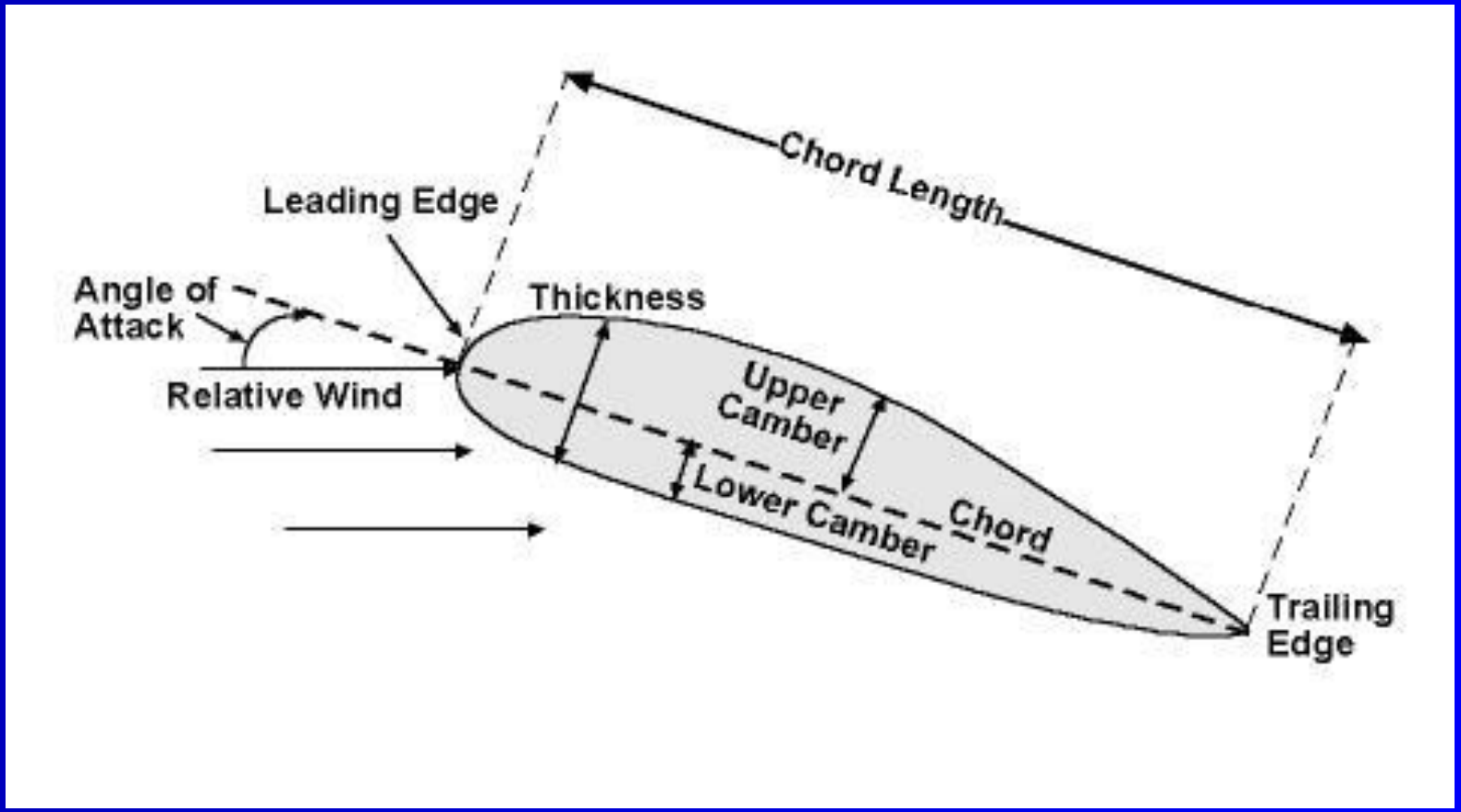
Everything You Always Wanted to Know About Wings and Sail Trim

And Don't Be Afraid to Ask…..

