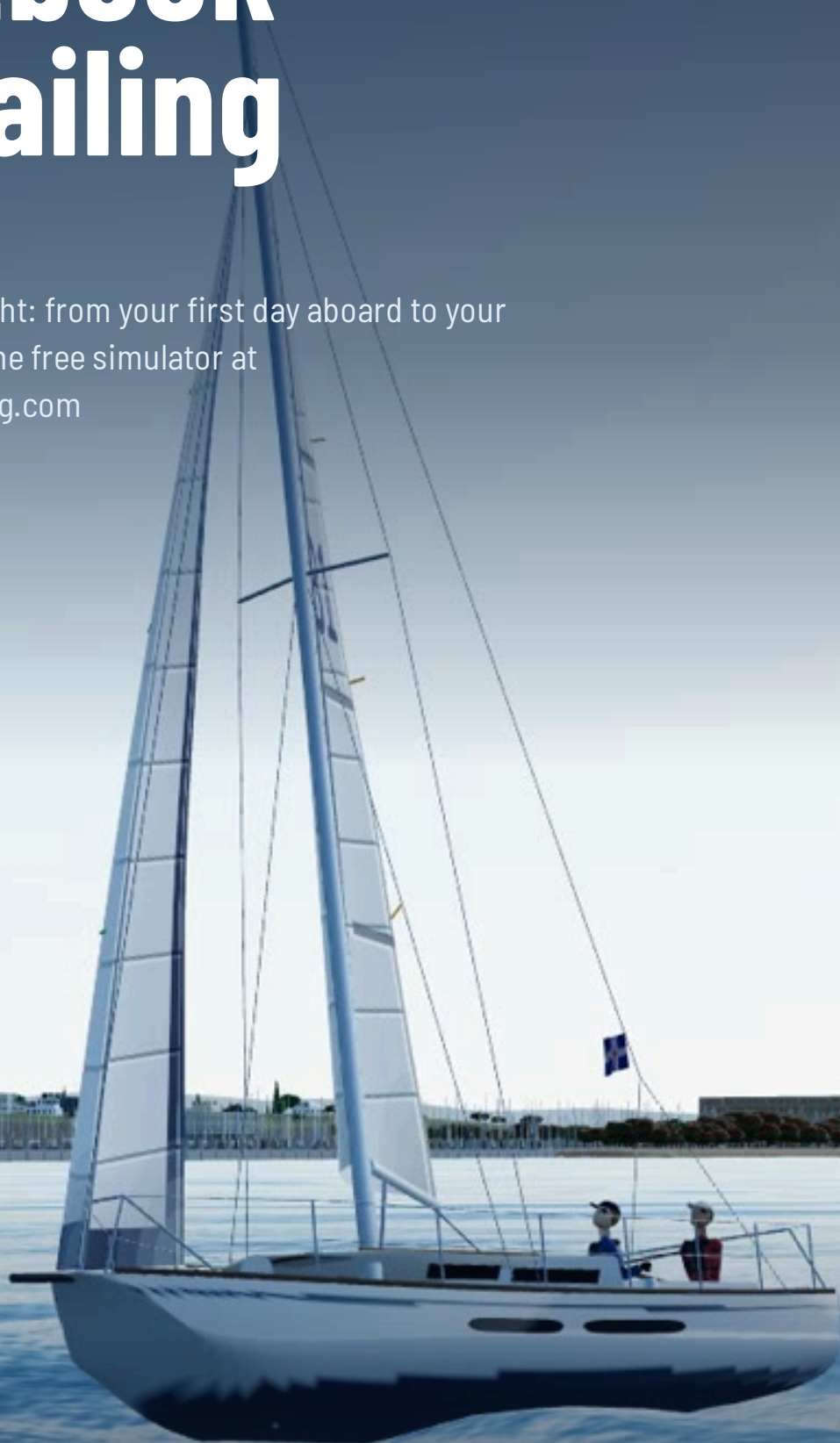


A FREE ILLUSTRATED GUIDE

Textbook of Sailing

How to sail a yacht: from your first day aboard to your first race, with the free simulator at textbookofsailing.com



CHRIS PATON

Sailed in Auckland's
Waitematā Harbour

About this book

This book goes with the free sailing simulator at textbookofsailing.com, which recreates Auckland's Waitematā Harbour, a 9.4 metre cruising yacht, the wind, the waves and the tides, and the harbour's traffic, closely enough to learn on.

The chapters follow the order you'd learn in on the water: first what the parts of the boat are called and how a sail works, then the points of sail and how to trim, then the manoeuvres, from tacking to berthing in a marina, then safety and the rules, and finally your first race. Each chapter ends with the simulator lessons that go with it, so you can try everything you've read about straight away.

The photographs are all taken in the simulator, and the diagrams are the same ones used in the *Textbook of Sailing* video series on YouTube.

How to use it

Read a chapter, then sail the lessons that go with it. Throughout the book you'll find these boxes:

Try it in the simulator

The lessons that go with what you've just read.

Common mistake

The things that catch out most people, and how to avoid them.

Remember

The one thing to take away.

Safety

Things that keep you and your crew safe.

A word of caution

No book, and no simulator, can replace time on the water with a good instructor. Use this book to understand what's going on and to prepare, and then go sailing with people who know what they're doing. Yachting New Zealand, Coastguard Boating Education and sailing clubs all run courses for beginners.

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PART ONE • FIRST PRINCIPLES

01

The sailing boat

Before you can sail a boat you need to be able to talk about one. This chapter goes round a typical cruising yacht from bow to stern, and introduces the words you'll hear on every boat you step aboard.

IN THIS CHAPTER

- Bow, stern, port and starboard
- The hull, keel and rudder
- The rig: mast, boom and sails
- Sheets, halyards and other lines
- Windward and leeward

The boat in this book, and in the simulator, is a 9.4 metre cruising yacht of the kind you'll find in any marina: a sloop, which means she has one mast and two sails, a mainsail behind the mast and a jib in front of it. Almost everything here applies just as well to a small dinghy or a much bigger yacht.

Finding your way round

The front of the boat is the **bow** and the back is the **stern**. Anything towards the bow is **forward**, and anything towards the stern is **aft**. Looking forward, the left-hand side of the boat is **port** and the right-hand side is **starboard**. These don't change when you turn round: port is always the left side of the boat as you face the bow, whichever way you happen to be facing yourself.

A simple way to remember which is which is that *port* and *left* both have four letters, and that a little red port wine is left in the bottle. The navigation lights follow the same pattern: red on the port side, green on the starboard side, which you'll meet again in Chapter 12.

The width of the boat at her widest point is her **beam**, and something that is "on the beam" is out to the side, at right angles to the boat. The **bow** and **quarter** are the forward and aft corners: a ship "on the starboard bow" is ahead and to the right; one "on the port quarter" is behind and to the left.

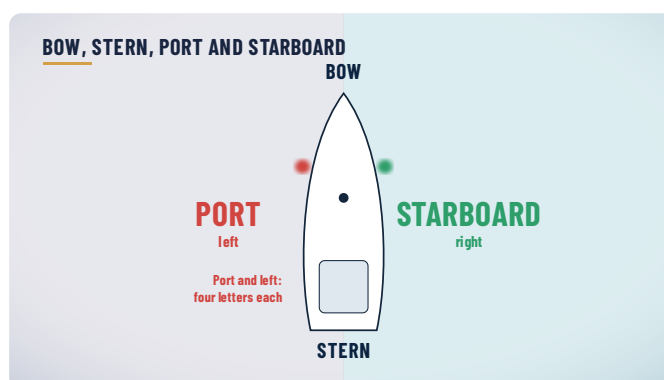


Figure 1.1 Bow and stern, port and starboard. At night a boat shows a red light on her port side and a green one to starboard.

The bottom of the mainsail is held out by the **boom**, a horizontal pole that pivots at the mast. The boom swings from one side of the boat to the other as the boat turns, and it does so at head height, which is why the first rule of sailing a boat like this is to know where the boom is.



Figure 1.3 The rig from alongside: the mast, the boom swung out to leeward, and the two sails.

Sheets, halyards and other ropes

On a boat, ropes are usually called **lines**, and most of them have their own names. The ropes that pull the sails in and let them out are **sheets**: the **mainsheet** controls the boom and the mainsail, and there are two **jib sheets**, one on each side, for the jib. The ropes that pull the sails up the mast are **halyards**. All of this moving rope is the **running rigging**, to tell it apart from the standing rigging.

Pulling a sheet in is called **sheeting in** or **trimming**, and letting it out is **easing**. Most sheets are led round a **winch**, a drum with a handle that gives the crew enough power to hold a sail full of wind, and are held fast on a **cleat** or in a jammer when they're set.

Many modern yachts, including this one, have the jib on a **furler**: the sail rolls up round the forestay like a blind, so it can be set or put away from the cockpit without going forward.

Windward and leeward

Two more words come up all the time. The **windward** side of the boat is the side the wind is blowing onto, and the **leeward** side, pronounced "loo-ard", is the side away from the wind. The sails always lie out on the leeward side. When the boat heels, the leeward side goes down towards the water, and the crew usually sit on the windward side to help hold her up.

The same words describe anything around you. A boat that is **to windward** of you is upwind of you; a buoy **to leeward** is downwind. Upwind is where the wind comes from, and it's the direction that takes effort to reach; downwind is the easy way.



Figure 1.4 The windward side is the side the wind blows onto. Leeward is the sheltered side, where the boom and sails lie.

Try it in the simulator

Walk round the boat in the simulator's first lesson, which names the parts as you go. Lesson: Welcome aboard, at textbookofsailing.com.



PART ONE • FIRST PRINCIPLES

02

How sailing works

A boat can sail across the wind and even towards it, which seems unlikely until you see how the sails and keel work together. This chapter explains the forces at work, and why a boat heels.

IN THIS CHAPTER

- A sail is a wing
- Lift and drive
- What the keel does
- Apparent wind
- Heeling, and what stops it

Sailing downwind is easy to understand: the wind pushes the sails, and the boat goes with it. But a sailing boat can also go across the wind, and even make progress towards it. To do that, the sails work like an aircraft's wing.

A sail is a wing

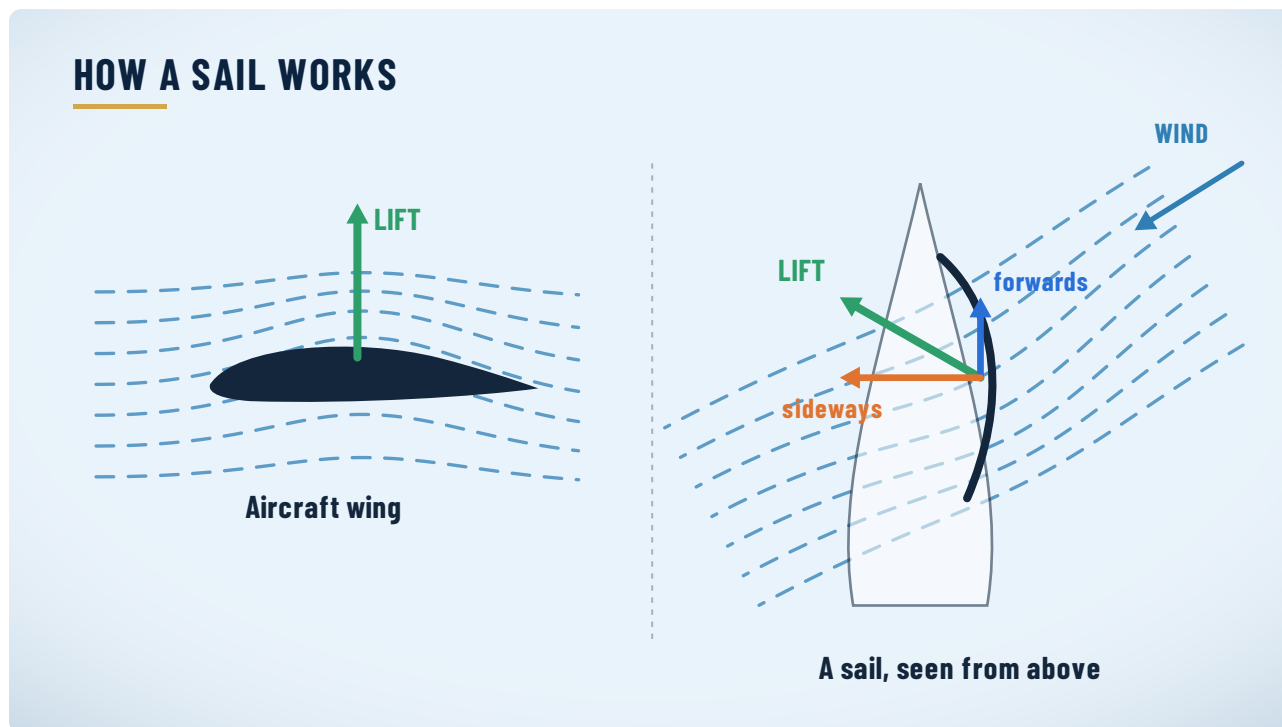


Figure 2.1 Air flowing round a curved sail. The air on the outside, leeward face travels faster, and the pressure there falls: the sail is pulled towards it.

When a sail is set at a small angle to the wind it takes up a curved shape, a bit like the wing of an aeroplane stood on its end. The wind splits at the front edge of the sail, the **luff**, and flows round both sides. The air flowing round the curved, leeward side of the sail has further to go and speeds up, and as it speeds up its pressure drops. On the windward side the air slows a little and its pressure rises. The difference in pressure between the two sides produces a force called **lift**, which pulls the sail towards its leeward side and slightly forwards.

The important thing is that the sail is being pulled, not just pushed. That's what lets a boat sail across the wind, and closer to it, much faster than if the wind were simply blowing her along.

Drive and side force

The pull of the sail doesn't point in the direction the boat is going. Only part of it, the **drive**, points forwards; most of it pushes the boat sideways. Left to itself the boat would simply slide away across the water.

That's where the keel comes in. A deep fin under the boat is very hard to push sideways through the water, but it slips forwards easily, so it resists the side force and leaves the drive to move the boat ahead. The keel is itself a wing, working in the water: as the boat moves it meets the water at a very

small angle and produces its own lift, sideways, opposing the sails.

The boat still slides sideways a little as she goes, by a few degrees. This is called **leeway**, and you can see it in the wake, which trails off slightly to windward of the line of the boat.

