Annual General Meeting

Due to the Corona Virus Pandemic we are forced to hold the Annual General meeting by Zoom.

The meeting to be held on Wednesday night at 8:00 pm on the 26th August 2020 by Zoom. Please indicate your interest and support by advising your participation so we can send you the ID and Password.

Email:-*Alex on* sthmst729@yahoo.com.au

your attendance.

Agenda

1. Attendance and Apologies

2. Minutes of Previous Annual General Meetings

3. Correspondence

4. Reports
   - a) President's Report
   - b) Treasurer's Report

5. Election of Office Bearers
   - a) President
   - b) Vice President
   - c) Secretary
   - d) Treasurer
   - e) Newsletter Editor

6. General Business
   - a) Facebook
   - b) Timpenny Web site
   - c) Other

Editors Report

Welcome to our August Newsletter. Not a lot is happening being the middle of winter and Melbourne in lockdown due to Covid 19 virus. At present the class is going through a change as many older owners are retiring from the sport. The boats are also aging with the average age around 40 years old. This is not to say that the boats are not in good condition and the boats remain an excellent buy. A new yacht of similar size would cost you $60k or more and would not be as seaworthy or practical to use.

May I encourage members to get involved in the class both in participation in cruising, racing or in the management of the Association. Please tell us about your great adventures, both good and bad, positives and negatives of equipment purchased and used and little tricks that save money and time.

This months Newsletter is on sail power, how is works and what to look for on your sails. Perhaps next newsletter can address little changes to boat and fittings and Man over Board.

THE SCIENCE BEHIND YOUR SAIL TRIM

Induced Drag and Mainsail Leeches

By far the largest and most destructive drag for sailing performance is induced drag. The root cause of induced drag is the changing of the direction of the air flow by the foil. With airplane wings that change is downward; with a sail it's to weather. The change in flow direction is the beginning of the process of lift.

So, induced drag is a direct result of the creation of lift. In more technical terms, induced drag is the varying **coefficient of lift (Cl)** across the span. In other words, the differences in lift across or over the total area of a sail or wing cause induced drag.

How does induced drag relate to real life on a sailboat? Assuming the boat is well trimmed and properly set up, about 80 percent of the total sail area will experience relatively constant Coefficient of Lift. However, in the aftermost 20 percent of the sail, the velocity of the flow rapidly decreases; and with it, the lift. The rapidly changing Cl results in significant induced drag, some on the leech and some at the head and foot. This induced drag forms the vast majority of the total drag.

There are two variations of induced drag:

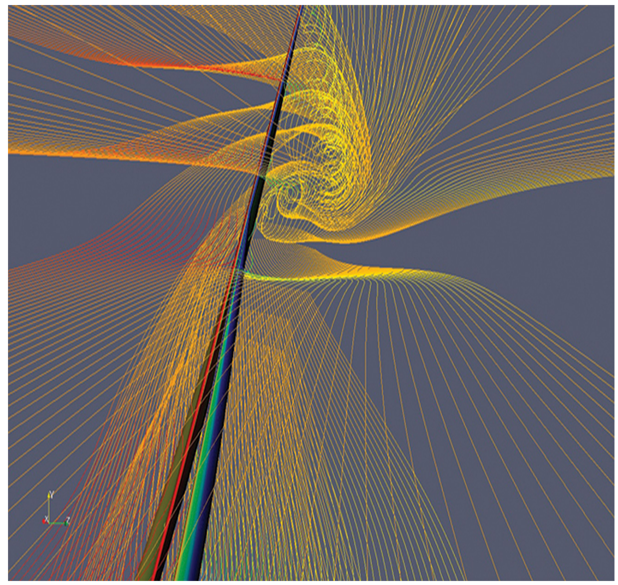
- off the trailing edge (leech)
- off the tips (head and foot)

Induced Drag off the Leech

These are vortices, spinning counterclockwise-off that trailing edge. A deeper head section, compared to the bottom, minimizes the flow of air trying to find the shortest path from the high-pressure windward side to the low-pressure leeward side.

Leech twist is very significant for the optimization of upwind speed. It's been said that the only reason to have a front of a main is to be able to attach the leech area to the mast! The leech of the main not only ensures that the air bent around the front of the main is allowed to exit with the least interference (induced drag), but also to help steer the boat.

So, how should the trimmer adjust the leech to best attain the above two goals while sailing upwind? With a well-designed and relatively new main, the answer is to sheet the main until the top telltale (preferably hanging off the back of the top batten) just begins to stall. If it's constantly stalled (hidden to leeward), it's a sign drag is too high. The lift-to-drag (L/D) ratio is lowered. If the telltale is flying straight back or there is an excess of backwind, it's a sign that the sail could be sheeted tighter to allow the boat to sail closer to the wind. In this case, the L/D ratio is reduced for the opposite reason.