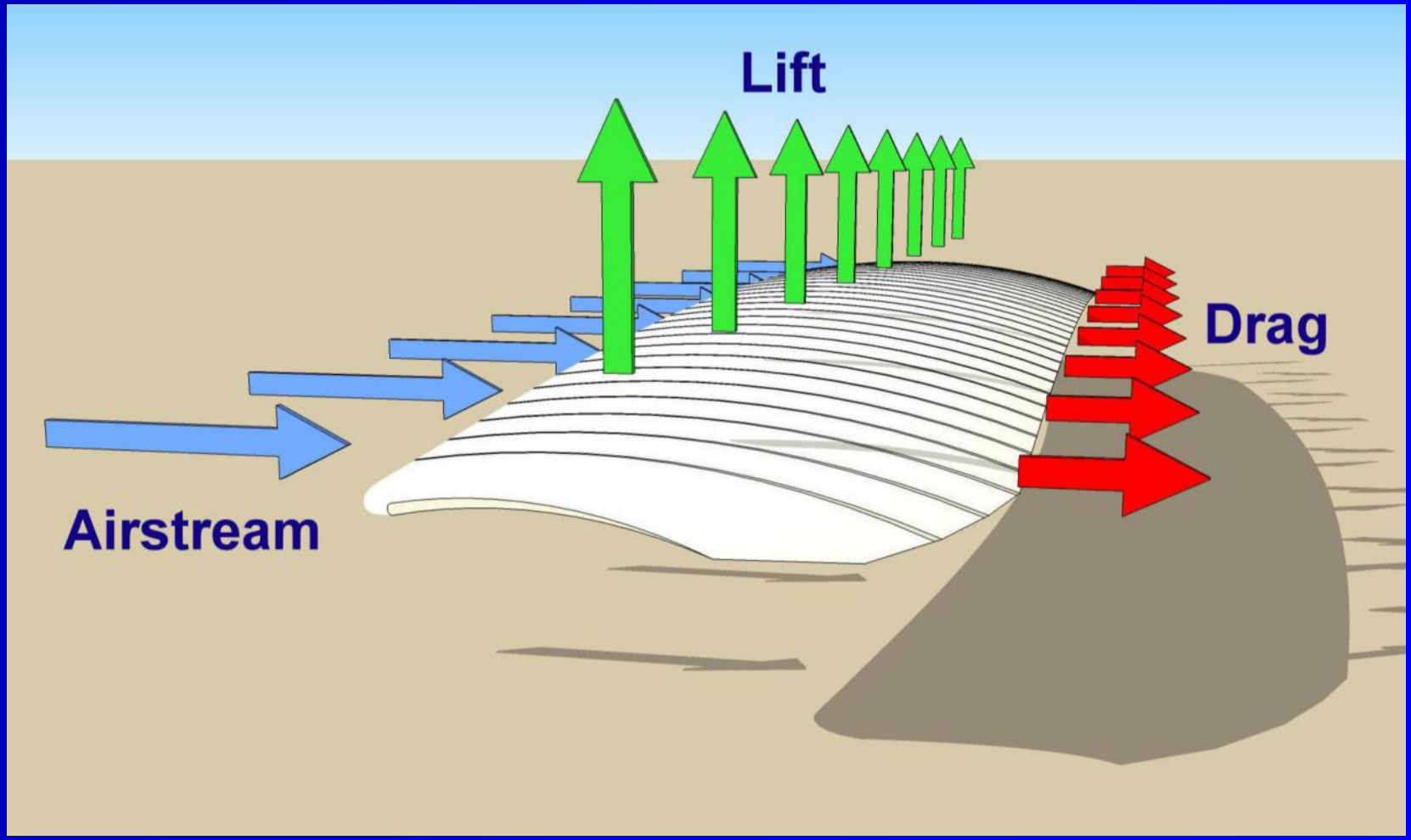
Huh?

- Wings – The Fat and the Skinny
- Upwind Sailing
  - Headsail Trimming
  - Mainsail Trimming
- Downwind Sailing
- Takeaways
- Practice Scenarios…

Parts of a Wing



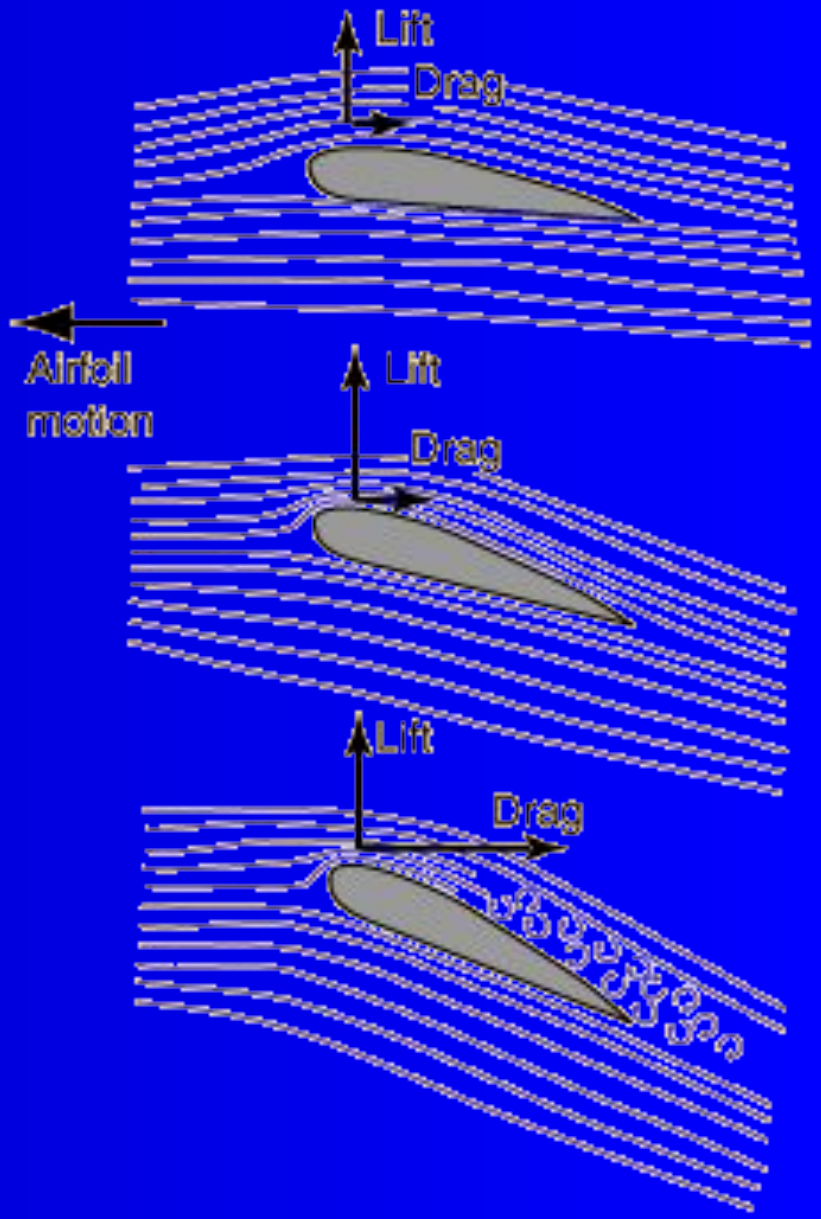
How Does a Wing Work?