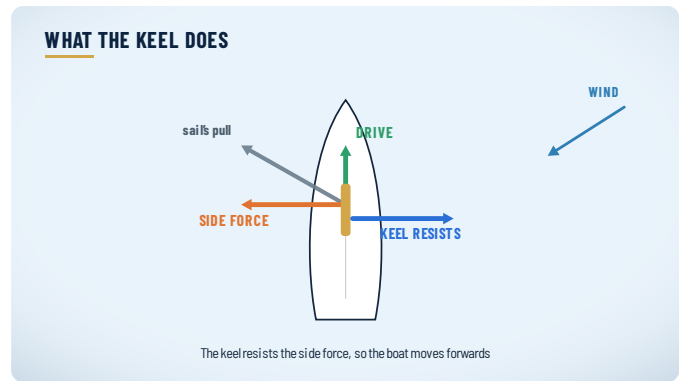


Figure 2.2 The sail's pull splits into a small forward part, the drive, and a much bigger sideways part. The keel resists the sideways part.

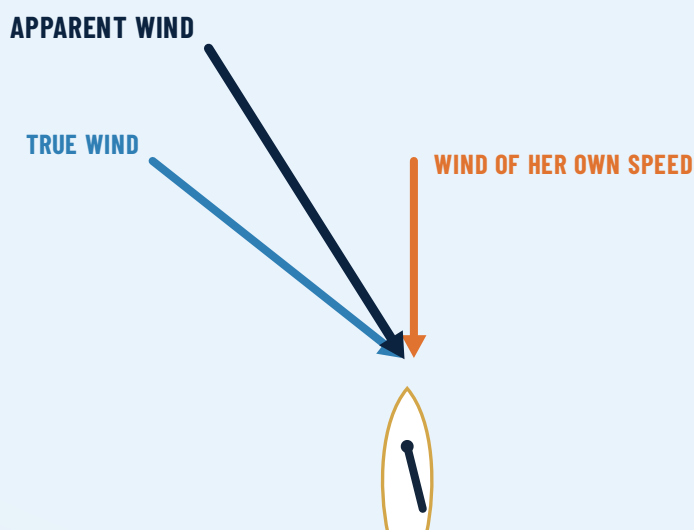


Figure 2.3 Close-hauled, seen from above. Under the water the keel is doing most of the work, stopping her sliding sideways.

Apparent wind

As soon as the boat moves, she makes a wind of her own. If you stood on deck in a flat calm while the boat was motoring at five knots, you'd feel a five-knot breeze on your face from straight ahead. Under sail, that breeze adds to the real wind, the **true wind**, and the wind you actually feel on board, and that the sails work in, is the combination of the two. It's called the **apparent wind**.

APPARENT WIND



Moving forwards adds a headwind, so the wind she feels comes from further ahead, and is stronger, than the true wind.

Figure 2.4 The apparent wind is the true wind and the wind of the boat's own motion added together.

The apparent wind always comes from further forward than the true wind, and when you're sailing towards the wind it's stronger, too. When you sail away from the wind the opposite happens: your own speed takes away from the wind, so it feels lighter and comes from further aft. This is why a day that feels pleasant running downwind can turn out to be quite breezy when you turn round to sail home.

Remember

The wind indicator at the top of the mast, and the wind angle on the instruments, show the apparent wind. When sailors talk about the wind angle, this is usually what they mean.

Heeling

The side force from the sails acts high up the mast, while the keel resists it far below the water. The two together try to tip the boat over, and she **heels**, leaning away from the wind.

What stops her going right over is the keel's weight. As she heels, the heavy keel swings out to windward, and its weight pulls the boat back upright, harder and harder the further she leans. At some angle the two balance and she sails along steadily, heeled over. The crew sitting on the windward side help by moving their weight to where it does most good.

A little heel is normal, and comfortable, but more isn't faster. Once a boat like this heels past about 20 degrees, the sails start to spill wind, the rudder loses its grip and she becomes hard to steer. Chapter 9 is about what to do when that happens.

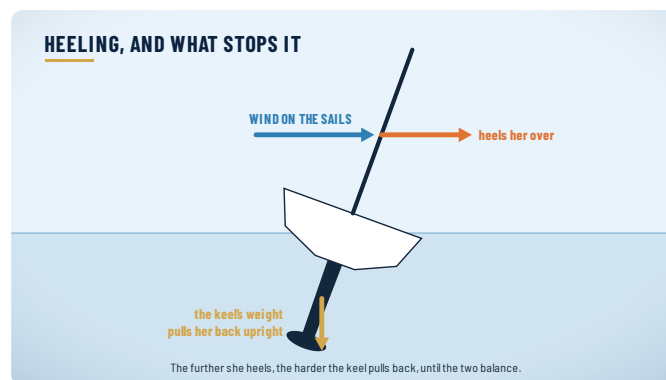


Figure 2.5 Heeling. The wind on the sails tips the boat; the weight in the keel pulls her back upright.



Figure 2.6 Close-hauled in a fresh breeze, heeling about 15 degrees. The crew sit on the windward side.

Try it in the simulator

Watch the heel and leeway readings as the wind changes. Lesson: **Welcome aboard**, at textbookofsailing.com.



PART ONE • FIRST PRINCIPLES

03

Points of sail

A sailing boat can't go everywhere. There's a zone either side of the wind where she can't sail at all, and every other direction has its own name and its own way of setting the sails.

IN THIS CHAPTER

- The no-go zone
- Close-hauled, reaching and running
- The one rule for the sails
- Getting upwind by zigzagging
- Pinching

The angle between the direction a boat is heading and the direction the wind is coming from decides almost everything about how she sails: how fast she goes, how much she heels, and how her sails should be set. The different angles are called the **points of sail**.

The no-go zone

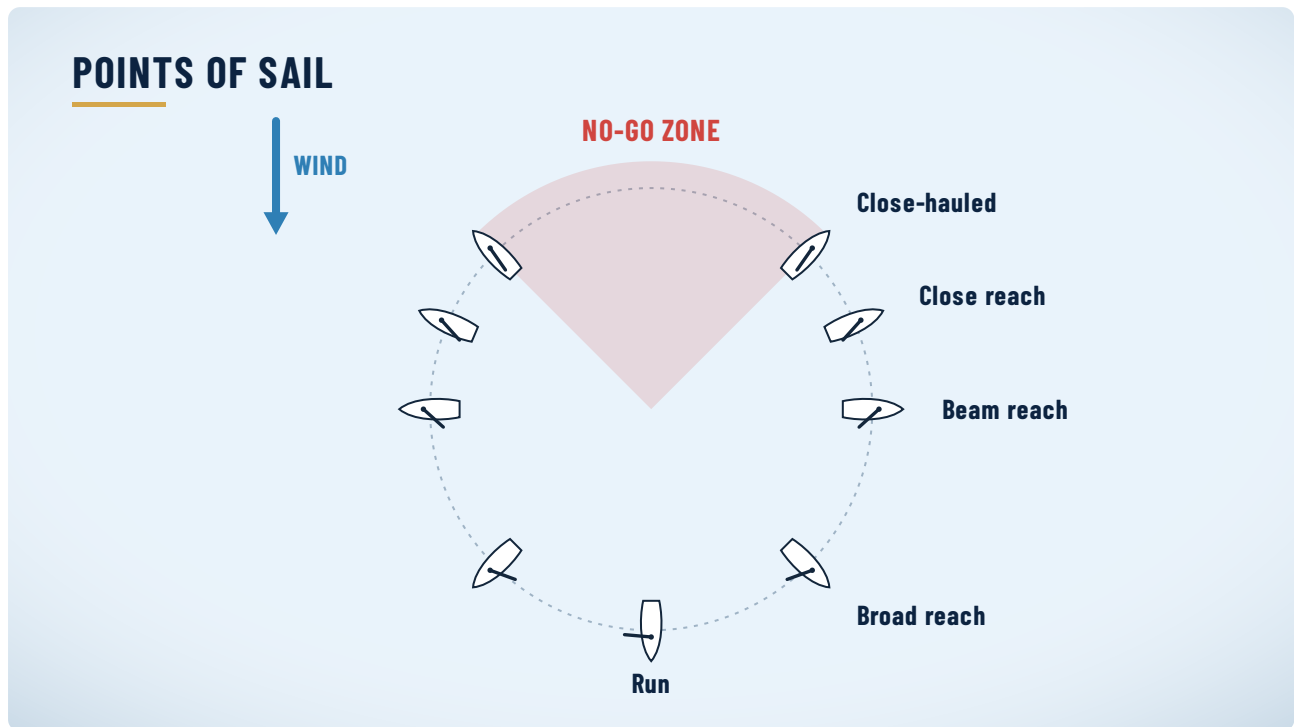


Figure 3.1 The points of sail. In the red zone either side of the wind the sails can't produce lift, and the boat can't sail.

Imagine the wind coming from twelve o'clock. For about 45 degrees either side of it, a sailing boat can't make any headway at all. If she's pointed into this area, called the **no-go zone**, the sails can't take up their curved shape: they just flap, like a flag, and the boat slows down and stops. A boat that's stopped head to wind like this is said to be **in irons**.

Exactly how close to the wind a boat can sail depends on the boat. A racing yacht with good sails might sail at 35 degrees to the true wind; an older cruising boat might struggle to do better than 50. For the boat in this book, and for most purposes, 45 degrees is a good figure to remember.

Close-hauled

Just outside the edge of the no-go zone, with the sails pulled in tight, the boat is **close-hauled**. This is as close to the wind as she'll go, and it's how you make progress upwind. Close-hauled is when the boat heels the most and when the apparent wind is strongest, so it feels fast and exciting, though she isn't actually at her quickest.



Figure 3.2 Close-hauled on starboard tack: both sails pulled right in.

Reaching

Turn away from the wind and you're **reaching**. With the wind about 60 degrees off the bow it's a **close reach**; with the wind straight over the side it's a **beam reach**; and with the wind coming from behind the beam it's a **broad reach**. For most boats the beam reach is the fastest point of sail, and it's the most comfortable too: the boat is fairly upright, easy to steer, and very forgiving if the sails aren't set quite right. It's the best place to learn.

Running

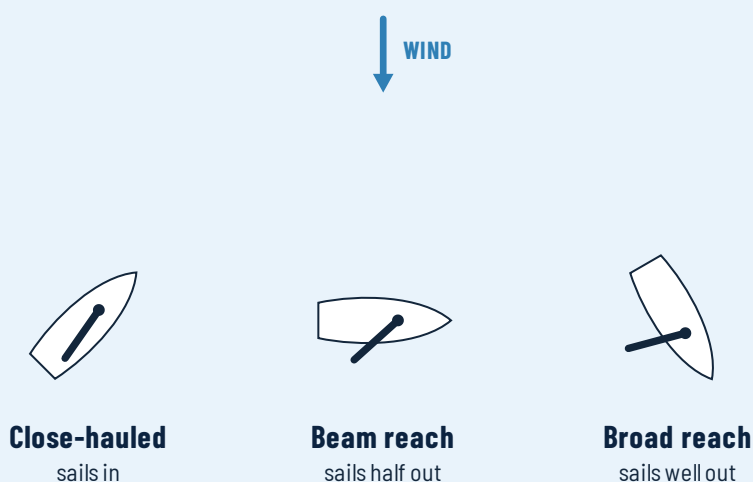
With the wind coming from directly behind, the boat is **running**. The sails are let right out and the boat is pushed along, rather than pulled. It feels calm, because you're travelling with the wind and the apparent wind is light, but it needs care: if you steer a little too far, the wind can get round behind the mainsail and swing the boom violently across the boat. Chapter 6 deals with that.



Figure 3.3 A broad reach: the wind from behind the beam, the sails well out, the boat upright.

The rule for the sails

THE RULE FOR THE SAILS



Turn away from the wind, let the sails out. Turn towards it, pull them in.

Figure 3.4 The one rule that ties it all together.

Put all of this together and you get the one rule that matters more than any other: **the further you turn away from the wind, the further you let the sails out; and as you turn back towards it, you pull them in.** Close-hauled, the sails are pulled in tight; on a beam reach they're about halfway out; on a broad reach and a run they're out as far as they'll go.

Remember

Turn away from the wind: let the sails out. Turn towards it: pull them in.

Getting upwind

If the place you want to get to is straight upwind, in the middle of the no-go zone, you can't sail there directly. Instead, you sail close-hauled one way, then turn the bow through the wind and sail close-hauled the other way, in a zigzag. Each turn is called a **tack**, and each leg of the zigzag is a **board**. Sailing a zigzag course to windward is called **beating**.

The side the wind is coming from also gives its name to the tack you're on. With the wind coming over the starboard side, you're on **starboard tack**, and the boom is out to port; with it coming over the port side, you're on **port tack**. You'll need this when we come to the rules of the road.

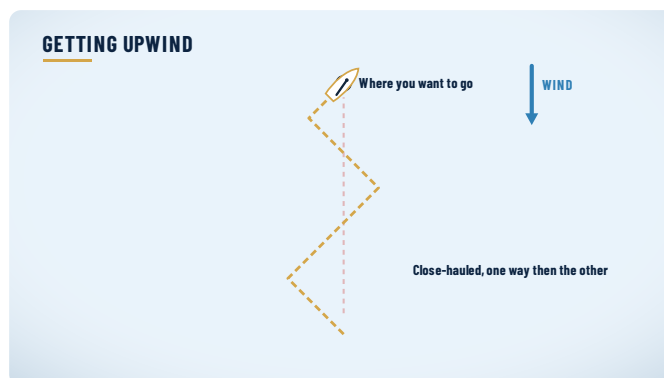


Figure 3.5 You can't sail straight to a point upwind, so you zigzag: close-hauled one way, then the other.

