

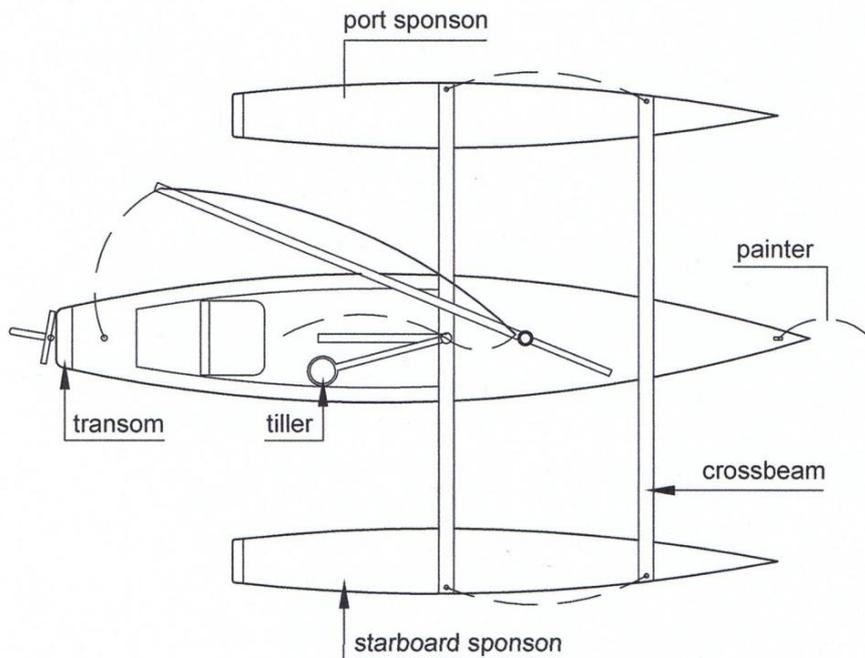
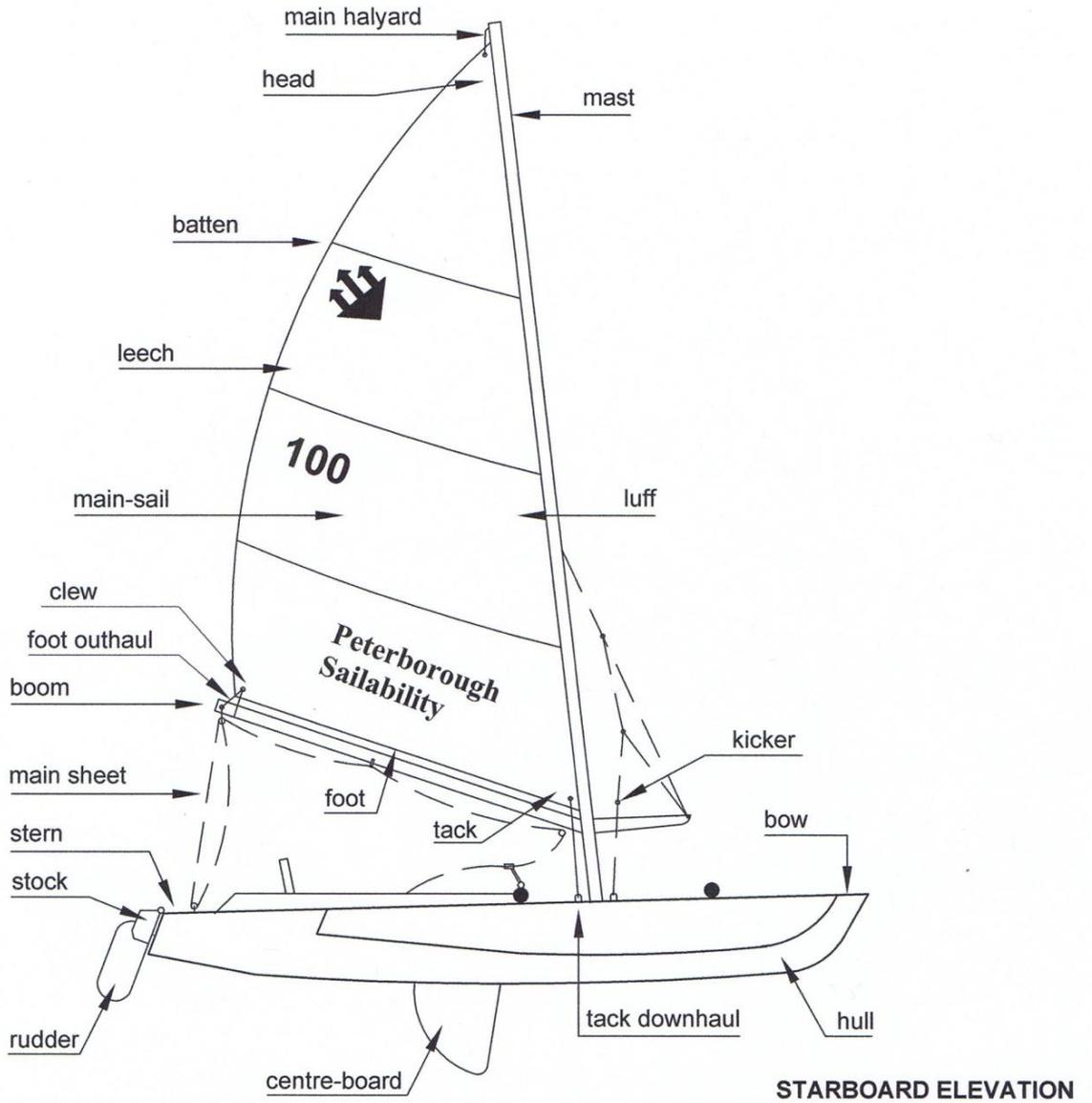
The CHALLENGER TRIMARAN HANDBOOK & TUNING GUIDE