What is Stall?

When the angle of attack of a wing is increased the amount of lift increases. The drag also increases – that is the cost of greater lift.

At a certain angle of attack, the "laminar" (smooth) flow over the top of the wing starts to separate from the wing. This is "turbulent" flow and it significantly decreases lift and increases drag.



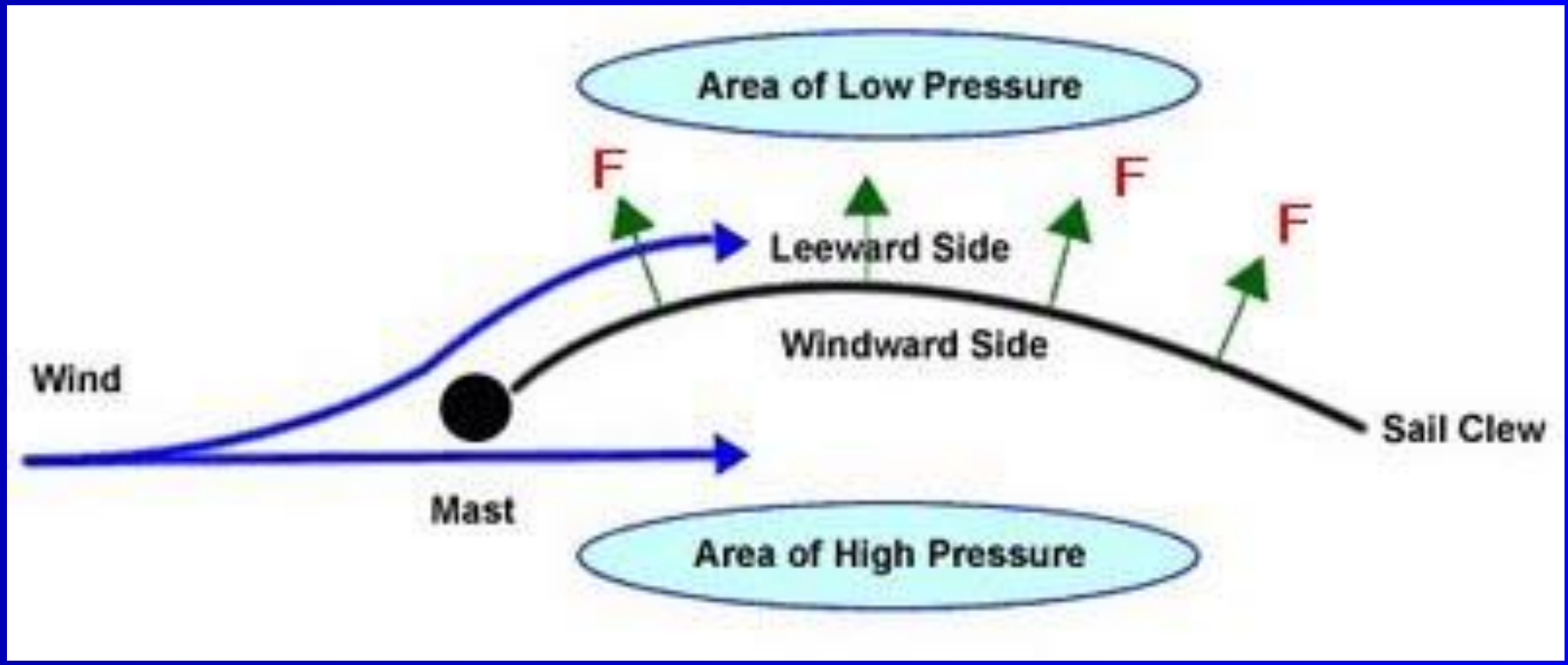
Fat Wings

Fat wings provide a lot of lift at low speeds, and do not “stall” easily. The price: lots of drag.

Skinny Wings

Skinny wings provide lift at high speeds with less drag. However, they are more prone to stall.

How is a Sail Like a Wing?



Sails can stall just like an aircraft wing – this happens when you over-trim. Likewise, when you let a sail out too much you get an angle of attack of zero and very little lift.