Common mistake: pinching

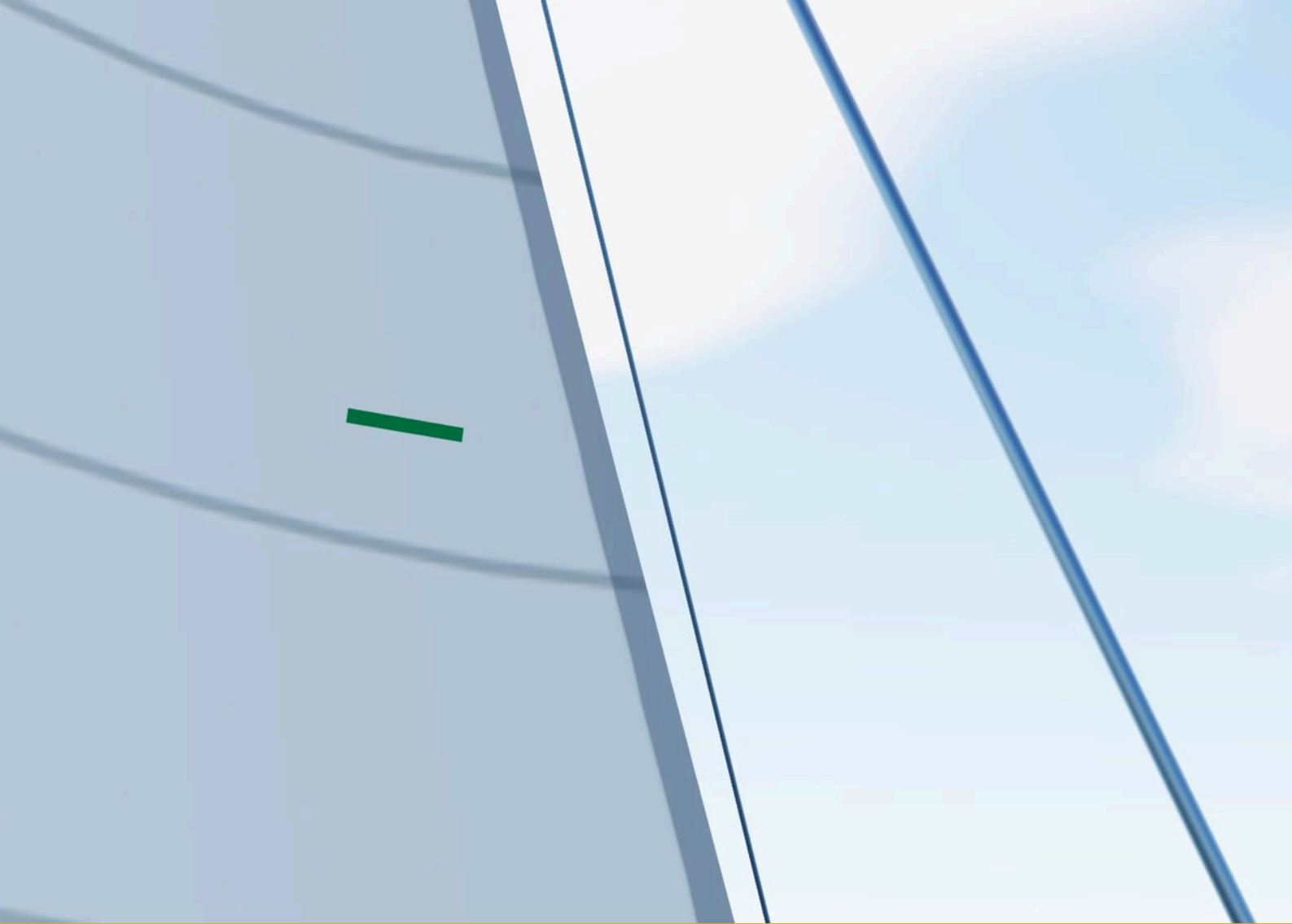
When you're trying to get upwind, it's tempting to steer a few degrees closer to the wind to save distance. The front of the sails starts to flutter, the boat slows, and she slips sideways more. You end up going slower, without pointing any higher. Bear away a few degrees and let her pick up speed.



Figure 3.6 Pinching: steered too close to the wind, the jib's luff lifting and the boat slowing down.

Try it in the simulator

The guides can draw the no-go zone on the water for you, and the instruments show your wind angle. Lesson: **Points of sail**, at textbookofsailing.com.



PART ONE · FIRST PRINCIPLES

04

Trimming the sails

Getting the sails close is easy; getting them right takes a little more. Two pieces of wool on the jib tell you exactly when to pull in and when to let out, and a few more controls change the sail's shape for the conditions.

IN THIS CHAPTER

- Telltales, and how to read them
- Steering by the telltales
- The parts of a sail
- Sail shape: depth and twist
- Balancing the boat

Trimming just means adjusting the sails to suit the wind. The rule in the last chapter gets you close, but the wind is always changing a little in strength and direction, and to get the sails exactly right you need to be able to see what the air is doing.

Telltails

Telltails are short pieces of wool or ribbon attached near the luff of the jib, one on each side of the sail. Most jibs have two or three pairs at different heights, and the sail is thin enough that you can see the far one through it. On the boat in the simulator the port telltails are red and the starboard ones green.

READING THE TELLTALES

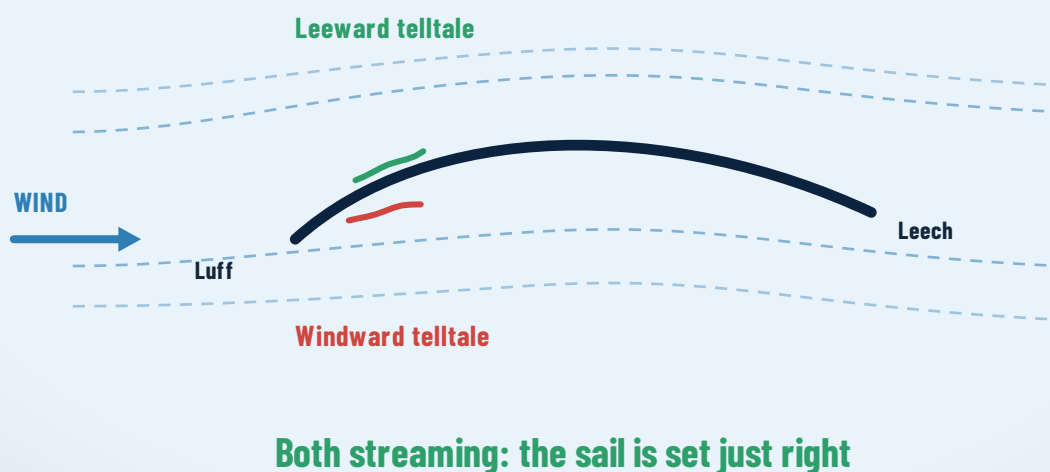


Figure 4.1 Both telltales streaming: the air is flowing smoothly round both sides of the sail.

When both telltales stream straight back along the sail, the air is flowing smoothly over both sides, and the sail is producing as much drive as it can. That's what you're aiming for.

Eased too far: the windward telltale lifts

If the sheet is let out too far, the sail is no longer at a good angle to the wind. The air hits the front of the sail on the wrong side, and the **windward** telltale starts to lift and flutter. Let it out further and the luff of the sail starts to curl and flap. **Pull the sheet in** until the telltale streams again.

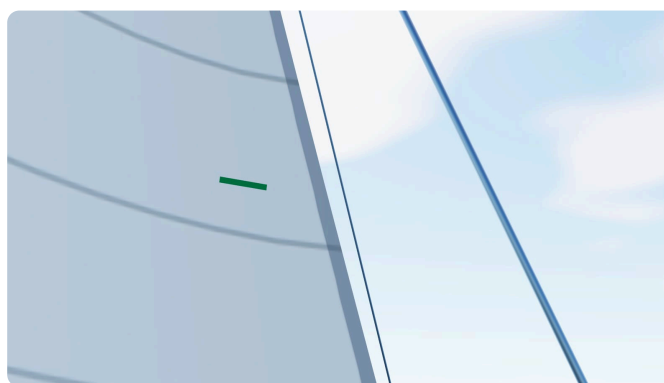


Figure 4.2 The windward telltale on the jib's luff, streaming aft.

Pulled in too tight: the leeward telltale droops

The opposite mistake is more common and harder to spot. When the sheet is pulled in too far, the air on the leeward side can't follow the curve of the sail. It breaks away from the back of the sail, and the sail **stalls**. The **leeward** telltale droops, or spins round. The sail still looks full and powerful, and the boat may heel a bit more, but she's slower. **Ease the sheet** until the telltale streams.

Remember

Move the sail towards the side whose telltale isn't streaming. Windward one lifting: pull in. Leeward one drooping: let out.

If you're not sure, let the sail out until the windward telltale just starts to lift, then pull it back in a little. That's where it works best.

READING THE TELLTALES

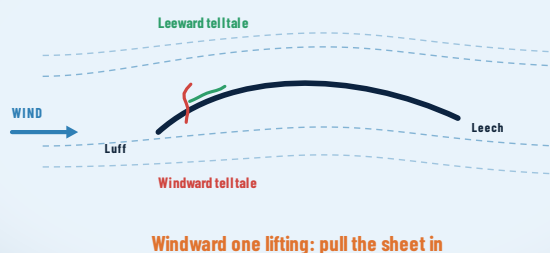


Figure 4.3 Sheet eased too far: the windward telltale lifts.

READING THE TELLTALES

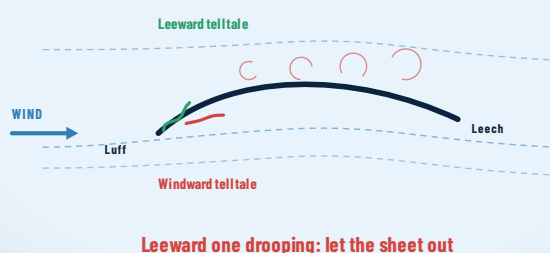


Figure 4.4 Sheet pulled in too tight: the flow breaks away behind the sail, and the leeward telltale droops.

Steering by the telltales

When you're close-hauled, the sails are already pulled right in, so you can't trim them any further. Instead, you steer by the telltales. If the windward one lifts, you're too close to the wind: turn away slightly. If the leeward one droops, you've turned too far away: turn back towards the wind slightly. Small movements of the tiller are all it takes, and good helmsmen do this all the time without thinking about it.

You see	It means	Off the wind: trim	Close-hauled: steer
Both streaming	Just right	Leave it	Hold your course
Windward one lifting	Sail too far out, or too close to the wind	Pull the sheet in	Turn away from the wind a little
Leeward one drooping	Sail stalled: too far in, or too far off the wind	Ease the sheet	Turn towards the wind a little

The parts of a sail

Every sail has three corners and three edges. The top corner is the **head**, the bottom front corner is the **tack**, and the bottom back corner is the **clew**, where the sheet is attached. The front edge is the **luff**, the back edge is the **leech**, and the bottom edge is the **foot**. The mainsail's leech is usually stiffened by **battens**, flat strips slid into pockets across the sail.

The mainsail often has telltales too, on its leech. When they stream out behind the sail the main is trimmed well; when they keep disappearing round behind it, the mainsheet is too tight.

Sail shape

Once the sails are at the right angle, the next step is their shape. Two things matter most: how deep the curve of the sail is, and how much it twists from the bottom to the top.

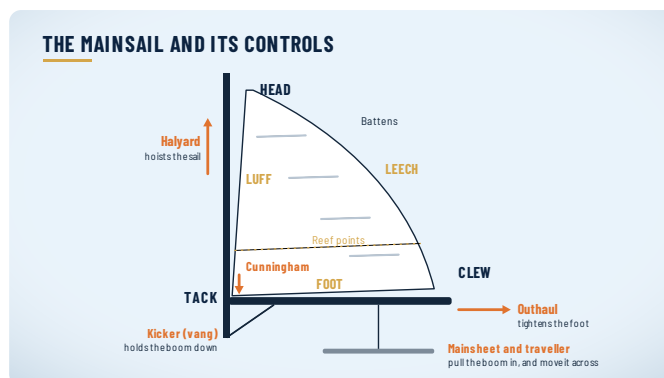


Figure 4.5 A mainsail's corners and edges, and the controls that hoist it, set it and shape it.



Figure 4.6 Depth and twist. A deep sail gives more power; a flat one less. Twist opens the top of the sail to spill wind.

A **deep**, full sail gives a lot of power, which is what you want in light winds and choppy water. A **flat** sail gives less power and less drag, which is what you want when it's windy and the boat is heeling too much. On the mainsail, pulling the **outhaul**, the **cunningham** and the backstay tight all make it flatter.

Because the wind is stronger higher up, and comes from a slightly different direction, the top of the sail should be set a little further out than the bottom. This is called **twist**. The **kicker**, or vang, holds the boom down and so controls how much the leech twists open: pull it on to straighten the leech and add power, let it off to let the top of the sail open and spill wind. The **traveller** moves the boom across the boat without changing the twist, which makes it a quick way to depower in a gust.

Key terms

Outhaul	pulls the clew out along the boom: tighter is flatter
Cunningham	pulls the luff down: tighter is flatter, and moves the depth forward
Kicker (vang)	holds the boom down and controls twist
Traveller	moves the boom across without changing the twist

Balance

A well-trimmed boat should be **balanced**: if you let go of the tiller, she should turn very slowly up towards the wind, and you should only need a little pressure on the tiller to keep her straight. A boat that pulls hard to windward, with the tiller held well up, has too much **weather helm**, usually because the mainsail is pulled in too hard or she's heeling too much. Ease the mainsheet or drop the traveller, and she'll sail more easily and faster.

Try it in the simulator

The simulator's telltales behave like real ones, and there's a little picture of them by the sheet controls. Lessons: **Trimming the sails**, **Sail shape: twist, flat and the traveller**, at textbookofsailing.com.



PART TWO · HANDLING THE BOAT

05

Steering and tacking

Steering a sailing boat takes a little getting used to, because the tiller works backwards. Once it feels natural, the next step is the tack: the manoeuvre you'll do more often than any other.

IN THIS CHAPTER

- Steering with a tiller
- Heading up and bearing away
- Tacking, step by step
- Getting out of irons
- Losing as little as possible

On a boat with a tiller, you push the tiller the opposite way to the way you want to go. Push it to port and the bow swings to starboard; pull it towards you and the bow swings away. It feels strange for about ten minutes, and then you'll never think about it again.

Steering

The helmsman normally sits on the windward side, facing across the boat, with the tiller in their aft hand and the mainsheet in the other. From there you can see the sails, the telltales and the water ahead, and you can feel the boat heel.

Turning towards the wind is called **heading up** or **luffing up**, and you do it by pushing the tiller away from you, towards the sails. Turning away from the wind is **bearing away**, and you do it by pulling the tiller towards you. As you turn, the sails need adjusting: pull them in as you head up and let them out as you bear away.



Figure 5.1 The helmsman's view, sitting on the windward side: the jib, the telltales and the water ahead.

A rudder only works when water is flowing past it. At speed, a few degrees of tiller is all you need; when the boat is going slowly you need much more, and when she's stopped the rudder does nothing at all. Steer with small, smooth movements, and give the boat time to respond before you move the tiller again. Over-steering is the commonest beginner's habit, and it slows the boat down.

Tacking

A **tack** turns the boat's bow through the wind, from close-hauled on one side to close-hauled on the other: a turn of about 90 degrees. It needs speed, because for a few seconds in the middle the sails are flapping and producing no drive at all, and the boat carries on through the turn on her momentum.

TACKING, STEP BY STEP

- 1 Close-hauled and up to speed
- 2 Look around: is it clear?
- 3 "Ready about?" – "Ready!"
- 4 "Lee-oh!" Tiller towards the sails
- 5 Through the wind: boom across, heads down
- 6 Swap the jib sheets, move across
- 7 Straighten up at 90°, build speed

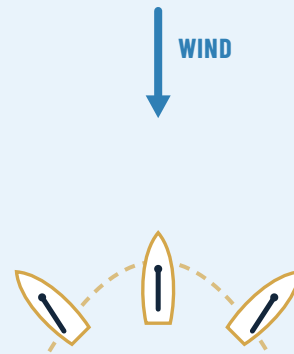


Figure 5.2 Tacking, step by step, and the turn seen from above.