This screen shot, from a RANS-code CFD analysis, illustrates the tip vortices emanating primarily from the top leech of the main on a fractional-rigged boat. The orientation is looking back at the top of a rig and sails from just to leeward and forward of the onset flow.

Induced Drag off the Head and Foot

The second variation in induced drag is tip vortex. On a plane, these flow off the ends of the wings; on a sail, they flow off the head and foot. There is a pressure difference, or delta, from the lee side of the sail to the windward side. Nature abhors pressure deltas. It's why we have wind. And, it's why the flow on the high-pressure side of a sail wants to escape over the top or end to help equalize this pressure.

Almost all modern race boats employ a fractional rig. At the hounds, the main's chord on the fractional rig is still quite long and therefore helps shed the headsail's tip vortices. On a masthead rig, the tip vortices of the headsail are matched with the tip vortices of the mainsail. Not good!

UPWIND SAIL POWER

by Bill Gladstone

Understanding and controlling sail power is essential to optimizing upwind performance.

The Three Sources of Sail Power

1. Angle of Attack
2. Sail Depth (Draft)
3. Sail Twist

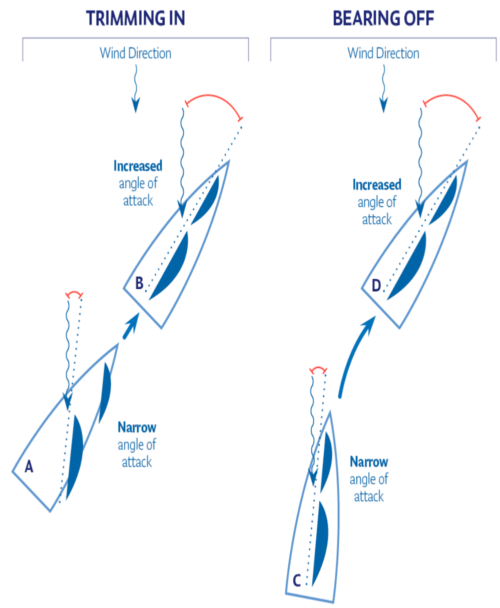
Total sail power is the sum of power from the three sources. Sail trimmers first try to get the boat to full power (neither underpowered or overpowered), and then adjust the mix of power from angle of attack, depth and twist to match the sailing conditions and optimize performance. When overpowered or underpowered, we work to decrease or increase power.

Sailmakers design and build sails that are both fast and can be adjusted to perform well in a range of conditions. As sail trimmers, our goals parallel those of the sailmaker: First, achieve the designed shape and second, fine tune the shape to the conditions. We'll look more at fine tuning sail shape after we define each of the three sources of sail power, as well as some other characteristics of sail shape.

1. Angle of Attack

The first source of power is angle of attack. At zero angle of attack, the sail is luffing. Trim in to increase angle of attack and thus, to increase power. Ease the sails out, and power is reduced. Angle of attack is also controlled by the driver. Bear off to increase power, and head up to reduce power.

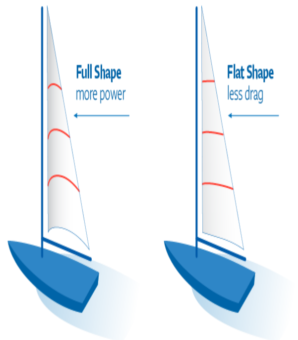
Power increases as angle of attack increases, up to the point of a stall. When angle of attack is too great, flow stalls and power drops quickly.



Trimming in, as shown (A-B), increases angle of attack and power. The driver can also increase angle of attack and power by bearing off (C-D). Ease sails or head up to reduce power.

2. Sail Depth (Draft)

Sail depth, also called draft or camber, is the second source of sail power. Sail depth controls the power, acceleration, and drag of the sail. More depth creates more power and better acceleration; while a flatter sail has less power and less drag. As with angle of attack, power increases with depth up to the point where flow stalls. Maximum power is achieved just short of a stall.



A deep or “full” shape is more powerful than a flat shape. Deep sails are best for power and acceleration. A flat sail is best when overpowered in heavy air. A flat shape is also fast in smooth water, as it creates less drag.

A deep sail is best to punch through waves and chop, or to accelerate after tacking.

A flatter sail reduces power and also drag. In overpowering conditions, a flat sail is best. A flat sail also will be fast in smooth water. When overpowered reducing drag can improve performance. In underpowered conditions adding power is more important than reducing drag (see fig. 2).