Some people think a wing is a sail…

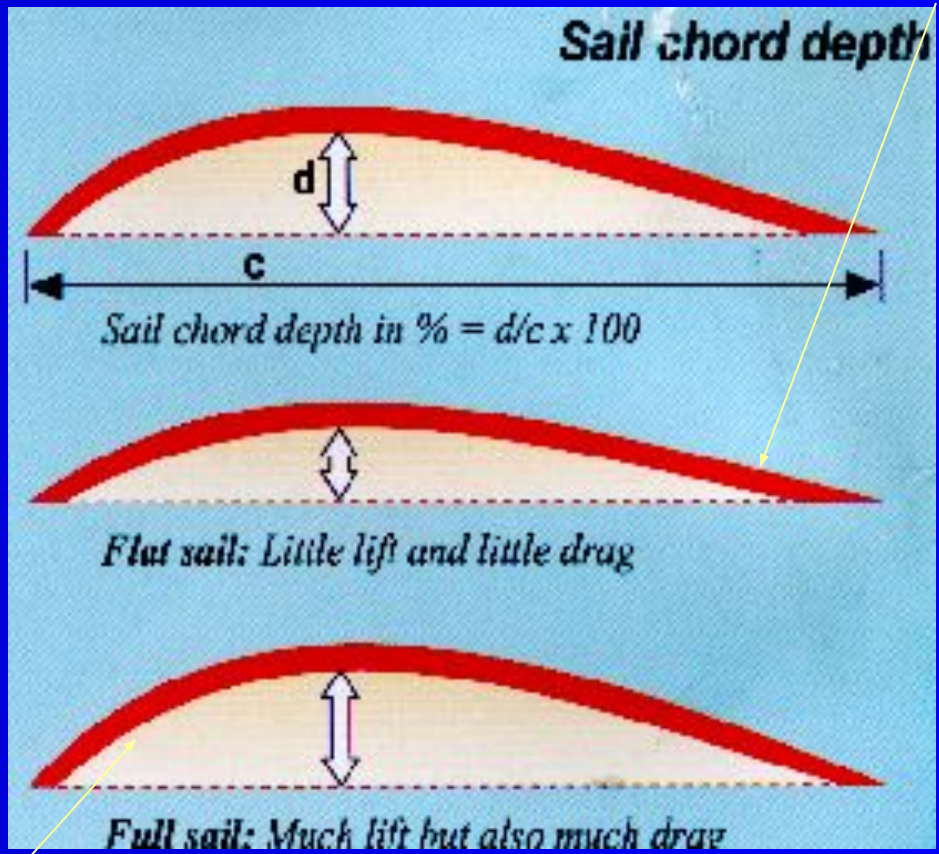
Trimming Sails? Think:

- Depth
- Draft position
- Entry shape/angle
- Twist
- The Slot

Depth

Hey look, a skinny wing

- Decreased Depth – less power, less drag (good for high speed) (TIGHTEN Forestay)
- Increased Depth - more power, more drag (good for acceleration) (EASE Forestay)

