



# THE CHALLENGER TUNING GUIDE

# CHALLENGER SAFETY CHECKS

## Before Going Sailing

- Crossbeam bolts should be finger tight plus  $\frac{3}{4}$  to 1 turn with a spanner. Always use a washer.
- Make sure the mast deck straps are secure over the mast deck ring.
- Put tape over D-shackle pins and rings. Check regularly, to make sure they don't come undone.
- Check that the steering shackles and lines are secure before every trip.
- Make sure all control lines have a stopper knot in the end to prevent them jumping out of the cleat. Regularly check all lines for damage.
- Regularly check the securing nut on the tiller pivot, as it may work loose.
- Make sure the spring that stops the rudder coming off is secure and working.
- Drain water from the hulls by opening the bungs and tipping the boat back.
- Make sure all the drain bungs are done up before launching. The hulls are then sealed and the cockpit is self-draining. They also have foam reserve buoyancy inside to ensure the boat will not sink even if holed.

## When You Are Sailing

- Sit securely in the boat with feet braced if possible, to avoid falling over the side.
- Do not tie the painter rope around the crossbeams. Keep the end in the cockpit so that you can throw it to shore crew or rescue boats.
- Do not sail near a lee shore (= wind blowing onto beach) in rough weather. Tacking is slow, so you may stall the boat and be blown ashore.
- If you do stall in a tack, reverse the tiller and let the sail out to 90 degrees. When it fills, centre the tiller and pick up speed before sheeting in again to sail away from the shore. Keep the sail filled and don't let the speed drop or you will stall and be blown back towards the shore, which is very dangerous.
- If you get into trouble, signal for rescue sooner rather than later by raising and lowering arms, shouting, blowing a whistle or doing anything that will attract somebody's attention.
- If you fall out, stay with the boat. It is safer and rescue will find you more quickly. If you run aground, don't try to get out unless you are mobile enough to wade through waves. Brace yourself in the cockpit and wait for rescue.

## After Sailing

- Make sure the boat is securely on its trolley before pulling it out of the water.
- When the sail is down, secure the boom so that it does not swing about and hit someone.
- Make sure the boat is securely tied down so that it will not rock or move when parked.

# CHALLENGER SAIL TUNE & SET

## • **Basic Principles**

- A different shape is needed for light, medium and heavy winds.
- There are also different settings for Upwind and Downwind
- You can tell if the shape and trim is right when:
  - Telltales stream horizontally most of the time
  - The helm feels light and balanced.
  - Sheet tension increases as you pull it in.
  - You are going faster than the opposition in a race.
- *Battens* - only need to be a snug fit in the sail pockets. Excessive tension makes them hard to tack but make sure they are properly seated at the front of the sail otherwise they will rip out of the side of the pockets.
- *Controls* - lines should be as thin as possible and pulleys large. This gives less friction and a lighter pull.
- Easy movement of sail corners and edges is important. Lubrication of mast and boom tracks and ball bearing controls make settings more precise.
- Mark the position of fast sail settings on the mast and boom so that they can be reproduced easily.

## **How to Use the Sail Controls**

- Because the boom is sloping, tensioning the downhaul will also tighten the foot of the sail, which reduces its depth and depowers it. The sequence in which the sail controls are adjusted is therefore an important factor in controlling the sail shape and performance.

## **Initial Setup for the Beat**

- Pull on the **tack downhaul** to the required luff (front of sail) tension.
- Then, pull the **foot outhaul** to give correct foot (bottom of sail) depth
- Then, set the **kicker** to give correct leech (back of sail) tension/mast bend
- Then, pull the **sheet** in and go!

## **Going from Upwind to Offwind**

- Ease the **kicker** to the required setting. This can be done before letting the sail out as tension will be maintained by the mainsheet
- Then, slacken the **tack downhaul** the required amount. This should be done before turning downwind, as luff tension will be maintained by friction in the mast luff groove until the sail is let out.
- The **foot** is adjusted automatically when the downhaul is slackened but may need easing more for extra depth in some circumstances (see Downwind Sail Settings).

# UPWIND SAIL SETTINGS

## Light Winds

The sail should be smooth and flattish with no sharp curves. There should be a straight flow at the leech, with maximum fullness 40%-50% back from the mast, about in line with the front of the Challenger symbol.

