

Smart Series



Craig Cobbin - Professional Sailing Coach.

25 years international professional coaching experience.

Australian Open 470 Champion.

British Open 470 Champion.

Australian Team Racing Champion.

Training Partner- Merricks/Walker British 470 Olympic Silver medalists.

Professional coached at 26 Olympic class, Youth World Championships in Europe, Asia, USA, Australia & Middle East.

10,000 Ocean miles as skipper. Crossed Atlantic & Pacific Oceans.



Calum Gregor/Hugo Christensson (HKG-54857) - lead 420 Open 2015 420 World Championships

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- Predicting wind shifts.
- Sail Trim.

Moments of Truth —

Big Fleet Championships



2023 Star World Championship © Martina Orsini

Months before- Putting together equipment – hull/mast/sails.

- Are you/crew the correct weight for boat design? Hours on water?
- **Race day** – Do you **understand what is causing the wind(fuel)?**
- **1 hour before start.** Tune rig to wind/waves, checking speed/height with reliable tuning partner.
- **Start** – Did you get a clear air start, gap to leeward?
- Could you **hold your lane** until you wanted to tack?
- **1st Tack** – Did you tack at the right time?
- **2nd Tack** - Did you tack at the right time?
- If you did all above you will be in top 10-15% at the first mark, in the hunt.

“Sailing is a simple sport”

Mike Fletcher (Fletch) Olympic Coach



- 80–20 rule from business; 80% of profits come from 20% of customers.
- Don't overcomplicate it.
- With limited time for sailing, you improve fastest focusing on things providing 80% of performance.

Predicting shifts: understand what is causing the wind

Avoid “*Local knowledge*” in championships as it is sometimes misleading.

“Its’ never like this....”

1. Physics of wind is the same globally, except that northern hemisphere opposite to southern.
2. Seek **raw data**; forecast & real time. Make a prediction.
3. Monitor on water, review at day’s end—Why did the wind do this?

Micro-Meteorology is not an exact science; 80-20 rule.





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Micro-Meteorology is a big body of knowledge – we touch basics.

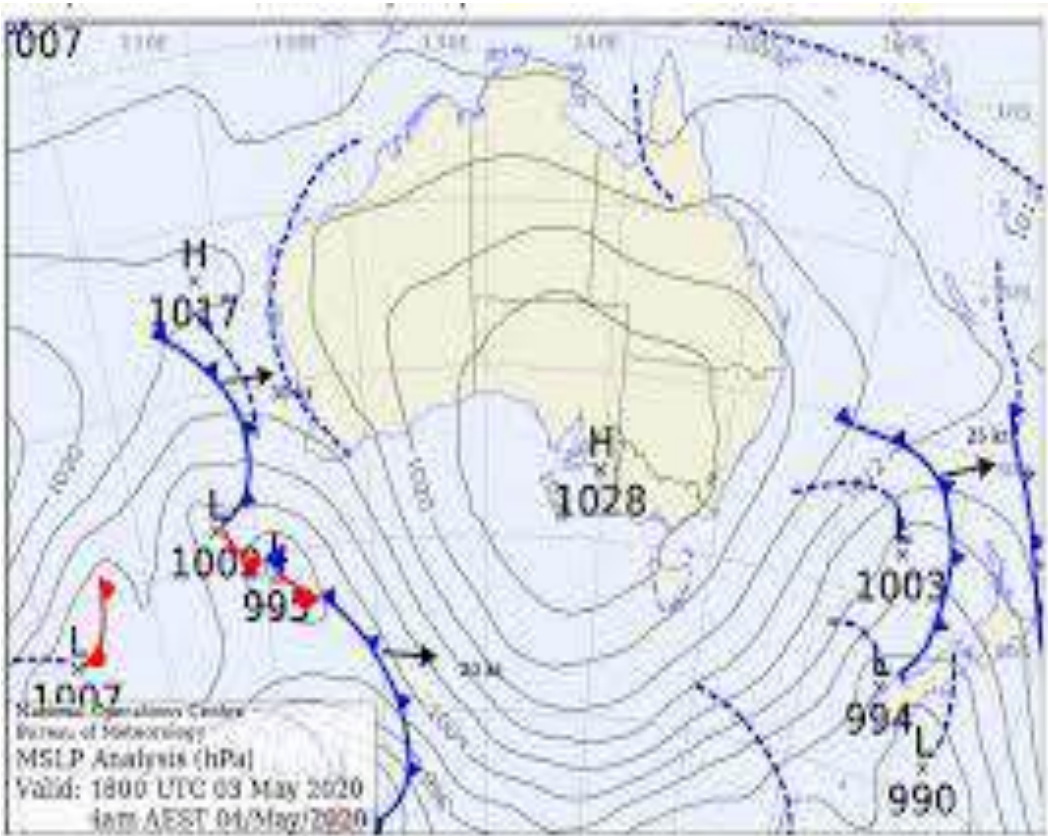
- 3 main causes of wind -
They combine into one

Look at them separately first :

- 1- Gradient Wind — Mean Sea-Level Pressure Analysis. (weather map)
- 2- Thermal wind.
- 3- Rain Cloud wind.

They combine into one wind.

Upper level winds mixing with surface as air rises, falls we will skip today.(It's a 20%er).