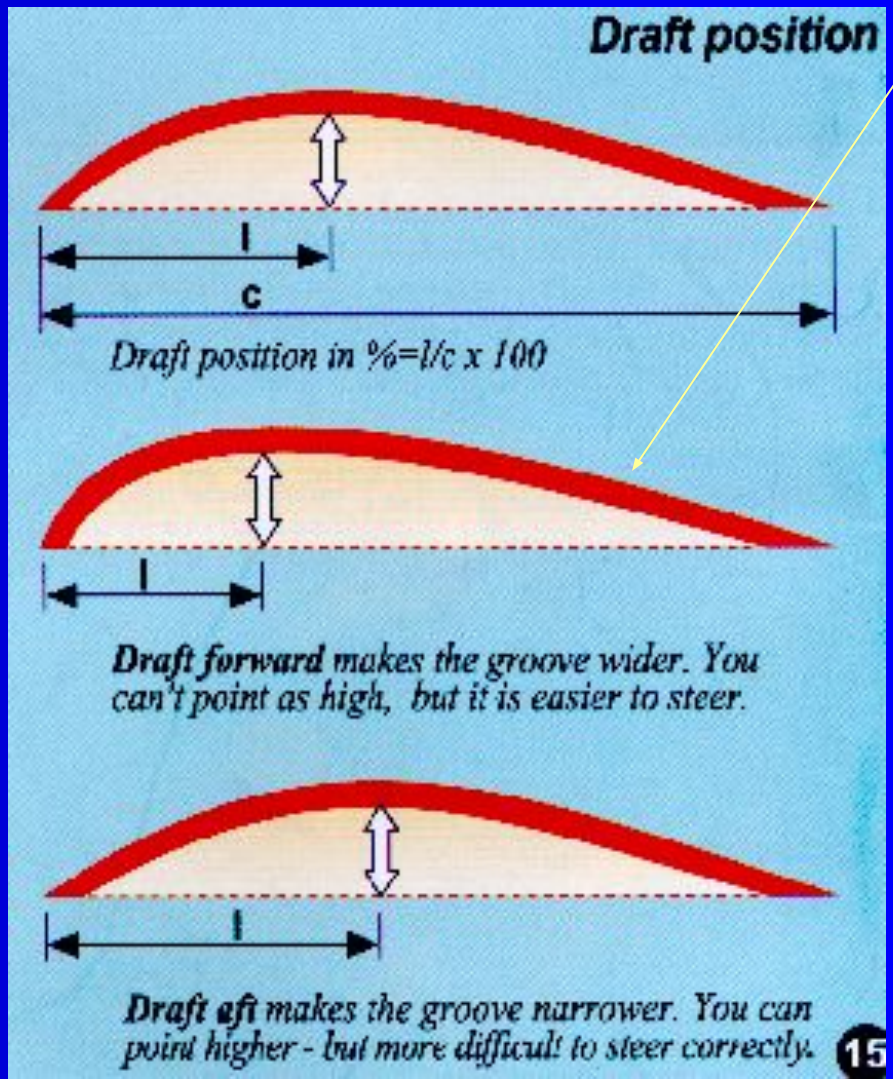


Hey look, a fat wing

Draft Position

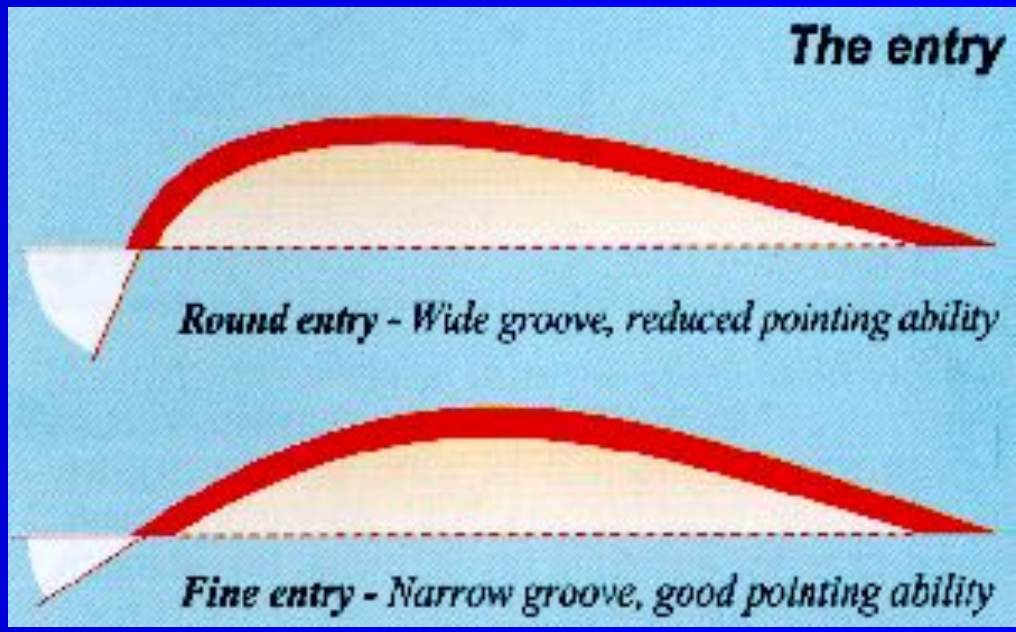
Hey look, a fat wing

- Draft Forward – sail is forgiving (no stall) and easy to steer, but poor pointing (good for lumpy conditions) TIGHTEN HALYARD
- Draft Middle – good pointing and speed (good for flat water) EASE HALYARD
- Ideal position 40-50% aft



Entry Shape/Angle

- Round entry means a wide groove, useful when steering in big waves, in heavy traffic at start lines, or when training new people at the helm
- Narrow Entry Angle needed for best pointing

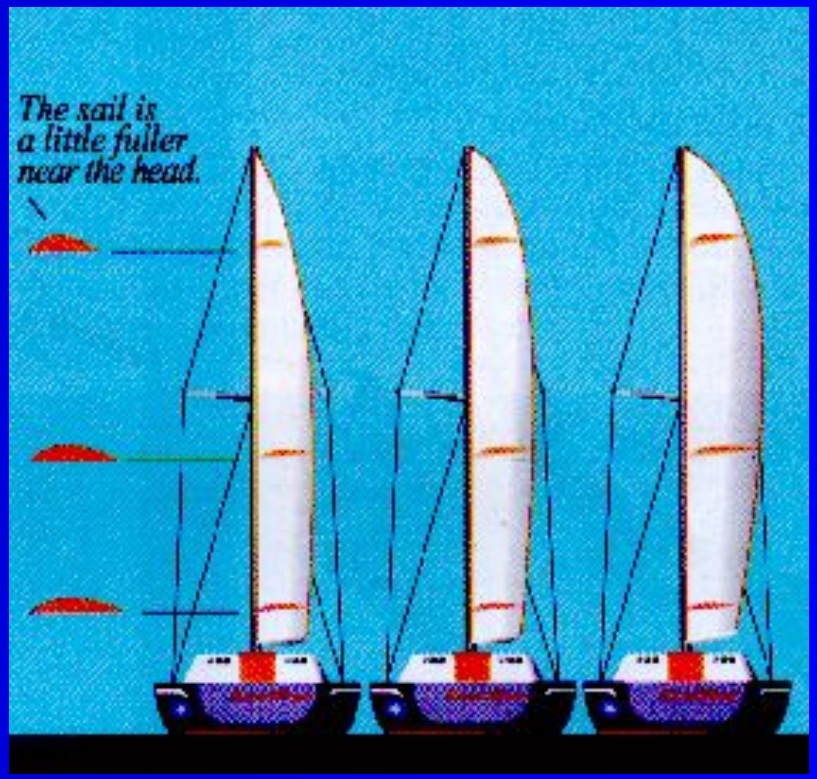


Twist

- Bottom of sail is trimmed in more than the top of the sail

- Works in conditions of wind shear, when you need acceleration,(start lines, lumpy seas) or when it's blowing the dog off the chain.

