently to the water until the ring is just above the surface. Bring the dinghy alongside it.

You now have to pass the sling through the anchor ring and set it up in such a way that the anchor, when lowered further, will hang directly below the boat.

With the anchor now totally supported by the boat, the lowering line can either be cut or undone by a diver from below the boat.

**Running Out the Anchor**

You are now ready to run out the anchor and the first job is to coil the line down in the boat so that it will run free, leaving the bitter end secured aboard the vessel.

If the line is to be run out across the wind or tide, make sure you make a big up-wind/up-tide allowance. You can always drift down on to the required dropping point. You will find it almost impossible to get back up to windward if you have not made a sufficient allowance.

It is best if the order to let go the anchor is given from the ship as its exact placement is usually of great importance and, once you have dropped it, there is no way of getting it up again from the dinghy.

As a result, make sure you have worked out some easy form of communication between boat and ship.

On the order to ‘let go’, cut the sling. The anchor will drop clear from the boat and the weight of the hawse can be taken on the ship’s winch or windlass.

**7.6 ‘Dredging’ the Anchor to Move Ship Across Tide**

In a strongly running tide-way, it is possible to sheer your vessel across the tide without engines, using only the rudder and the anchor.

With the ship lying to her anchor, heave in the cable until the anchor just begins to drag. If the helm is now put hard over the tidal flow past the rudder, it will cause the ship to sheer and move in the direction opposite to that in which the cable is leading. Figure 7.7 shows how this is achieved.

![Fig. 7.7 Moving the ship across tide by dredging the anchor](image)
7.7 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. In what state should you keep your anchor and windlass after coming in from sea, or when operating in protected, cramped, crowded or hazardous waters?

2. Describe how you would turn short round using an anchoring. List all helm and engine movements and include a diagram.

   Diagram:

3. With multiple vessels berthed abrest alongside, which set of lines will bear the greatest strain?

4. Describe some strategies that will improve this situation.
5. Sketch the “GOVE” bunkering situation set out in Fig. 7.4 [2] and explain what your lines and the anchor are doing.

Diagram:

6. Describe using the anchor alongside a wharf exposed to surge fore and aft.

7. When would you use a kedge anchor?

8. Before beaching a vessel, what should you consider doing with your anchor?

9. How is a tender used to kedge an anchor and why is it important to use a strong back or spreader?
10. Describe what you understand “dredging the anchor to move ship across the tide” to mean.
Chapter 8 Twin Screws

8.1 Characteristics of Twin Screws

Twin screws are fitted in vessels for a number of reasons.

In big ocean liners and large warships twin, triple and often quadruple screws are installed because (at least in the immediate past) it was difficult to transmit the necessary power for high-speed performance through one engine and shaft assembly.

Secondly, there is the question of reliability and this is borne out by the number of twin-screwed vessels that have safely made port on one engine after a major breakdown in one engine or damage to one of the propellers.

The third, and very important reason, is one of manoeuvrability and this is the one that most concerns us in the study of ship handling characteristics.

If you will cast your mind back to Chapters 1 and 2 where we discussed propeller and rudder action, you will recall that a very significant factor in handling a powered vessel was the transverse thrust effect of the propeller, particularly when going astern.

The clock-wise turning (or right-handed) propeller threw the stern slightly to the right when going ahead and to the left when stern power was applied.

The main result of this in ship handling was that a port-side-to berthing approach was relatively easy while starboard-side-to had all sorts of problems due to the stern throwing away from the wharf when stern power was applied.

In a properly designed twin screw installation, one propeller will be right-handed, the other will be left-handed. So you have the best of both worlds and can berth with equal ease either side to.

However, there is another very important factor to be taken into account. This is the offset placement of those two screws.

![Fig. 8.1](image)

The twin-screw vessel in Figure 8.1 (1) is going ahead on its starboard engine only. Because the propeller is offset to the starboard side of the vessel, she will pay off to port and will require a compensating amount of starboard wheel if she is to steer a straight course while steaming on one engine. (Figure 8.1 (2).)

If that same engine is now run astern, that same offset placement is going to pull the stern to port (as in Figure 8.2).
However, there is also the transverse thrust effect to be taken into account. If that starboard screw is right-handed, when stern power is applied it will rotate anti-clockwise and increase the leftward swing of the stern. But what would happen if that starboard propeller was left-handed?

In practice, it is a ship handler’s nightmare as the transverse thrust effect cancels the offset effect and the ship may swing either way or may not even swing at all. Therefore, if you want good manoeuvrability in a twin-screw vessel, both screws must be out-turning – a right-handed propeller to starboard and a left-handed to port. (Figure 8.3.)

During World War II, a few of the 50 or more Australian built Corvettes were built with in-turning twin screws. It was believed this gave them better speed. Be this as it may, it also gave many naval officers some harrowing times and undeserved reputations as poor ship handlers.

### 8.2 Rudder Placement in Twin-Screw Vessels

Before we look at the handling characteristics of twin-screw vessels, a word about rudders is once again necessary. For many years it was normal practice to install a single midships rudder in a twin-screw vessel, and many are still built in this way. The significance of this is that the rudder is not in the propeller wash and will only be effective when the vessel is making sufficient way through the water for the actual water speed to act on the blade. In the ordinary way, this is not of great importance but it becomes a very real problem when one engine is out of use and we will look at this separately later. Modern practice is to have twin rudders set directly in the wash of the two propellers. Such rudders can be considerably smaller than the large single midships assembly. (Figure 8.4.)
Figure 8.4

8.3 Twin Screw – Handling Characteristics

The effect of twin screws is best illustrated in the ability to turn the vessel through $180^\circ$ without moving any appreciable distance from the starting point – known as turning short around and, though the same manoeuvre can be accomplished with a single screw (as we will see later) it is much more difficult to do and less likely to succeed in any sort of wind.

Turning Short Around

The first point to bear in mind is that, due to the propeller design and the water flow around the hull, ahead power at any given revolutions will normally be greater than the stern power at the same engine speed.

We wish to turn the ship short around to starboard so your first engine movements will be slow ahead port – half astern starboard.

The forward thrust of the port engine will be cancelled out by the stern thrust of the starboard so the ship should neither move ahead nor astern. (Some adjustment of the relative speeds of the two engines may be necessary to achieve this.)

The offset placement of the port engine will push the bow to starboard while its left-handed rotation will wind the stern to port – exactly what we require.

At the same time, the starboard engine, with its right-handed propeller going in reverse – that is, rotating to the left, is also pushing the stern to port while its offset placement is further accentuating the effect.

The result is that the vessel will be pivoting on a point about one-third of the way back from the stem and not moving any significant distance ahead or astern. The pivot point can be moved forward by sternway or aft by headway or by varying the rpms of the engines.

The value of such a capability will be immediately obvious. You can, in effect, stop in midstream and pivot the vessel around in any direction you wish.

So far we have not mentioned the rudders in this context. In fact, she will swing very satisfactorily with the helm amidships but, if the rudder is put hard over to starboard the propeller wash from the port screw is going to push the stern even faster to port and the bow to starboard.
The starboard rudder (also over to starboard, of course) will have no effect whatever while the starboard engine is running astern.

Remember this particular point as it is most significant when we look at carrying out the same manoeuvre in a single-screw vessel.

You should also realise that if the vessel we were handling was twin screw but single rudder there would be no point at all in putting the helm over to starboard as, without forward movement, it would have no turning effect on the ship.

However spectacular as this ability to turn short may be, it is by no means the main and only manoeuvring advantage of twin screws.

We will now go back to that original calm water berthing approach we looked at when first considering propeller and rudder action and see how it is accomplished in a twin-screwed vessel.

### 8.4 Berthing a Twin-Screwed Vessel

Figure 8.5 shows the vessel on the same 40° approach that we make in our single-screw ship.

As before, engines are stopped a suitable distance off and the vessel allowed to carry its way towards the berth. In position (2) (Figure 8.5) the wheel has been put over to starboard and the ship’s head is beginning to pay off. She is still moving ahead at perhaps two or three knots (3).

At this point go half astern on both engines. This will slow the ship but not affect her heading which will still be ‘bow in’ to the berth.

While she is still making headway, stop the port engine only. The starboard engine, still turning astern, will take the remaining way off the ship and, at the same time, wind the stern into the wharf. If you stop that engine at just the right moment, before she gathers sternway the ship will drop sweetly alongside.

And remember, it is just as simple to carry out the same approach starboard side-to.

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![Fig. 8.5 Simple port side-to approach with twin screws](image)

### 8.5 Leaving a Berth with a Twin-Screwed Vessel

Twin screws make leaving a berth in calm conditions relatively simple.

Figure 8.6 shows how, by going ahead on the outboard engine and astern on the inboard one and with the wheel hard over towards the berth the stern will wind itself clear. (1)
When you have sufficient offing you can increase the power on the engine that is running astern and the vessel will start to gather sternway while still continuing her outward swing. (2)

At the right moment the ‘ahead’ engine is stopped and the ship pulls herself cleanly away.

Fig. 8.6 Leaving a berth

Using a Spring with Twin Screws

Propeller action alone will rarely pull clear of a berth if there is any sort of onshore wind. Under such circumstances, a spring rigged to push the stern clear (as discussed in Chapter 5) is the best way of tackling the problem.

However, your twin screws are still going to be of great assistance.

First, rig your spring as before (Figure 8.7) and go ahead on your starboard engine with the wheel hard over to port.

In most circumstances this will ease the stern out sufficiently for the purpose but, with a very strong wind, she may still not come clear.

Fig. 8.7 Using a spring with twin engines

The temptation now is to give her more ahead power, with the probable result of breaking the spring. This is where you must remember that you have a port engine as well.

By applying stern power on the port engine as you increase power on the starboard, you will get the extra propeller thrust that you need without increasing the strain on the spring.

Once the stern is sufficiently far out, increase the stern power on the port engine as you ease the head power on the starboard. Let go the spring. Stop starboard. The vessel will move rapidly astern with the port engine still clawing her outwards to take you clear. Use plenty of power to pull her clear before the wind blows you back to where you just came from.

8.6 Proper Use of Power

Whatever size or type of powered vessel you are handling, there are certain precautions and limitations that must be observed if you want to get the best results and not damage, or unnecessarily strain your engines, gear box and transmission.

Few, if any of you studying this manual will have occasion to handle a vessel where the engine orders are transmitted by an engine room telegraph. The engine controls – gears and throttle – will almost invariably be alongside the wheel in the wheelhouse under the direct hand of the skipper.

This has enormous advantages, of course. It also has its hazards. If you ring for full astern from full ahead on a bridge telegraph, the engineer down below knows it is an emergency and acts accordingly.

However, because he knows his engines, he carries out the order with due regard to the consequences. He will give you maximum stern power in the shortest possible time without (to use an old seagoing phrase) breaking anything.

With bridge control of the engines, this responsibility now reverts to the skipper.
Here are the points you should watch.

1. Always pause in neutral when going from ‘ahead’ to ‘astern’. The faster you are going, the longer this pause must be to allow the engine to drop to idling revs and the shaft to stop revolving.

2. Apply and reduce power GENTLY, even in the greatest emergencies. In many larger vessels, reduce power AHEAD will actually slow the ship more quickly, in the first instance than stern power.

   A fast throttle movement will not make the propeller pick up its revolutions any quicker and will only strain the engine, the transmission, the shaft and the propeller itself.

   Even in a high powered outboard motor the same rule applies. The most common repair job to water ski-ing motors is replacement of the rubber clutch in the propeller caused by ‘hitting’ the throttle for a fast acceleration.

3. When berthing, or carrying out any other close manoeuvre in a trawler, or similar vessel, the engineer should always be close to, or in the engine room to re-start the engines in the event of them stalling.

4. Make sure you know the ‘safe’ readings of the engine monitoring gauges on the bridge:
   - Engine temperature. This also includes the auxiliary engines.
   - Exhaust temperature.
   - Oil pressure (main engine and auxiliaries).
   - Revolution counter.