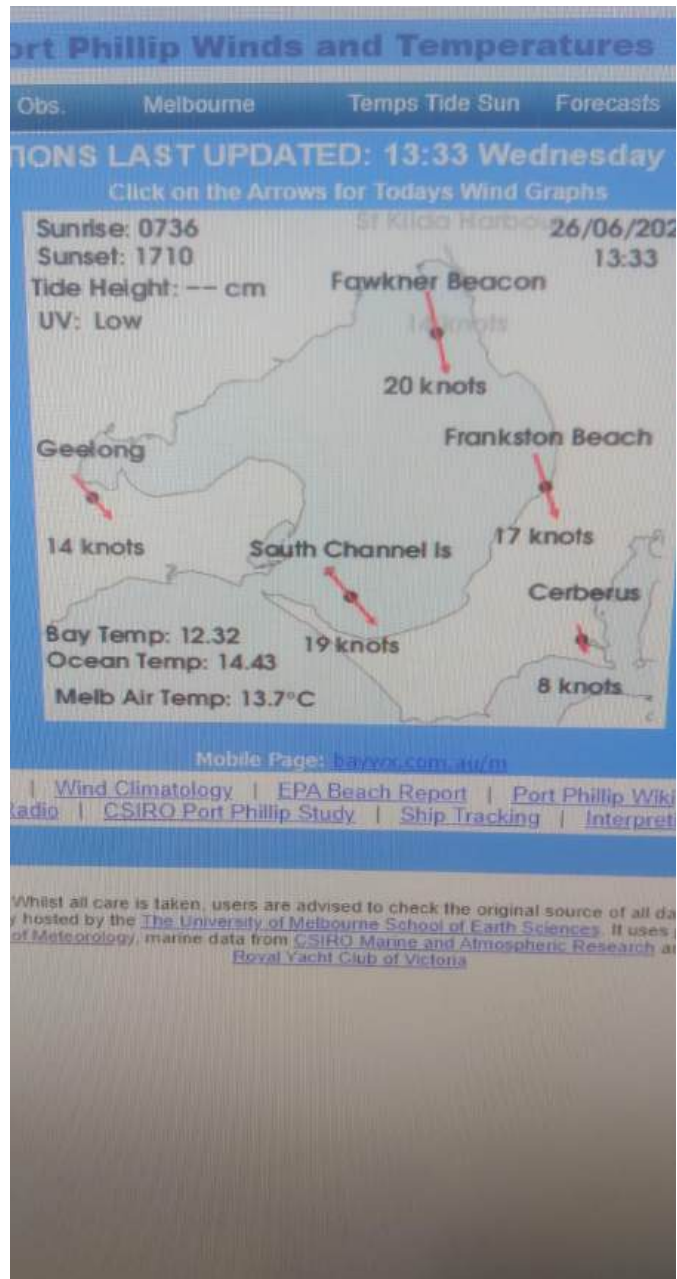
Data collection.

Gradient wind.

1. Surface pressure gradient - Weather map on BOM.

www.bom.gov.au/australia/charts/

2. Barometer; real time pressure reading. Check where you are on map real time as BOM is often hours old.



Real time data – test against forecast

www.baywx.com.au – Real time wind & temp data away from land effect.

Look out the window at sea, sky, flags, ships.

Raw data so can gain an understanding of what creates & changes wind, make your own predictions - test them, learn.

Marine traffic app. Check nearby ship's real time wind instruments.

2. Thermal wind - “Sea & Land” Breezes

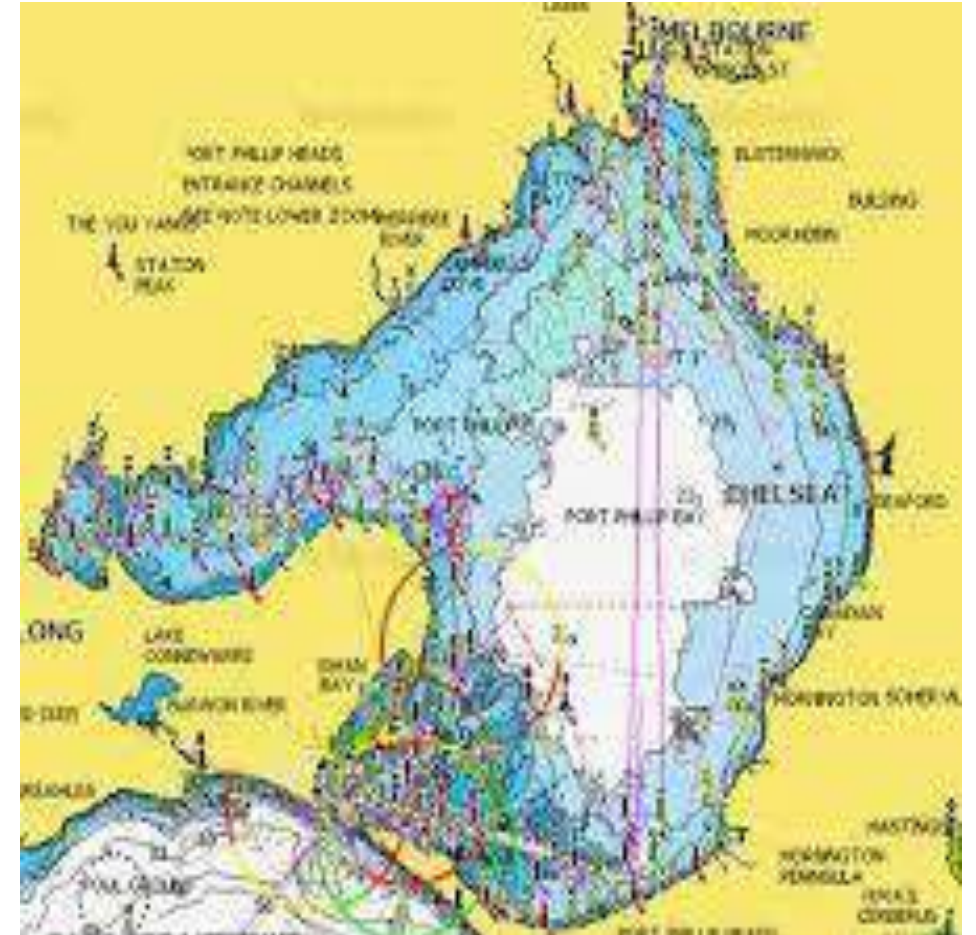
- Wind caused by a difference from land to sea temperatures.
- Venues have different geography, water temps.
- Real time land & sea temps available online. Olympic teams used to measure water temp with thermometers.
- Altona different to Brighton shoreline geography.
- Nautical chart of venue.
- Land, sea temperature, both real time & forecasts.

Port Philip (whiteboard).

San Francisco.

Hong Kong.

Sea and land breezes usually start/end about 90 degrees to local shoreline.



