

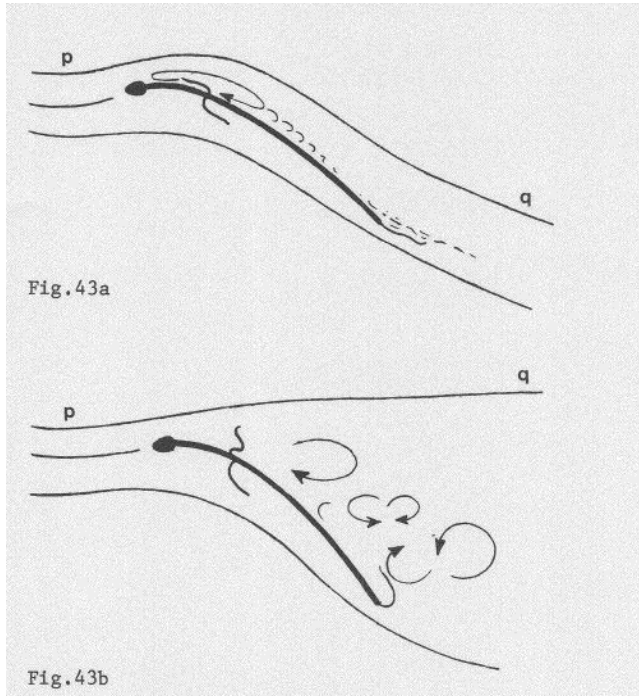
Section V

Sailing off the wind

1 Sail shapes and flow patterns - off the wind

a) Principles

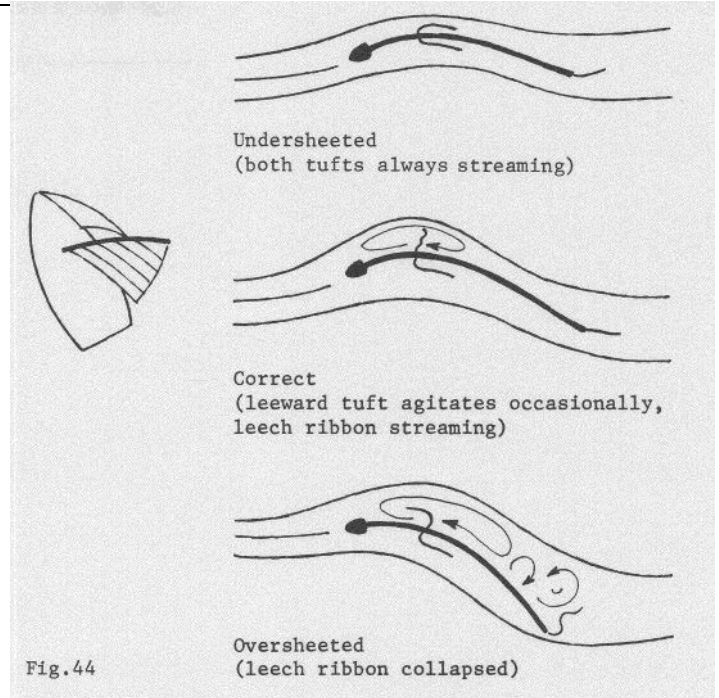
When reaching, it is maximum thrust which is important, and here the leech ribbons come into their own. Fig.43a shows a sail sheeted so that the leech ribbon is still streaming off the leech, but only just. The flow line pq curves around the leeward side of the sail and contributes a substantial suction force to the thrust which is at its maximum at this setting - leech ribbon streaming, but on the point of collapse. What about the drag? The drag is greatly increased but it is not working against the direction of the boat - only against the hiking power of the crew



In Fig.43b the sail has been sheeted in so far that the airflow has separated from the leeward side of the sail. The leech ribbon has collapsed behind the leech. The flow line pq is now blowing straight downwind, not attempting to follow the sail's curve at all. If there is no curve there can be no suction, so the total thrust from the sail has decreased substantially. This sail is said to be stalled.

b) Tuning - CLOSE REACH Settings

The "Close Reach" settings should be used when off the wind, but with the apparent wind forward of the beam. The boat will sail fastest when sheeted so that the leeward tufts usually stream but occasionally agitate (Fig.44). Off the wind, the vang is used only to control mainsail twist. The close reach settings will give a fuller lower and upper main, and increased rotation of the mast will keep the mast aligned with the fuller sail. The jib sheet travelers will be open for the widest possible sheeting angle. The centerboard should be raised "half up".



In light air and flat water, as soon as the leech ribbons won't stream, revert to "one dot" settings to flatten the mainsail.