- 1 **Get ready.** Sail close-hauled, with the boat up to speed. Look all round, especially behind you and on the side you're turning towards, to check the water is clear.
- 2 **"Ready about."** Warn the crew. They get into position, take the working jib sheet off its winch ready to let go, and put the new sheet on the other winch. When they're ready they answer "Ready."
- 3 **"Lee-oh."** Push the tiller firmly towards the sails. The bow swings up into the wind and the sails start to flap.
- 4 **Through the wind.** Keep the turn going at a steady rate. As the bow passes through the wind the boom comes across, so keep your head down. The crew let the old jib sheet go and pull in the new one, quickly, before the sail fills.
- 5 **Change sides.** The helmsman crosses the boat to the new windward side, facing forward, swapping hands on the tiller and mainsheet behind their back.
- 6 **Settle.** Straighten the tiller when you're about 90 degrees from where you started, close-hauled on the new tack. Let the boat build up speed before you point as high as you can again.



Figure 5.3 Close-hauled, the boat at full speed. A tack starts from here.

Getting out of irons

The commonest problem when you're learning to tack is turning too slowly. The boat runs out of speed while she's still pointing into the wind and stops, with the sails flapping. She's **in irons**, and you can't steer her out, because there's no water flowing past the rudder.

To get out, hold the jib out on the side it was on, against the wind. This is called **backing the jib**. The wind pushes on the back of it and pushes the bow round. If the boat starts to drift backwards, the rudder works the other way round, so push the tiller the same way you want the stern to go. Once she's turned far enough to fill the sails, let the jib across, pull it in on the new side, and sail away.



Figure 5.4 In irons: head to wind, the sails flapping, the boat stopped.

Common mistake: a half-hearted turn

Push the tiller firmly and keep it there until the bow is through the wind. A slow, uncertain turn, or one that stops halfway, is how boats end up in irons. Next time, carry more speed into the tack.

A good tack

A good tack loses very little: the boat comes out of it at perhaps two-thirds of her speed, and is back up to full speed within a few boat lengths. A slow or untidy one can cost several boat lengths every time, which adds up on a long beat. The things that make the difference are starting at full speed, a smooth, steady turn, getting the jib across and sheeted quickly, and resisting the temptation to point high again before the boat has picked up speed.

Try it in the simulator

There's a tack button that does the turn for you, so you can watch how it's done, then do it yourself by hand. Lesson: **Tacking**, at textbookofsailing.com.



PART TWO · HANDLING THE BOAT

06

Gybing and sailing downwind

Turning with the wind behind you is called gybing. Done carelessly it can be violent, and it's the cause of many injuries on yachts. Done properly it's gentle and safe.

IN THIS CHAPTER

- Tacking and gybing compared
- The controlled gybe
- Sailing by the lee
- Accidental gybes, and how to prevent them
- Spinnakers

When you tack, the bow turns through the wind and the sails flap as you go round. When you gybe, the stern turns through the wind instead, and the sails stay full of wind the whole time. That's why the boom can come across a gybing boat so fast.

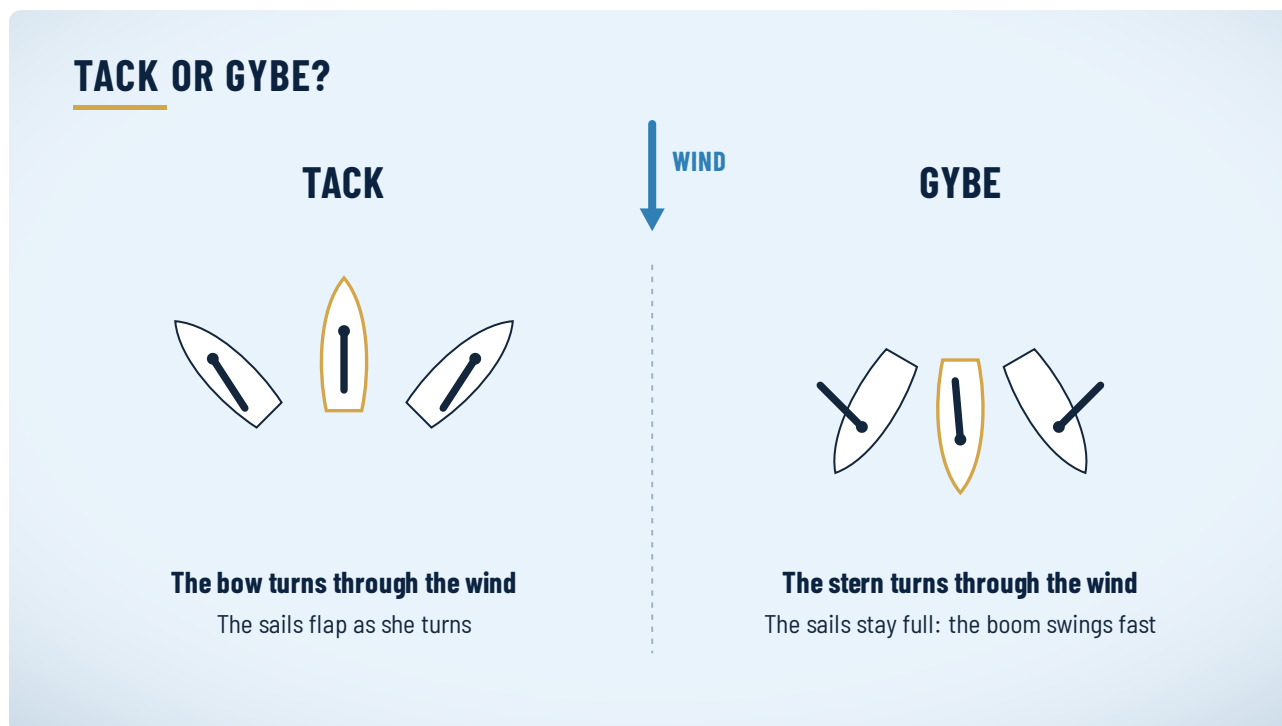


Figure 6.1 In a tack the bow turns through the wind; in a gybe, the stern does.

Why gybe?

Gybing is how you change from one side to the other when the wind is behind you. If the place you want to get to is downwind, you'll often get there sooner by sailing on a broad reach, first on one gybe and then on the other, than by running straight there. A broad reach is quicker than a dead run and the boat is much steadier, so you zigzag downwind just as you zigzag upwind.

The controlled gybe

The key to a safe gybe is the mainsheet. The further the boom has to travel across the boat, the faster it will be moving when it gets there, so bring it into the middle before you turn.

- 1 Get ready.** Start on a broad reach. Check the water around you is clear, and call "Ready to gybe." Everyone keeps their head low, well out of the way of the boom and the mainsheet.
- 2 Bear away to a run,** with the wind almost directly behind you.
- 3 Pull the mainsheet in,** bringing the boom in towards the middle of the boat.
- 4 Turn slowly.** As the stern passes through the wind, call "Gybe-oh." The boom swings across, but only a short way.
- 5 Ease the mainsheet out smoothly** on the new side, and straighten the tiller so the boat doesn't swing round towards the wind.

6 Bring the jib across, trim, and you're on a broad reach on the new gybe.

Remember

Main in, then turn. The less distance the boom has to travel, the more gently it will cross.

Sailing by the lee

Take care whenever you're sailing dead downwind. If you steer a little too far, the wind gets round behind the mainsail, onto what was its leeward side. This is called **sailing by the lee**, and it's when accidental gybes happen. Signs that you're there include the boat feeling unsettled and rolling, the boom starting to lift, and the jib falling limp and then trying to cross over. Turn back towards the wind a little until she settles.



Figure 6.2 Running, the boom right out. A little further, and the wind gets behind the main.

Accidental gybes

An accidental, or **crash**, gybe happens when the boom comes across without anyone meaning it to, usually with the mainsail let right out. The boom swings through 90 degrees or more at head height, hits the end of its travel with a bang, and the boat can be thrown round into the wind. In stronger winds it can break the boom or the rig, and it can easily hurt someone.

On a long run, many crews rig a **preventer**: a line from the end of the boom forward to the bow and back to the cockpit, which holds the boom out and stops it crossing if the boat gybes by accident. It must be possible to release it quickly from the cockpit.

Common mistake: gybing with the main let right out

Always pull the mainsheet in first. And if it's blowing hard and you're not confident, there's a perfectly good alternative: head up, tack, and bear away again on the new side. It takes longer, but it's much gentler on the boat and the crew. Some sailors call it a chicken gybe; there's nothing wrong with it.

Spinnakers

Off the wind, many boats set a **spinnaker**, a large, light, balloon-shaped sail flown in front of the boat in place of the jib. The boat in the simulator carries an **asymmetric** spinnaker, which is tacked down to the bow like a big jib and gybed by letting the old sheet go and pulling in the new one round the front of the boat. It adds a lot of speed on a broad reach, but it also adds a lot of power, so take it down early if the wind builds.



Figure 6.3 Broad reaching under the asymmetric spinnaker.

Try it in the simulator

Lessons: Gybing safely, Flying the spinnaker, at textbookofsailing.com.



PART TWO · HANDLING THE BOAT

07

Under power, and in the marina

Most yachts have a small diesel engine for getting in and out of harbour. Manoeuvring a boat in a tight marina is a skill of its own, and the most important part of it is going slowly.

IN THIS CHAPTER

- The engine and gear lever
- Prop walk
- Leaving a berth, and springing off
- Coming in to a berth
- Fenders and lines

A boat has no brakes. The only way to stop is to put the engine astern, and that takes time and distance. Everything about handling a boat under power in a marina follows from that one fact.

The engine

The gear lever has three positions: **ahead**, **neutral** and **astern**, and on most boats the same lever is also the throttle. Always pause in neutral for a moment when changing direction: it's kinder to the gearbox, and it gives you a moment to think. Before starting the engine, check that no lines are trailing in the water near the propeller, and once it's running, look over the stern to check that cooling water is coming out of the exhaust.

Engine checks

- Fuel, and the fuel tap on
- Oil and coolant levels
- Raw-water seacock open
- No ropes near the propeller
- Cooling water from the exhaust once it's running

Prop walk

A propeller doesn't only push the boat forwards or backwards. Because it's turning, it also pushes the stern sideways a little. Going ahead the effect is small, and as soon as there's water flowing over the rudder you can steer it out. In reverse it's much stronger, and until the boat has picked up speed astern the rudder can do little about it. On most boats, including this one, the stern kicks to port when you go astern; on some it goes to starboard.

It's worth finding out which way your own boat walks, in open water, before you need to know. And once you know, you can use it: if the stern walks to port, come alongside with the pontoon on your port side, and a short burst astern will both stop the boat and pull her stern neatly in.

Leaving a berth

If there's no wind, leaving a berth is simply a matter of letting the lines go and motoring gently out. When the wind is blowing you onto the pontoon it's harder: let go and motor ahead, and the wind will push you along the pontoon and into the boat in front. The answer is to **spring off**.

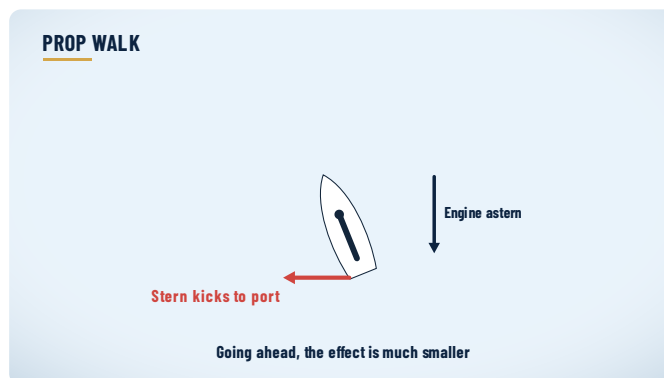


Figure 7.1 Prop walk. Going astern, the propeller pushes the stern sideways, to port on this boat.

SPRINGING OFF

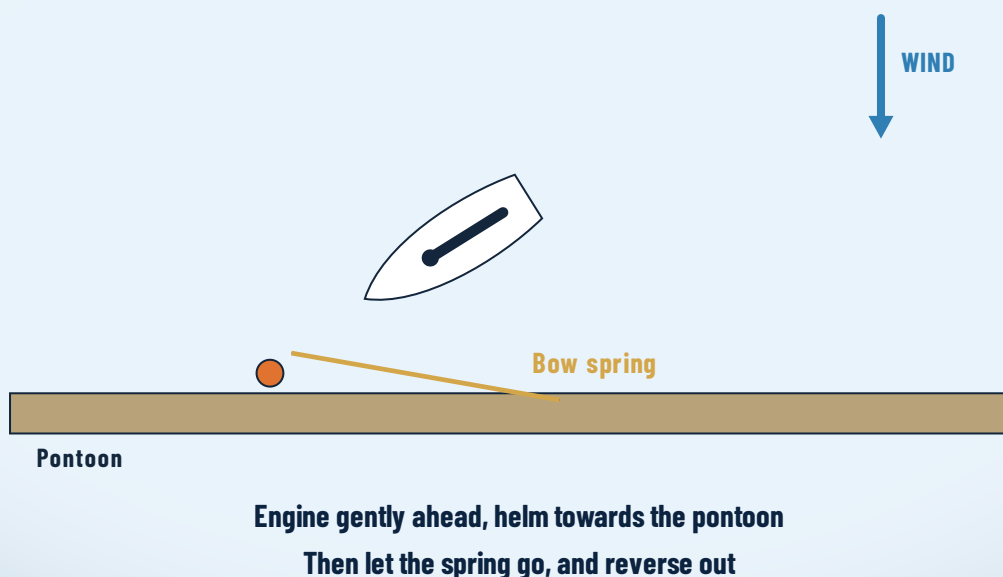


Figure 7.2 Springing off. With only the bow spring on and the engine ahead, the bow pivots on its fender and the stern swings out into the wind.

- 1 Put a fender right forward on the bow.
- 2 Take in all the lines except the **bow spring**, which runs from the bow aft to a cleat on the pontoon.
- 3 Turn the tiller towards the pontoon and motor gently ahead against the spring. The spring stops the boat moving forward, so the bow pivots on its fender and the stern swings out.
- 4 When the stern is well clear, go to neutral, let the spring go, centre the tiller and motor firmly astern, out into clear water.

Coming in

Coming back in, keep the speed right down. Approach at about walking pace, which is around one and a half knots: you can always give a short burst of power to help you steer, but you can't take speed off quickly. If you can, come in heading into the wind, so it helps you stop.