3. Rain Clouds

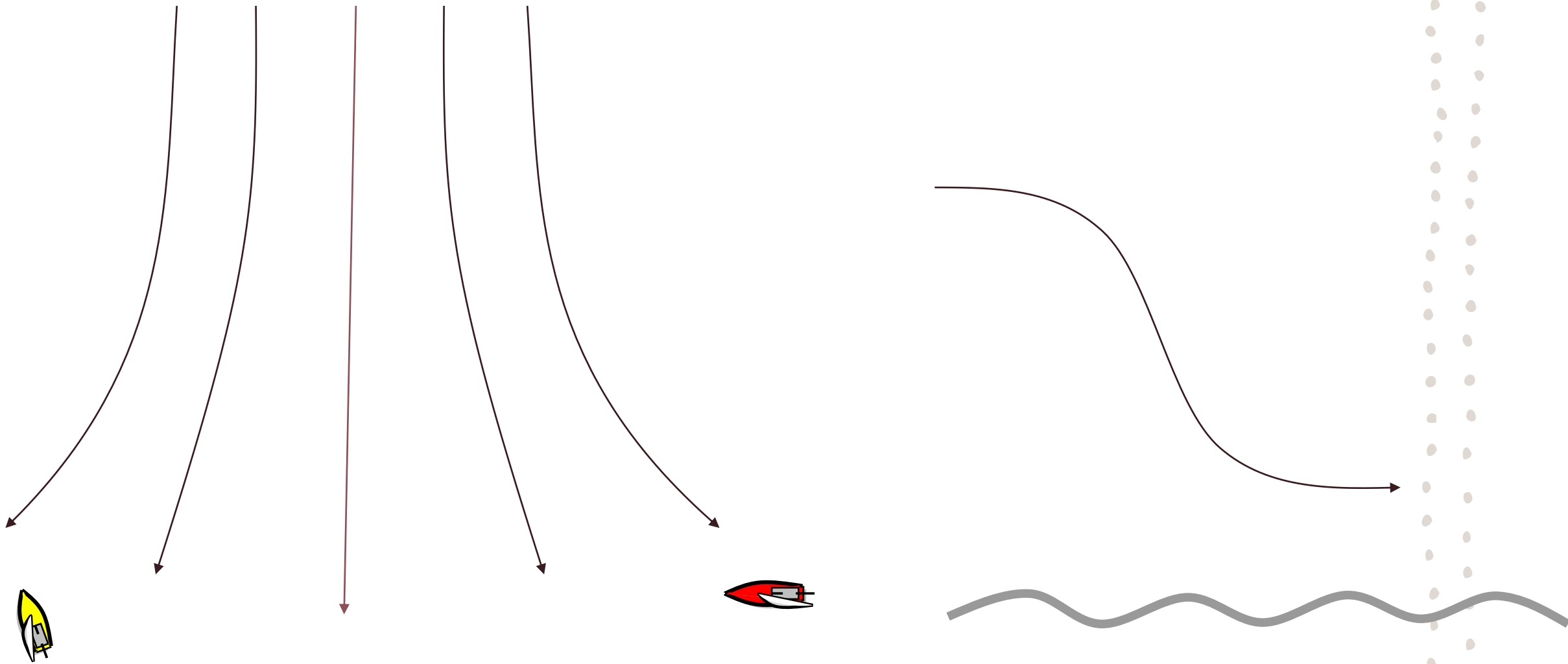
Rain clouds are easy to see & can shift wind during a race.

Can increase or decrease wind strength.

Rain clouds are blowing clouds.(whiteboard).

80-20 rule. Upwind sail towards them.

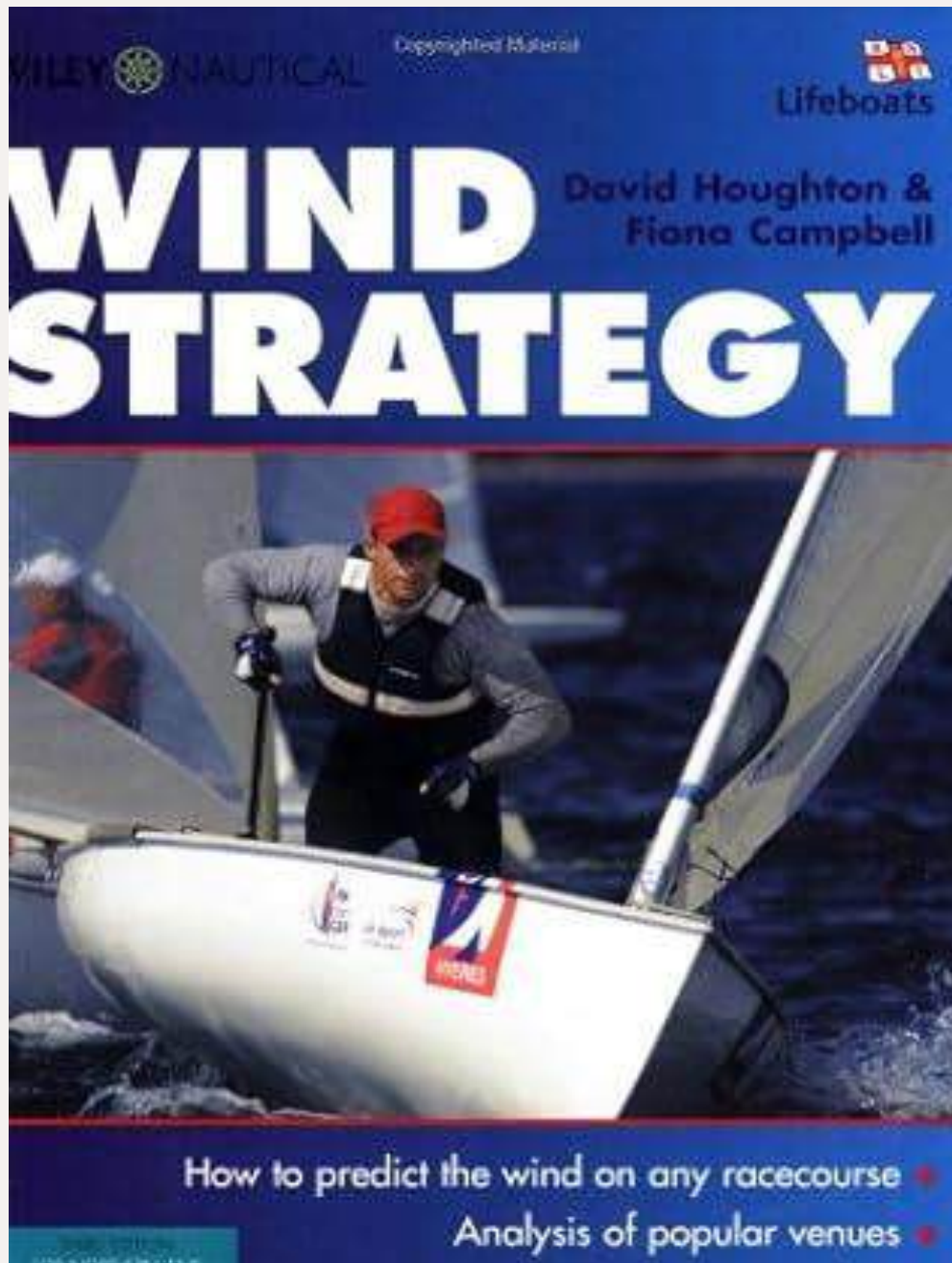
Rain clouds are normally dark, easy to see, and they often move onto a course and off.