- Twist reduces heel
- Twist reduces pointing and maximum speed

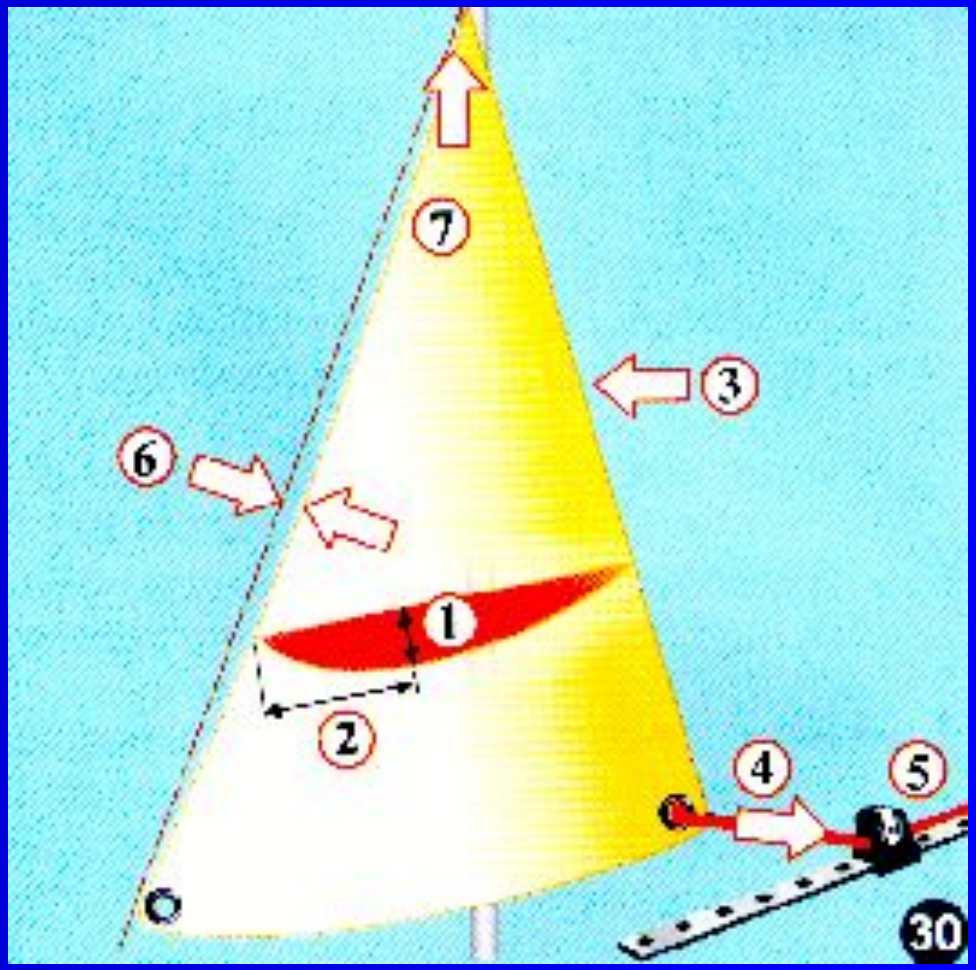


When to Use Twist – Example

Sailing Upwind - Headsail

Headsail Trim Control

- Sheet Tension (affects twist)
- Sheet Lead Position (affects twist and depth)
- Halyard Tension (affects draft position)
- Forestay Tension (affects depth)

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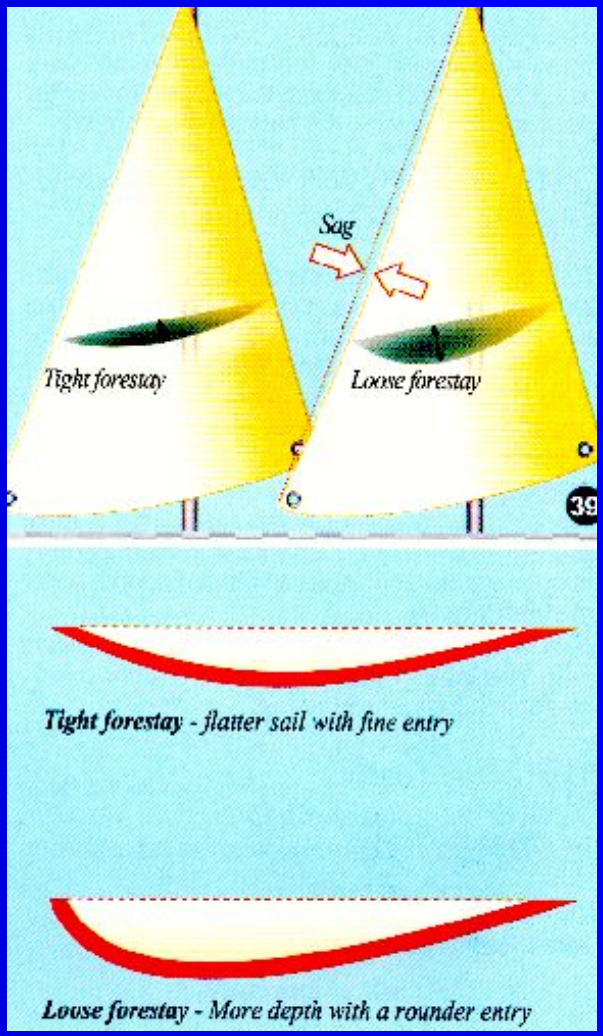
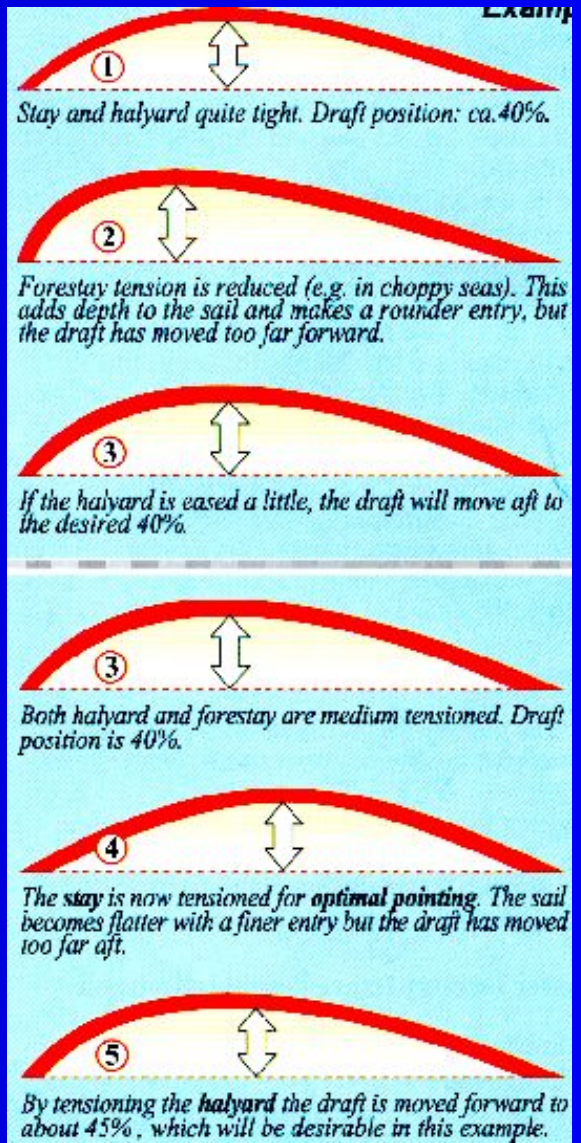
Effect of Forestay Tension