- **Downhaul** - Just enough tension to remove creases from the luff, any more will pull the maximum fullness too far forward.
- **Outhaul** - Maximum foot depth should be 8-10cm [a hand width] from the boom.
- **Kicker** - Pull on until the top leech telltale just stalls when sailing, with the other two flying.
- **Sheet** - The boom should be about an arm's length outside the cockpit.

## Medium Winds

The sail should be as full as possible, curving from luff to leech with maximum fullness 40% from the mast.

- **Downhaul** - Little or no tension. Only used to make the bottom of the luff straight if it starts to sag. Pull on more tension if the wind rises and starts to blow maximum fullness further back in the sail [when this happens, the helm will feel heavy and sluggish]
- **Outhaul** - Maximum foot depth should be 14-16cm [a hand's length] from the boom.
- **Kicker** - 2/3rds on for maximum leech tension, more if you are not pointing as high as other boats. The top batten end should be roughly parallel with the boom.
- **Sheet** - The boom should be about 2/3rds of an arm's length from the cockpit, with the end over the corner of the transom.

## Stronger Winds

The sail should be progressively flattened with maximum depth kept 35-40% from the mast. It should twist off at the top, to spill wind in the gusts.

- **Downhaul** - Progressively harder on, until almost on the boom. Pull with both hands if it's really windy, until the helm feels balanced.
- **Outhaul** - Start with 14-16cm foot depth to keep maximum drive low down. If overpowered, gradually reduce depth to 8-10cm.
- **Kicker** - Full on, to bend the mast but ease to release leech tension and spill wind in gusty weather.
- **Sheet** - Should be progressively eased as the wind rises, to reduce leeway (being pushed sideways) and keep the boat moving. The boom can be over an arm's length out, as it is more important to keep the boat moving than to point high, especially in waves.

# DOWNWIND SAIL SETTINGS

## Light Winds

The sail should be fuller than for upwind with some twist. The shape should be fine-tuned on the reach to get as many telltales to fly as often as possible, which shows a smooth and even flow of wind over the sail. The order below is how the controls should be adjusted:

- **Kicker** - 3/4 off to give fullness with a flattish run back to the leech and some vertical twist.
- **Downhaul** - Off, or a little tension to remove creases from the luff.
- **Outhaul** - May need easing slightly, so that maximum foot depth is 14-16cm from the boom.
- **Sheet** - Ease whilst rounding the mark so that telltales keep flying. Make sure the boom is out at 90 degrees for the run for maximum projection of the sail area.

## Medium Winds

The sail should be very full with plenty of twist. Luff creases don't matter.

- **Kicker** - The fully-off position is designed to be the automatic medium downwind setting.
- **Downhaul** - Fully off
- **Outhaul** - May need easing so that maximum depth is 18-20cm.
- **Sheet** - Try to lean the boat to windward as you bear away and let the sheet run out freely as you turn to minimise any resistance. Constantly check and retrim on the reach to keep the telltales flying. Aim to run dead downwind or trim to run by the lee (wind blowing from back to front of sail) to try and encourage a smoother airflow over the sail.

## Stronger Winds

The sail should be a little fuller than for upwind but needs twist in the leech to spill wind in the gusts and stop the bows digging into waves. Any fullness should be lower down in the sail.

- **Kicker** – 1/4 to 1/3 on
- **Downhaul** - Off but, as winds get stronger, enough tension to pull out luff creases and keep the maximum fullness in a line down from the front of the Challenger symbol. When it's really strong, lots of tension will flatten the top of the sail and let it spill wind.
- **Outhaul** - Don't ease. Releasing the downhaul will also slacken the foot and give enough extra fullness for offwind sailing.
- **Sheet** - Constantly adjusted. Keeping speed up is more important than flying the telltales. Ease and bear away in heavy gusts. To avoid damage, ensure the boom cannot go more than 45 degrees forward of the mast (*15 metre long mainsheet recommended*) because the rig can rotate around the mast, wrap the control lines tightly and bend the kicker boom.

# TACKING AND GYBING

## Different to a Monohull

- Multihulls are difficult to tack because of the high turning resistance of the long narrow hulls. The rudder stalls easily causing a braking effect if the tiller movement is too sudden and it is most important to have enough speed going into the tack for the boat to carry its way through the wind until the sail fills on the new tack.
- The rudder will also stall when sailing offwind if the bow submerges and lifts the stern out of the water during a gust or a gybe. Again, the long narrow hull makes this feature much more noticeable than in a wider monohull boat.
- In all weathers tacks should be smooth but firm, with particular care taken to maintain speed in the second half of the tack until the sail fills.
- Gybes should be co-ordinated so that, when the sail crosses to the new side, the power comes on as smoothly as possible, to prevent the stern lifting, stalling the rudder and reducing control.