Index

Parts of the Challenger	~	Glossary of Sailing Terms
Safety Checks	~	Sail Tuning
Upwind Sail Setting	~	Downwind Sail Setting
Tacking & Gybing	~	Controls
Beating, Reaching & Running	~	Trailing & Assembly Hints

The CHALLENGER TRIMARAN



© Drawing copyright John J Stokes Feb 2011

The CHALLENGER TRIMARAN ~ GLOSSARY OF SAILING TERMS

The Boat

- **Boom** Horizontal spar attached to the mast which controls the foot of the sail
- **Bow** Front of the boat
- **Crossbeams** Aluminum tubes that hold the hulls together
- **Falls of Rope** The part of the rope hanging between two points
- **Gybing Lines** Lines attached each side to the kicker boom to pull out the sail
- **Kicker** Other name, vang. Pulls the boom down to tension the sail leech
- **Luff** Front edge of sail (attached to mast)
- **Painter** Rope attached to the bow, used for towing or tying up the boat
- **Port** Left hand side of the boat when facing forward
- **Rig** The mast, boom, sail and control lines
- **Sponsons** Outer hulls of a Challenger Trimaran
- **Starboard** Right hand side of the boat when facing forward
- **Stern** Back of the boat
- **Stock** Plate assembly that is attached to the boat and holds the rudder
- **Tiller** A wood or metal pole the helmsman uses to control the rudder
- **Transom** Back surface of the boat's hull

The Sail

- **Battens** Plastic stiffeners in the sail which help give it shape
- **Clew** Rear lower corner of the sail
- **Cunningham** (or tack downhaul) control line to tighten the luff of the sail
- **Foot** Bottom edge of the sail
- **Head** Top corner of the sail
- **Leech** Back edge of the sail
- **Outhaul** Control line to tighten the foot of the sail
- **Sheet** Rope that controls the boom and sail positions
- **Tack** Front lower corner of the sail
- **Tell-tales** Strips of material with one end attached to the sail to show the wind flow. If they all fly horizontally the wind is flowing smoothly across the sail