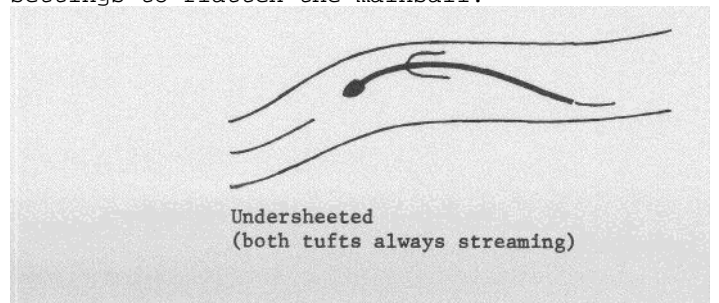
Fastest settings

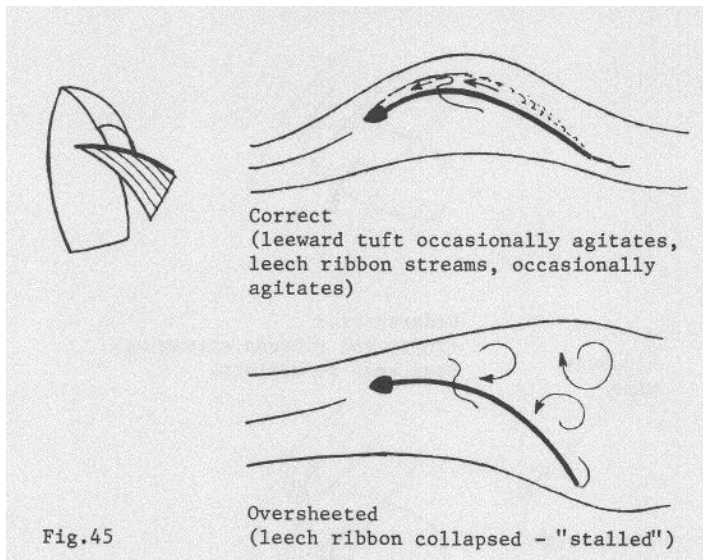
Upper main camber (12%)	1/8
Lower main camber (12%)	1/8
Jib sheeting angle	20%
vang tension Two	dot

c) Tuning - BROAD REACH Settings

"Broad Reach" settings give a yet fuller mainsail. When the apparent wind is on, or aft of, the beam, the boat will sail fastest when the leech ribbons usually stream but occasionally agitate. Adjust twist with vang until the upper ribbons agitate simultaneously with the lower ribbon. (If the uppers agitate first, ease vang; if they lag, tension vang.)

In light air and flat water, as soon as the leech ribbons won't stream, revert to one-dot settings to flatten the mainsail.





Fastest settings

Upper main camber	1/7 (15%)
Lower main camber	1/7 (15%)
Jib angle	20%
vang	Two dot

2 Sailing faster –off the wind

a) Boom vang and leech tension

In virtually all conditions, the lightness of the hull and the ease with which it cuts through the water and then jumps onto a plane means that we can handle, and in fact want, as much power as possible from the rig. We now know that this is obtained with a straight mast and a tight leech to produce the fullest sail. With the vang set at the two-dot position, the mast will be straight but there will be enough tension on the boom to hold the leech tight.

Increasing the tension on the vang will not tighten the leech anymore (it is already tight) but will only bend the mast, flatten the sail and, when sailing dead downwind, put unnecessary strain on the whole rig.

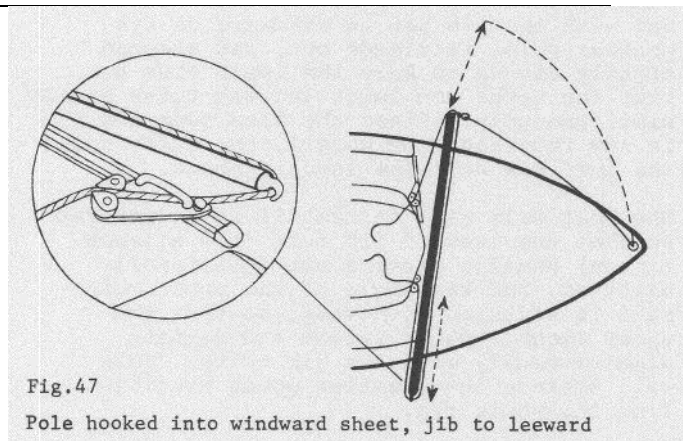
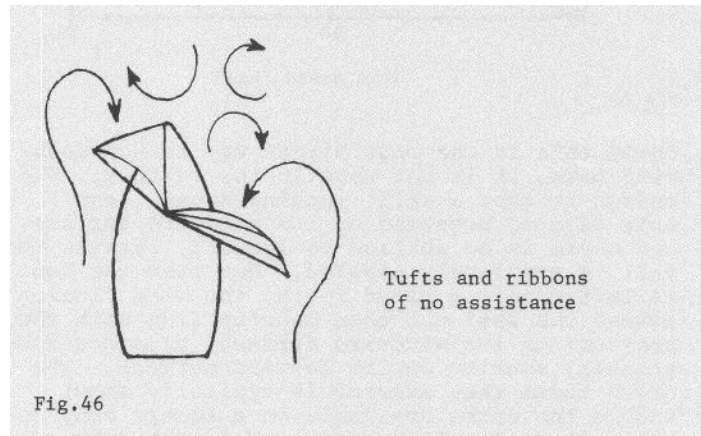
In the event that the two-dot position should become overpowering, the crew should release the tension slightly at which point the leech will start to twist off. However, never let the upper mainsail get beyond the "balance position; trim in the boom to compensate.