## Light Winds [0-3 knots/force 1]

**TACK** - Push the tiller gently to no more than 45 degrees to turn into the tack. As you go into the tack, pull the sail in a little then, as the battens pop over, ease the boom out 2-3 feet and centralise the tiller. Wait for the boat to pick up speed, which usually takes 5-10 seconds, and gently sheet in as full speed is reached. Don't be tempted to try pointing up towards the wind again too soon, as the boat is initially sliding sideways (leeway) and this will only be exaggerated if you steer to turn back up into the wind. With the tiller central, the boat will bear away and pick up speed - listen for the wake - and it can then be brought back on course.

If the battens won't pop across, pull on the downhaul until they do, or reach behind and give the two falls of the mainsheet a sharp jerk.

**GYBE** - If you are on a reach, the turn should be smooth, not sharp. If you are sailing dead downwind the boom can be pulled across with the two falls of mainsheet behind the sailor or with special gybing lines attached to the kicker boom in front of the mast. Make sure the mainsheet does not droop and catch in the rudder T-bar and, after tacking or gybing, make sure the sail is set properly by trimming and adjusting until all the telltales are flying across the sail horizontally.

# TACKING AND GYBING 2

## Medium Winds [4-10 knots/force 2/3]

**TACK** - To turn into the tack, push the tiller smoothly but firmly to 45 degrees and pull the sail in. As the battens pop across, ease the sail slightly, so that the boom end is over the corner of the transom. Straighten the tiller and wait for the boat to pick up speed then concentrate on pointing the boat as close to the wind as possible whilst making the telltales on the sail fly horizontally.

**GYBE** - If you are sailing a reach, the turn can be sharper. If you are sailing a run, the sail can be pulled or left to blow across but make sure the mainsheet is not slack as it will catch in the rudder T-bar and is difficult to free.

## Stronger Winds [11-33 knots/force 4/7]

**TACK** - To turn into the tack, push the tiller smoothly but firmly to 45 degrees and pull the sail in. As the boat goes beyond head-to-wind, ease the boom out 3-4 feet, or even more in strong winds. Straighten the tiller as the sail fills but, if the boat does not accelerate, ease the sail out and bear away a little more, otherwise you will go head-to-wind and stop. As the boat accelerates, gradually sheet in but do not pull the boom closer than about an arm's length from the cockpit. Be very careful not to point too high and stall. Speed is more important than sailing close to the wind.

**GYBE** - *Reaching:* Ease the sail and bear away to a run then sheet the sail almost right in, turn a little more and, as the sail blows across, let the boom run out to 90 degrees or until the telltales are all flying horizontally.

*Running:* Pull the sail in as far as possible and turn. Doing this means that a smaller course change is needed than just letting the sail blow across. As you gybe, steer an S-shaped course to counteract the force of gybing. Let the boom run out to 90 degrees being careful not to let the force lever the stern out of the water, reducing steering control and slowing the boat.

## Trim, Balance and Course Made Good

- The Challenger is designed so that the crew do not need to move about the boat but, going upwind, it can pay to lean over the leeward side in light weather, to lift the windward sponson out of the water and reduce drag.
- Downwind you should lean out over the windward side, so that the leeward sponson is lifted and the sail is heeled to windward, which both cuts down drag and moves the sail's centre of effort over the boat's centre line. If the sail's force is all on one side of the boat's centreline, it will try to push the boat around in a circle. When it is over the boat's centre, the boat will track straight with no correction needed by the rudder.
- If the bows dig in when it is gusty, sliding seats can be moved back a notch to trim the bows up. Otherwise the boat should always be trimmed level to make the longest waterline, which gives maximum speed (*Formula: Speed = 1.45 x square root of waterline length*).
- On a beat in stronger wind, continuous spray coming off the outer end of the front crossbeam shows that full speed has been reached. Keep tacks to a minimum (but don't hesitate when it is necessary), as they take a long time and you may lose ground to boats that tack less often than you.