- Forestay tension affects both depth and entry of the headsail
- A tight forestay is needed for pointing, but this will create a narrower groove, and less power.
- A looser forestay will make for a wider groove, but limit pointing and speed



Forestay/Halyard Interaction

- The forestay and headsail halyard are often adjusted in unison



Headsail Lead Position

Top telltale luffing (inside telltale fluttering) - move lead forward

Top telltale stalled (outside telltale fluttering or hanging) - move lead aft

Check the Headstay Sag

This involves sending someone who knows how to check up to the bow. They sight up the forestay and check the distance between the middle of the forestay and an imaginary straight line from the tack to the head. Headstay sag should not be more than 2-3 inches on a 30’ boat, perhaps 3-4” on a 35’ boat, and 4-5” on a 40’ boat.

Sailing Upwind - Mainsail

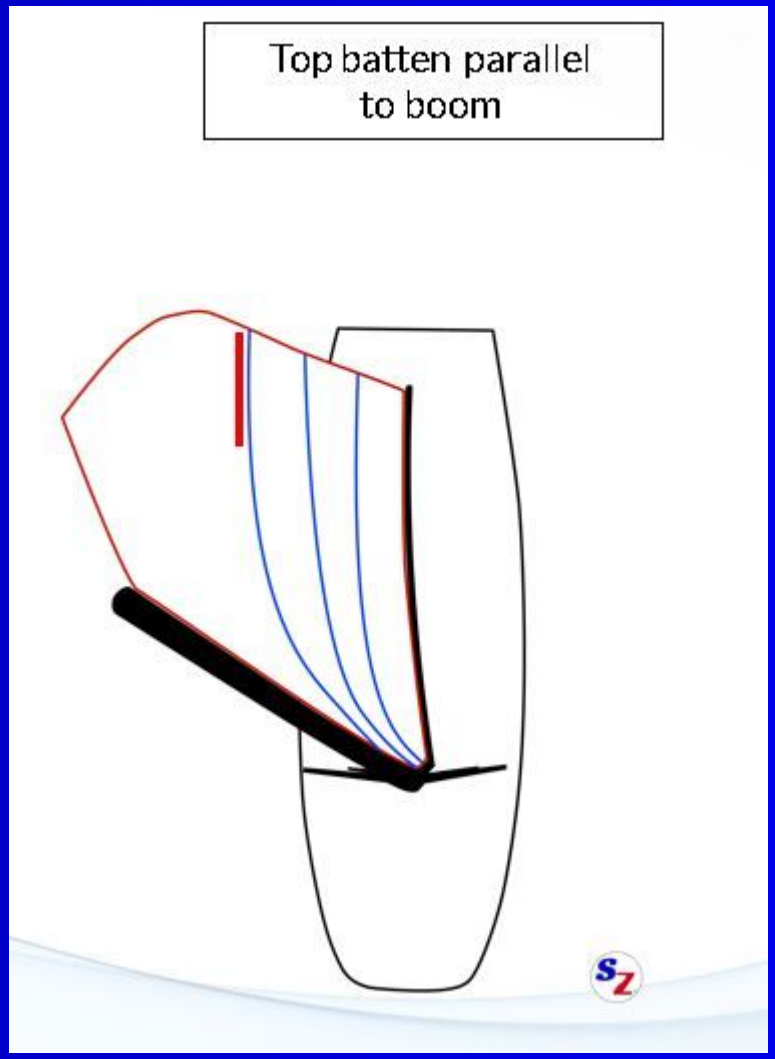
Mainsail Trim Variables

- Sheet Tension (affects twist)
- Traveller Position (affects entry angle)
- Outhaul Tension (affects depth in lower part)
- Vang Down (Up?) (affects twist)
- Cunningham Tension (affects draft position in lower part)
- Halyard Tension (affects draft position)
- Backstay Tension (affects depth in upper middle and twist)
- Boom Position (affects slot and angle of attack)

General Rules of Mainsail Trim

- Adjust halyard to just remove horizontal wrinkles
- Adjust outhaul for depth suitable for conditions
- Adjust sheet tension (or vang) so the top batten is parallel to the boom
- Adjust traveller, generally start with the boom on the centre line and ease down a bit if the boat is heeling too much. Adjust sheet tension again to get the telltales flying (top one most of the time)
- Check draft position, adjust halyard/cunningham for conditions (maybe)

Top Batten Parallel to the Boom



Mainsail Trim Progression

Wind	Seas	Traveller	Outhaul	Vang	Cunn	Halyard	Backsty	Boom
Drifting	Flat	Full Windwrd	Medium	Support Boom (Up)	Eased	Min	Min	Below Centre
Light (2-6 kts)	Flat	Full Windwrd	Tight	Support Boom	Eased	Min	Medium	Centre
Light /Med (6 – 9 kts)	Flat	Adjust for Top Batten/Centre Boom	Tight	N/A	Eased	Min	Medium	Centre
Light /Med (6 – 9 kts)	Lumpy	Above Centreline	Ease	Hand Tight	Eased	Tight	Min	Centre