3. Sail Twist

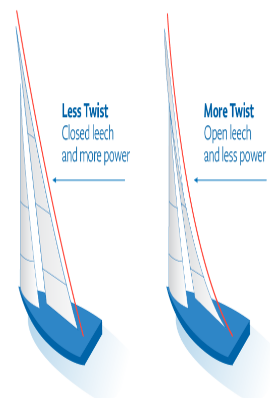
Twist is the third source of sail power. Twist describes the relative trim of the sail high and low. A sail has lots of twist when the upper part of the sail is open. The opposite is a closed leech with little twist.

Increasing twist reduces power; decreasing twist adds power. Increasing twist spills power from the upper part of the sail. Again: More Twist = Less Power. (fig. 3). As with angle of attack and depth, reducing twist adds power up to the point where the sail stalls and power drops. So, why twist, and how much?

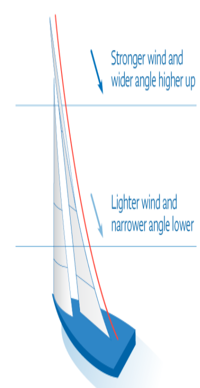
Wings and keels are not designed with twist, but sails (and propellers and windmill blades) are. Due to less surface friction, the wind is stronger aloft than at the surface; this is known as *wind gradient*. The true wind and boat speed together create the apparent wind. The stronger true wind up high creates a wider apparent wind angle (and stronger apparent wind) aloft. The upper part of the sail is twisted out relative to the lower part of the sail to match the more open apparent wind angle. The sailmaker designs twist into the sail to match the average wind gradient.

Sail twist is then fine-tuned to match the sail shape to the prevailing wind gradient. We further fine tune twist to wind and sea conditions, and to match our performance goals.

Fine tuning twist is one the most powerful trim adjustments we can make.



Twist is the difference in trim of the sail high and low. Increasing twist reduces power by spilling open the top of the sail.



Sails are designed with twist to match differences in apparent wind caused by wind gradient.

PUFF RESPONSE UPWIND

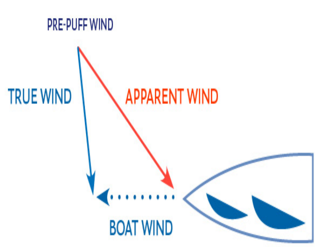
By Bill Gladstone

Proper response to a puff is critical to optimum performance. The best response is a change in trim to match the changing apparent wind angle. Here's why:

Apparent Wind

We'll start with our wind triangle before the puff hits. Figure 1 shows how apparent wind is the vector sum of Boat Wind and True Wind.

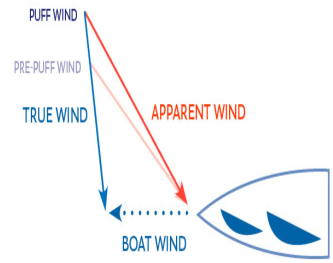
Fig. 1: Apparent Wind is the sum of True Wind and Boat Wind.



The Puff Hits

When the True Wind increases ("*Puff!*"), it creates a stronger Apparent Wind and a wider Apparent Wind Angle. Trimming sails to match this change usually means lowering the traveler, which is the fastest way to maintain a balanced helm and consistent angle of heel.

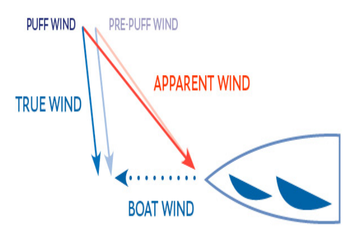
Fig. 2: A puff results in stronger Apparent Wind and a wider Apparent Wind Angle. Drop the traveler to match the new wind angle.



Acceleration

Once the boat's helm is balanced again, the boat then accelerates to match the new wind speed. That moves the apparent wind forward, so then we need to re-trim the sails again.

Fig. 3: As the boat accelerates with the new wind, the apparent wind moves forward, and we need to trim in again.



Wasted energy

If we don't change sail trim in response to the puff, its energy is wasted in heeling force and weather helm rather than being turned into acceleration. The boat may eventually accelerate – after making leeway – but by then all of the more responsive crews will have jumped ahead.

Why change trim? Why not just feather the helm?

Trim Response lets you accelerate more quickly. Feathering (heading up, to reduce heel angle) will give you a brief bit of height, but that is usually offset by more leeway. Changing sail trim gives you speed, and speed then gives you height.

Why use the Traveler?

Lowering the traveler reduces angle of attack, which is the preferred trim response on a moderate displacement keelboat. On higher performance boats or multihulls, especially those with square top mains and high aspect keels, it is more effective to ease the mainsheet to adjust twist. On some boats – for example, an Etchells – a big pull on the backstay is very effective.

Some boats use "*Vang Sheeting*" (where the mainsheet controls angle of attack) and respond to puffs by playing the main.

Which is Best?

Snappy Answer: Whichever is fastest.
Longer Answer: You'll have to test to see what works best on your boat. As a general rule, Trim Response is preferred to just feathering/ steering through the puff.