# CHALLENGER SAILING TECHNIQUE

## Beating

**Light Winds** - Don't pull the sail in too tight as the boat stalls easily at slow speeds. Keep the tiller central and as still as possible to stop the rudder acting as a brake. Keep weight forward to lift the stern out of the water and keep the boat heeled so that one sponson is always out of the water to reduce friction. Keep still in the boat to avoid disturbing the wind and water flows.

**Medium Winds** - Pull the boom in over the transom corner but be careful not to oversheet and stall, when there will be a dramatic speed reduction and you may end up head-to-wind. (to recover from this, see page 2) Use short tiller movements to luff slightly over the waves and bear away down the back of them.

**Stronger Winds** - If the boat is struggling, ease the boom out a little. Look upwind for gusts approaching and be ready to spill wind or luff slightly to keep the speed up. Lean out to windward to stop the leeward sponson from burying and be careful not to point the boat too high and get "into irons" (stopped head to wind). It is very difficult to get going again if the boat stops.

## Reaching

**Light Winds** - Keep easing the sail out until all the telltales are streaming horizontally. Keep the tiller as central and still as possible. Keep one sponson out of the water at all times, preferably by leaning to leeward, as this will allow gravity to swing the boom out.

**Medium Winds** - Constantly check and re-trim the sail to keep the telltales flying. Surf on the waves by bearing away as crests come under the boat and luffing off them as they go by. Lean to windward as you ease the sail and steer to bear away, which lifts the leeward sponson to take advantage of hull steering.

**Stronger Winds** - Waves are larger and medium weather technique is applied more vigorously. If the leeward sponson submerges in gusts, luff a little to ease the pressure and bring it up again. When using the rudder frequent small movements are more effective than large ones as the rudder gives more control and is less likely to stall. It also takes less strength and energy. When bearing away, make sure to let the sail out quickly just before using the rudder to steer, so that it doesn't try to resist the turn.

# CHALLENGER SAILING TECHNIQUE

## Running

**Light Winds** - Ease the sail out to 90-100 degrees from the centreline. This should keep the boom out when you heel the boat to windward. Sailing by the lee (wind blowing from the sail side of the mast), with wind streaming from the back to the front edge of the sail, is fast. Try to make some of the telltales fly to show the wind flow. It is essential to fit gybing lines so that the rig can be trimmed in and out, as required.

**Medium Winds** - Boom out to 90 degrees (marks on the mast and deck will confirm the angle). Boat heeled to windward and surfing on the front of waves is fast. Speed is not increased by broad-reaching so point dead downwind or sail by the lee for the shortest distance between two points. Weight should be kept forward to trim the hulls level as, the longer the water line, the faster the speed that can be obtained.

**Strong Winds** - Concentrate on surfing down the waves and keeping maximum speed. If the boat tries to bear away, pull 2 or 3 handfuls of sail in, which should counteract it. Sliding seats can be pushed back to keep the stern down and the rudder in the water but make sure the stern doesn't drag as it will slow the boat, which will make gybing more violent and put a strain on the rig. Sitting in a semi-lying position feels more secure in big waves.

## Centreboard Control

The centreboard is quite large and has considerable drag when lowered. To avoid drifting sideways (leeway), the board should always be swung fully down when beating. On a reach, the board can be lifted as much as required, depending on the exact point of sailing and the weather. It is often possible to raise the board so that only the tip is down because the long narrow hulls give good directional stability on their own. When running, the board can always be lifted right up and the reduced friction makes a big difference to the speed.

Both centreboard and rudder should be frequently checked and should be smoothed and polished to reduce friction in the water. The board should be a snug fit in the slot, with no sideways slop.

## Steering

The system should be taut with no slop. Check the tightness of the tiller pivot by moving the steering arm up and down and tighten if necessary. The lines should be as tight as possible without any friction drag and it is important to adjust them so that the tiller and rudder are both in line on the centreline of the boat. The blade should have no sideways movement in the stock but should also pivot up and down easily using the control lines.