Get the fenders out and the lines ready well before you arrive, coiled and led outside everything so they can be handed or stepped ashore with. When you reach the berth, a short burst astern stops the boat. Step off with the middle line, or a spring, first: it holds the boat close while the bow and stern lines go on. Never jump; step off when the boat is alongside and nearly stopped.



Figure 7.3 Alongside the visitors' pontoon at Westhaven Marina, Auckland.

Key terms

Bow line, stern line	hold the ends of the boat in to the pontoon
Springs	run diagonally fore and aft, and stop the boat surging along the pontoon
Fenders	cushions hung over the side to protect the hull

Common mistake: coming in too fast

It can feel as though you have more control at speed, but you actually have less, and every bump costs money. If an approach isn't working, go back out and try again. Nobody will think any less of you.

Try it in the simulator

All at Westhaven Marina, recreated berth by berth. Lessons: **Motoring and prop walk**, **Leaving the berth: springing off**, **Berthing in the marina**, at textbookofsailing.com.



PART TWO • HANDLING THE BOAT

08

Anchoring and moorings

One of the pleasures of a yacht is being able to stop for lunch, or for the night, in a quiet bay. To do that you either pick up a mooring or let go the anchor, and both have a right way to do them.

IN THIS CHAPTER

- Choosing a spot
- How much to let out
- Anchoring, step by step
- Picking up a mooring
- Ropes and knots

An anchor holds a boat by digging into the seabed, and it holds best when it's pulled along the bottom rather than upwards. Most of the art of anchoring comes down to that.

Choosing a spot

Look for a place that's sheltered from the wind and the waves, now and from the direction the forecast says the wind will come from later. The bottom should be sand or mud, which an anchor digs into well; rock and weed hold badly. Check the chart for the depth and the type of bottom, for cables and other things you mustn't anchor on, and for how much the tide will rise and fall. And leave room: the boat will swing round her anchor as the wind and tide change, and so will every other boat in the bay.

How much to let out

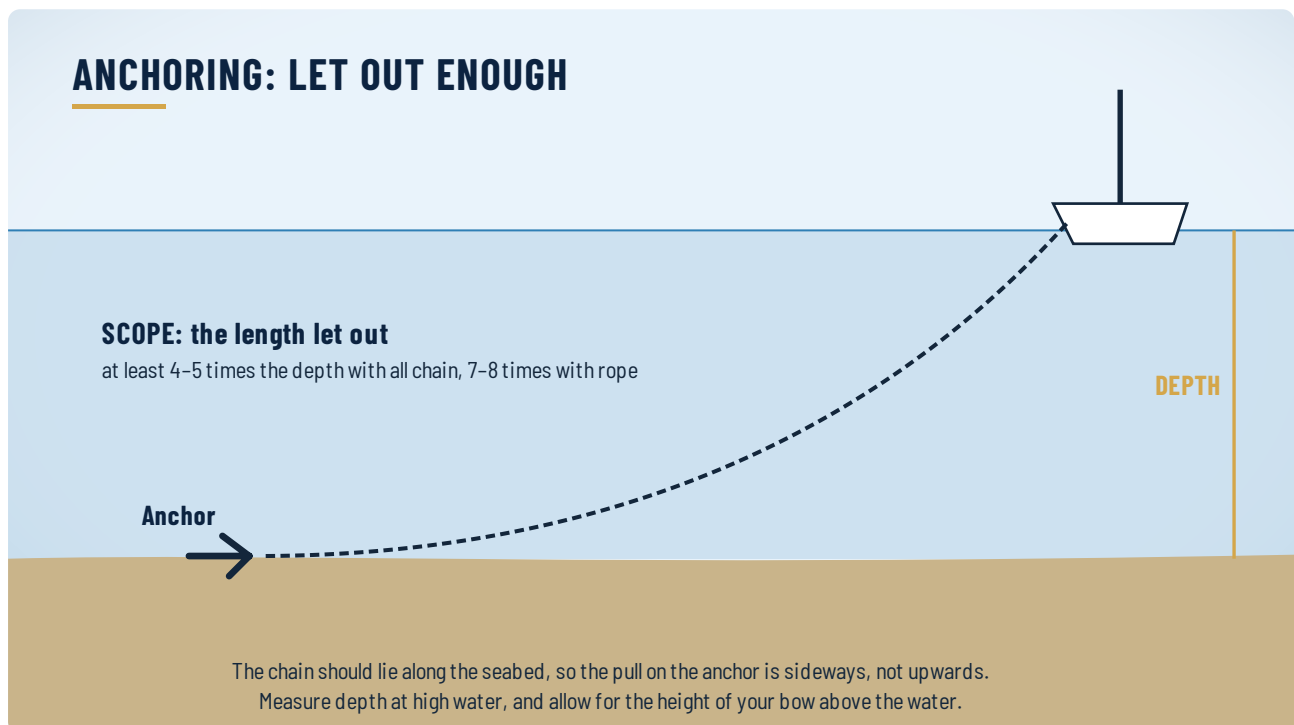


Figure 8.1 Scope: the length of chain or rope let out, compared with the depth.

The length of chain or rope between the boat and the anchor is called the **rode**, and the amount let out compared with the depth is the **scope**. With all chain, let out at least four to five times the depth; with rope, seven to eight times. Measure the depth at high water, and add the height of the bow above the water. In strong winds let out more.

With enough scope, the weight of the chain makes it lie along the seabed, so that the pull on the anchor is sideways, which digs it in, instead of upwards, which pulls it out.

Anchoring, step by step

- 1 Motor slowly into the spot you've chosen, heading into the wind, and stop the boat.

- 2 Lower the anchor to the bottom, and let out chain as the boat drifts back. Don't just drop it all in a heap on top of the anchor.
- 3 When you've let out about three times the depth, hold the chain and let the boat's weight pull the anchor in.
- 4 Let out the rest of the scope, then go gently astern under engine to set the anchor firmly.
- 5 Check that you're holding: pick two objects ashore that line up, a **transit**, and watch that they stay lined up.
- 6 At night, show an all-round white anchor light; by day, a black ball in the rigging.

Picking up a mooring

A **mooring** is a heavy weight on the seabed with a chain up to a buoy, laid permanently for a boat to tie to. To pick one up, approach slowly, heading into the wind or the tide, whichever is stronger, so that you can stop with the buoy alongside the bow. The crew on the foredeck points at the buoy throughout, because the helmsman soon loses sight of it under the bow, and picks up the line with a boathook. Make it fast to a cleat on the bow, and check that you're lying comfortably before you switch off the engine.

Remember

Approach a mooring, an anchorage or a berth into the wind or tide. It slows you down and lets you stop where you mean to.

Ropes and knots

A handful of knots will do almost everything you need on a boat. They're best learned with a piece of rope in your hands, from someone who can show you; practise until you can tie them without thinking, and in the dark.

Knot	What it's for
Bowline	A loop that won't slip or jam, and is easy to undo: tying a sheet to a sail, or a line round a post
Round turn and two half hitches	Tying a line to a ring, a post or a rail, especially under load
Clove hitch	A quick temporary hitch, for fenders on a rail
Cleat hitch	Making a line fast on a cleat: a full turn, figures of eight, and a locking turn
Figure of eight	A stopper knot in the end of a sheet, so it can't run out through a block
Reef knot	Tying the two ends of a reefing tie round a sail
Rolling hitch	Taking the strain off a loaded line, such as a jammed sheet

Try it in the simulator

Lessons: Anchoring, Picking up a mooring, Crossing a tidal stream, at textbookofsailing.com.



PART TWO · HANDLING THE BOAT

09

When the wind gets up

A boat heeled right over isn't going fast; she's overpowered. Reducing sail makes her more upright, easier to steer, and usually faster too, and the time to do it is the first time you think about it.

IN THIS CHAPTER

- The Beaufort scale
- Signs of being overpowered
- Heaving-to
- Putting in a reef
- The forecast

Wind strength is measured in **knots**, nautical miles per hour; one knot is a little under two kilometres an hour. Forecasts also use the Beaufort scale, which describes the wind by its effect on the sea.

The Beaufort scale

Force	Knots	Description	At sea	For a yacht like this
0-1	0-3	Calm, light air	Mirror-flat, or ripples	Not enough to sail
2	4-6	Light breeze	Small wavelets	Gentle sailing
3	7-10	Gentle breeze	Large wavelets, a few crests breaking	Ideal for learning
4	11-16	Moderate breeze	Small waves, frequent white horses	Good sailing; reef as it builds
5	17-21	Fresh breeze	Moderate waves, many white horses	First reef; experienced crews
6	22-27	Strong breeze	Large waves, white foam crests, spray	Second reef; stay in harbour if inexperienced
7	28-33	Near gale	Sea heaps up, foam blown in streaks	Deep reefed; best avoided
8+	34+	Gale	High waves, crests blown into spindrift	Stay in port

Gusts can be much stronger than the average wind, especially near land, and a forecast of “15 knots gusting 25” needs the same respect as a steady 25.

Too much sail

The signs that a boat has too much sail up are easy to read: she heels more than about 20 degrees, the tiller pulls hard to windward all the time, and every gust makes her turn up into the wind on her own, however hard you pull. She’s also slower, because the sails are spilling wind and the keel and rudder are losing their grip.

In a gust you can ease the mainsheet or drop the traveller to spill wind, and that’s fine for the odd gust. If you find yourself doing it all the time, it’s time to make the sails smaller.



Figure 9.1 Heeling hard in a fresh breeze, with full sail up.

Heaving-to

Before putting a reef in, it helps to stop the boat, and the way to stop a sailing boat is to **heave-to**. It’s also a good way to stop for lunch, to sort out a problem, or to give a seasick crew a rest.

- 1 Sailing close-hauled, tack the boat, but don’t let the jib across: leave it sheeted on the old side, so it’s backed.

- 2 Let the mainsheet right out.
- 3 Push the tiller to leeward, as if you were trying to turn back up into the wind, and tie it there.

Now the jib is trying to push the bow away from the wind and the rudder is trying to turn it back, and the two balance each other out. The boat settles down, lying across the wind and drifting slowly sideways, and everything goes quiet. To sail on, untie the tiller, let the jib across, and bear away.

Reefing

Most mainsails have one or two rows of **reef points** across them. Putting in a reef lowers the sail to one of these rows and ties the spare sail along the boom, making the sail smaller and its centre of effort lower.

- 1 Heave-to, or sail close-hauled with the mainsheet eased so the sail is flapping.
- 2 Ease the kicker, and take up the topping lift if the boom has one, so the boom doesn't drop.
- 3 Ease the halyard, so the sail comes part of the way down.
- 4 Hook the reef point at the front of the sail onto the hook by the mast.
- 5 Pull the halyard tight again.
- 6 Pull in the reefing line, which tightens the back of the sail down onto the boom. Tie up the loose sail with the reef ties if it has them.

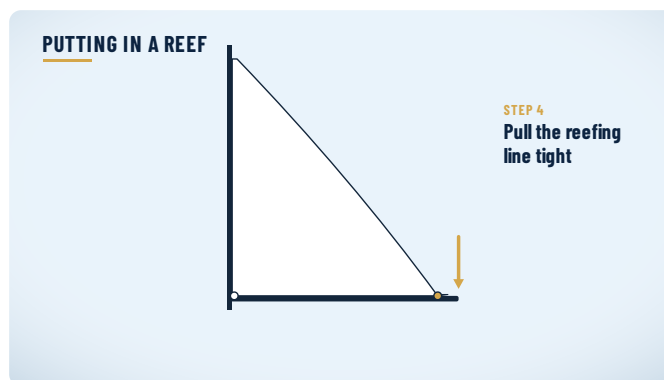


Figure 9.2 A reef tucked in: the reef point hooked on at the mast, the reefing line pulling the leech down to the boom, and the spare sail gathered along it.

If there's still too much power, roll away some of the jib as well; you want to keep the boat balanced, with a smaller mainsail and a smaller jib together. Shaking a reef out when the wind drops is the same steps in reverse.



Figure 9.3 The same boat in a stronger wind, with a reef in the mainsail and some of the jib rolled away: upright, and faster.

The forecast

Check the forecast before you go out, and again during the day if you're out for long. In New Zealand the MetService marine forecasts cover each coastal area, and the VHF radio carries regular weather broadcasts. Look at the wind strength and the gusts, the direction and when it's expected to change, and the sea state.

BEFORE YOU GO

FORECAST

NE 20-25 kn

gusting 30

If you're wondering whether to reef, it's time to reef.

Figure 9.4 The rule most sailors live by.

If strong winds are expected, put the reef in before you leave the marina, while it's calm and easy. Putting one in when you're already overpowered is hard, wet work.

Common mistake: leaving it too late

If you're wondering whether to reef, it's time to reef. You can always shake it out again.

Try it in the simulator

Both can be tried in a strong breeze, without any of the risk. Lessons: Reefing in a blow, Heaving-to, at textbookofsailing.com.



PART THREE • SAFETY AND THE RULES

10

Safety on board

Sailing is a safe sport when it's done with care. A few habits, a little equipment, and knowing how to call for help cover almost everything that can go wrong.

IN THIS CHAPTER

- Before you go
- Lifejackets and harnesses
- The safety briefing
- Calling for help on the VHF
- Cold, sun and seasickness

Most problems at sea start ashore: a forecast not checked, a boat not ready, nobody told where you were going. The checks before you leave matter as much as anything you do on the water.

Before you go

- **Check the forecast**, for the whole time you'll be out, and be honest about whether it suits your boat and your crew.
- **Tell someone your plans**: where you're going, who's on board and when you'll be back. In New Zealand you can also log a trip report with Coastguard on the VHF or with their app, and they'll start looking for you if you don't close it.
- **Check the boat**: fuel, water, the engine, the bilge, and that the safety gear is aboard and working.
- **Take two ways of calling for help** that will work when wet, such as a waterproof handheld VHF and a phone in a waterproof bag.



Figure 10.1 Three things before every trip.

Lifejackets

Wear a lifejacket. Most people who drown in boating accidents weren't wearing one, and a lifejacket only works if it's on: there's rarely time to put one on once something has gone wrong. On yachts most crews use inflatable lifejackets, which are comfortable enough to wear all day; check the gas cylinder and the auto-inflation head regularly, and have them serviced as the maker says.

At night, in rough weather, or when working on the foredeck, clip on: a harness, usually built into the lifejacket, with a tether clipped to a strong point or a jackstay running along the deck. The aim is to stay on the boat in the first place.