- Rain clouds are blowing clouds. They increase wind strength in front, shift wind & can reduce wind behind. After leaving race area, wind can return to previous direction, strength of gradient or thermal

Golden rules during races.

- Feel breeze getting warmer? – Wind may shift to come off land.
- Feel breeze getting colder? – Wind may shift from out to sea.
 - Get on longest tack/gybe before main opposition.
 - Boat in most wind runs fastest.
 - Not sure? Concentrate on speed – go with fleet.
- Light air – pick a side, normally go towards the closest shore. Less tacks.
- Remember forecast, but observe while on water to see how reality relates.
- Offshore wind; stay on lifted tack(stay in pressure); likely to shift around, big gust/lull changes.
 - Early building sea breeze– most pressure from perpendicular to local shoreline.



To dig deeper into this knowledge stream.

A great book to learn more advanced micro meteorology for racing sailors at several famous championship venues.

5 Minute Break.

<https://starclass.org/history/1978-worlds-championship-san-francisco-ca>



Sail Trim

THE BASICS





Moments of Truth -

Big fleet championships

Months before - When you gather equipment - hull/mast/sails.

Are you/crew the correct weight for the class?

Have you done enough training.

Race day - Do you understand what is causing the wind? 1 hour before start. Tune rig to wind/wave conditions, checking speed/height with reliably fast tuning partner. Set up mast bend(depth for lulls).

Start -Did you get a clear air start - gap to leeward?

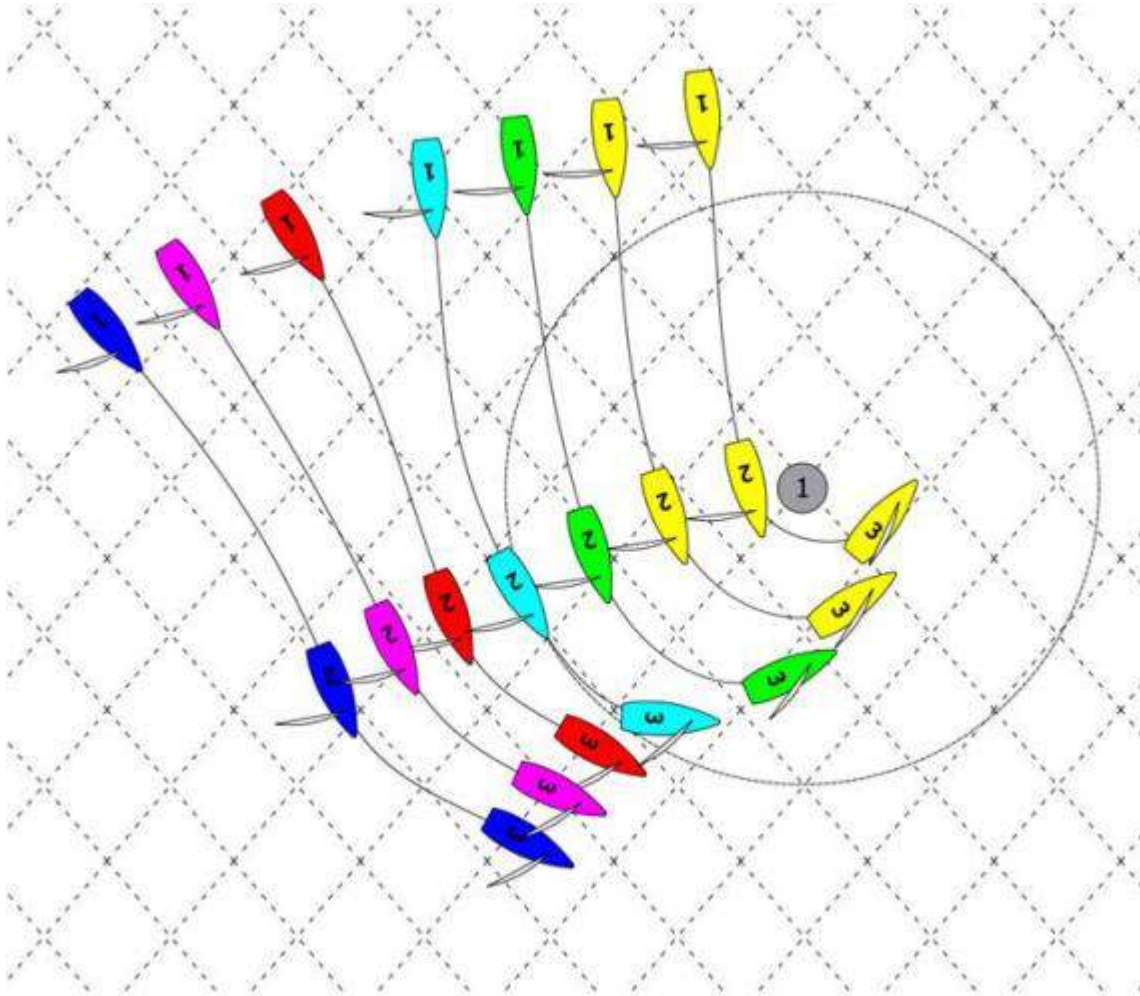
*** Could you hold your lane until you wanted to tack?**

1st Tack - Did you tack at the right time?