Sailing Generally

- **Bear Away** Turn the boat away from the wind
- **Beating** Pointing the boat as close to the wind as possible with the sail pulled in and the centre-board down
- **By the Lee** Sailing downwind with the boom on the windward side and the air flowing in reverse, from the back to the front of the sail
- **Gybe** Turn the boat so that the wind passes across the back of the boat from one side to the other to move the sail from the old lee side to the new lee side
- **Leeward** The side of the boat that faces downwind
- **Luff Up** Turn the boat towards the wind
- **Reaching** Sailing with the wind blowing across the boat
- **Running** Sailing with the wind behind the boat
- **Tacking** Turning the boat's bow through the wind until the sail fills on the opposite side
- **Wake** Small waves made by the stern of the boat as it passes through the water
- **Windward** The side of the boat that faces upwind, or the opposite side to where the boom is, when running

The CHALLENGER TRIMARAN ~ SAFETY CHECKS

Before Going Sailing

- Crossbeam bolts should be finger tight plus 3/4 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 keep them in the cleat and regularly check all lines for damage
- Regularly check the securing nut on the tiller pivot, as it may work loose
- Make sure the rudder retaining spring is secure and working
- Drain water from the hulls
- Make sure all the bungs are in. 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 boat
- Do not sail near a lee shore 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 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 await 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

The CHALLENGER TRIMARAN ~ SAIL TUNING

Basic Principles of Sail Setting

- Different sail shapes are needed for **Light, Medium** and **Heavy** weather
- There are also different sail shapes 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
- Battens only need to be a snug a fit in the sail pockets. Excessive tension makes them hard to tack but make sure they are properly located at the front, otherwise they will rip through the sail
- The Ropes used to control the boat should be as thin as possible and pulleys large as practicable. Thin ropes in large pulleys mean less friction and a lighter pull
- Most Control lines are 4mm diameter, 8 or 16-plait polyester re-stretched rope. Best mainsheet is 6-7mm diameter polypropylene rope
- Easy movement of the Clew is important for sail foot adjustment and, for older boats, the slug should be replaced by a roller track with an elastic inhaul
- Fast sail settings should be marked so that they can easily be reproduced without having to guess
- Sail Terms; Luff ~ front edge (nr mast). Leech ~ back edge. Foot ~ bottom edge

How to Use the Sail Controls

Because the boom is sloping, tensioning the downhaul will also tighten the foot of the sail, reducing its depth and depowering the sail. The sequence in which the controls are altered is therefore an important factor in controlling the sail shape and performance

Initial Set up for the Beat;

1. Pull the **tack downhaul** onto the required luff tension for the beat
2. Then, pull the **foot downhaul** to give correct foot depth for the beat
3. Then, set the **kicker** to the required tension
4. Then, pull the **sheet** in and go!

Going from Upwind to offwind;

1. Slacken the **tack downhaul** the required amount
2. Ease the **kicker** to the required setting
3. Slacken the **foot outhaul** if more foot depth is required

The CHALLENGER TRIMARAN ~ UPWIND SAIL SETTINGS

Light Winds (0-3 knots / force 1)

Sail should be smooth and flattish with no sharp curves. A straight flow near the leech, with maximum fullness 40-50% back from the mast – roughly 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 it on until the top leech (back) telltale just stalls when the others are flying. Viewed from behind, the leech should also have some vertical twist
- Sheet;** Boom should be about an arm's length outside the cockpit

Medium Wind (4-10 knots / force 2-3)

Sail should be as full as possible with a curve from luff to leech and maximum fullness 40% from the mast. Small creases don't matter but the leech needs some kicker tension to power-up.

- Downhaul;** Little or no tension. Only used to make the bottom of the luff stand straight if it starts to sag. Pull on more tension if the wind rises and starts to blow the point of maximum fullness further back in the sail (when this happens the helm starts to feel slightly heavier)
- Outhaul;** Maximum foot depth should be 14-16cm (a hand's length) from the boom
- Kicker;** 2/3rds on, so that the end of the top batten is roughly in line with the boom and maximum fullness is at least 40% back
- Sheet;** Boom should be in over the corner of the transom (about ½ an arm's length from the cockpit).