   You should also make it your business to find out what is the optimum stern power that you can use. Some vessels can use maximum astern revolutions to advantage. With others, the underwater configuration of the hull causes cavitations past a certain point and the propeller can become totally ineffective at that speed. Your effective ‘full astern’ may well be 1,200 revs out of an engine capable of turning at 2,000. Use any more than the 1,200 revs and you would get no stern power at all.

   Keeping to these rules sometimes takes a lot of self-discipline in a real emergency. Engaging astern propulsion abruptly can break the gear bringing a range of consequences with it. You will stop more slowly if sudden application of power results in cavitation. If cavitation results, you must reduce power and apply it again and try to do better.

### 8.7 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. Set out the reason for the development of multiple screws.

   (a) 

   (b) 

   (c)
Questions 2-5: circle or tick ✓ correct answer.

2. A left hand screw, operated ahead, will cause the stern of the vessel to move a little to:
   Port / Starboard.

3. On conventional twin screw vessels the propellers turn:
   Inwards / Outwards.

4. Propeller design, location and the pressures bearing on them make them more effective driving:
   Ahead / Astern.

5. With twin screws, to pivot the ship on her axis, the propeller going astern would need:
   More RPM / Less RPM.

6. What would an optimal approach angle be?
   __________________________ degrees

7. What difference is there, berthing a twin screw vessel Port or Starboard side to?

   __________________________________________________________

   __________________________________________________________

8. Describe departing from alongside, stern first with twins.

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________

9. Set out your considerations and actions in going from the full ahead, to the full astern, in an ‘emergency stop’:

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________
Chapter 9  Specialised Propulsion Units

9.1 Bow Thrusters

It has already been shown how twin screws permit a vessel to be swung in either direction without making headway and it is important to once again stress that this pivoting takes place in the average vessel at a point about one-third of the ship’s length back from the bow.

If greater manoeuvrability is required, as in the case of an oil rig tender, which may have to hold an exact position (often in rough seas) while heavy gear is transferred between the deck and the oil rig, a bow thruster will often be installed.

This is a propeller operating in a tunnel running thwartships across the hull close up to the bow (Figure 9.1).

![Fig. 9.1 Bow (or transverse) thrust unit](image)

This thruster will usually be electrically or hydraulically operated from a bridge control console. Depending on its rotation, it will push the bow either to port or starboard.

In the situation shown in Figure 9.1 the starboard engine is ‘ahead’, the port engine is ‘astern’ and the effect is to push the stern in the direction shown. The bow, of course, will want to swing the opposite way.

With the bow thruster also pushing to starboard, instead of the ship pivoting as she normally would, she instead moves bodily sideways through the water.

Most large commercial vessels and modern warships are being similarly fitted to give them greater manoeuvrability in berthing and turning in confined spaces.

9.2 Kort Nozzles

A kort nozzle is a form of tunnel which greatly increases propeller thrust by concentrating it through the confines of the nozzle. Its main application is in tugs.

The propeller is designed to rotate within very small tolerances inside the nozzle (see Figure 9.2) the tips of the blades being shaped to exactly conform to the inside diameter of the nozzle.

The fitting of a nozzle does appear to slightly reduce the free running speed of the vessel, but this is more than outweighed by the increased towing efficiency.

The usual arrangement is for a normal rudder to be set in the slipstream but occasionally the nozzle itself is steerable and takes the place of the rudder.

![Fig. 9.2 Fixed kort nozzle](image)
The two types have markedly different handling characteristics and it is important to be aware of this fact when taking charge of such a vessel.

Fixed Nozzles

A fixed kort nozzle will usually negate the transverse thrust effect of the propeller. This is because it captures the energy escaping laterally off the tips of the propeller blades and focuses it in the main stream. Most vessels will be different if not difficult to handle on occasions, as there is no guarantee that the stern will swing in the expected direction when the engines are put astern.

The nozzle also tends to make the vessel slower to answer her helm, both underway and when using a short burst of power with helm over to swing her rapidly when at rest.

Steerable Nozzles

While considerably more expensive to install and maintain, a steerable nozzle, if used to its full advantage, can perform manoeuvres with a single screw that few other vessels with a single screw can match.

Such a nozzle usually has a maximum ‘helm’ of 25° (as against the usual 35° of an orthodox rudder). However, its effect is virtually to direct the whole propeller thrust in the direction to which it is turned. A rudder only partially achieves this objective.

At the same time, like an outboard motor, unless you have propeller thrust you have no steering control. Even if a rudder blade is fitted as a part of the nozzle design it is, of necessity, so small as to be virtually useless with engines stopped.

In summary, therefore, while you have power, you have a very superior steering arrangement. Without power, you have none at all.

The other special characteristic of a steerable nozzle is its ability to step the ship astern. The transverse thrust is negligible because of the way the propeller is enclosed and the stern will swing according to the way in which the propeller jet is directed.

This means that, when berthing, you can choose either side-to and throw your stern either way at will.

Figure 9.3 shows how it works on our normal 40° approach.

The secret is not to use more than 10° of helm when going astern. Anything more than this will destroy the directional pull of the nozzle.

Fig. 9.3 Berthing with steerable kort nozzle
9.3 Variable Pitch Propeller

Many vessels today are being fitted with variable pitch propellers – a propeller in which the angle of the blades can be controlled. This is usually done from a direct bridge control and takes the place of engine reversing gear for stern power.

This means that, for normal steaming, when you are seeking the best speed you operate just short of the coarsest pitch that the engine will make its RPM without excessive slip, cavitation and vibration.

For towing, the blades are angled to shorten pitch and reversed pitch is applied for stern power.

Since the engine will be governed, any form of manoeuvre can be carried out with the engines running at constant revolutions, if you wish, taking you from ahead, through stop to astern without changing either the speed of revolution of the shaft or its direction of rotation.

In general terms, berthing with a variable pitched propeller is little different from the way in which you would approach it in an orthodox vessel with the important exception that the direction of the propeller rotation does not change when applying stern power.

This simply means that a vessel with a variable pitch right-handed propeller would handle best starboard side-to rather than the port side-to berth that you would choose with a reversing propeller.

9.4 Outboard Motors and Outdrive Units

As every small boat owner knows, outboard motors and out-drive units powered by inboard engines are steered by turning the whole propeller assembly.

This has many advantages which, as always, are balanced by certain disabilities. It also calls for a very different technique when handling such vessels.

Firstly, as with steerable kort nozzles, the vessel will have virtually no steerage with engines stopped, so the engine must be turning ahead right up to the last moment of a berthing approach.

Secondly, they have notoriously poor stern power, although this is counter-balanced by their ability to steer as well astern as ahead.

We will go back to our original 40° approach to a berth and see how it now works out with an outboard or out-drive powered vessel.
In Figure 9.4 you will notice that, at the last moment, the engine is stopped and the wheel put to port as stern power is applied.

This will take the way of the vessel and, at the same time, pull her stern alongside. This will work equally well either side-to, regardless of the direction of the propeller.

**Twin Outboard/Outdrive Assemblies**

It is very rare to find these assemblies with contra-rotating propellers. In fact, there is little point in doing so except, perhaps, to reduce the upward torque when running at high speed.

To turn short around with this type of installation, going astern on one engine while you go ahead on the other will actually slow down your speed of turn rather than increase it.

Figure 9.5 shows why this is so and demonstrates an alternative manoeuvre that will achieve much the same result.

**9.7 Self-assessment Questions**

Check your answers with those provided at the back of this book.

1. Bow thrusters are controlled either ________________ or ________________ from the bridge.
2. Sketch a vessel using twin screws and bow thruster to go STBD side to a wharf. Show rudder positions and propulsion to make her move bodily sideways through the water.

*Diagram:*

3. What is a kort nozzle?

4. Kort Nozzles can be of a steerable type or have a conventional rudder in the flow (circle correct answer).  
   True / False

5. Describe an emergency stop with variable pitch propeller.

6. With a right handed variable pitch propeller, which would be the preferred side to come alongside?

7. Describe coming alongside with a single outboard. Explain any differences between PORT side or STBD side-to.

8. Name and describe two downside characteristics of outboard operation.
   1. 
   2. 

9. Describe how you would best turn short round with twin outboards.
Chapter 10    Special Manoeuvres

10.1 Turning Short with a Single Screw

We have already looked at the method employed in turning a twin-screw vessel short around in a confined space by going simultaneously ahead on one screw and astern on the other.

The same manoeuvre can be carried out in a single-screw vessel but will require greater skill and knowledge of your vessel’s capabilities. Nevertheless, it is a very important accomplishment for any ship handler.

It is done by alternate bursts of ahead and stern power, using the initial forward thrust of the propeller against the rudder when going ahead and transverse thrust of the reversed screw when astern.

We know that with a right-handed propeller and engines astern, the stern of the vessel will swing to port and the bow to starboard. No position of the rudder is going to affect this in any way. So, with a right hand propellered vessel, always swing her short to starboard.

We also know that, although the right-handed propeller, when going ahead, will tend to throw the bow to port, this can easily be overcome by applying a compensating amount of rudder. Therefore, with the ship at rest, if the rudder is put hard over to starboard and a short burst of ahead power applied, the head will swing to starboard.

This swing to starboard will be immediate, even before the ship begins to gather headway. Since the whole purpose of the manoeuvre is to stay in one place as you swing, stop engines just as she starts to move ahead and to Full Astern.

The reversed propeller will take off that little bit of headway while the transverse thrust will push the stern further to port, continuing the swing.

Once again, before you start to gather sternway, stop engines and, with the wheel still hard over to starboard, give her a burst of head power.

You continue in this way with these alternate bursts of power ahead and astern, never letting the ship move more than a few feet in either direction as she pivots on her axis in virtually the same place.

Generally speaking, this is a calm water manœuvre and will rarely be successful in a strong wind.

10.2 Securing to a Buoy

The value of a mooring over anchoring is that you are not concerned about the nature of the bottom for good anchor holding, you will have a much smaller swing circle and, provided you are satisfied as to the strength and condition of the mooring, you can expect it to be more secure than any anchor.

A standard mooring buoy will have a large eye at the top (although many private moorings have the securing warp permanently shackled to the buoy, ready to be picked up and dropped straight over the forward samson post or bitts).

It is the standard type of mooring buoy we intend to look at here and you must realise that such a buoy may well be two metres or more in diameter and quite capable of supporting the weight of a person without sinking or turning over.
The following description applies for the larger types of fishing vessels and trawlers but skippers of smaller boats will readily see how it can be simplified to fit their needs.

![Fig. 10.1](image)

The first step is to put a person onto the buoy and, in the larger type of vessel we are considering, this will normally mean putting the dinghy in the water. (In a smaller vessel, it is quite practical to lay yourself alongside the buoy and put the person across that way.)

With the buoy jumper safely on the buoy you can now steam gently up to it, making sure your approach is up-wind or up-tide, and stop with the bow alongside it. While you hold her in position pass out a pick-up wire or rope, one end of which is turned up on the forward bitts. This pick-up rope is passed through the eye of the buoy and back on board where it is secured.

This rope or wire will now hold you close to the buoy while you pass out the rope and secure the chain cable or wire which will be shackled to the buoy by the buoy-jumper.

The ship can now be allowed to fall back onto the main wire by slacking off the pick-up rope. (The pick-up rope should be left in place if your stay is not of long duration as you will use it in getting away from the buoy. Just allow it to lie completely slack.)

**Leaving a Buoy**

Leaving the buoy is going to be the reverse procedure to the one described above. The vessel is about to proceed and is lying back on her cable or wire which is shackled to the ring of the buoy.

1. Put the person on the buoy and (if it is not already there) pass the pick-up rope or wire exactly as you did before.

2. Bring the ship close up to the buoy so that the weight is taken off the mooring chain or wire. You can do this with main engines or by taking the short inboard end of the pick-up to the drum of the windlass and hauling her ahead that way.

3. With the ship now hanging to the pick-up rope (it would be more correct at this point to call it a *slip rope*) the main cable can now be unshackled and the buoy jumper brought aboard.
4. Letting go from the buoy is now simply a matter of throwing off the turns from one end of the slip rope and allowing it to run out and through the eye of the buoy as the ship moves astern.