2nd Tack - Did you tack at the right time?

If you survived the "moments of truth" you will be in top 10-15% at the first mark, - you will be in the hunt.

Forces effecting the boat.



- Mainsail on - points boat into wind.
- Jib on - Mainsail OFF bears the boat away.

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Correct sail **Depth** is most crucial for upwind speed, then twist.

* Basic concepts for Upwind trim we need to divide into a framework of three conditions for **better understanding** :

Heavy Air(17-30+ knots) - **Overpowered**. Flatter sails, wider angles of attack/ trim **to reduce power/heeling** & to **reduce leeway**.

Moderate Air (8-16 knots) - from underpowered (5 knots) to edge of **overpowered(16-17 knots) depending on boat design**. Deepest sail, closest trim to centerline. We can have tighter leaches without stalling flow on sails or keel/CB.

Light Air (0-5 knots) - **Underpowered**. Flat sails, wide angles of trim to reduce leeway. Open leaches. **High Risk of stalling**(plane falls out of sky) due to low flow on sails & Keel/CB.

*All boats are different in the knots range. Base it on feel. Do you feel overpowered/underpowered? Above are basic concepts and depend on the class of boat.

For example, a 505 is overpowered early, 470 later, 420(small main) much later. Dinghy sailors must match the best weight for the class to achieve best speed across wind range.

Key points : Sail **Depth** and crew weights

Each boat design is unique, refer to world champions in each class for specifics- sailmakers who made best sails.

Depth is most important to get right, & it effects twist.

Set up mast bend(mainsail depth) for the lulls.

Think in terms of **sailing "wings" through the air**,
and **foils through the water**.

Apparent wind is usually constantly changing in direction and strength. Hard to be accurate in trim/steering.

Waves jolt boat, flow over keel/CB and sails.



Critical shape risks detached flow—plane falls out of sky

Too deep can be slow because it's a more **critical** shape (stalls easily), and can become overpowered as apparent wind strength and direction changes, big gusts hitting waves, making any sheet trim/steering mistakes much worse. If slow, try flatter sail shape.

*(Laser Radial uses vang on too hard for ideal twist, to flatten top third depth in light air, because Depth matters more.)

* Windsurfer foil's top third sail shape very flat, flexible. Very forgiving shape to trim. Very fast foil through air.

Tighter leach gives height but requires more accurate steering through the apparent wind to avoid flow stalling in light air.

Looser leach reduces power(depth), allows you to go faster, but lower.

Waves matter. Bigger chop; boat needs more power (depth) to punch through. Flat water means you can often use flatter, more critical shaped sails. Draft can be further back, point higher.



Flat in head(top 3rd) is hard to stall



Legends who changed classes/sail design

Ian Walker(GBR) he was curious about windsurfer sails back in the 1990s. Olympic Silver medalist(470 & Star).

Buddy Melges(US) turned up to the 1978 Star worlds with flat sails compared to the fleet and won every heavy air race, the Championship.(Olympic Gold medalist, AC winner).

David Ullman(US) developed flat sail rig - 3 times 470 World Champions.

For most classes **fastest upwind VMG steering grooves** are:

Light air - *Low/fast* to keep flow attached to keel/CB & sails so they don't stall & reduce leeway. (sideways drift hurting height). Low/fast = Tell tales both flowing back (pic 2).

Moderate air- *High/slow* - plenty of power, reducing risk of detached flow on keel/CB or sails. (Tighter leach ok.) Critical shape is OK.

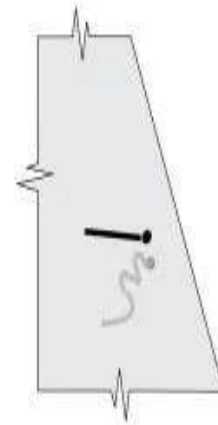
High/slow = Windward tell tale lifting (pic 3 or 4 in gusts to depower & not heel).

Heavy air - *low/fast*. Leeway a problem, like light air it is gusty so apparent wind changing a lot. Overpowered so angle of attack wide, especially in gusts. Waves hitting boat = **need speed more than height, especially planing dinghies**.

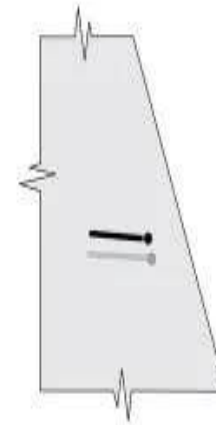
Low/fast = Tell tales both flowing back (pic 2, 3 or 4 in gusts to depower & not heel)

Sail dinghies flat, keel boats at a **constant angle of heel**.

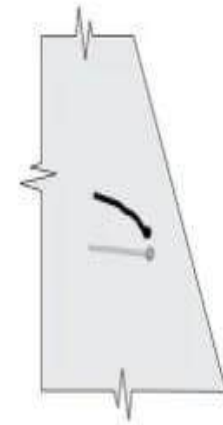
***Upwind Sail trim angle of attack should match fastest VMG steering groove.**



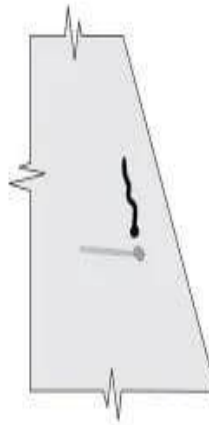
1. Bow-down Speed-building Mode: Leeward telltale dances and windward telltale streams straight back. This mode is used for building speed when coming out of a tack or when going through steep motorboat chop.



2. Max Speed Mode: Both telltales streams straight aft.



3. Pointing Mode: Leeward telltale streams aft, and windward telltale dances between straight back and 45° above horizontal. This mode is used when sailing to windward in flat water in winds over 10 knots.



4. Pinching Mode: Leeward telltale streams aft, and windward telltale stands straight up. To be used when trying to get over another boat or make it around a channel mark.

Light Air VMG speed upwind - *encouraging flow.*



Easy to stall flow on sails & keel/CB.

If flow stalls a plane falls out of the sky.

= high leeway.

Boat stops & starts in lulls/gusts (0-5 knots)
so apparent wind moves a lot(stalls easily.)

Priority: keep boat moving at all costs.