The safety briefing

Before you leave, show everyone aboard, especially anyone new to the boat:

Where...	and how
Lifejackets	how to put one on, and adjust it
Fire extinguishers and the fire blanket	and how to use them
The liferaft or dinghy, and the grab bag	if the boat carries them
The VHF radio	and how to make a distress call
The flares and the EPIRB	and when to use them
The first-aid kit	
The engine controls and kill switch	how to start and stop it
The man overboard gear	lifebuoy, dan buoy, throwing line, and the drill in Chapter 11
The gas and the seacocks	how to turn them off
The heads(toilet)	and how not to block it

Calling for help

On a VHF radio, channel 16 is the distress, safety and calling channel, and it's monitored by Maritime Radio and Coastguard. A **Mayday** is for grave and imminent danger to a vessel or to life: sinking, fire, a person overboard, or a serious injury. A **Pan-Pan** is for an urgent situation where there's no immediate danger to life, such as engine failure near rocks.

Mayday call (VHF channel 16, high power)

MAYDAY, MAYDAY, MAYDAY. This is *[boat name, three times]*.

MAYDAY *[boat name]*.

My position is *[latitude and longitude, or distance and bearing from a landmark]*.

[What has happened], and I require immediate assistance.

[Number of people on board], *[anything else that will help: abandoning to the liferaft, injuries]*.

Over.

Then wait for an answer. If none comes, repeat. If your radio has a red DSC distress button, press it first: it sends your position automatically.

Cold, sun and seasickness

New Zealand water is cold enough to be dangerous even in summer. Someone who falls in gasps involuntarily and may breathe in water, and within minutes their arms and legs stop working well enough to swim. That's another reason to wear a lifejacket and to get people out of the water quickly. Once they're aboard, get them dry, warm and sheltered.

On the water the sun is reflected back at you, and it's easy to burn without noticing. Wear a hat, sunglasses and sunscreen, and drink plenty of water.

Seasickness affects almost everyone at some point. It helps to stay on deck in the fresh air, look at the horizon, keep warm, eat plain food, and have a job to do; steering is the best cure of all. Tablets work best taken before you go out. A seasick crew member can be surprisingly unwell, and shouldn't be left alone on deck.

Try it in the simulator

The boat-ownership modules also cover the VHF radio and pre-departure checks. Lesson: **Welcome aboard**, at textbookofsailing.com.



PART THREE • SAFETY AND THE RULES

11

Man overboard

Someone falling overboard is the emergency every crew should practise for. Within seconds the person in the water is hard to see, and the boat is sailing away from them.

IN THIS CHAPTER

- The first three things to do
- Stopping the boat
- Getting back to them
- The final approach
- Getting them aboard

The best way to deal with someone falling overboard is to stop it happening: wear lifejackets, clip on at night and in rough weather, and always keep one hand for yourself and one for the boat. But every crew should know the drill, and practise it with a fender or a bucket until it's second nature.

The first three things

MAN OVERBOARD

- 1 Shout "man overboard!"
- 2 Point, and keep pointing
- 3 Throw the lifebuoy, mark the position
- 4 Come back slowly, on a close reach
- 5 Get a line on them, then get them aboard

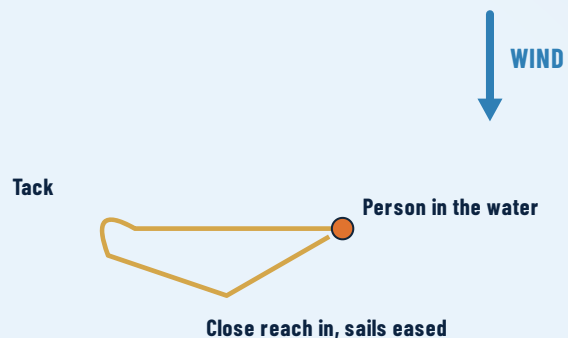


Figure 11.1 Man overboard: the checklist, and one way of getting back.

- 1 Shout "Man overboard!" so the whole crew knows.
- 2 **Point:** one person points at the person in the water and keeps pointing, and does nothing else. A head among waves is very easy to lose.
- 3 **Throw** the lifebuoy and the dan buoy, a floating pole with a flag, so the person has something to hold and you have something bigger to look for. Press the MOB button on the plotter or GPS to mark the position.

Then send a Mayday. It's far better to cancel one later than to lose time.

Getting back to them

There are several ways to get back to a person in the water, and the right one depends on the boat, the wind and the crew. The simplest under sail is the **beam-reach method**: keep sailing on a beam reach for a few boat lengths, so that you have room to turn; tack; and come back on a broad reach, passing a little downwind of the person. When they're about 60 degrees off the wind from you, turn towards them, so that you make the final approach on a close reach.

Another is the **quick stop**: turn straight up into the wind and tack immediately, leaving the jib backed, so the boat stops close to the person, then sail slowly back to them. Under engine, take the sails down or furl them, and always put the engine in neutral well before you get close.

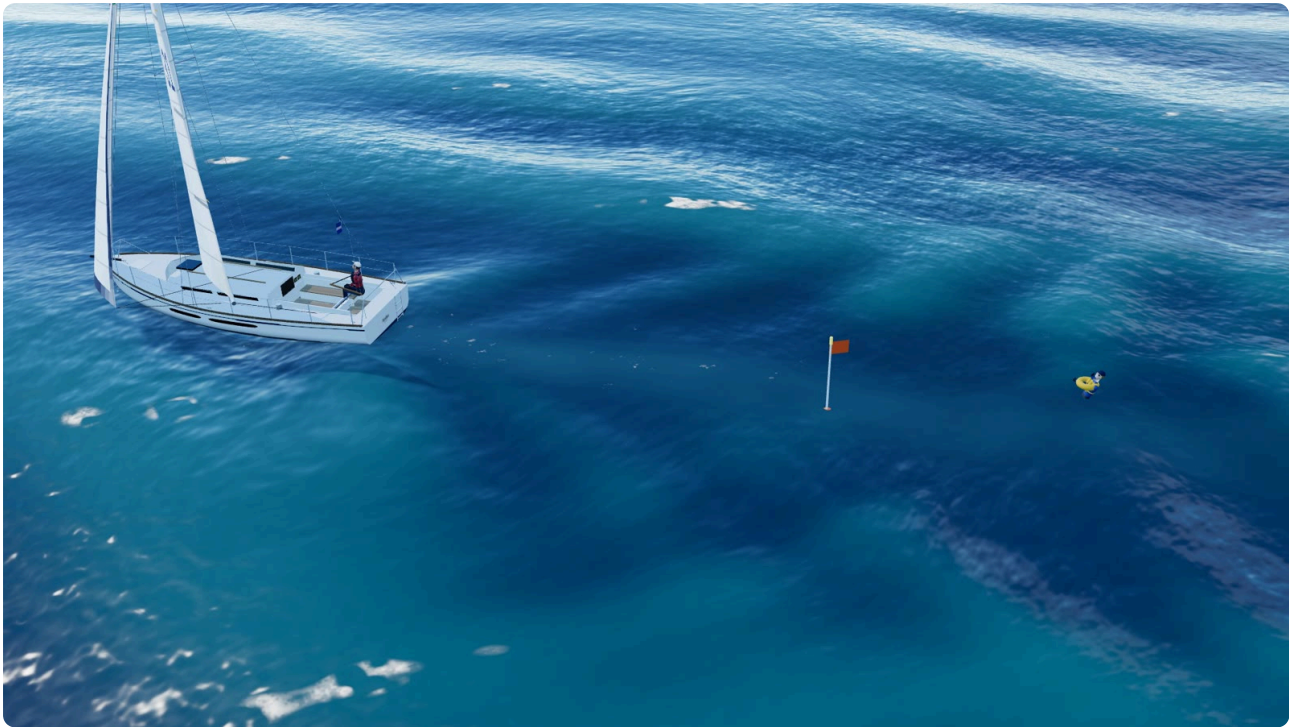


Figure 11.2 The swimmer and the dan buoy astern of the boat, seen from above.

The final approach

The close reach is important, because it's the one point of sail where you can control your speed: let the sails out to slow down, pull them in to speed up. Over the last few metres let the sails right out and bring the boat to a crawl. Aim to stop right beside the person, level with the middle of the boat.

Never near the propeller

If you're using the engine, put it in neutral before you get close, and keep it there until the person is out of the water.

Getting them aboard

Get a line to them first, so they can't drift away again. Getting someone back aboard is often the hardest part of the whole drill, especially if they're cold, tired or heavy in wet clothes. A boarding ladder, a halyard clipped to their lifejacket and winched in, or a sling all help. Once they're aboard, get them warm and dry and watch them closely: call for medical help on the VHF if they're injured, very cold or have breathed in water.

Common mistake: coming back too fast

The commonest mistake is approaching too fast and sailing straight past. Then you have to go all the way round again, and the person in the water is getting colder all the time. Slowly does it.

Try it in the simulator

The simulator times the recovery, and tells you if you sail past. Lesson: **Man overboard!**, at textbookofsailing.com.



PART THREE • SAFETY AND THE RULES

12

The rules of the road

Out on the water, as on the roads, there are rules about who gives way. They're set out in the International Regulations for Preventing Collisions at Sea, which everyone calls the collision regulations, or COLREGs.

IN THIS CHAPTER

- Keeping a lookout
- Sailing boats meeting
- Boats under power
- Big ships, ferries and narrow channels
- Sound signals, lights and fog

The rules exist to make every encounter predictable. One boat, the **give-way vessel**, keeps out of the way; the other, the **stand-on vessel**, holds her course and speed so the first can tell what she's doing.

Keeping a lookout

The first rule is to keep a proper lookout, all round, all the time, by sight and by hearing. On a sailing boat the jib hides a large part of the view to leeward, so make a habit of looking under it.

IS THERE A RISK OF COLLISION?

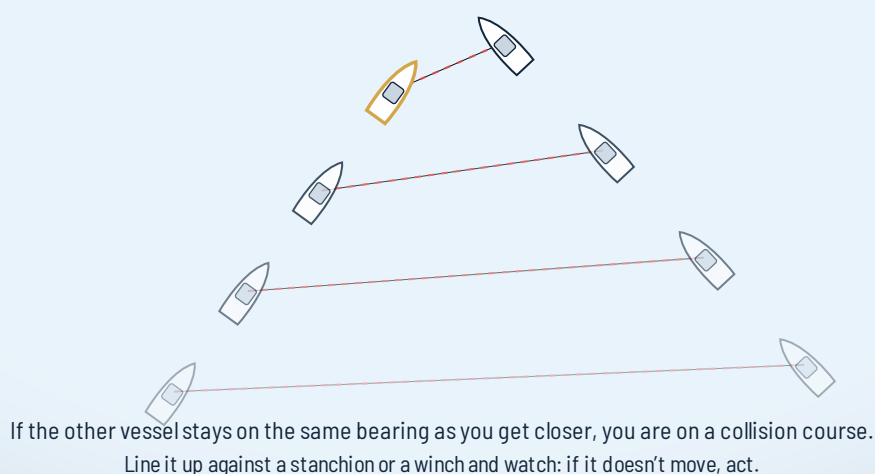


Figure 12.1 A constant bearing. If another boat stays in the same place against your boat as you both get closer, you're on a collision course.

To tell whether you're on a collision course with another vessel, watch its bearing. Line it up against something fixed on your own boat, a stanchion or a winch, and watch it for a minute. If it moves ahead, it will pass ahead of you; if it moves aft, it will pass behind; if it stays in the same place while getting closer, there's a risk of collision and someone needs to act.

Two sailing boats

- **Opposite tacks:** the boat with the wind on her port side, the port-tack boat, keeps clear of the one on starboard tack. That's why racing sailors call out "Starboard!"
- **Same tack:** the boat to windward keeps clear of the boat to leeward.
- **Overtaking:** any boat overtaking another keeps clear of it, whether she's sailing or under power.

If you're on port tack and can't tell which tack the other boat is on, assume she's on starboard and keep clear.

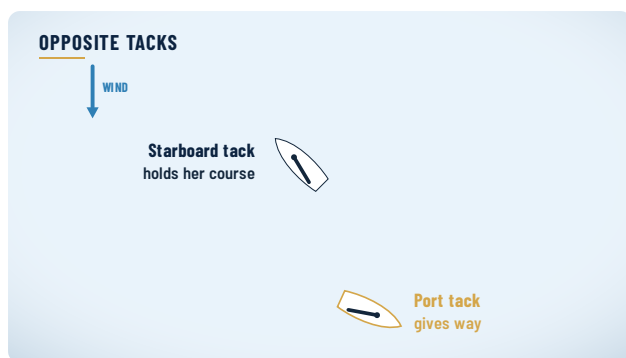


Figure 12.2 On opposite tacks, the boat on port tack gives way.

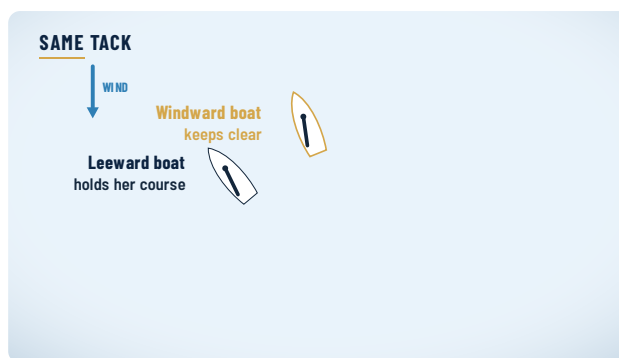


Figure 12.3 On the same tack, the windward boat keeps clear.

Under power

As soon as you start the engine you count as a **power-driven vessel**, even with the sails up, and different rules apply.

- **Head-on:** both boats turn to starboard, and pass port side to port side.
- **Crossing:** the boat that has the other on her own starboard side gives way, preferably by turning to starboard and passing astern of her.

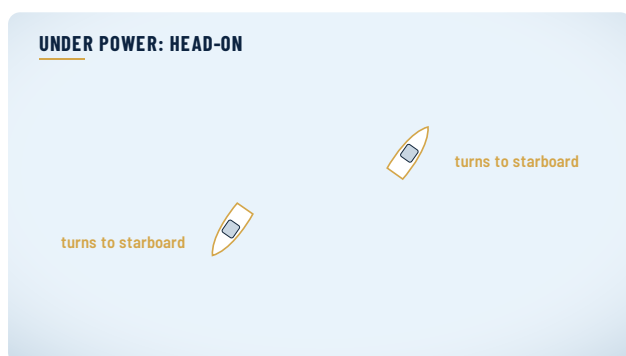


Figure 12.4 Two boats under power, head-on: both turn to starboard.