# CHALLENGER GLOSSARY OF SAILING TERMS

- **Battens** – Plastic stiffener rods in the sail which help to give it shape
- **Bear Away** – Turn the boat away from the wind
- **Beating** – Pointing as close to the wind as possible with the sail pulled in
- **Boom** – Horizontal spar attached to the mast and the foot of the sail
- **Bow** – front of the boat
- **By the Lee** – sailing downwind with the boom and sail on the windward side
- **Clew** – Back lower corner of the sail
- **Crossbeams** – Aluminium tubes laid across the hulls to hold them together
- **Cunningham** – (or tack downhaul) control that tightens the front edge (luff) of the sail
- **Falls of Rope** – The part of the rope hanging between two points
- **Foot** – Bottom edge of the sail
- **Gudgeon** – Bracket with hole in it for locating a pintle to form a hinge
- **Gybe** – When sailing downwind, turning away from the wind and moving the sail across the boat so that it fills on the opposite side
- **Gybing Lines** – Two Lines running from each side of the kicker boom to the sailor in the cockpit to pull out or gybe the sail
- **Head** – Top corner of a triangular sail
- **Kicker** – Other name, vang. Pulls the boom down to tension the sail leech
- **Leeward** – The side of the boat that faces downwind
- **Luff** – Front edge of the sail
- **Luff up** – Turn the boat towards the wind
- **Leech** – Back edge of the sail
- **Outhaul** – Control line attached to the clew to tighten the foot of the sail
- **Painter** – Rope attached to the bow, used for towing or tying up to a mooring
- **Port** – Left hand side of the boat when facing forward
- **Pintle** – Short vertical bar. Mates with Gudgeon to form a hinge for the rudder
- **Reaching** – Sailing with the wind blowing across the boat
- **Rig** – The mast, boom, sail and control lines
- **Running** – Sailing with the wind behind the boat
- **Sheet** – Rope that controls the boom and sail positions
- **Sponsons** – Outer hulls of a Challenger trimaran
- **Starboard** – Right hand side of the boat when facing forward
- **Stern** – Back of the boat
- **Stock** – Cheek-plates, hinged to the stern of the boat, holding the rudder blade
- **Tack** – Front lower corner of a sail
- **Tacking** – Turn the bow through the wind until the sail fills on the opposite side
- **Tell-tales** – Strips of material attached to the sail at one end to show the wind flow
- **Tiller** – A wood or steel pole the helmsman uses to control the rudder
- **Transom** – Back surface of the boat's hull
- **Wake** – Small waves made by the stern of the boat passing through the water
- **Windward** – The side of the boat that faces the wind or, when running, the side opposite to the boom

# TRAILING & ASSEMBLY HINTS

## Assembly

- Fit the crossbeams, mast and boom before attaching the sponsons. Wheelchair sailors can then access the main hull to complete the rigging.
- Keep the front (short) and rear (long) crossbeam bolts in separate, marked plastic bags. This avoids mixing long and short bolts during assembly.
- Put all the loose fittings, trailer straps etc. into a big plastic box. Everything for assembly and dismantling is then in one place (it's not funny when you get to a distant event and find that the crossbeam bolts are still at home!)
- A pair of simple support trestles made from scrap wood makes removing the sponsons very much easier.

## Dismantling

- Leave as much connected as possible, i.e. tiller lines to the rudder bar, which is carried in the cockpit, so that assembly is much quicker and there is less chance of leaving something behind. Remember to tie parts on and check that pins and shackles are tight, though, as bits have been known to fall off during a journey.
- Make sure items are loaded onto the trailer in the correct order: Main hull mounted and lashed, then mast, beams & boom and finally sponsons. Hulls are best held by webbing straps and tensioners, beams, mast and sail by bungees, which don't slip and tighten under load. The sail can be carried under the boat cover or on top of the beams, between the sponsons.
- Load the mast with the foot at the front then, if it slips back, the lashings will tighten and prevent it from falling off.
- Average assembly/stripping time is 30-45 minutes with practice

## Trailing

- Make a master check list of everything and go through it each time. It is surprisingly easy to forget to pack the obvious—like the sail!
- Keep the boat fittings box in the boat. That way there is less chance of leaving it behind and it is ready for boat assembly at the other end.
- A front jockey wheel is essential for moving the trolley and road trailer.
- Paint the boat number and name on the trailer, launching trolley, road and spare wheels for easy identification and security.

## Suggested Reading List

Racing Rules of Sailing	- Ref. YR1	[RYA]
Tactics	- Rodney Pattison	[Fernhurst books]
Sails	- John Heys	[Fernhurst books]
Helming to Win	- Smith & Pinnell	[Fernhurst books]
Wind Strategy	- David Houghton	[Fernhurst books]
Tides and Currents	- David Arnold	[Fernhurst books]