- Flat sails, especially top third, so sheet trim is less critical to maintain flow.
- -Steer low/fast speed, not height, priority to reduce leeway = wide angle trim.

Light Air upwind (***maintaining flow***).

Steering groove low/fast.

Priority is keeping boat moving so flow stays attached onto sails and keel/CB to reduce leeway(sideways drift losing height).

1. Both jib telltales flowing back straight.
2. Sail trim must match steering angle = best VMG.
3. Wide angle of attack, boom wide, jib lead wide, open leaches. Draft aft and round in back is OK. Old sails sometimes competitive in light air.
4. Flat sails. HOW FLAT? Frank Bethwaite argues *"Set mainsail to a fullness of about 8%," and steer about "45 to 50" degrees to wind and always "ease sheets deliberately if air falls lighter."* 1.

1. Frank Bethwaite, *High Performance Sailing*, Page 281-283.

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Moderate Air (7-14 knots) *harnessing power*

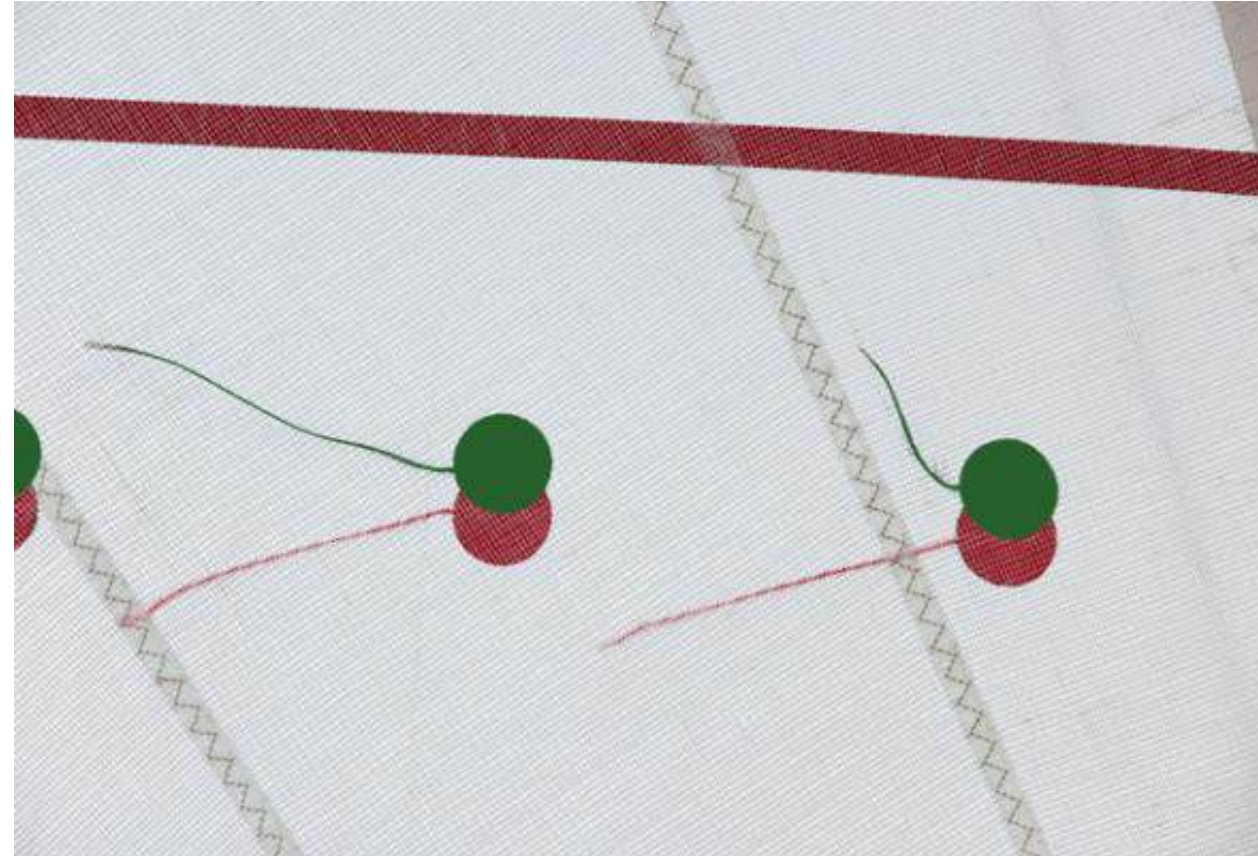
Fully powered up, but not too much wind to knock boat over in gusts. (Knots depends on class/boat.)

Keel/CB and sails do not stall easily because plenty of flow over foils and sails so you can safely steer in high groove without risk of stalling.

Jib Tell tails - windward one flicks up, leeward one straight.

Sail trim; main leach on centerline, jib lead inboard, firm leaches. (Laser boom in most inboard they go.)

*** Mainsail leach tighter gives you more height.**



Moderate Air (*harnessing power.*)

Waves get bigger, stopping boat; need power(depth).

Deep mainsail = Straighter mast, no Cunningham, no vang or backstay. Moderate is the deepest your sail will be, **but too deep is slow.**

In gusts keep leach on firm, just steer higher to reduce power maintaining angle of heel.

Frank Braithwaite argues "wind speed effects lower sail too" so the force on sails "jumps by about 300%" from light air to moderate, "You can feel this extra force cut in as if a switch had been thrown,"² all wind speeds above a meter are now same, "apparent winds at all heights are the same," (2) thus firm leaches are the order of the day.

2. Frank Bethwaite, *High Performance Sailing*, Page 287.

20XX



Winner Australian Etchells Midwinter Championship – moderate race.

Etchells ; **Max crew weight** so you can keep main on centerline/leach tight - it cannot plane upwind so best VMG is high/slow for as late as possible.