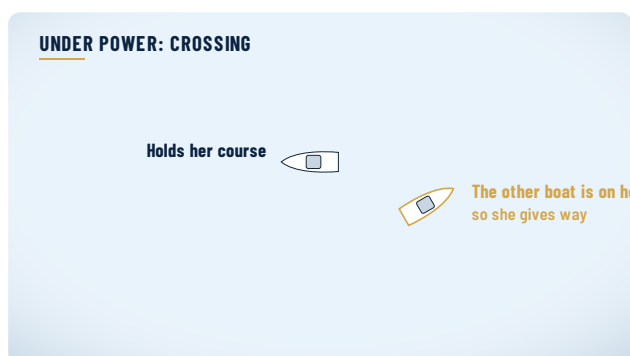


Figure 12.5 Crossing under power: the boat with the other on her starboard side gives way.

In general a power-driven vessel keeps clear of one under sail, which keeps clear of vessels fishing, vessels restricted in their ability to manoeuvre, and vessels not under command.

Big ships and narrow channels

The most important exception in a busy harbour is big ships. In a narrow channel, a small boat must not get in the way of a vessel that can only navigate safely within it, and that includes sailing boats. A container ship can't stop or turn quickly, and from her bridge a small yacht close under her bow may be out of sight altogether. Keep well clear, and make your intentions obvious early. The same goes for ferries: they run to a timetable, they're fast, and they're much bigger than you.

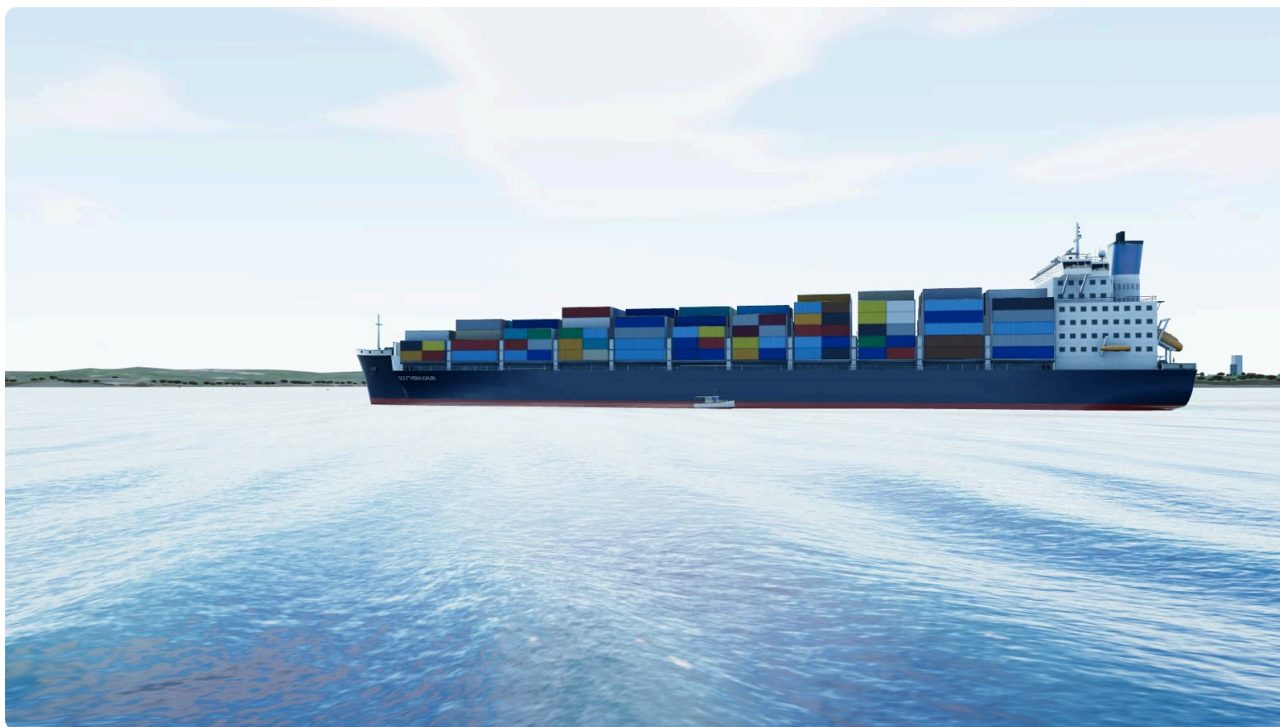


Figure 12.6 A container ship in the channel. Keep well out of her way, and make it obvious early.

How to give way

If you're the give-way vessel, act early, and make your turn big enough that the other skipper can see what you're doing: a series of small changes of course is hard to read and causes as many problems as it solves. Avoid crossing ahead of the other boat. If you're the stand-on vessel, hold your course and speed; but if it becomes clear that the other boat isn't going to keep clear, you must act too, and in the end both boats must do whatever is needed to avoid a collision.



Figure 12.7 An overtaking boat keeps clear, sailing or under power.

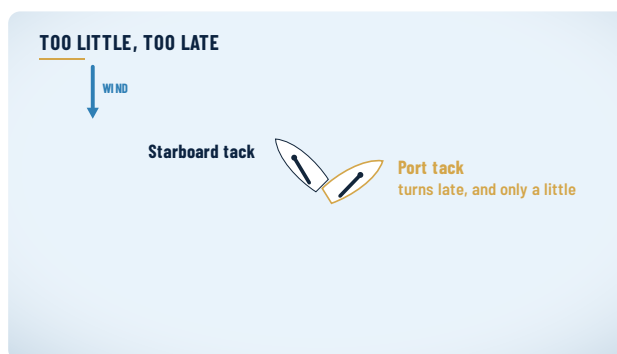


Figure 12.8 Too little, too late: a small turn at the last moment that the other skipper can't read.

Sound signals

Signal	Meaning
One short blast	I am altering course to starboard
Two short blasts	I am altering course to port
Three short blasts	I am operating astern propulsion (going astern)
Five or more short blasts	I don't understand your intentions, or doubt you are taking enough action
One prolonged blast	Approaching a blind bend; or, in fog, a power-driven vessel under way
One prolonged, two short (in fog)	A sailing vessel, or one restricted in her ability to manoeuvre, every two minutes

Lights at night

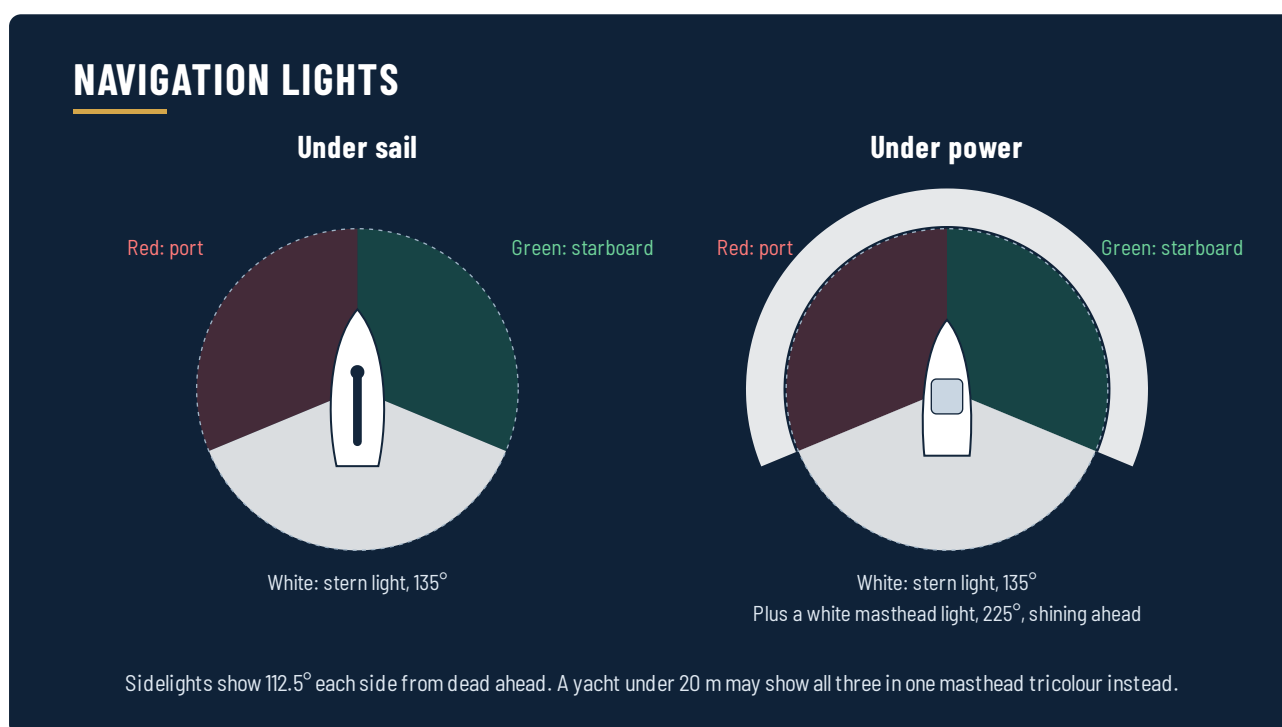


Figure 12.9 Navigation lights: red to port, green to starboard and white astern; a power-driven vessel adds a white masthead light.

Between sunset and sunrise, and in poor visibility, every vessel shows lights that say what she is and which way she's heading. A sailing boat shows a red **sidelight** to port, a green one to starboard, and a white **stern light**. Under power she adds a white **masthead light** shining forward. So if you see red and green together, with a white light above, a power-driven vessel is heading straight for you.

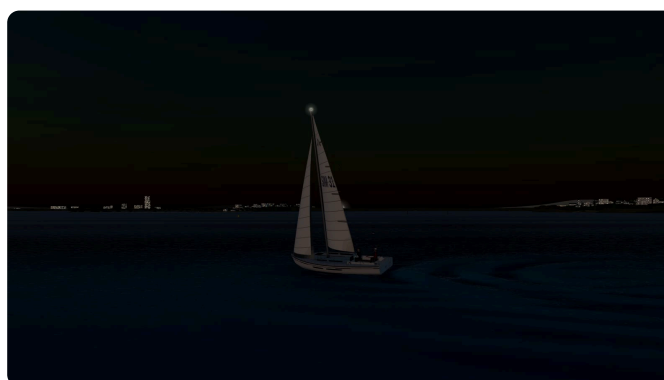


Figure 12.10 Dusk on the harbour: the navigation lights are on.

Fog

In restricted visibility, go slowly enough to stop in the distance you can see, sound the fog signal, keep a lookout by ear as well as by eye, and get out of the shipping channels. Switch on the navigation lights, and if you have radar, use it.



Figure 12.11 Fog: visibility down to a few hundred metres. Slow down, sound the signal and listen.

Try it in the simulator

Practise them in Auckland's real harbour traffic. Lessons: COLREGs: who gives way, Navigation lights at night, Fog: restricted visibility, Rules on the water, at textbookofsailing.com.



PART THREE • SAFETY AND THE RULES

13

Buoys, charts and tides

Buoys and beacons show you where the safe water is. Charts tell you what's under it, and the tides change how much water there is, and which way it's moving.

IN THIS CHAPTER

- Lateral marks
- Cardinal marks and the others
- Reading a chart
- Tides and the rule of twelfths
- Tidal streams

New Zealand, like Europe, Australia and most of Asia, uses the IALA A buoyage system. The Americas, Japan and Korea use IALA B, where the colours of the lateral marks are the other way round.

Lateral marks

Lateral marks show the sides of a channel. In IALA A, coming into harbour, or going upstream, you keep the **red**, can-shaped port-hand marks on your port side and the **green**, cone-shaped starboard-hand marks on your starboard side. Going out of harbour, it's the other way round. Where it isn't obvious which way is "in", the chart shows the direction of buoyage with an arrow.



Figure 13.1 The IALA A marks: lateral, cardinal, isolated danger, safe water and special marks.

Cardinal and other marks

Cardinal marks are placed north, east, south or west of a hazard, and you pass on the side they're named after: pass to the north of a north cardinal. They're yellow and black, and the two black cones on top point the way: both up for north, both down for south, points together for west (a "wasp-waist") and points apart for east (an "egg"). At night they flash white in patterns based on a clock face: continuously for north, three for east, six for south and nine for west.



Figure 13.2 Motoring in towards Westhaven Marina and the city. Entering harbour, keep the red marks on your port side and the green on your starboard side.

An **isolated danger** mark, black with red bands and two black balls on top, sits right on a small danger with safe water all round it. A **safe water** mark, with red and white vertical stripes, shows deep water all round, often at the entrance to a channel. Yellow **special marks** show something particular, such as a racing mark, a cable or a speed limit zone: the chart tells you what.

Charts

A nautical chart is a map of the sea. Depths are shown in metres, measured from **chart datum**, which is roughly the lowest the tide ever goes; so the real depth is almost always the charted depth plus the height of the tide. Contour lines join points of the same depth, and the shallow areas are tinted blue. Drying heights, underlined, show banks that are uncovered at low water.

The chart also shows the buoys and lights with their characteristics, the type of seabed, wrecks and rocks, anchorages, cables and restricted areas. Check the chart is up to date, and always look at it before you go somewhere new: the simulator's chart plotter is drawn from the same kind of information.

Key terms

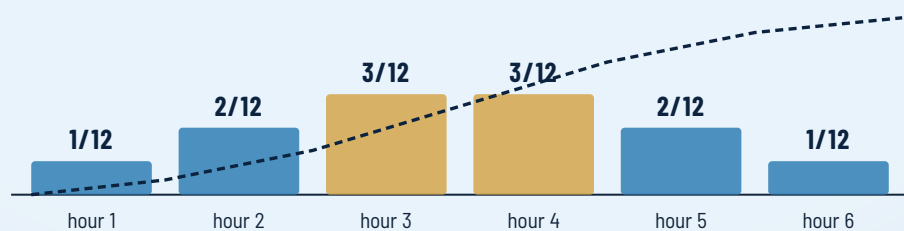
Chart datum	the level depths are measured from: about the lowest tide
Drying height	a height above datum, of a bank uncovered at low water
Characteristic	a light's colour and pattern of flashes, printed beside it on the chart

Tides

Most coasts have two high and two low tides a day, about six and a quarter hours apart. The difference in height between high and low water is the **range**; in the Waitematā Harbour it's about two to three metres. The range is biggest at **springs**, just after full and new moon, and smallest at **neaps**, at half moon.

THE RULE OF TWELFTHS

Total rise: **12/12**



From low water to high water takes about six hours. The tide rises slowly at first, fastest in the middle two hours, then slowly again.

Figure 13.3 The rule of twelfths: the tide rises (and falls) slowly at first, fastest in the middle, and slowly again at the end.

The tide doesn't rise at a steady rate. A rough guide is the **rule of twelfths**: in the first hour after low water it rises by one twelfth of its range, in the second by two twelfths, in the third and fourth by three twelfths each, and in the fifth and sixth by two and one. It's handy for working out whether there will be enough water over a bank at a given time.