Heavy Wind (11-33 knots / force 4-7)

Sail should be progressively flattened and allowed to twist and flatten at the top to spill wind in the gusts. The downhaul is the main depower control, so needs to be powerful and easy to use.

- Downhaul;** Pull on to remove all luff creases. Pull tighter, to keep maximum fullness only 30-40% back and flatten the top of the sail. If the helm feels heavy, pull really hard to get more on, until the sail tack is touching the boom.
- Outhaul;** Start with foot depth 14-16cm from the boom. The drive from low down in the sail is the last to be reduced. When the boat is overpowered, pull on progressively more tension to reduce maximum depth to 8-10cm (a hand's width). More control line tension will be needed than in light weather because of wind pressure on the sail so remember this when marking settings.
- Kicker;** As much as is needed to flatten the sail but may be eased slightly, when full downhaul is on in higher winds, to twist off the top of the sail and spill wind.
- Sheet;** Should be progressively eased out as the wind rises, to reduce leeway and keep the boat moving. The boom can be 2 feet or more (over an arm's length) out from the cockpit if necessary. Keeping speed up is the top priority to stay in control of the boat. Don't let the sail flap too much; it will only slow you down.

The CHALLENGER TRIMARAN ~ DOWNWIND SAIL SETTINGS

Light Wind (0-3 knots / force 1)

Sail should be fuller than for upwind with some twist. The shape should be fine-tuned on the reach to try and get as many telltales to fly as often as possible, to indicate a smooth and even wind flow across the sail.

- Kicker;** 3/4 off, to give fullness with a flattish run back to the leech and some twist to the sail. This allows air to flow freely across it and exit smoothly from the leech without causing turbulence and drag, shown by leech telltales fluttering
- Downhaul;** Off, unless some tension is needed to keep telltales flying
- Outhaul;** Ease, so that the foot is 14 - 16cm from the boom. This will have been partly achieved by easing the downhaul
- Sheet;** Ease whilst rounding the mark so that telltales remain flying. Make sure the boom is at 90 degrees for the run; any less is depowering the sail.

Medium Wind (4-10 knots / force 2-3)

Sail should be very full with plenty of twist. For best balance on the run, the boat should be heeled by leaning to windward.

- Kicker;** Fully off, giving maximum fullness and twist (the kicker assembly should be set up so that, when released, the boom rises only to the point where the mast is fully straightened)
- Downhaul;** Off, creases don't matter but shape and fullness do
- Outhaul;** Ease, so that the foot is 18-20cm from the boom
- Sheet;** Ease quickly whilst turning around the mark and try to lean the boat to windward, otherwise there will be resistance to the helm and the boat will slow. Constantly trim on the reach to keep the telltales flying. Ease to 90 degrees on the run. Sometimes, sailing by-the-lee, with the wind flowing from leech to luff, is quicker than a dead run with telltales stalled.

Heavy Wind (11-33 knots / force 4-7)

Sail should be a little fuller than for upwind sailing but needs twist to spill wind in the gusts and prevent the bows digging in.

- Kicker;** 1/4 on. More, to flatten the sail, if the bows dig in on the run
- Downhaul;** Enough tension to remove creases and keep the maximum fullness 40% from the mast. Progressively more tension as the wind rises stops the bows digging in, by flattening, depowering and letting the sail spill wind at the top
- Outhaul;** Don't ease. Releasing the downhaul will give enough extra fullness
- Sheet;** Constantly played. Keeping speed up is more important than flying the telltales. Sail must be eased whilst bearing away in the gusts and sheeted in so that telltales are all flying for the lulls. Never over-sheet as it will slow the boat and encourage the bows to dig in. If the bows do go under, steer straight and ease the sheet a handful or two to release pressure until the bows reappear!

Make sure there is a knot in the sheet to stop the boom going more than 45 degrees forward of the mast. More than this will make it impossible to retrieve in heavy weather & may bend the kicker boom as the control lines are wound around the mast when the boom is more than 180 degrees forward of it.