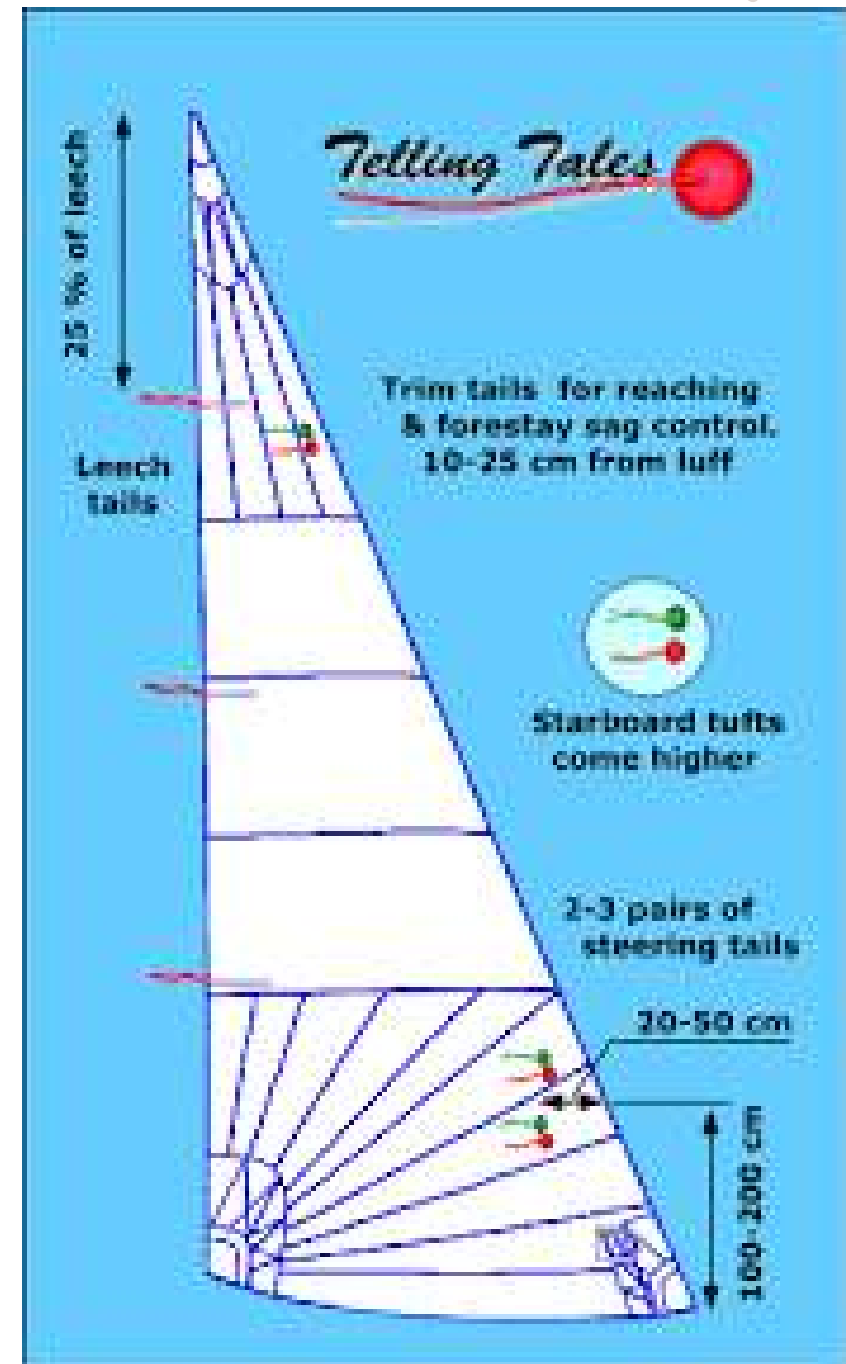
Tell tales: Where do you need them?

Mainsail.

- Light air - Need leach telltale at top third, normally at end of top batten. Tells if you risk stalling.
- Moderate air - Put tell tales in deepest points of mainsail, **especially the top 3rd**. If windward one lifts you are too deep. Middle for mast bend, bottom third testing if outhaul is too loose.

Jib

Steering pair(for steering groove), and top third leach tell tale(to prevent stalling) most important.



Heavy air (16- 30 knots) *depowering*.



Knots depends on class/boat. Being knocked over in gusts, or always heeled.

Steering groove low/fast.

1. Priority is keeping boat moving so flow stays attached on keel/CB **to reduce leeway**. (leeway is a problem in heavy air, like light air).
 2. Wide angle of attack- boom out, jib leads out, **straight shape in back of sail**. In **planing dinghies the priority** is to keep it planing (double the speed). Pointing high is NOT a priority. Pointing high increases leeway = low/slow.
- 3. Flat sails.**
- CB up as you are not steering high/slow so it is drag when down, boat trips over it in gusts.
- Etchells - **must have max crew weight** so you have righting moment to steer low/fast in heavy **air to keep constant flow on keel**.



Because apparent wind is always changing, detaching flow – “**Acceleration is the most important aspect of speed.**”

Draft (position of max depth).

Draft back is ok for flat water, constant light air. Curved in the aft third of sail ok for light or moderate in flat water.

Draft forward good for gusty wind, choppy waves, because its easier to reattach flow after jolting of boat killed it.

You can **accelerate in gusts. In gusts apparent wind shifts in direction. Gusts shift wind aft, upwind shift forward. Upwind lulls knock you, gusts lift you. Sailing into a lull if fels like a knock, but it is a pressure knock, not a true wind knock.**

Straight exit is fast in heavy air, less drag -- you are not trying to go high, just fast.

Some keels/CB designs are more critical to maintain flow. 470/420 is bad CB design, thus a critical, hard to sail fast boat.