Tidal streams

As the tide rises and falls, the water moves: a **tidal stream**. It runs in on the rising tide, the **flood**, and out on the falling tide, the **ebb**, and is strongest in the middle of each. In narrow entrances and between headlands it can run at several knots, which is more than enough to stop a small yacht making progress, or to set her sideways onto a hazard. Tidal stream atlases and the chart show the direction and rate for each hour. Plan to go with the stream where you can, and remember that wind against tide makes for short, steep, uncomfortable waves.

Try it in the simulator

The simulator's harbour has real tides, and the chart plotter shows the depths. Lessons: **Buoyage and harbour entry**, **Crossing a tidal stream**, at textbookofsailing.com.



PART FOUR · GOING FURTHER

14

Your first race

Racing is one of the quickest ways to become a better sailor. Even if you finish last, you'll learn a lot just by watching the boats around you, and the start is where most races are won and lost.

IN THIS CHAPTER

- The start sequence
- The start line and the favoured end
- A timed run to the line
- Being over early
- Clear air, and the racing rules

Most club races follow the same pattern: a start, a beat to a windward mark, a run back to a leeward mark, perhaps another lap, and a finish. Everything you've learned so far comes into play, along with a few rules of its own.

The start sequence



Figure 14.1 The start sequence: warning at five minutes, preparatory at four, one minute, and the start.

A race begins with a countdown, signalled with flags and sounds from the committee boat. The **warning signal** goes at five minutes, with the class flag raised; the **preparatory signal** at four minutes, when the preparatory flag goes up; at one minute the preparatory flag comes down with a long sound; and at the **start** the class flag comes down. The flags are what count: if the sound signal is late or missing, go by the flag. Start your watch on the five-minute signal, and check it at four.

The start line

The start line runs between a mast on the committee boat at one end and a buoy, called the **pin**, at the other. It's rarely exactly square to the wind, and the end that's further upwind is called the **favoured end**, because it's closer to the first mark. To find it, sail along the line and luff head to wind in the middle: the end your bow points more towards is favoured. Starting there gives you a head start, which is why it's also where the crowd will be.

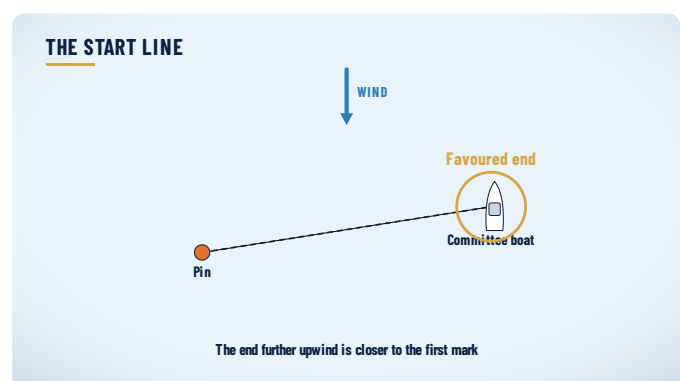


Figure 14.2 The start line, between the committee boat and the pin. The end further upwind is favoured.

A timed run

The aim is to cross the line at full speed, just as the start signal goes. A simple way to do it is a **timed run**:

- 1 With a few minutes to go, sail away from the line on a reach for a set time, say one minute.
- 2 Tack or gybe, and sail back towards the line. The run back takes about the same time.
- 3 Adjust: if you're early, let the sails out to slow down; if you're late, pull them in and go.
- 4 In the last seconds, pull the sails in, bear away a little to build speed, and cross close-hauled at full speed with the gun.

Keep a gap to leeward, so you have room to bear away and accelerate, and keep an eye on the boats around you. Coming in on starboard tack gives you right of way over boats on port, which is one less thing to worry about in a crowded start.

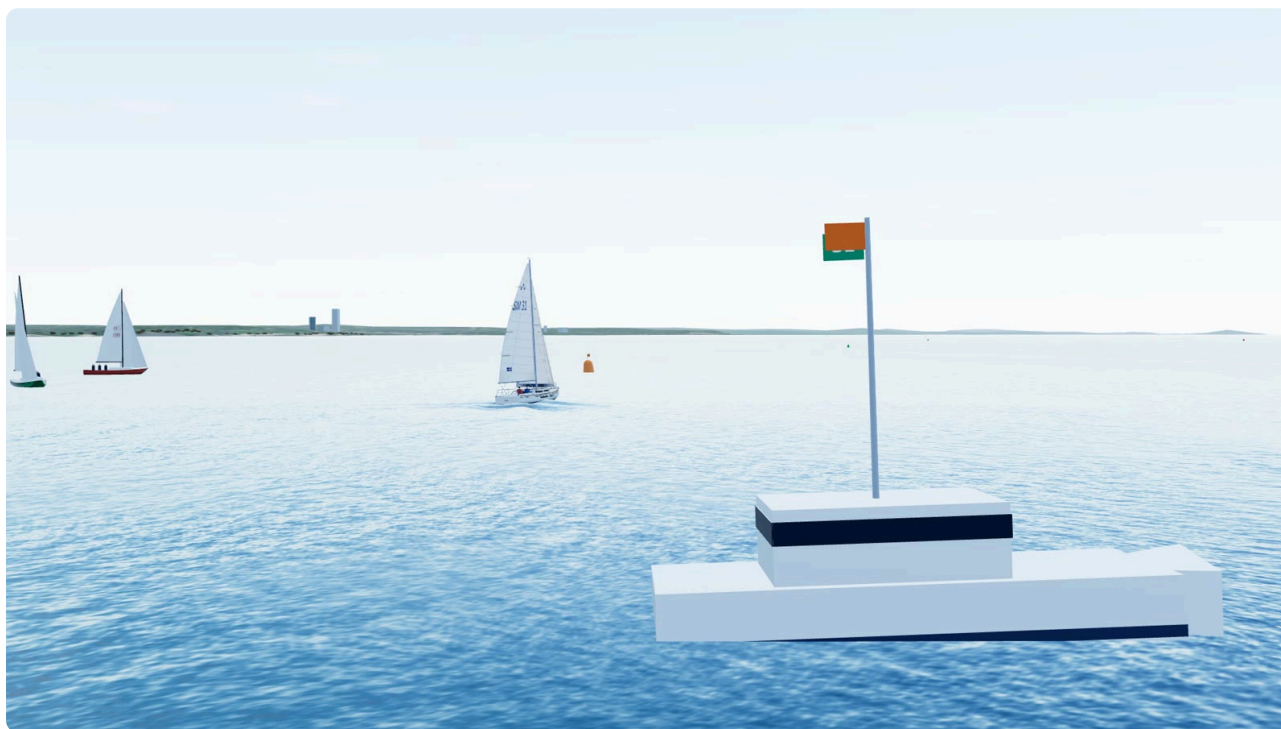


Figure 14.3 A fleet on the start line, seen from the committee boat.

Over early

If any part of your boat is over the line when the start signal goes, you're **on the course side**, or OCS. The committee will usually fly flag X and make a sound signal, and you have to go back to the pre-start side of the line and start again, keeping clear of everyone who started properly. You'll lose a lot of ground: it's much better to be a second late than a second early.

Remember

Better a second late than a second early.

The racing rules

Racing has its own rules, the Racing Rules of Sailing, which replace the collision regulations between boats in the same race. The basics are the same ones you already know: port keeps clear of starboard, windward keeps clear of leeward, and an overtaking boat keeps clear. On top of those, boats must give room to boats on the inside at the marks, and a boat that breaks a rule takes a penalty, usually a turn of 360 degrees, as soon as possible. If there's a dispute, it's settled ashore in a protest hearing.

When	Who keeps clear
Opposite tacks	the port-tack boat
Same tack, overlapped	the windward boat
Same tack, not overlapped	the boat clear astern
Tacking	a boat that is tacking keeps clear of one that isn't
At a mark	outside boats give room to boats overlapped inside them

Clear air

The air behind and to leeward of a boat's sails is slower and disturbed, for several boat lengths. Sailing in it, called **dirty air**, costs you speed and height, and it's the commonest reason a boat slips back through a fleet. If you're losing speed close behind another boat, tack or bear away to find clear air. On the first beat, stay in clear air, keep the boat moving fast, and don't tack more than you need to: every tack costs a little.

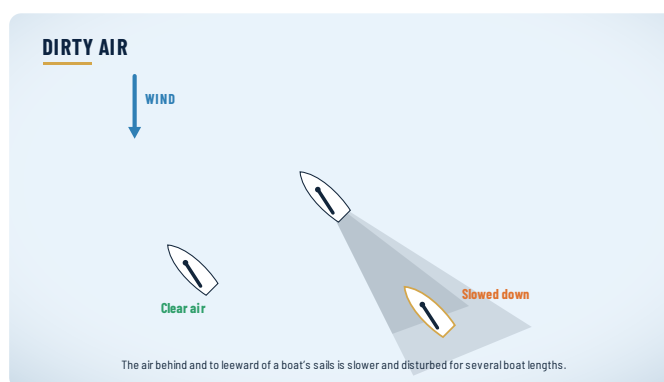


Figure 14.4 The wind shadow behind a boat. Sailing in it costs speed; get out of it.

Common mistake: sailing in someone else's wind

If the boat ahead is slowly pulling away and you can't work out why, look up: you're probably in her wind shadow. Tack away.

Try it in the simulator

Then try the Daily race, where everyone sails the same course and the times go on a leaderboard. Lessons: The start, Your first race, The racing rules, at textbookofsailing.com.

Glossary

Abeam: at right angles to the boat.

Aft: towards the stern.

Apparent wind: the wind felt on a moving boat: the true wind plus the wind of her own motion.

Backed (jib): held on the windward side, so the wind pushes on its back.

Battens: stiffening strips in the mainsail's leech.

Beam: the boat's width; also out to the side.

Beam reach: sailing with the wind straight over the side.

Bear away: turn away from the wind.

Beat: sail to windward in a zigzag of tacks.

Boom: the spar along the bottom of the mainsail.

Bow: the front of the boat.

Broad reach: sailing with the wind from behind the beam.

By the lee: running with the wind on the same side as the boom: an accidental gybe is close.

Cardinal mark: a buoy north, east, south or west of a danger.

Chart datum: the level charted depths are measured from.

Cleat: a fitting to make a line fast on.

Clew: the back bottom corner of a sail.

Close-hauled: sailing as close to the wind as possible, sails pulled in.

Close reach: sailing with the wind about 60° off the bow.

COLREGs: the International Regulations for Preventing Collisions at Sea.

Cunningham: a line that pulls down the luff of the mainsail.

Dan buoy: a floating pole and flag, thrown to a person overboard.

Draught: how deep the boat is under water.

Ease: let a sheet out.

Fender: a cushion hung over the side to protect the hull.

Foot: the bottom edge of a sail.

Forestay: the wire from the bow to the masthead.

Furler: gear that rolls the jib up round the forestay.

Give-way vessel: the one that must keep out of the way.

Gybe: turn the stern through the wind.

Halyard: a line that hoists a sail.

Head: the top corner of a sail; also the boat's toilet.

Head up: turn towards the wind.

Heave-to: stop the boat with the jib backed and the tiller to leeward.

Heel: lean over under the wind's pressure.

In irons: stopped head to wind.

Jib: the sail in front of the mast.

Keel: the heavy fin under the boat.

Kicker (vang): a tackle holding the boom down.

Knot: one nautical mile per hour, about 1.85 km/h.

Lateral mark: a red or green buoy marking the side of a channel.

Leech: the back edge of a sail.

Leeward: away from the wind; said "loo-ard".

Leeway: the sideways drift of a boat sailing to windward.

Luff: the front edge of a sail; also to head up until it flaps.

Mainsail: the sail behind the mast.

No-go zone: the angles either side of the wind where a boat can't sail.

Outhaul: a line that pulls the clew along the boom.

Pinching: sailing slightly too close to the wind.

Port: the left side, facing forward.

Prop walk: the sideways push of the propeller, strongest astern.

Reef: reduce the size of a sail.

Rode: the anchor chain or rope.

Rudder: the steering fin at the stern.

Run: sailing with the wind directly behind.

Scope: the length of rode let out, compared with the depth.

Sheet: a line that controls a sail's angle.

Shrouds: wires holding the mast up from each side.

Spring: a mooring line led diagonally fore or aft.

Stand-on vessel: the one that holds her course and speed.

Starboard: the right side, facing forward.

Stern: the back of the boat.

Tack: turn the bow through the wind; also the front bottom corner of a sail, and which side the wind comes from (port or starboard tack).

Telltale: a strip of wool on a sail that shows the airflow.

Tiller: the handle that turns the rudder.

Transit: two objects lined up, used to check position.

Traveller: a track that moves the mainsheet across the boat.

Trim: adjust the sails; also pull a sheet in.

Windward: towards the wind.

Quick reference

Before you go

- Forecast checked: wind, gusts, direction, sea state, and any changes during the day
- Someone ashore knows your plans; trip report logged
- Lifejackets for everyone, and worn
- Two ways of calling for help that work when wet
- Fuel, water, engine checks; safety briefing given

The sails

Point of sail	Wind angle	Sails
No-go zone	up to about 45°	can't sail: they flap
Close-hauled	about 45°	pulled right in
Close reach	about 60°	a little eased
Beam reach	90°	about halfway out
Broad reach	120–150°	well out
Run	180°	right out; watch for a gybe

Telltails: windward one lifting, pull in or bear away; leeward one drooping, let out or head up.

Who gives way

Situation	Who keeps clear
Sailing, opposite tacks	the port-tack boat
Sailing, same tack	the windward boat
Any boat overtaking	the overtaking boat
Under power, head-on	both turn to starboard
Under power, crossing	the boat with the other on her starboard side
Big ships in a channel	you do

Calls and signals

Call	Meaning
"Ready about" ... "Lee-oh"	about to tack ... tacking now
"Ready to gybe" ... "Gybe-oh"	about to gybe ... gybing now
"Man overboard!"	shout, point, throw
Mayday (VHF 16)	grave and imminent danger
Pan-Pan (VHF 16)	urgent, but no immediate danger to life
One / two / three short blasts	turning to starboard / to port / going astern
Five short blasts	I don't understand your intentions

Anchoring and buoys

Scope: at least 4–5× the depth with chain, 7–8× with rope. **Entering harbour (IALA A):** red to port, green to starboard. **Cardinals:** pass on the side they're named after.



Learn to sail, for free

The Textbook of Sailing simulator recreates Auckland's Waitematā Harbour, a real cruising yacht, and the wind, waves, tides and traffic around her. It runs in your web browser, on a computer or a phone, and its lessons go with the chapters of this book: from the parts of the boat and the points of sail to tacking, gybing, berthing in a marina, man overboard, the rules of the road and your first race.

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