b) Booming the jib

A refinement for extra speed when beam reaching or broad reaching in stronger winds is to boom the jib to leeward (this is permissible in the Tasar Class Rules). The method is shown in Fig. 47

d) Tuning - RUNNING SQUARE "Two dot" settings

When Running Square (Fig. 46) the wind is no longer flowing across the rig, and tufts and leech ribbons are useless. When Running Square, use two-dot settings, except that full rotation (to keep the mast locked in rotation the proper way) will be more convenient. Never use severe vang tension downwind in strong winds. The two-dot setting will always be adequate.

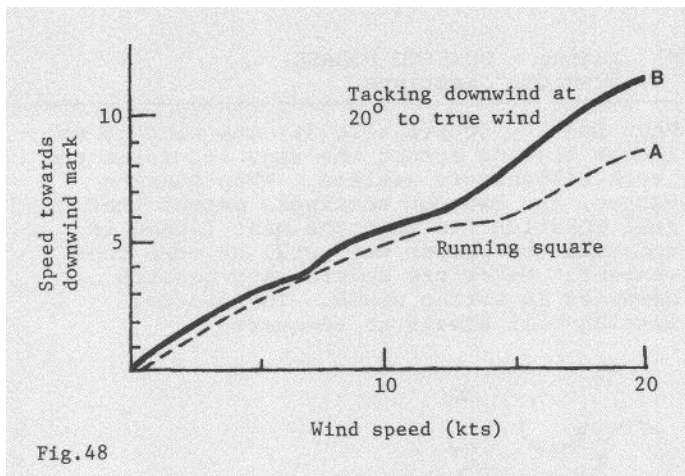


c) Running square or tacking downwind

The fastest way to the downwind mark will combine four factors:

Running square or tacking downwind Sailing the "Headers" Wave riding Sailing the "Channels"

If we assume flat water and a steady wind, there are two ways to run downwind. The first is to set the boom almost square on one side, and the jib on the other, and head straight downwind. Handled this way, the Tasar will sail at the speeds given in curve A, Fig. 48.



While this is the most direct way to the downwind mark, it is not usually the fastest. The reason is that a sail, running square, can only develop pressure on its windward surface, and there is no suction to leeward, because the sail is completely stalled. But when the boat is luffed onto a broad reach, the wind flowing across the sail can then benefit from both the pressure on its windward surface, plus the substantial suction on its leeward surface. The drive force then exerted is typically about double the force available on a square run, so the boat will sail faster, and if the extra speed more than makes up for the extra distance sailed, you're ahead.

d) Tuning - TACKING DOWNWIND
) Settings

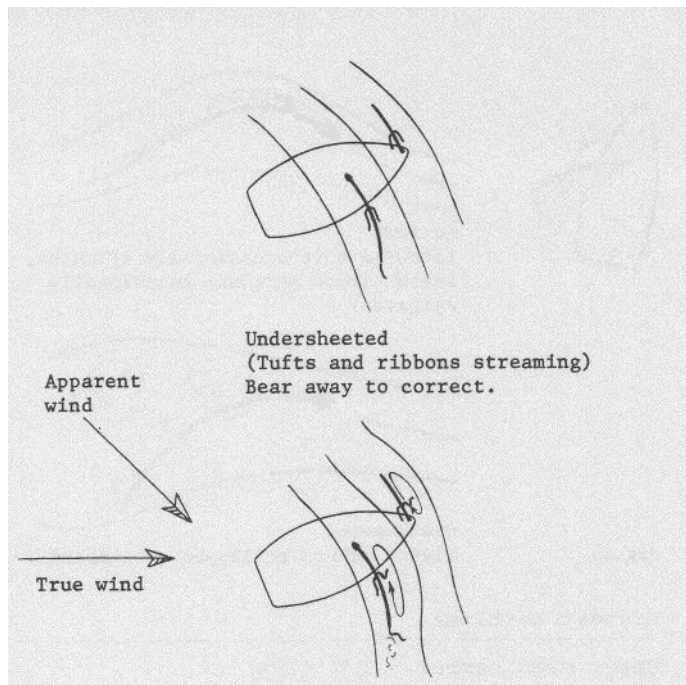
Tacking Downwind uses Broad Reach settings, but with the jib set to windward on its whisker pole, fairleads out, and sheeted tightly enough to keep the leech firm so that the upper and lower leeward tufts stream simultaneously. Since the flow over the jib is now reversed from normal, the tufts near the luff now act like leech ribbons.