10.3 Deliberate Beaching and Refloating

A vessel may be beached to save her from foundering in deep water, to flood her in the event of an uncontrollable fire or, in less urgent or dramatic circumstances, to carry out an underwater inspection or clean down the bottom where a slipway or dry dock is not available.

If this ship is not at very grave risk, even in the panic situations referred to, it is important that the keel should settle on a level bottom. A steep hollow or rise in the bottom under the keel will probably break her back.

Small ships in remote areas, particularly where there is a large tidal range, often use beaching as a cheap and convenient method of ‘dry-docking’ the vessel. The following procedure should be followed.

- Select a level or very gently sloping stretch of seabed, preferably with a sand bottom. The safest way to do this is at low tide where it can be physically inspected.
- Spring tides are the most suitable period as you will have a much greater time to work on the hull after the tide has dried her out. Just make sure that you do not take her too far up at the top of a King tide and find yourself high and dry for the next three months. In this regard, the safe way is to carry out the operation two or three days before the highest of the spring tides are due.
- Bring the ship in slowly on the falling tide about one to two hours after high tide until she just touches bottom, holding her there until the falling tide settles her gently.
- If the vessel is not flat bottomed and you want her to lie in a particular way, trim her in that direction by shifting fuel or ballast before you start the operation.
- Once she has dried out, run mooring lines ashore if you want to stay in that position over several tides as she will be afloat again at high tide some eight hours later.

A Few Words of Warning

A deep keel vessel cannot be safely beached in this way unless you make provision for timber ‘legs’ or some other way to prevent her lying flat on her side when she dries out. If you fail to do this, the rising tide will fill her up before the side lifts.

10.4 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. How do you turn short round a vessel with a right hand single screw?
2. What will be the effect of the rudder while going astern during this manoeuvre?

3. Compare the merits of a mooring buoy to anchoring.

4. Describe how a vessel would secure to a mooring buoy with a slip line and how it would get underway.

5. To beach successfully a vessel should have a flat even ____________

6. What sort of sea beds should you avoid when beaching?

7. If you were going to beach (careen) your vessel for urgent repairs, what would be your considerations?
   (a) ________________
   (b) ________________
   (c) ________________
   (d) ________________
   (e) ________________
Chapter 11  ‘Man Overboard’ (MOB)

11.1 Precautions:  Equipment

The most common cause of loss of life at sea is by falling overboard (known as MOB). Even when a person is seen to go over the side, the chances of recovery in a rough sea are by no means certain, while at night the odds against success are increased tenfold, especially in fishing vessels such as trawlers which have to recover their gear before they can manoeuvre back to pick up a person in the water.

The best cure, as always, is prevention. This means using safety harnesses in small vessels when working on deck and rigging lifelines across open sections of the deck in larger vessels when the sea conditions warrant it.

Another vital precaution is to see that efficient lifebuoys are stowed in positions where they can be readily heaved over the side in the event of such an emergency, that they have self-igniting flares or lights attached to them and that both buoys and lights are regularly maintained in top rate condition.

It is a sad fact that the only time this is done in many commercial fishing vessels is when the surveyor is coming aboard for his/her annual inspection. Self-igniting electric lifebuoy lights can be tested by simply lifting them out of the holding clip and turning them upside down – the way they float. A mercury switch makes contact and completes the electrical circuit to the torch batteries.

It is also good practice to instruct your crew that they must report to the bridge or wheelhouse whenever they are about to do any job which carries a higher than usual risk of falling over the side – such as going out on the booms of a trawler underway. In such case, the crew member on watch is aware of the fact and can keep a general eye on the person in the water.

11.2 Immediate Action

We are going to look at this emergency from the small ship angle which differs from the procedure in large ships where the stopping distance and turning circle may be measured in miles, response to helm and engine orders is slow and recovery of the person from the water almost invariably involves lowering a boat.

You have four immediate and vital duties to attend to, all of which are equally important to the well-being of the person in the water.

1. Prevent injury to the person from the propellers.
2. Get a lifebuoy over the side, both as a marker and as a life-saving float.
3. Keep the person in sight at all times.
4. Pick the person up safely.

Danger From the Propellers

When a person falls overboard forward there is a very real possibility of being sucked into the propeller stream especially from the bow. This can be minimised, if you see the person fall, by putting the helm hard over to the side on which he or she has fallen, at the same time stopping the engine and pulling it out of gear. In a twin-screw vessel, stop the engine on that side.
Here it is in practice:

The call is ‘Man overboard starboard side’.

Hard a’starboard. Stop engines (or stop starboard engine).

Lifebuoy Over the Side

Except in very calm weather, it is difficult, and often impossible, to see a person’s head in the water. Your lifebuoy, on the other hand, will be bright orange or yellow and be much more easily observed.

At night, of course, it will be your only way of finding the position where the accident occurred. The self-igniting light will give you a datum point and will also be seen by the MOB.

Your crew should be trained to look for and swim towards the buoy.

Keeping the MOB in Sight

It is of vital importance that the MOB in the water (or the lifebuoy, if the MOB is not visible) be kept in sight. It is difficult for the skipper to do this successfully and the duty should be undertaken by the nearest available crew member who stands where he/she can be seen from the helm and indicates the direction continually with an outstretched arm.

If look-outs let their attention wander for even a moment, they will probably lose sight of the MOB, particularly as the ship will be altering course and the relative bearing will be changing rapidly.

Making a Safe Pick-up

In a large ship, it is accepted practice to do an elliptical turn or a Williamson, both of which are designed to bring the vessel back to the point at which the accident occurred. In small vessels, this is not only unnecessary but can actually increase the risk by taking the vessel a needlessly greater distance away from the MOB.

You will probably have pulled off your power as soon as you saw the person go overboard and the ship will not have travelled a very great distance past that point. Under no circumstances use stern power.

What you have to do is to come round in a large enough circle to be able to approach the MOB under full control and, preferably, up-wind.

The most common mistake is to turn too soon and find the MOB inside your turning circle. This was the reason for the elliptical turn which was referred to earlier and is illustrated in Figure 11.1 below.

![Fig. 11.1 Elliptical turn](image)

This manoeuvre is ideal if the MOB is not noticed until after the stern of the ship is clear. Course and speed are maintained for a short distance, keeping the MOB in sight. You then put the helm hard over and run back on a reciprocal course until you are well past the MOB before putting the helm hard over again to bring the vessel on a recovery course.
You will notice that if the same amount of wheel is used at both A and B, with the vessel kept at a constant speed, you should come back exactly to the spot where the person fell overboard.

Adapting the Turn for Small Ship Use

Figure 11.2 shows how a pick-up might eventuate from a small vessel using an adaptation of the same principle.

![Diagram](image)

**Fig. 11.2** Elliptical turn adapted to small ship use

The dotted line in the diagram shows what would happen if you followed your natural instinct to get back to the MOB as soon as possible.

Despite having one wheel hard over, the person is inside your turning circle and, when you have come around, it is still too far away to reach him.

By steaming a short distance down wind you can give yourself enough water to come around and bring the person directly ahead of you for an up-wind approach under full control of power and rudder.

11.3 Making a Safe Pick-Up

You will notice the stress that has been placed on an *up-wind* approach. There are two good reasons for this.

1. Safety demands that you make the approach at *very slow speed*. With your head to wind you can stop engines well before you get there and let the wind take the way off the ship, avoiding necessity for stern power and the very real danger of sucking the person in to the propeller.

2. The up-wind approach allows you to place the person on the side of your choice and, during the rescue operation, the vessel will have less tendency for the head to swerve.

Figure 11.3 shows what happens in a small vessel on a cross-wind.

As you make your final approach, that heaving line we referred to earlier should be made ready, with a large bowline tied in the end – big enough to go over the MOB’s head and shoulders and finish up under the arms.

If you have a rescue lifebuoy – one with a fixed line attached – this is the time to use it although it is still good practice to have a heaving line ready as well.

While these preparations are in progress the look-out keeps the MOB continually in sight and continues the direction with an outstretched arm. *This is vitally important in the final stages of the approach as the crew at the helm will be unable to see the MOB over the bow.*
‘Man overboard’ should be regularly practised, whatever the size of the vessel, using a buoy or marker as the victim and going through the whole routine, including the throwing over of the life belt.

This is the only way in which the drill becomes automatic and you would be wise to allow other members of the crew to take the helm on occasions. If the skipper is the only one aboard who can manoeuvre the vessel in this situation, it would be a grave omission if the skipper is the one unlucky enough to fall over the side.

11.4 Man Overboard at Night

This is the most dangerous situation of all as, without some sort of light or flare marker there is little or no chance of a successful rescue effort.

As a result, it is once again worth stressing the point that all lifebuoys should have an automatic light attached.

Having seen the person go over, the routine is exactly the same as before, with the possible addition of a good spot light. However, remember that a spot light is a handicap if it blinds the searchers and must be carefully handled with this in mind.

Assuming you can locate the buoy, put the spot light beam on to it and hold it there. This not only gives you a mark to steer by (preventing you from becoming disorientated) but allows the person in the water to see it and swim towards it.

*It is highly improbable that you would see a swimmer’s head in the light beam.*
11.5 Person Missing at Sea

When a person is missing aboard a vessel at sea it must be assumed that he has gone overboard and the only hope of finding the person is to search on a precise reciprocal course along the track you have been following.

Firstly, this means turning the vessel around so that she comes back exactly along her previous tract and this is done by means of a Williamson turn (picture in Figure 11.4).

Here is a recommended action sequence:

1. Alert the crew.
2. Note your course. This is vital as success in the search will hinge on exactly retracing your track.
3. Carry out a Williamson turn and steady on the reciprocal of the compass course you have been steering.
4. Reduce speed and drop a marker buoy. This will give you a datum point to come back to if the first sweep back along the track does not produce results.
5. Relocate your course. The reciprocal compass course you have steadied on does not take account of the different deviation and this must now be corrected. Allowance for leeway must be made. There is no need to allow for current as you are both affected.
6. Carry out the search.

The search down that reciprocal track is now a matter of minute attention to steering and keeping a good look-out. If you can establish when the person was last seen, this will be of great value in determining how far back you can search with advantage. For example, if the MOB was discovered missing at 1500 and he was positively remembered as having been seen at 1400, he cannot be further back than one hour’s steaming at the speed you were maintaining at the time.

If other vessels are in the vicinity you should hoist flag ‘Oscar’ and transmit a ‘PAN PAN’ (not Mayday) on the frequency you anticipate they will be monitoring (VHF Ch 16). In a fishing fleet your best chance of a reply will be on 4620 and 2112 kHz and on channel 16 VHF. In an organised yacht race the appropriate frequencies would probably have been promulgated as part of the race instructions.

In such cases, the vessel that has lost the person overboard is the controlling station and would organise the search from the datum buoy. This buoy, incidentally, should never be anchored. You want it to drift with the tide as the person in the water will also be similarly affected.

When searching at night it should be remembered that sound carries a long way over water. Don’t forget, also, that the person in the water can probably see you. You should therefore stop periodically, shut off all unnecessary noise and LISTEN.
11.6 Man Overboard from a Working Trawler

A trawler with its gear down cannot manoeuvre back to a person in the water without first recovering its gear and this will usually take far too long.

It is worth having your crew trained to the routine that, in the event of a person overboard at night when trawling, the ship will be immediately stopped.

With her heavy gear on the bottom, this is almost instantaneous and she will then be ‘anchored’ by her nets on the bottom (albeit with considerable future problems in recovering tangled nets or bogged otter boards).

Provided all crew members can swim, the person in the water has only a very short swim back to the brightly illuminated trawler.

How the person comes to terms with an irate skipper is another story!

11.7 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. What is the most common cause of loss of life at sea?

   ____________________________________________________________

   ____________________________________________________________

2. Nominate three steps to guard against having a MOB situation.

   ____________________________________________________________

   ____________________________________________________________

   ____________________________________________________________

3. Describe a self-igniting lifebuoy beacon and how you would test it.

   ____________________________________________________________

   ____________________________________________________________

4. Name four aids or pieces of safety equipment to do with recovering, preserving and re-locating MOBs.

   1. _______________________________________________________

   2. _______________________________________________________

   3. _______________________________________________________

   4. _______________________________________________________
5. List the Master or Watch keeper’s four immediate main concerns in the case of a MOB:

1. 