Mainsail Trim Progression

Wind	Seas	Traveller	Outhaul	Vang	Cunn	Halyard	Backsty	Boom
Medium (10-15 kts)	Flat	Centre or Below	Tight	Hand Tight	Eased	Min	Min	Boom Below Centre
Medium (10-15 kts)	Lumpy	Below Centre	Medium	Hand Tight	Tight	Tight	Tight	Boom Well Below Centre
Med/ Heavy (15 – 20 kts)	Flat	Max Ease	Max	Hand Tight	Medium	Medium	Tight	Well Below Centre
Med/ Heavy (15 – 20 kts)	Lumpy	Max Ease	Medium	More than Hand Tight	Mediu m	Medium	Medium	Ease for Twist

Goals in Sea/Wind Conditions

- Very Light – Keep Moving!
- Light – Best speed, point in the puffs
- Light/Med/Flat Seas – Point high
- Light/Med/Lumpy Seas – Consistent Speed
- Med/Heavy/Flat Seas – Point high
- Med/Heavy/Lumpy Seas– Steering control, Consistent Speed

Example – What Do You Notice?

Sailing Upwind - Both Sails

The Slot

- Vertical gap between headsail and main
- Size of the gap affects of air flow on inside of headsail and the back of the main
- Important to keep slot as big as possible to prevent excessive backwind on main. This is important any time the traveller must be eased.
- Keep the bodies out!

Wind Shear

- Wind shear exists when the wind aloft is a somewhat different direction from the wind at water level.
- Very common in light air or transition zones.
- When this happens, you will need different trim (headsail lead position, main sheet and traveller) on one tack than the other.

Drifting Conditions

- Move headsail sheet leads full aft (create twist)
- Support boom if possible (vang or topping lift) to help twist the main
- Don’t try to point high, keep sheets eased until you’re moving
- Ease backstay.
- Once moving, reduce twist a little. Check boatspeed and increase twist again if the boat slows.

Choppy Seas

- Ease forestay a little (more depth for acceleration)
- Tighten halyards (rounder entry for easier steering)
- Ease outhaul (more depth for acceleration)
- Increase twist (better acceleration)

Its BTDOTC and Overpowered

- Lots of Halyard Tension
- Lots of Forestay Tension (Max Backstay)
- Max outhaul, cunningham
- Twist main and keep slot open by keeping traveller in the centre (or even higher!) and easing sheet a little. Control twist with vang (vang-sheeting).
- Twist headsail by moving lead aft, and/or easing sheet a little to keep slot open
- Move headsail lead position outboard if possible

Before the Start

- Twist headsail by moving leads aft
- Twist main by easing sheet
- Increase depth by easing outhaul on main, forestay on headsail
- Move draft forward by keeping halyards tight (remove horizontal wrinkles)

Shortly after Start

- Increase outhaul to flatten main, decrease drag, improve pointing
- Increase forestay tension to reduce depth, improve pointing
- Increase headsail sheet tension to reduce twist
- Increase mainsheet tension to reduce twist
- Move headsail lead forward to normal position

Sailing Downwind

Downwind

- Ease outhaul, halyards, backstay
- When sheets are eased, both the headsail and main instantly develop TWIST!
- Use a barberhauler or move the lead position forward and outboard to reduce twist in the headsail
- Use vang down to reduce twist in the main so all telltales fly
- In light air, support the boom with vang or topping lift to get some twist.

Downwind with Spinnaker

- Displacement boat - unless very light wind, usually better to sail deep and trim pole back. Use VMG to find best angle if equipped.
- Easily driven/planing boat - usually better to sail a slightly higher angle and increase speed. Use VMG.
- Pole height/aft position is crucial, adjust often if racing.

What Else Is There?

- Reaching/Broad Reaching – use a barber-hauler or other method to move the headsail lead position forward (and outboard if possible) to reduce twist when the sheet is eased. Usually this is done with a spare sheet through a block on the toe-rail.
- Upwind In-haulers - are becoming popular. You need a powerful sail plan, or lots of wind, to make them work, but they do work.

Barberhauler

Inhauler

What Else Is There?

- Before the start, around corners, in big waves – set the boat up for maximum acceleration (ease outhaul, ease backstay, ease halyards, twist the main, headsail cars aft)
- After the start – set the boat up for best pointing and speed depending on conditions
- Don’t have a backstay? Trim the mainsheet in harder than normal so the top telltale is just flicking now and again.

Takeaways

- Most boats are sailing with too much halyard tension. This makes steering easy but pointing difficult and lowers speed because of the rounded entry. Consider easing both main and headsail halyards until the horizontal wrinkles just start to show.
- Sail upwind before the start to set the correct amount of forestay sag using the backstay.
- Use the mainsheet and traveller to put the boom on the centreline with the top batten parallel to the boom and the top telltale flying most of the time.

Takeaways

- Twist before the start, untwist afterwards
- Windshear: trim for some twist on one tack, and zero twist on the other.
- Good trim makes good boatspeed. Good boatspeed makes you look like a tactical and strategic genius!

What do you notice?

What do you notice?

What do you notice?

Scenario 1

- It’s blowing 12-15 kts, and you have just come out of the flat water in the harbour into choppy seas outside Protection Island. You are pointing well but your competition seems to be going a little faster. What adjustments will you make?

Scenario 2

- It's moderate breeze and flat water just after the start, and a boat is trying to squeeze up under you from the leeward side to force you to tack away. You need to point as high as possible. What adjustments will you make?