The boat will sail fastest if it is steered so that the leeward jib tuft (now a leech ribbon) usually streams but occasionally agitates, and the angle of the upper main- sail is adjusted with vang, so that the upper leech ribbons stream and agitate simultaneously with the jib tufts. This will achieve the greatest power possible from the whole rig.

Luff no more than is necessary to make the tufts and ribbons stream. As the wind blows across the sails, the boat will accelerate, the apparent wind will move ahead and it will be possible to bear away several degrees and still maintain the cross-flow indicated by the streaming tufts and ribbons. The final heading will be about 20 from directly downwind.

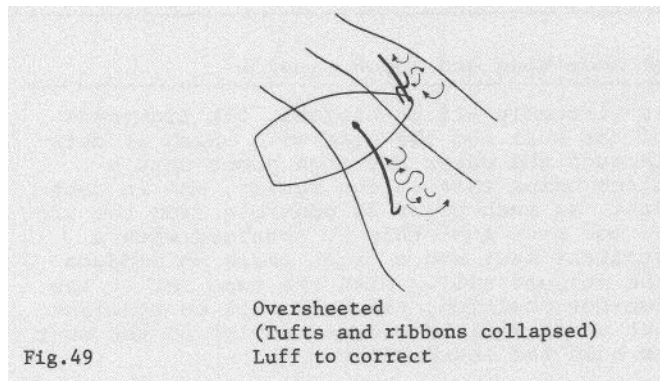
In light air and flat water, as soon as the leech ribbons won't stream, revert to one dot settings to flatten the mainsail.

Note: Never use severe vang tension downwind in strong winds. Always use two-dot setting



Correct (Tufts and ribbons stream, but sometimes agitated) Adjust upper main with sheet and/or vang until main leech ribbons stream or collapse at same time as jib tufts, then steer for streaming with occasional agitation.

Note: Tufts near jib luff now act like leech ribbons.



Fastest settings	
Upper main camber	1/7 (15%)
Lower main camber	1/7 (15%)

This technique calls for the boat to be sailed downwind responding to each minor variation in the wind exactly as when sailing to windward. Gybe through about 40 from time to time to reach the downwind mark. See section e.

When it is handled this way, the Tasar will approach the downwind mark at the speeds given in curve B, Fig.48.

In practice, when tacking downwind in light airs, the boat will sail fastest with the leeward stay slid forward, the boom far out,

vang slack, and the upper leech well forward of the mast. As the wind increases, maximum speed will be maintained if the mainsail is trimmed progressively towards the balance position, and at all wind speeds stronger than about 12 knots the balance position will be fastest. (Both stays back, vang firm but not tight, upper mainsail at right angles to the center line, and boom aft as far as necessary to achieve this.)

Several points emerge from Fig.48. First in a steady wind and flat water, the Tasar tacked downwind should always beat the Tasar which runs square. Secondly, the Tasar which runs square benefits from only one "kink" in its speed curve - it needs winds of 16 knots or more to plane the boat cleanly at speeds of 7 knots or more. Third, the tacking boat benefits from two kinks of its speed curve. When the wind speed exceeds about 7 knots, the apparent wind exceeds 3 knots and laminar separation ceases to be a problem and the sails can push harder. As soon as the wind exceeds 12 knots, the boat begins to plane fast and cleanly.

e) Gybing in the lifts

In Fig.50 A, B and C are three Tasars all tacking downwind on starboard tack at 20° to the wind which, let's say, is initially blowing directly towards the leeward mark. All tufts and ribbons are streaming. At point 2 there is a 10 shift which 'lifts' all three boats. Boat A notices that her tufts have collapsed (i.e. the sails have stalled), gybes onto port and gets her tufts flowing again. B does not notice the shift and sails on with sails stalled.