2. 

3. 

4. 

6. You are working on nets down aft. You see a man who is working just forward of mid-ships fall over the right-hand-side of the boat as you are looking forward. What would you yell?

__________________________________________________________________________

__________________________________________________________________________

7. Set out two reasons why you would give information about which side they went over:

1. 

2. 

8. List two reasons for throwing the lifebuoy ASAP:

1. 

2. 

9. What is the only appliance that is likely to help us find a MOB at night?

__________________________________________________________________________

10. Describe the consequences of a situation where a crewman, who is given the task of keeping his eyes on the MOB and continually pointing at him, lets his attention wander.

__________________________________________________________________________

11. Should you ever go hard astern immediately after someone has fallen overboard? Yes / No

12. What is the preferred way to approach the MOB in the water?

__________________________________________________________________________
13. Set out two good reasons for making an upwind approach.
   1. ________________________________________________
   2. ________________________________________________

14. What assumptions must be made if a person is missing from on board while at sea?

   ________________________________________________
   ________________________________________________

15. What are the six sequential steps of actions to be taken, as recommended for a missing MOB?
   1. ________________________________________________
   2. ________________________________________________
   3. ________________________________________________
   4. ________________________________________________
   5. ________________________________________________
   6. ________________________________________________

16. List three likely effects caused by inattention.
   1. ________________________________________________
   2. ________________________________________________
   3. ________________________________________________

17. Where there are other vessels in the vicinity, you would hoist code flag ____________ and precede your radio traffic with the words _________________ on Channel ______________ on VHF, and/or other channels likely being monitored.
Chapter 12  Towing and Being Towed

12.1 Towing

This subject can be separated into three convenient subdivisions:

1. Selection of a towing method and preparations prior to passing the tow.
2. Passing a tow. Manoeuvring the ship into a suitable position.
3. The actual towing operation and care of the tow line to prevent chaffing and breaking.

Taking another vessel in tow in calm sheltered waters presents no real problems but it is when the same job has to be done in the open sea, in heavy weather, that all your skills of seamanship and ship handling have to be combined to carry out the job successfully and to see that ships and people are not hurt.

In the ordinary course of events, the vessel to be towed will be without power and will consequently be lying beam to sea and drifting sideways down-wind.

The problem confronting you in passing a tow line from your stern to the vessel’s bow is to get close enough to pass across a heaving line or to use a line throwing gun and to remain in that position while the main line is passed across. Under the best conditions, this will take a considerable time and will probably be even more prolonged in rough seas.

As a consequence, all preparations that can be made before you make your approach should be completed as far as is possible, both aboard your own vessel and aboard the vessel to be towed.

It is also important to establish right from the start that it is the master of the towing vessel who is in charge and who will make all decisions on how the job is to proceed.

This brings us to deciding on what sort of tow line will be used.

12.2 Choice of a Tow Line

If you are going to tow in rough water the tow line must be strong, long and heavy and, unless you are a commercial tug, it is unlikely that you will have a line or wire on board that comes close to meeting all three of these requirements.

This needs some explanation.

There is no need to dwell on the need for strength in the line. The reason for length and weight is the necessity of giving the line spring or elasticity to withstand the immense strains that will be imposed on it in rough seas.

In general terms, you could say that if a tow line pulls taut in big seas it is going to break, regardless of its size or composition. If it is very long and heavy its own weight prevents it straightening.

If the vessel to be towed has chain cable, this will make the best tow line of all. You can shackle this to a strong wire at the towing end to give a manageable line to handle aboard your own vessel and get the required length at the same time.

However, it will often happen that small vessels do not have chain cable and you may well be faced with the prospect of using ropes or wires regardless.

The strength of such a tow line can be greatly increased in two ways. You can hang a heavy weight (such as an anchor) in the centre of the tow line. This will
have a similar effect to the heavy line described above and will greatly assist in preventing the line becoming taut.

The second method is to ‘build in’ some elasticity into the line. This can be done by using old motor tyres as springs in the line and can be especially useful when the tow line has to be constructed from several relatively short lengths of rope. (See Figure 12.1 below.)

![Fig. 12.1](image)

We will look at how we would go about taking another vessel in tow in rough weather. We can assume for this first example that your own vessel is an 80 ft trawler and that the vessel to be towed is of a similar type and size and has chain cable.

Radio contact between the two vessels can be by VHF (call up on channel 16) or on HF transceiver using low power on 2112 or 4620 MHz. (Both these frequencies are ship-to-ship voice frequencies.)

### 12.3 Preparation

Being a trawler, you will have plenty of heavy wire on board, the ideal being a new 40-fathom bridle wire which will already have a soft eye spliced in one end.

This wire will need to be got on deck and flaked (or ‘faked’) down so that it will run free when required. You are probably aware that a coil of wire will not run free from a coil like rope and will have to be unwound, either on a horizontal or vertical reel or by rotating it by hand on the deck.

Figure 12.2 shows how a wire is flaked down.

![Fig. 12.2 Flaking down a wire for free running](image)

It is important that each ‘flake’ be as long as deck space permits and that each loop be pushed under the preceding one and that you finish with the eye splice outboard and leading aft.

The wire will not run out without kinks when the weight is taken on the spliced end.

The next consideration will be the selection of a strong towing point. Of necessity, it will have to be right aft (although a towing point forward of the centre line is more satisfactory but can only be employed by a vessel especially designed for towing).
The after bitts in a trawler will usually be strong enough and, if this is your decision, pass the eye of the wire out through the port, over the bulwarks and back on board. Meanwhile, the other end must be passed under or around the end of the flaked wire and turned up on the bitts.

This is done with ordinary ‘figure 8’ turns around the uprights. (There is no way you can take an initial round turn with heavy wire.) Continue the turns right up to the top of the posts and make sure there is a long tail left over – you will need this extra length when freshening then nip during the course of the tow.

To secure the wire so that it will not jump off the bitts, pass a line several times around the centre of the turns as was described in Chapter 3 (Figure 3.5).

It is vital to do all this before you attempt to pass the wire. Once it starts to run under its own weight, there is no safe way of stopping it and any attempt to do so will probably result in mangled limbs as the flakes or wire run out.

Another point to watch is the direction in which the lead of the wire passes through the port. Figure 12.3 makes this clear.

As a final preparation, loosely secure your best shackle to the eye of the wire ready for the other boat to shackle it to its cable.

If you are not satisfied that the bitts are strong enough as a towing point you may have to arrange some other strong point. This is usually solved by passing a heavy wire bridle round some strong deck fitting or piece of machinery.

This has the disadvantage that you are forced to shackle your end of the tow line and consequently have no quick way (other than cutting it) of slipping the tow in an emergency.

Alongside the wire, have at least two heaving lines ready made up for throwing with the end of one of them tied securely to the eye of a full coil of good rope heavy enough to take the weight of the wire. This rope is the ‘messenger’ and will be used to haul the heavy tow wire across when you are in position.

You are now as ready as you will ever be. You will have instructed the Master of the distressed vessel that he is to shackle your wire to the outboard end of his cable or, if you wish, directly to the eye of the anchor itself.

The incorporation of the anchor into the centre of the tow line is an advantage in most circumstances, acting as an extra weight to prevent the tow line rising under load.

His preparations may involve breaking his cable on deck but it is more likely that he will elect to leave the anchor in place. Very few trawlers have a joining shackle close to the anchor and, in such a case, he will not have any real alternative.

If he is lucky, the eye of the anchor will be accessible from the deck side of the hawse pipe, in which case he will prepare to pass your wire up the hawse pipe and shackle it to the anchor shackle or ring.

However, in most vessels this is not possible and the shackling on will have to be done from outboard – by lowering the anchor until the ring is just clear of the hawse pipe.
Some crew member will then have the unenviable task of going over the bow in a bosun’s chair to do the shackling job. If this is so, the vessel receiving the tow should have a bosun’s chair ready and the necessary tools (spikes and spanners) ready to be lowered to him on long lanyards. All is now in readiness to pass the tow.

12.4 Passing the Tow

With two fairly similar vessels, the rate of drift will be much the same. We have already noted that the other vessel will probably be drifting beam to sea so, if you place yourself just ahead of him, both vessels will drift to leeward at the same rate and you can control the distance apart by judicious use of a small amount of ahead or stern power.

With different rates of drift you will probably have little option but to heave to off his bow, carefully watching the distance between the ships and making certain that you don’t allow your bow to cross the wind in the wrong direction. (See Figure 12.4(b).)

![Fig. 12.4 Holding vessel in position while tow line is passed](image)

It will be readily seen that, if the towing vessel allowed herself to fall into the ‘dangerous quadrant’ she would have great difficulty in pulling clear without collision.

These, of course, are only guidelines and your final solution will be made in the light of circumstances at the time, the state of the weather, the handling ability of your vessel and the dictates of safety and good seamanship.

Whichever way you tackle it, your stern must come close enough to the bow of the other vessel to allow the heaving line to be passed.

If the first throw fails, the second line should be used immediately. You will hopefully have the mate (or, at least, an experienced seaman in charge aft) and he will be as anxious as you to widen that dangerously small safety margin between the two vessels as quickly as possible.

Once the line has found its mark the receiving crew will haul it away, taking with it the heavy rope messenger. You can now widen the gap between the ships to a slightly safer margin (but not too much as the wire is very heavy and the crew on the receiving ship may be unable to haul it across if you are too far away).

You will have secured the inboard end of the messenger to the eye of the wire (which is already passed outboard through the port – see Figure 12.5) and, once
they take the weight on the messenger the wire will run out of its own accord through the port.

![Fig. 12.5 Heaving line and messenger](image)

Once the eye is aboard the other vessel, its crew will turn it up on the bitts and, having left sufficient length for the eye to reach the shackling point on the anchor, proceed with the securing of the shackle. This is the job that will usually take the greatest length of time.

You can afford to widen the gap a little more at this stage but must take care not to put any great weight on the wire.

In my experience, this is the point at which tempers begin to get frayed. The strain of holding a ship in dangerous proximity to another in rough seas makes one very impatient at any time and it is easy to become intolerant of what will appear to be incompetence and wasted time aboard the other vessel.

On the other hand, the person in the bosun’s chair isn’t enjoying it either. That person is probably hanging on with one hand while attempting to manipulate a heavy shackle and a cantankerous wire with the other. At the same time he is being bashed against the ship’s side and periodically submerged and is unlikely to be in any mood for criticism from his own skipper or the stranger across the way.

If his own crew know their business, the wire eye will be suspended on a light line at exactly the right height for the crew in the chair while the shackle will be similarly suspended and being carefully tended so that it does not swing across and smash his skull as the ship rolls.

Once that wire is shackled on it is all straight going. The turns are thrown or levered off the bitts on the towed vessel allowing the wire to go over the side and hang from the anchor.

The towing vessel is now going to widen the gap by going very slowly ahead on its engines and will instruct the tow to gradually veer its cable for a length of three or four shackles. This cannot be safely done with the towing vessel stopped as the weight of the cable will very effectively pull the two ships together.

When sufficient cable has been veered the windlass brake should be applied and the windlass put into gear. As a further preventer, a heavy wire should now be shackled to the cable ahead of the windlass and turned up on the bitts on both sides of the forecastle.

The brake can now be eased very gently to allow the wire to take an equal part of the strain.

The tow will now signal to the towing vessel that it is ready to proceed.

12.5 Getting Underway

It is most likely that the vessel to be towed will not have steering power and, if this is the case, she should ensure that the rudder is midships before the tow commences. If it appears likely to move it should be wedged into position at the quadrant or tiller head.
If she is able to steer, this will make life much easier all round and she should be instructed to follow directly in the wake.

Initial power must be applied very gently and, as the line starts to take the strain, you will see the vessel astern slowly swing round to follow in your wake. Be satisfied with a very slow speed at first and see how everything shapes up.

If you are towing from the bitts on one-quarter there will be a slight sideways drag on your stern and you would expect to have to use some compensating rudder to correct it. If you have your vessel on auto pilot you will need to use a higher helm setting than normal to allow for this.