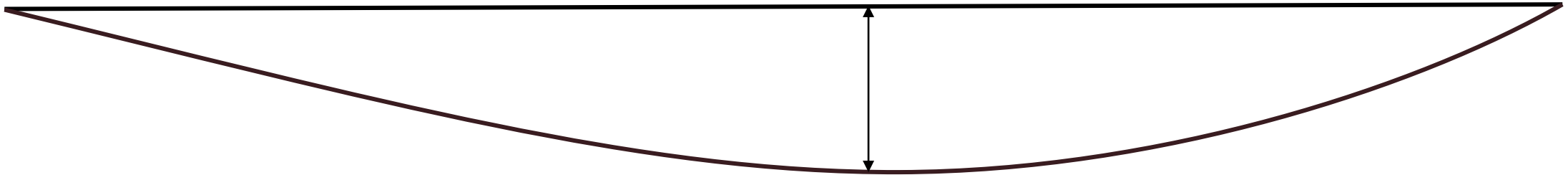
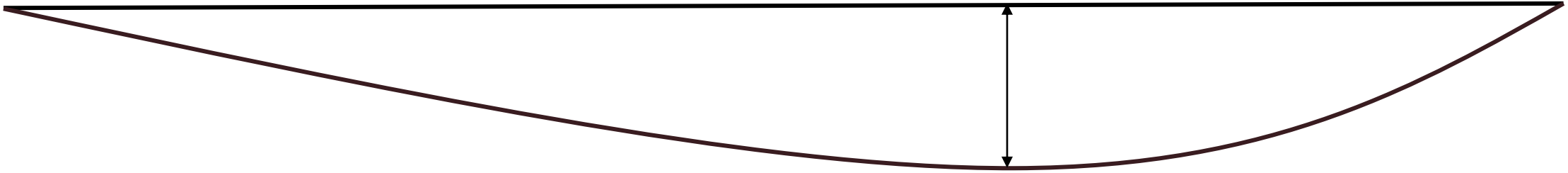
All classes steering grooves are a little different.(keel boat designers give you target speeds).

It takes some time to learn the fastest VMG steering groove for each class, the three grooves and transition knot strength.

Heavy and light airs are most difficult to master because they are wider grooves.

20X Moderate is easier as you just stick it as high as possible in most cases.

Which shape is fast in light, or gusty heavy air ?



Slot between Main and headsail

Basic rules:

- Mainsail and headsail leaches should be similar twists.
- Slot should be parallel.



Sailmaker Tuning Guides - *use them.*

All classes vary as to when you change from low/fast steering & sail trim, to high groove, and then back to low/fast groove.

Do it by feel, ask champions in your class.

It takes a while to learn a new classes' grooves.

NORTH SAILS TUNING GUIDE.

Basic 420 Rules

Barber haul in all conditions, except the extremes (They mean light and heavy airs- **why?).**

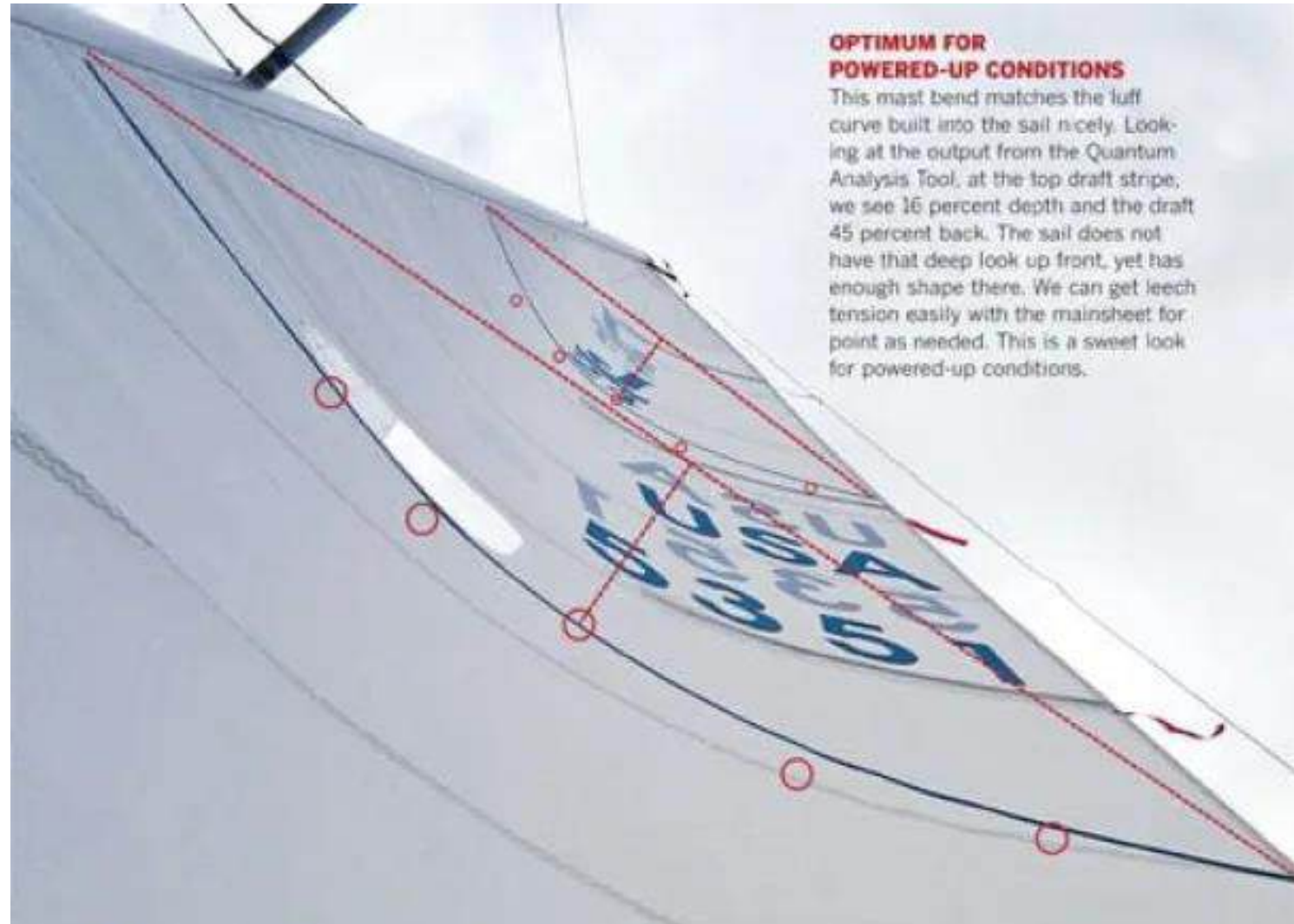
- 1. 3. Use as much kicker as possible in heavy airs.(**why?**).**
- 2. 4. Never use cunningham until overpowered.(**why?**)**

"Always bet on a horse called self-interest."

Sailmakers have an interest in your success, in the business of selling racing sails.



You can take photos and measure depths



Enjoy! The fastest route to becoming a tactical genius is
Speed. **Speed is everything!** 80-20 rule.