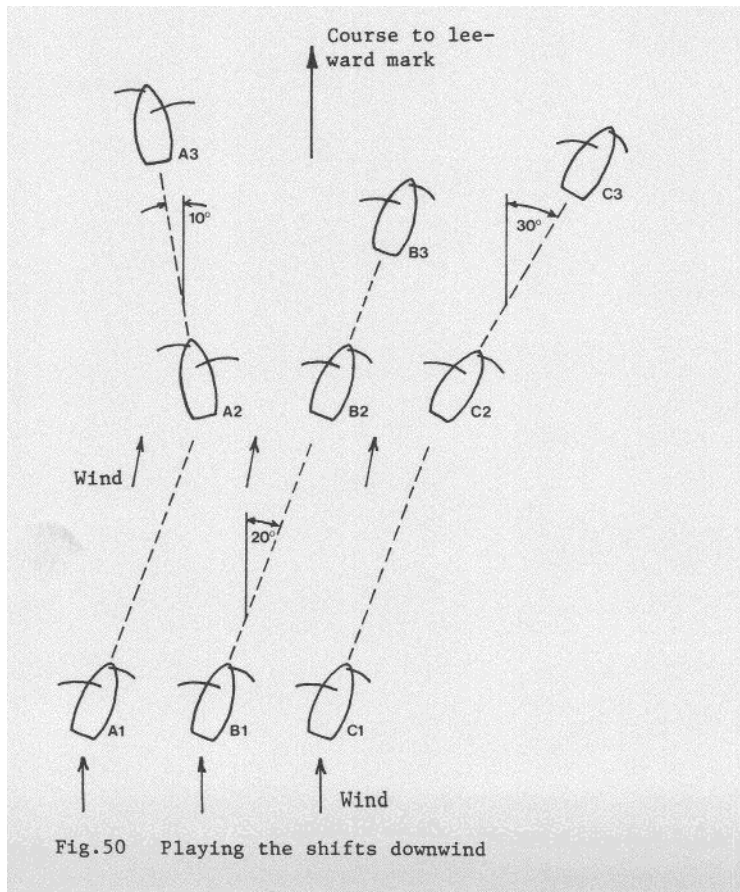


Fig.50 Playing the shifts downwind

C, noticing her tufts stalled, luffs 10° to get her tufts streaming again. The net result is that A and C are now both sailing at the same speed, both sailing faster than B and A's course is only 10 off the leeward mark and C's is 30 The moral

is that there are just as many shifts downwind as upwind.

A boat tacking downwind is also immune from cover, if for no better reason than that a gybe will put the coverer in your wake. So, with the extreme maneuverability of whisker pole and no spinnaker, the technique of tacking downwind spells the end of dreary processions to the downwind mark. Instead the Tasar skipper can tack away, sailing fast, escaping cover, and looking for favorable shifts and channels and waves. So sailing your Tasar downwind will reward wit and skill, just as much as sailing it to windward.

(Often there are channels of stronger and lighter wind every few hundred yards, aligned up and down wind. A boat which finds and tacks back and forth within a channel will sail downwind faster than any other boat.)

f) Wave riding

Fig.48 indicates that in most winds a boat will run downwind at about half the wind speed. The waves will therefore usually be traveling a little faster than the boat, and it is possible with skill to "catch" wave after wave and be carried along with each one, riding its forward face like a surfboard, and thus substantially increasing average speed. However, as the Tasar "loses" the previous wave, its speed will reduce sharply as the bow rises and the boat lies "uphill" on the retreating "back" of the last wave. The technique, therefore, is not to stay on the face of the wave until you lose it completely but rather, before this happens, the boat should be luffed smoothly but quickly to avoid sailing in the "uphill" water where too much speed is lost. Every effort should be made to maintain speed; sitting out hard and a couple of quick "pumps" on the mainsheet can achieve wonders, and are all legal. It is at this instant, whilst the boat is more crosswind, and therefore reaching, that the maximum effort should be made to accelerate quickly. The boat can then be turned smoothly downwind as the next wave begins to lift the stern. A couple of final smooth powerful "pumps" at this instant will match boat speed with wave speed well enough for the wave to pick up the boat and carry it for whatever distance that wave is good for.

All of the above discussion also applies to a boat on a reach with the exception that you are closer to the wind so speeds are higher on the "downhill" side of the wave. Once again -do not try to "milk" the wave for all its worth; while you still have maximum speed luff slowly, hiking hard, and traverse across the downhill side of the wave until you pick up the next crest and once again bear off on that one for maximum speed. On most reaching legs you will find your course takes you below the mark as you go down the wave and above it as you traverse.