Check with the other skipper to see that all is well from his end. That skipper will be closely watching the end of the cable as the strain is applied and this is the time to correct it if things are not going according to plan.

You can now gradually increase your speed a few revs at a time, checking after each speed increase until you are satisfied that you have reached the optimum towing speed. Only you can decide what that speed should be but the things to watch are that the bight of the tow line does not come clear of the water and that the other vessel is not labouring unduly or sheering too far off course.

12.6 Safety Measures While Towing

1. See that the correct day and night towing signals and lights are displayed aboard both vessels.

2. Keep a close watch on the tow line, particularly where it passes out through the port. This is where it is most subject to chafing and this can be reduced by having a heavy motor tyre wedged at the point of contact.

   Even so, on a long tow this part of the line will be the first to break and this can be prevented by periodically ‘freshening the nip’. To do this, the way must be taken off the ship to ease the strain. While two or three people lay their weight to the tail of the wire the lashing is eased off. The wire may pay out of its own accord but you will probably have to remove several turns of the wire to achieve the desired result.

   Ease it out 18 inches or so, replace the turns and re-secure the lashing.

   The vessel being towed should also have a watch posted near the forecastle towing point if weather conditions permit.

3. Keep a continual watch on the vessel being towed and on the bight of the tow line, particularly if the tow begins to shear badly. If the tow line leads at too great an angle from the line of advance it can seriously affect the steering of the towing vessel and may, in extreme cases, capsize her.

   It is for this reason that it must be possible to slip the tow quickly either by removal of the turns from the bitts (you need a sharp knife at hand to cut the lashing) or, if towing from a bridle, by cutting the wire with bolt or wire cutters.

   This watch would be kept from the bridge or wheelhouse by the skipper or mate.

4. The vessel being towed must also watch her own progress. It is not unknown for vessels to be towed under, particularly at night in poor visibility when the towing vessel cannot see her charge.
Emergency signals between the two vessels must be arranged in case radio contact breaks down at a vital moment. It should be remembered that a vessel being towed by her cable has no quick way of slipping the tow in an emergency.

12.7 Towing Lightly Constructed Vessels

The problem in towing lightly constructed vessels is the difficulty in finding a sufficiently strong towing point in the fore port of the vessel that will not pull out of the deck under continuous strain.

A way of overcoming this is to pass a heavy bridle right around the vessel from forward to aft, just below the gunwale. It should be stopped with strong lashings to the topsides at regular intervals to hold it in place.

Fig. 12.6 A ‘round the hull’ bridle for towing lightly built vessels

12.8 Shallow and Restricted Waters

You should always remember that a long tow line is dragging well below the surface and (particularly if the anchor forms part of the line) will readily snag on the bottom as you approach shallowing water. It is therefore necessary, as you approach a port or anchorage, or are forced to cross an area of shallow water, to first shorten the tow line.

If the other vessel is being towed on his cable this is a very simple operation, provided he has power on his windlass. He has only to remove the wire preventer and heave in on the windlass until the anchor is clear of the water.

While this is in progress you will, of course, have taken the way off your own vessel. Once again there will be a tendency for the two ships to come together and you may have to use a little power to keep your distance.

You can control a tow reasonably well in restricted waters on a short tow line as far as direction is concerned but your only means of stopping the other vessel is by allowing her to lose her way. It is therefore necessary to slip such a tow before you reach the close proximity of wharves or closely anchored vessels.

This may well be as far as your responsibility goes and you can direct him to slip his end of the tow and let go his anchor at a suitable location. However, if you wish to take the tow further and even put it alongside a wharf you will need a much greater degree of control.

This is achieved by the ‘alongside’ towing method.

12.9 Towing a Vessel Alongside

This is a method of towing that can only be employed in calm water but is one which gives the towing vessel good control over the tow and allows close manoeuvring, even to the point of safely putting the other vessel alongside a berth.
Figure 12.7 shows how this is done and can be surprisingly effective even when the towing vessel is considerably smaller than the ship she is towing.

If you refer again to Figure 12.7 you will see how the towing vessel is secured to the quarter of the other vessel with her stern projecting well behind that of her charge.

This way you can minimise the drag of the other vessel pulling you round in circles. Nevertheless, you will need a lot of compensating rudder to hold a straight course and turning to starboard needs a lot of sea room.

In Figure 12.7 the helm of the towing vessel could be neutralised by making the tug fast with her bow pointed further to port, ie toward the tow. This would also have the effect of making the turning circles more similar on either hand. You will see this in use with small tugs pushing lighters. You will notice also that they have plenty of pins for lashing, in all the right places, and that their stern line (c) might go across to the far side of the tow.

In the towing arrangement shown she will turn very readily to port and your manoeuvres must be worked out in advance to use this to your advantage.

**Method of Securing**

The method of securing the vessels together is very important. The spring (D) is the actual tow line and will take most of the strain when going ahead. When you apply stern power to stop or slow down the strain will be taken on the after spring (C) assisted by head rope (A).

The short breast rope (E) holds you firmly alongside and the forward breast (B) prevents the bow from swinging out with the interaction of the water between the two hulls.

This last rope is as important as the towing spring and takes enormous weight because, in your effort to hold the tow on a straight course, you will have your own wheel constantly to starboard.

One way to keep this line taut is to take it to your forward windlass warping drum. It can be turned up on the drum and periodically tightened as necessary. Another method generally used by tugs, is by slowly turning to make headine ‘A’ taut. When the long stern line becomes slack then nip it up. This manoeuvre must be done with enough room and no likely interruption.

We have already looked at the problems in keeping a straight course ahead. When you go astern, regardless of your propeller rotation, you will automatically swing your stern towards the towed vessel – in the case shown in Figure 12.7 this means the stern will swing to port and the bow to starboard.
This can be turned to your advantage. We have already seen how difficult it is to turn to starboard with headway on the vessels. You can, however, make a very tight turn to starboard by the simple expedient of putting your engines astern.

None of this is easy and requires painstaking care but it does work. You will also need an intelligent hand on the bridge of the other vessel as a look-out to indicate your distance off if you are going to place the tow alongside a berth. In the final and vital phase of the maneouvre, your view of the berth will be totally obstructed by the other vessel.

12.10 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. How will a vessel lie in relation to the wind when it is drifting?

2. It should be made clear that one person is in charge when one vessel takes another in tow. Who should that be?

3. The ideal characteristics for tow line are:
   (a) 
   (b) 
   (c) 

4. Describe two shock absorbing devices you might rig to on tow lines.

5. Describe how you would pass a tow line to another vessel in moderate to rough sea conditions.
6. Describe, or draw and name, the parts of the tow in place about to get underway.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

7. How would you direct the towed vessel to steer?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

8. How must the initial power be applied?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

9. What would you consider when determining best speed for the tow, and what would you see if this was exceeded?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

10. What actions would you take and what orders would you give as the master of a towing vessel?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

11. It must be remembered when a vessel is being towed by her own anchor cable, that she is unable to cast off the _____________________.

12. What can be a problem in towing lightly constructed vessels?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
13. How would you alter your towing arrangements on approaching shallow water?

14. How would you alter your towing arrangements on entering a busy port?

15. What are your two primary considerations in how you lash up and adjust your lines to tow alongside?
   1. 
   2. 

16. What are likely consequences of the tow lines coming slack when towing alongside?

17. Without regard for propeller rotation:
   (a) What will be the effect of coming to ‘stop’?
   
   (b) What will be the effect of going astern?
   
   (c) Which lines (in Figure 12.7) are handling the greater forces when going astern?
Chapter 13  Rough Sea Conditions

13.1  Heavy Weather

If you stay at sea long enough, the time will surely come when you have to nurse your vessel through excessive weather conditions that will call on all your accumulated skill and experience.

Far more frequent will be the spells of dirty weather that do not reach that extreme stage but will still call for a high degree of seamanship if damage to the vessel and injury to the crew are to be avoided.

Handling a Head Sea

The safety of your vessel when punching into a head sea is, in general terms, dictated by your speed. Discomfort aside (and uncomfortable it almost invariably will be) your main concern must be to prevent excessive ‘pile driving’ – the experience of having the fore part of the ship airborne before it drops into the following trough with a bone shattering concussion.

Too much of this sort of treatment can severely damage the strongest vessel. It can fracture bottom plates or planks, cause fractures in the ship’s side and across the deck and can move engines on their mountings.

Secondly, you have the danger of big seas breaking aboard, carrying away deck fittings and stoving in hatches.

For many fishing vessels there is a third and very real hazard. A heavily laden vessel returning to harbour will often have the catch stacked high on deck with a resultant decrease in both stability and freeboard.

Unless the water that comes aboard can drain off very rapidly the additional topweight can give her a negative stability factor resulting in a capsize. 

All these dangers can be reduced or removed altogether by a reduction in speed.

You will also find that the ship will ride more easily with her bow a point or two off the wind and sea rather than heading directly into it. You may still need to head her up into a particularly steep or breaking sea and will probably have to slow down even further for the biggest of them.

Even so, sea conditions may become so bad that any sort of headway is impossible and this is the stage at which you have to – maintaining just enough power to hold her with the sea on the bow. At this point, all other considerations have become secondary to keeping your vessel afloat until the weather eases.

Handling a Following Sea

A steep following sea is possibly the most dangerous situation for any vessel and even more so for the inexperienced master. It is so easy to be lulled into a sense of false security by the comparative comfort experienced under these conditions and the possible exhilaration when the ship surfs down the face of the wave.

The forces at work on the vessel when this happens are all bad, in the worst sense of the word.

The slop of the wave face is increasing your speed and this is further accentuated by the forward movement of the crest of the wave. If the ship’s head starts to pay
off either way at this moment the bow will tend to ‘dig in’ while the stern will be pushed further round by the wave’s momentum.

Worse still, the bow will be further held by the reverse movement of the wave force in the trough. If the swing cannot be checked (and it is very hard to stop once it begins) she will continue to sheer around until she is beam to sea.

*Her own centrifugal force, coupled with the continuing press of the crest of the wave will probably roll her right over.*

This is known as **broaching to** and has probably been the cause of more losses of vessels at sea than any other single factor.

Once again, this can be prevented up to a point by *reducing speed*.

Remember – *you cannot run away from a big sea*.

At slow speed, the following sea will rise under your stern, pass beneath you and drop you back in the following trough.

Maintaining this slow speed and still keeping steerageway in a big following sea can be a very real problem that can be partly overcome in small vessels by towing long warps or a drogue of some sort astern.

These will slow the vessel and, at the same time, assist in preventing the stern falling away and precipitating a broaching situation.

Different sea conditions will pose different problems and it may well turn out that your best chance lies in bringing the ship head to sea and heaving to.

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**Fig. 13.1 Ten seconds from eternity. A small trawler is pooped surfing down the face of a big sea breaking unexpectedly**

### Running in a Quartering Sea

Most vessels are difficult to control with the sea on the quarter and, if those seas become too steep, you may well have to square away and run directly before it.

Even before this situation arises, the occasional extra large wave may pose a threat of broaching. (You are already half way towards broaching by your angled course across the wave.)

Safety demands that you should square away and take such a sea right astern, slowing down if necessary to prevent her from surfing and only resuming your old course after the wave has passed under you.

### Turning in Rough Seas

The decision to heave to is probably going to be made at a stage when the sea conditions are already excessive and the risks involved in this manoeuvre must never be underestimated.
To bring the ship round from having the sea astern to putting it on the bow, the vessel has, at some stage, to be beam-on to the seas. Under the conditions we are talking about, such seas could roll her right over or break aboard with sufficient force to cause serious structural damage.

The only way it can be done is to watch the pattern of the seas astern and wait for a short lull in the wave train. This usually comes after a series of excessively large seas and you must patiently wait for just the right moment before acting.

The moment comes! Now get her round as quickly as you can before the next big sea catches you on the beam.

Be careful of using too much power under full helm as this will heel the vessel to leeward and, additionally, you may meet the oncoming sea (when almost through the turn) at too high a speed.

It is all a matter of judgement and timing and this is one of those occasions when you must do it right the first time.