If you have a sliding seat, the normal position is fully forward to trim the boat level but it can be slid back one notch to re-trim in stronger wind and waves.

The CHALLENGER TRIMARAN ~ TACKING & GYBING

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 and this will only be exaggerated if you steer to turn back up into wind. With the tiller central, the boat will bear away and pick up speed – listen for the wake – and it then can be brought back on course. If the battens won't pop across 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 the 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.

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 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 horizontal.

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.

Heavy Wind (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 flying horizontally.

Running: Pull the sail in as far as possible and turn. As the boom blows across, steer an S-shaped course to counteract the force of the gybe. Let the boom run out 90 degrees being careful not to let the sail fill early, as the force will lever the stern out of the water, reducing steering control and slowing the boat.

The CHALLENGER TRIMARAM ~ CONTROLS

Different to a Mono-hull

- ❖ Multi-hulls 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 gybe. Again, the long narrow hull makes this much more noticeable than in a wider mono-hull boat
- ❖ In all weathers tacks should be smooth but firm, with particular care taken to maintain speed in the second half of the tack
- ❖ 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

Trim, Balance and Course

- ❖ The Challenger is designed so that the crew do not need to move about the boat but, on a beat, 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 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, 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 for maximum speed
- ❖ 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, as they take a long time and you may lose ground to boats that tack less often than you

Centre-board Control

The centre-board is quite large and has considerable drag when lowered. To avoid drifting sideways, 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 centre-board 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 arm up and down and tighten if necessary. The lines should be as tight as possible without any friction drag and it is important that the tiller and rudder are both aligned fore-and-aft. The blade should have no sideways movement in the stock but should pivot up and down easily using the control lines.

The CHALLENGER TRIMARAN ~ BEATING, REACHING & RUNNING

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 & 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 & water flow.

Medium Winds; Pull the boom in over the transom corner but be careful not to over-sheet and stall, when there will be a dramatic speed reduction and you may end up head-to-wind. (*To recover from this see Safety Checks 'when you are sailing'*) Use short tiller movements to luff slightly over the waves and bear away in front of them.

Heavy 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 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, as it is very difficult to get going again if the boat stops.

REACHING

Light Winds; Keep easing out the sail until all the telltales are streaming horizontally. Keep the tiller as central and as 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.

Heavy 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 so that it doesn't try to resist the turn.

RUNNING

Light Winds; Ease out the sail to 90-100 degrees from the centre-line. This should keep the boom out when you heel the boat to windward. Sailing by the lee, 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.

Heavy Winds; Concentrate on surfing down the waves and keeping maximum speed. If the boat tries to bear away, pull 2 or 3 handfuls of sails 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.

The CHALLENGER TRIMARAN ~ TRAILING & ASSEMBLY HINTS

Assembly

- ❖ Fit the mast and boom before attaching the sponsons. Wheelchair sailors can then access the main hull to complete the rigging
- ❖ Keep the front and 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. This ensures that everything is together for assembly and dismantling (*it isn't funny when you get to the Irish Championships and find that the crossbeam bolts are still in England!*)
- ❖ A pair of simple 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 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, the sail carried under the mast between the sponsons
- ❖ Load the mast with the foot at the front end 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 in the boat. That way there is less chance of leaving it behind and it is ready for assembly at the other end.
- ❖ A 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

Further Information

Books

Racing Rules of Sailing	Ref. YR1	Royal Yachting Association
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

Internet

Peterborough Sailability	www.peterboroughsailability.org.uk
Royal Yachting Association, Sailability	www.rya.org.uk
Challenger Class Association	www.challenger-sailing.moonfruit.com
Challenger Builder	www.whiteformula.com

Email

Peterborough Sailability	peterborough.sailability@hotmail.co.uk
--------------------------	--

This booklet has been compiled on behalf of Peterborough Sailability by John J Stokes
Using copyright information kindly provided by the author Richard Johnson