13.2 Swell and Breakers: Causes and Effects

Waves have what is best described as orbital velocity. This is more simply understood if you imagine each wave as a circular force beneath the surface which lifts the sea as it passes but does not carry the sea surface along with it – much as you produce waves in a garden hose by flicking one end and watching the waves travel the length of the hose.

If you throw some rubbish overboard in rough weather it will be drawn backwards towards an approaching wave, lifted up, carried forward and dumped in its original position.

In deep water, waves roll along unimpeded, lifting the surface of the sea as they pass beneath it. When they reach shallow water, the bottom of the system starts to lift and is slowed down. The wave becomes higher and steeper and, as a result of the slowing effect, the following waves catch up and the period between waves becomes much shorter.

In other words, the seas becomes shorter, steeper and more frequent. Eventually the waves become too high, fall forward and become breakers.

The ratio of wave height to water depth at which a wave will break is about three to four. That is to say – a six foot wave will probably break in about eight feet of water. So a bar, which is negotiable at high tide (though the waves may be short and steep) becomes a wide area of breakers once the level of the tide drops to that critical breaking point.

Swell is waves caused by a disturbance at some distance from the area in which they are being experienced and may often occur on an otherwise calm sea. They may come from many hundreds of miles away and, because they are often spaced well apart, their height (from trough to crest) may not be apparent.
On the west coast of Australia, it is quite common to get ocean swells between 20 and 30 feet high and it is worth bearing in mind that a 30-foot swell is going to break in 40 feet (12 metres) of water.

This highlights the danger of anchoring on an 8-metre or 10-metre shelf adjacent to very deep water. At periods during the day (on any day) you will get a ‘freak wave’ – one that is the combined height of two or more separate wave systems. This combination of the wave systems (or trains) will occur with clockwork regularity, often several hours apart, and many small fishing boats have been lost in this way.

This may occur when the average height of the swell is perhaps only 10 or 15 feet. The monster that does the damage could be more than twice that height.

### 13.3 Crossing a Bar

There are many fishing harbours and river mouths on the Australian coast where boats have to cross a bar on leaving and returning to shelter. Most of these have their own peculiarities and, where possible, the first rule should be to talk to the local fishermen and learn all you can about the bar before attempting it on your own.

With most bars, there is no well-defined channel. The action of the sea and the outward flow of the tide from the river or harbour mouth causes a scour which results in constant changes.

As a rule, you will therefore have to ‘read’ the water, looking for those places with less broken water that will indicate a deeper channel. The locals will also know the signs and the times that the bar is, or will be, particularly dangerous.

This will usually be when there are strong onshore winds coupled with a low tide and possibly a strong outward tidal or flood water current. The height of the tide will usually be of vital significance, as will the height of the swell. You are looking at that three to four ratio of wave height to water depth which is the deciding factor on whether the sea will break.

Crossing the bar on the outward journey is the simpler of the two. For a start, you can pick your own time to leave and watch the pattern of the incoming seas. You are also stemming the sea, which means that you can ease the vessel over a particularly steep or even a breaking sea.

The return voyage can be a totally different matter. Weather conditions may have deteriorated while you were out. The onset of darkness may mean that you are unable to choose the best time of the tide if you are to make the crossing in daylight.

Worst of all, perhaps, is the difficulty in judging the strength of the seas when you are running with them. Looking at the backs of the waves, you can easily make the mistake of thinking they are smaller than they actually are.

Secondly, as you are now running with the sea, the risk of broaching to is very real. This is where you must use all the experience you have gained in running with big seas, remembering that those waves ahead of you are short, very steep and likely to break without warning. It is a good rule to stop or slow right down outside the area of broken water to choose the best track to follow and to watch the pattern of the seas. On a particularly bad patch you may have to stop and watch for several large seas to pass before you get an idea of the pattern and frequency of the big ones.
Once committed you must keep going. There is no turning back and, if the boat surfs on a big sea you must keep running square with it, fighting any tendency for her to pay off and broach to. If you reduce engine revs to slow her down make sure you do not lose steerageway.

You can never afford to get complacent about this sort of navigation and even the old timers (if they tell the truth) will admit that the next time out could be the time they get caught by the big one that they did not anticipate.

13.4 Heaving To

In excessive weather conditions, the situation may arise when it is unsafe or even impossible to continue steaming. This is the point at which you must consider heaving to and this can be done in three ways.

**Head to Sea**

This would be the usual method for small powered vessels from trawlers downwards. The principle is to lie with the sea about 30° on the port bow (for a right-handed propeller) using just enough engine power to maintain steerageway. You should avoid heading directly into the sea except to meet the occasional extra large or breaking sea. It would follow that a single-screw right-hand propellered vessel would handle best with the sea on the port bow.

**Fig. 13.3**

**Stern to Sea**

This implies running with the sea on the quarter, once again using just enough power to maintain steerageway. It has the danger in smaller ships that seas will break aboard and the greater problem of the vessel picking up and surfing. In such a case, you must immediately square away and run with it if you are to avoid broaching to.

You should also remember that, if conditions are still deteriorating, every minute spent on this course makes the job of turning to head the sea potentially more dangerous.

**Fig. 13.4**

**Drifting Beam to Sea**

This is a method fraught with enormous risk for the average powered vessel as rolling will be excessive and could well go past the point of no return. In addition, seas will break heavily aboard increasing instability and bring the risk of staving in deck hatches.

Small sailing vessels with a very low centre of gravity find this the ideal way to ride out very big seas but one would be well advised to try it out in better sea conditions.

**Fig. 13.5**
13.5 Sea Anchor

A vessel finding herself without power in a very rough sea may well find herself rolling to dangerous limits and the survival of the ship could depend on holding her head to sea.

This can be partly achieved by rigging a sea anchor – a heavy drogue or makeshift that can be streamed ahead on a long line to create sufficient drag to bring her head around.

Very few vessels carry a sea anchor as such and it must usually be contrived from materials available on board. Baulks of timber lashed together, large bundles of nets, cray pots are a few of the things that could be adapted in such an emergency. There will be enormous strain on the line and its components, and this will increase in direct ratio to the size of the gear being used. In a 20-metre to 30-metre trawler, for example, it would be useless to stream it on rope of any sort. Only a wire would stand any real chance of surviving.

13.6 Use of Oil in Rough Seas

Who hasn’t heard of the term ‘oil on troubled waters’. A very small amount of oil spread on a rough sea will prevent waves from breaking and reduce the chance of heavy seas breaking aboard. It works by changing the surface tension of the water it floats on.

Any sort of oil is effective but, in general terms, the heavier, the better. If you are drifting down wind, whether head, beam or stern to sea, the oil will gradually spread to windward with a dramatic calming effect on the sea.

If head or stern to sea it can be distributed over the bow. When beam on, toilet bowls provide the ideal way, a small amount being pumped or flushed out as occasion demands.

NOTE: Oil on deck is very dangerous especially with water as all grip on deck is lost completely.

13.7 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. How can pounding, or ‘pile driving’, be reduced when making way into a sea?

2. Describe some implications of subjecting vessels to excessive pounding.
3. How would you heave to in a power driven vessel?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4. Describe ‘broaching’.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

5. Is a reduction of speed a preventative step against the risk of broaching?  
   Yes / No

6. With a following sea worsening on the quarter, what is the next likely step you might be considering?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

7. What is a freak wave?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

8. List three factors you should consider when crossing a bar and how you would find out about them.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
9. The tide is getting to the bottom of the ebb. There is a fresh onshore breeze across the bar. What will it mean when you can see waves breaking?

10. When would you consider heaving to?

11. Which bow will you put to the weather when heaving to in a vessel with a right handed propeller?

12. When would you consider using a drogue or sea anchor?

13. What might be used for a makeshift sea anchor?

14. What effect will a small amount of oil have on the sea state around your vessel?

15. Describe a danger of using oil on deck while hove to.
Chapter 14  Ship Handling in Special Conditions

Emergencies

14.1 Shallow Water Effect

It is taken for granted that a conscientious skipper would always be aware of the draft of the vessel. What is not quite so obvious is that displacement type hulls considerably increase their draft when underway and this increases with speed.

Another, and even more important fact to bear in mind is that shallow water impedes the flow of water to the propeller and will pull the stern of the ship down. This is known as ‘smelling’ the bottom. The skipper who knows the ship will immediately sense this, particularly as it is usually accompanied by the stern wash moving forward and breaking with an audible rushing sound.

*It can immediately be corrected by reducing speed.*

This means that if you are taking your vessel over a very shallow patch with a minimum clearance below the keel, it should be at very slow speed. The flatter the ship’s bottom, the greater will be the downward drag. The general rule for displacement vessels, not keel yachts, is that the effects of shallow water may start to be apparent in water twice the vessels draft.

Flat faced ship berths and sea walls can have a similar effect.

14.2 Interaction Between Ships

Passing close to another vessel at speed has special dangers of which every crew member should be aware.

The bow wave of a vessel at speed tends to throw anything in its path well clear. However, directly astern of the bow wave, the force is directly into the ship’s side.

Further aft, the run is parallel to the ship’s side while the stern wash will again throw outwards. However, it is that inward suction of which you must be aware, particularly in a small vessel coming close in to a larger one to pass a message or transfer personnel.

If you are overtaking, or being overtaken by a much larger vessel in a narrow channel, this danger is particularly significant. It can also work to your detriment when passing such a vessel at close quarters on opposite courses.

Emergency Steering

14.3 Steering by Main Engines

A steering failure is something of a disaster at any time but in a twin-screwed vessel with out-turning propellers you can maintain quite a good course and even carry out quite difficult manoeuvres in restricted waters. In Chapter 8 we went into considerable detail about the characteristics of twin screws which, for our present purposes, can be summarised as follows:

- When going *ahead* on the starboard engine, the bow will swing to *port*.
- Similarly, ahead power on the port engine will swing the bow to starboard.
Stern power on the starboard engine will swing the bow to starboard.

Conversely, stern power on the port engine will cause the bow to swing to port.

The first thing to do before attempting to steer by main engines is to ensure that the rudder is amidships. If this is not possible, you have a much more difficult task ahead of you and we will look at this separately at a later stage.

Here is the sequence for steering a straight course using engines alone.

1. Set rudder amidships.
2. Put both engines ahead of the same revolutions. About three-quarters of your normal cruising speed is a good starting point.
3. One engine is left running at these constant revolutions. The other is slowed or speeded up as necessary to maintain course.

This is an art that requires some practice and is a good one to exercise when on passage in open water. This gives you an opportunity to find out the best constant revolution speed most suited to your particular vessel.

Rudder Jammed to One Side

For practical purposes, this will effectively rule out any chance of a normal speed as one propeller is going to be working wholly to counteract the turning effect of that jammed rudder. You may well find that you get your best result at slow speed where the water effect on the rudder is at its least.

Let us assume that the rudder is jammed to starboard. We will first try going slow ahead on the starboard engine. If she will hold her course without paying off to starboard we are already starting to win.

Now increase the speed on the starboard engine and see if she still holds her course. There will probably be an optimum speed at which this holds good. A tendency to swing to port is good news as you can put a small amount of power on that side and balance it up. However, even without any swing to port you can still maintain a course by periodically applying a small amount of stern power to the port engine.

If the starboard engine cannot counter the swing, whatever you do, you are faced with the necessity of rigging some device which will achieve the same result. A prawn trawler is ideally suited to this purpose as you can tow a drogue of some sort from the port boom – even to the extent of having your port otter boards in the water.

A vessel without booms must tow from the port quarter – which is not as good but still quite effective.

There are many variations of this technique and the one you choose will be that which applies most effectively to your particular ship in the circumstances applying at the time but the principle itself holds good regardless.

14.4 Rigging a Jury Rudder

The techniques described above have no application to a single-screw vessel and a wholly different approach must be taken.

Figure 14.1 shows a simple arrangement that is very effective in the type of vessel considered in this manual and has the great advantage of being easily and quickly constructed from readily available materials.
You will notice that the drogue is towed from one quarter and, in that position, will pull the vessel’s head in that direction. (Diagram 1)

When the steering line is hauled in from the opposite quarter it centralises the drag and she will hold a generally straight course. (Diagram 2)

To turn in the opposite direction, the steering line is hauled taut so that all the weight is now from the opposite quarter. (Diagram 3)

There is, of course, enormous weight on the system and, even in a very small vessel, it is unlikely that the steering line could be hauled in by hand. Fishing vessels would rarely have this problem as the steering line can be taken to a winch. Vessels without power on deck would need to rig a block and tackle system of sufficient power for the weight involved.

### 14.5 Secondary Steering Systems

Most vessels of any size have one or more secondary steering systems that can be brought into operation very quickly while the original problem is being investigated and, if possible, repaired.

Here are some of the things that can cause a steering failure and it is usually of paramount importance to find out quickly what has gone wrong so that effective measures can be taken.

- Failure of ship’s main power in electric/hydraulic systems. Vessels fitted with this type of equipment usually have an emergency system operated on the ship’s lower power (24 or 32 volt) circuits.
- Failure of the hydraulic motor. In most large fishing vessels this is driven directly off the main engine but many have an emergency pump that is either electrically driven or can be quickly coupled up by belt and V pulley.
- Failure of hydraulic system between wheelhouse and hydraulic pump. This can be due to many causes. In many vessels, there is a hand-operated valve in the tiller flat which allows the pump to be operated in either direction. A more difficult-to-operate version of the same system is a hand pump by which the hydraulic rams can be moved slowly in either direction. Both these systems require some form of wheelhouse-to-tiller flat communication.
- Broke tiller or quadrant. Vessels fitted with this type of steering assembly will usually have to resort to tiller steering. This is also the last resort of all the previous examples listed and needs to be discussed separately.
Steering by Emergency Tiller

The emergency tiller steering arrangement varies from vessel to vessel and is something that should be looked at and at least worked out in principle in a non-crisis situation.

Firstly, locate the tiller and work out how it is fitted. Next, decide how you will operate it, bearing in mind that, in a vessel of any size, it is physically impossible to move it by hand against the propeller thrust.

This means that it must be fitted with tiller lines which are taken to a winch or controlled by blocks and tackles (usually a combination of both).

In most cases, the tiller will be below deck in the tiller flat or steering compartment. There is probably a minimum of room to move about in and, unless the surveyor was really on the ball when the vessel was first surveyed, you will probably find that there are no anchoring points for any sort of pulley system.

The time to find this out is when the ship is snug alongside and facilities are available to put matters right – not in the middle of a force 10 gale when your survival might depend on getting the ship mobile in a minimum time.

This is what you should do before you even leave the wharf on your first commission.

1. Locate and identify the tiller and arrange a permanent stowage so that it will not be lost or mislaid.
2. Go through the procedure of rigging the tiller arm and setting up the tackles. Ensure that there are eyebolts to anchor the ends of the tackles and have two tackles made up and stowed with the tiller.
3. Work out how you are going to lead the running ends of the tackles from the steering compartment on to the deck where the winches are located.
4. Give some consideration as to how you will communicate between bridge and steering compartment. Intercom systems which plug into ordinary power points are one way around this and can be used for many other purposes around the vessel.

If you carry one, an engineer will doubtless be conversant with all the other secondary systems but experience has shown that the cautious skipper will personally become familiar with them.

14.6 Confined Channels

In a confined channel such as a deep water cut through very shallow water, a canal or similar, a ship tends to hold herself automatically in the centre. As she veers towards the bank the water pressure builds up between the hull and the bank and pushes her away from the bank.

As a result, you need very little helm in such a channel. However, if you veer in too sharply, the pressure could push you back so violently that you are unable to control the swing and could easily finish up swinging right across the channel.
14.7 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. What is a vessel doing when it sniffs the bottom?

2. What will be the signs of this happening?

3. What is causing it and how can you correct it?

4. While the pressure areas adjacent to a large passing vessel’s bow and stern may repel you, explain the effect between your vessel and the sides of that ship? Use sketches if necessary.

5. Could this attraction of large bodies have an effect on your vessel if they were passing in the opposite direction? Yes / No
6. Could passing close to a flat concrete sea wall have a similar effect?  
   **Yes** / **No**  
   Comments: ________________________________________  
   _______________________________________________  
   _______________________________________________  
   _______________________________________________  

7. Your vessel has outwards turning twin screws. Describe how you would steer her with the rudders jammed 10 degrees to port.  
   _______________________________________________  
   _______________________________________________  
   _______________________________________________  
   _______________________________________________  

8. Explain ‘trailing’ a drogue or ‘rigging a jury rudder’.  
   _______________________________________________  
   _______________________________________________  
   _______________________________________________  
   _______________________________________________  

9. What gear might yachts and trawlers have aboard to help rig a jury rudder?  
   _______________________________________________  
   _______________________________________________  
   _______________________________________________  
   _______________________________________________  

10. Will anything that can create drag and be suitably secured suffice?  
   **Yes** / **No**  
   Comments: ________________________________________  
   _______________________________________________  
   _______________________________________________  
   _______________________________________________  

11. What are the four steps you should take with emergency steering gear before getting underway? List these four steps with a view toward the emergency steering arrangements that should be carried out prior to the vessel working.  
   1. _______________________________________________  
      _______________________________________________  
   2. _______________________________________________  
      _______________________________________________
12. Draw a sketch indicating the pressure areas around a vessel steaming in a narrow channel.

13. What is a likely consequence of overly large helm variations while steaming in narrow channels?

14. Give an account of how she tends to steer herself:

15. Draw another sketch or give an account of how oversteering in this narrow channel could compound into a radical and dangerous movement.
Chapter 15    Responsibilities of the Master

15.1 Responsibilities

Nothing in this Advice Condones Breaking any Law

If one were to list the full responsibilities of the master of any seagoing vessel, they would fill a whole volume and still not be complete. In short, the master is responsible for everything that in any way touches the safety and well-being of the vessel and crew when at sea.

This responsibility must naturally be delegated and the master must rely heavily on the expertise of various members of the crew while still remaining responsible for their mistakes.

As President Harry Truman so succinctly put it: ‘The buck stops here’.

The engineer may warn that to continue steaming will cause incalculable damage to some engine component. The master has to weigh this against the more serious consequence of possibly losing the ship if he stopped engines at that particular time to carry out repairs.

The decision is his alone, albeit he may have to instruct and indemnify his engineer in writing and make a suitable log entry setting out the circumstances. Furthermore, he will have to justify his actions at a future date to an irate owner.

A ship of any size is never a democracy. Decisions must be made and the crew has a right to expect the master to make them. This does not mean that the master cannot seek advice from experts to establish options but the skipper cannot and must not expect (or allow) them to provide the answers.

Use of Unqualified and Inexperienced Watch-keepers

Even a large trawler will rarely have more than two certificated people on board in addition to the master. These would be the Mate and the Engineer. In small vessels, the master is probably also the engineer and may well be the only one with sea-going knowledge and experience.

In the real world, it is inevitable that there will be occasions when unqualified and inexperienced people are in temporary command of the vessel as watch-keepers, both at sea and in harbour. The extent to which they can be trusted to carry out their duties will vary with the Master’s assessment of their capabilities and the amount of effort that is put into their training.

It is very unwise to leave such people on watch with only verbal orders.

All vessels and particularly sea going vessels, should have an Order Book in the wheelhouse which sets out clearly the limits of watch-keepers’ responsibilities and the specific situations when they should call the Master.

This can be best illustrated by imagining a 30-metre trawler on a passage from Gove to Thursday Island – some 300 miles of open sea. The skipper is not going to be on watch for that whole period and several of the deck hands will undoubtedly be rostered to share the watch-keeping.

The notations in the Order Book should look something like this:
Order Book

20th Dec. 1998 On passage Gove to Thursday Island.

Course – 085 (compass).
Hourly positions marked on chart.
Keep visual and radar look-out.
Radar on 18 mile scale. Range ring set to 5 miles.
(Do not alter Radar settings.)
Engines – 1800 revs.
Watch temperature on port auxiliary. (Left hand gauge on panel.) Danger point 190°.
Check auto pilot is holding course at least every 15 minutes.

Call me:

1. If any other vessel is sighted within 5 miles. You can check this on the radar against the range ring.
2. If any radar echo is seen inside the 5-mile range ring.
3. If there is any appreciable change in the weather.
4. If there are any engine or steering problems.
5. If in any doubt whatsoever.

J. Smith

Note that last instruction and see that it is complied with, even if it means you are woken every fifteen minutes or so. And treat it with a good grace, even if you think that the question is a stupid one.

Skippers who react angrily to queries from the watch-keeper are likely to find that same person will not risk his anger on future occasions and may well delay calling until it is too late to save the situation.

These same responsibilities continue when the vessel is at anchor and even in harbour unless, or until, the master is officially relieved of them by the owners or the dockyard.

15.2 Statutory Responsibilities

The Master of any commercial vessel must be aware that he is bound by The Navigation Act, MARPOL and other Acts and Regulations when in Australian waters and, more specifically, by the various State Marine Acts.

If fishing commercially, the Master must be fully conversant with the Federal and State Fisheries Acts that have jurisdiction over activities and be aware of closed and restricted areas, size and bag limits, restrictions on size of gear and the health requirements regarding the handling and stowing of the product.
Equally important are the local (unwritten) laws that apply between fishermen where large fleets are working congested areas and the good practices of seamen.

It is also the Master’s responsibility to ascertain what special fishing returns are required and to forward them on the due date to the relevant authorities.

Taken by and large, the skipper or Master is a very busy person with enormous responsibilities – far greater, perhaps, than in any other walk of life.

It is for this reason that the examinations for Certificates of Competency in the various grades cover such a large subject matter.

Even so, any certificate is only a licence to go out and do the job, the examiner being satisfied, as far as possible, that you are competent to do so. The real test comes in the execution of the job and the realisation by the newly certificated Master that it is only just a starting point to learn what it is all about.

Perhaps many of the situations you have studied in this course may never come your way. On the other hand, you may go out to sea tomorrow and be put to the ultimate test. Tuck all this knowledge away in the back of your mind because some day you are going to need it.

15.3 Conning the Ship

One of the biggest differences in the handling of large vessels when compared with their smaller sisters is that a small-ship skipper will almost invariably personally handle the wheel and engine controls.

The Master of a larger vessel will rarely, if ever, take the wheel himself and will give his helm and engine movement orders to a bridge crew. These will vary with the size of the vessel.

This allows the Master free movement around the bridge to get the best view of what is happening. This same process can often be applied to great advantage in smaller vessels but it is important that helm and engine orders are given to a standard format so that there is no confusion as to what is required.

Helm Orders

A helm order must always start with the direction in which the wheel is to be turned (eg ‘starboard’) followed by the number of degrees of rudder required – indicated by the pointer on the helm indicator.

The orders ‘Hard a’starboard’ and ‘Hard a’port’ are normally used only as emergency orders and would be carried out with the degree of urgency implied by such an order.
On the other hand, if you want full wheel for ordinary manoeuvring, ‘Starboard 35’ will achieve the same result without an urgency implication. ‘Midships’ brings the wheel back to the central position with the indicator reading Zero.

The order ‘Steady’ requires the crew member at helm to call the compass heading at that moment and to continue to steer that course until ordered otherwise.

*It is essential that the crew member at the helm repeats all orders and reports when the order has been carried out.*

Here is an example of conning using this system. (The helm’s reply is shown in italics.)

**Conning Orders**

- ‘Starboard ten’.
  
  ‘Starboard ten’ . . . . ‘Ten degrees of starboard wheel on’.

- ‘Starboard twenty’.
  
  ‘Starboard twenty’ . . . . ‘Twenty degrees of starboard wheel on’.

- ‘Ease to ten’.
  
  ‘Ease to ten’ . . . . ‘Ten degrees of starboard wheel on’.

- ‘Midships’.
  
  ‘Midships’ . . . . ‘Wheel’s amidships’.

- ‘Steady’.
  
  ‘Steady’ . . . . ‘150’ . . . . ‘Steady on 150’.

When bringing a vessel alongside a berth or manoeuvring in a channel it is often better to get the crew member at the helm to steady the ship’s head on some land feature. This is done with the order ‘Steady as you go’ or simply ‘As you go’ and may be followed by a clarification such as ‘steer for the end of the jetty’.

It is essential that there be complete understanding between skipper and helm and this can only be achieved with practice and training.

**Engine Orders**

If you are using a helmsman in a small ship when manoeuvring he may also be handling the engine controls and a similar order routine is just as essential – an acknowledgement of the order and a report when it has been carried out.

To do this, it is important to establish engine speeds to equate the orders ‘Slow’, ‘Half’ and ‘Full’ for both ahead and astern.

In a diesel engined trawler, for example, with the main engines governed to maximum revs of 1800 rpm, you might stipulate the ahead power as follows:

- Slow ahead . . . .  600 revs (idling speed)
- Half ahead . . . . 1200 revs
- Full ahead . . . . 1800 revs (full power)

For astern, you may have to be a bit careful if, as has been referred to earlier, the propeller cavitates past a certain speed when running astern, so an astern ‘Table’ might read as follows:
Slow astern . . . . . 600 revs (idling speed)
Half astern . . . . . 850 revs
Full astern . . . . . 1200 revs

These should be displayed on a printed card in full view of the helmsman. He must also be aware of the danger to the engine and gearing if he goes directly from ahead to astern without pausing in neutral.

Modern high-speed engine manufacturers generally recommend maximum continuous RPM as 200 RPM less than the main engine’s potential. So if the manufacturer has governed the engines to 2600 RPM maximum, you would not cruise at over 2400 RPM, and otherwise always as per manufacturer’s recommendation.

Slow ahead or ahead at idle means that the main engine idle should give some steerage way, but be slow enough that the vessel can be put rapidly astern without damaging the gearbox.

15.4 Self-assessment Questions

Check your answers with those provided at the back of this book.

1. Do you agree it is fair to say: “The Master is responsible for everything that in any way touches the safety and well being of the vessel and crew on board”?  
   Yes / No

2. Is the Master still responsible in the end for the actions, omissions and mistakes of the crew?  
   Yes / No

3. List some of the things you would expect to find in the Orders Book.
4. Traditionally, who can relieve a Master of his responsibilities if incapable at sea?

5. As a Master, name some Acts of Parliament and regulations under which you might have responsibilities.

6. When would you use the order “hard a’port?”

7. What does the helm order “midships” mean?

8. What should a helmsman do after being told to “steady”?

9. Describe the telegraph position and engine application described as “Slow Ahead”.

Answers to Self-assessment Questions

Chapter 1

1. True
2. (c)
3. (b)
4. Main engine RPM; reduction ratio; propeller pitch; speed made good
5. Increase (working harder)
6. Nil (same S and D through water)
7. Decrease (giving assistance)
8. Nil (not affecting)
9. Ahead
10. Starboard / port
11. They would be reversed.
12. True
13. Induced low pressure causing water to aerate

Chapter 2

1. Effectiveness
2. You may not have enough power to make it turn at high speeds. Also, a large rudder area will set up massive vibrations at high speed and cause cavitations, which will affect the performance of the screw.
3. True
4. True
5. True
6. True
7. (d)
8. (b)
9. True
10. True
11. True
12. False
13. True
14. Yes
15. See Chapter 15, 15.3 – Conning the Ship.
16. (a)
17. No
Chapter 3

1. Beam on
2. The bow
3. Going astern so that the reversed propeller begins to pull the stern to port. The wind should then blow the bow to starboard, increasing its movement this way, created by your going astern. The vessel should end up with the stern to the wind and the bow pointing downwind. At this point, put the helm hard to starboard and engage ahead with a lot of power.
4. Watching the relative movement of objects ashore

Chapter 4

1. Steel wire rope, coir or nylon
2. Take turns around a cleat or other strong point.
3. See Figure 4.1.
4. Breast lines
5. Eye splice
6. Wharf pin or bollard
7. Bowline
8. See Figure 4.3.
9. See Figure 4.4.
10. (a) True
    (b) True
    (c) True
11. Two (2)
12. Yes
13. No
14. Scantlings and attachment
15. With a Samson Post hitch
16. 30m messenger with a monkey’s fist at the end
17. Passing lines or wires

Chapter 5

1. Forward spring. Hold her alongside with helm turned away from the wharf and the engine engaged ahead.
2. Helm turned towards the wharf to bring the stern out. Engine neutral. Instruct deckhand to let go forward spring. Once the spring is clear, engage astern.
3. Which side-to so that they can get the lines ready. Which line or lines you want to go ashore first. Where you want it secured aboard. If fenders will be required at some especially vital position, advise where. Make sure the wharf-jumper knows what is required. Any special problems that you can foresee.
Chapter 6

1. Safety
2. True
3. Anchor
4. Yes
5. Yes
6. 1. Depth of water
   2. Weather
7. (a) Stockless or Dreadnaught (see Figure 6.1 – 2)
   (b) Danforth
   (c) CQR or Plough
   (d) Admiralty pick
8. True
9. Your anchor may become stuck. Your anchor warp may chafe through. You may damage the coral.
10. Stowed
11. Drum
12. (a) Warping
    (b) Clutch
    (c) Brake
13. Chain
14. 1. Devils Claw
    2. Senhouse Slip
15. (a) Anchor
    (b) Anchor
16. Holds shank flat on seabed
17. Refer Unit 6.3 – Choosing a Suitable Anchor (also see Figure 6.1).
18. Minimum of three times of warp or chain to depth
19. Yes
20. Anchoring
21. Refer Unit 6.5 – Coming to Anchor.
22. Moused
23. Against greater of wind or tide
24. Fouls anchor
25. Sternway upon letting go
26. Bottom type
27. Chafing
28. Dragging
29. True
30. Yes
31. True

Chapter 7

1. Stopper cleared away, cable checked in the locker for running out, deckhand standing by the windlass ready for letting go
2. Refer Unit 7.2 – Using an Anchor to Turn Vessel Short Around.
3. First vessel to wharf
4. 1. Anchor out ahead
   2. Extra headline to wharf
5. Refer Unit 7.3 – Using Anchor as Off-Shore Mooring Line (also see Figure 7.4).
6. Refer Unit 7.4 – Lying Alongside in a Big Surge.
7. Refloating; keeping aligned; heeling
8. Set before beaching to haul off
9. The tender would be crushed.
10. Controlled sheering while dragging anchor

Chapter 8

1. (a) Vessel size
   (b) Reliability
   (c) Manoeuvrability
2. Port
3. Outwards
4. Ahead
5. More RPM
6. 40 degrees
7. Nil
8. Refer Unit 8.5 – Leaving a Berth with a Twin-Screwed Vessel.
9. Refer Unit 8.6 – Proper Use of Power.

Chapter 9

1. Hydraulically or electrically
2. See Figure 9.1.
3. A kort nozzle is a tight fitting tunnel that enhances the propeller’s performance by focusing it and not allowing energy to be scattered off the tips of the propeller.
4. True
5. Maximum reverse pitch without cavitating
6. Starboard

8. 1. Poor stern power
2. No steering when stopped
9. Use engine on outside of turn radius, one at a time.

Chapter 10

1. Refer Unit 10.1 – Turning Short with a Single Screw.
2. Little or nil
3. Refer Unit 10.2 – Securing to a Buoy.
4. Refer Unit 10.2 – Securing to a Buoy.
5. Keel
6. An uneven bottom should be avoided or the vessel may break its back.
7. Refer Unit 10.3 – Deliberate beaching and refloating (bullet points).

Chapter 11

1. Man overboard (MOB)
2. 1. Prevention harness
2. Well sited, tested light and line
3. Reporting incident
3. Floating light on line attached to life buoy. Stored globe down, and tested by inverting to floating position, where liquid mercury makes the circuit.
4. 1. Lifebuoy
2. Light and line
3. Watcher
4. Spot light
5. Compass
6. Helm
7. Rudder

Note: Also important, though not listed in the chapter text, are the Master, the ship’s telegraph/radio, a first aid kit, etc. It is important that everything is available and in good working order in a MOB situation, or someone will die.

5. 1. Prevent injury to MOB by propellers.
2. Get lifebuoy over the side.
3. Keep MOB in constant sight.
4. Recover MOB safely.
6. Man overboard starboard
7. 1. The side for the helmsman to turn towards
2. The side for all to keep in sight
8. 1. Keep MOB afloat.
2. Make MOB easier to see.
3. The lifebuoy is all you will see at night (not the MOB).
9. Self-igniting electric lifebuoy float
10. The MOB will be lost.
11. No
12. Up wind
13. 1. Enhanced steering
2. Ship will not get blown down on MOB
14. That they are MOB
15. Refer Unit 11.5 – Person Missing at Sea.
16. 1. Maybe not find them and MOB will die
2. Could run over them and MOB will die
3. Could lose them, run over them and MOB would die
17. Code flag ‘Oscar’; prefix ‘Pan Pan’; #16 VHF

Chapter 12

1. Laying blown beam to sea
2. Master of vessel making the tow
3. (a) Strong
   (b) Long
   (c) Heavy
4. Anchor; tyre
5. Refer Unit 12.4 – Passing the Tow
6. Refer Unit 12.5 – Getting Underway
7. Directly in wake of tow
8. Very gently
9. Bight of towline stays awash. Towing vessel is not sheeting off course or labouring unduly.
10. Refer Unit 12.6 – Safety Measures While Towing.
11. Tow
12. Insecure points of attaching tow (insufficiently strong towing point)
13. Shorten the towline.
14. Take the tow alongside.
15. 1. Stopping    2. Turning
16. Diminished control, sheering, shock on lines
17. (a) It will swing your stern toward the tow.
   (b) Stern will move toward side of tow.
   (c) A, C and maybe E.

Chapter 13

1. Reduce speed, fall a couple of points off the weather.
2. Severe structural damage
3. By leaving on only enough power to maintain steering to keep the bow to the weather, or by streaming a drogue, with or without oil, so as to keep her bow to the weather
4. Sliding down following sea, bow is buried so it becomes a pivot point, crest of wave flicks stern around, ships rolls in wave.

5. Yes

6. Reducing speed, running square before it, perhaps alternating with previous course

7. A wave that is the combined height of two or more separate wave systems.

8. Tidal conditions – consult the tide tables; Wind direction – make your own observations; Location of sand bars – seek local knowledge and make your own observations.

9. Perhaps shallow water, perhaps strong current against wind, very dangerous

10. When it is unsafe or impossible to continue steaming

11. Port

12. Without power in a rough sea

13. Fish traps, otter boards, bunk cushions; anything that can be firmly attached to make a drag

14. Remarkably calming

15. Perilously slippery

**Chapter 14**

1. The hull will be pulled toward the bottom (flow of water to propeller is impeded).

2. Pronounced stern wash, which moves closer toward your bow and usually becomes distinctly audible

3. Gravity overcoming buoyancy as it pushes down upon the hull, which is unable to resist due to the low pressure area under the hull

4. Your vessel is drawn toward centre of low pressure area. Refer Unit 14.2 – Interaction Between Ships.

5. Yes

6. Yes

7. Ahead Port, some Starboard astern, increase Port, vary Starboard astern. Continue to adjust and increase to practically limp home speed. Refer Unit 14.3 – Steering by Main Engines – Rudder Jammed to One Side.

8. Refer Unit 14.4 – Rigging a Jury Rudder.

9. Bundled sails, bank cushions, sheet lines, spare life jacket, plastic tubs, etc

10. Yes


12. Refer Unit 14.6 – Confined Channels.

13. Vessel may react savagely to ambient pressure areas causing excessive reaction.

14. Refer Unit 14.6 – Confined Channels.

15. Refer Unit 14.6 – Confined Channels.
Chapter 15

1. Yes
2. Yes
3. Refer Unit 15.1 – Responsibilities – Use of Unqualified and Inexperienced Watch-keepers.
4. Next most senior officer
5. Refer Unit 15.2 – Statutory Responsibilities.
6. When you want port helm applied fully, as quickly as possible
7. Helm back to centre RAI reading zero degrees
8. Call the compass heading and continue to steer as ordered.
9. Refer Unit 15.3 – Conning the Ship – Engine Orders.