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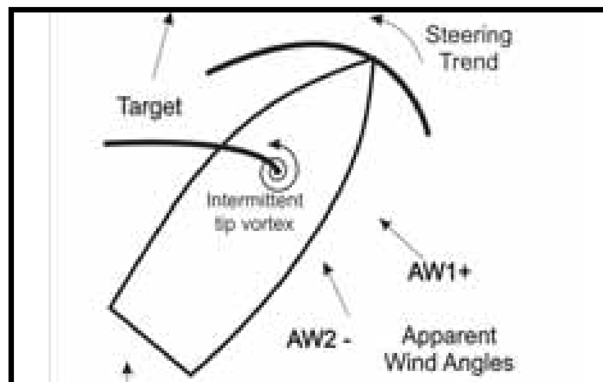
Sailrocket 2 Takes to the Water



Cover picture:
Sailrocket 2 launching
photo: Fred Ball

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Amateur Yacht Research Society

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Innovation is what it's all about!

Our front cover and lead story this edition are about Sailrocket 2, an innovative sailcraft if there ever was one. Based on the ideas of "40-knot Sailcraft" Smith, the Sailrocket boats have shown that his vision, widely derided at the time, had merit and could be applied practically. As we go to press, Sailrocket 2 is in Namibia and in the space of a few weeks has been tested and worked up to achieve speeds of over 40 knots. The real test will come next Autumn, when the steady winds blow, and Team Sailrocket have scheduled a month to attempt the World Speed Sailing record, currently held by a kitesurfer at 55.6 knots.

One wonders what would have happened if AYRS John Hogg Prize? It did not exist at the time, but I would like to think he would have been in the running for the £1000 prize. Do you have ideas as innovative and as capable of practical application? AYRS is looking to encourage such ideas, and the £1000 is sitting there waiting for a winner. Having opened the competition last year, so far we have no entries!

Do you think your idea could win?

To enter you need to send us a short summary (around one page only) of your idea as soon as possible, and then start preparing your formal entry which we need to receive by 1st October. More guidance as to how to prepare your submission, what to include, what to leave out, and how best to convince the judges that you have a worthy winner, will be found on the AYRS website at http://www.ayrs.org/jhogg_reprint.pdf.

Get your entry ready now! We look forward to receiving it.

Simon Fishwick

The Launch of Vestas Sailrocket 2

A very pleasant sunny March day at Venture Quay, East Cowes in the Isle of Wight was the setting for the launch and naming ceremony of Vestas Sailrocket 2 before she was packed up and transported to Namibia via Tilbury.

The ceremony was opened by a representative of Vestas, the main sponsor, who explained their interest was of course due to their involvement with wind turbines and the efficient extraction of energy from the wind, and reminded us that Vestas was opening a new research facility on the Isle of Wight, and that they were presenting their latest design of wind turbine blade in London on March 30th.

Paul Larsen then took over giving a short history of Vestas Sailrocket 1 saying that she had been very educational (see Catalyst 32!) being the fastest sailing boat in England and for a short period the World Record holder.

The present record is 55.6 knots held by a kite surfer so Vestas Sailrocket 2 has been designed to exceed 60 knots and then try for more!

She is an impractical boat for normal use, sailing on one tack only: the improved rig is intended to be fully feathering to allow return to the start of run position as quickly as possible towed by a RIB, to maximise the experience of sailing over the course and learn how best to trim the boat and rig.

The launch was performed using a very skilfully-driven crane and she was named and blessed with good wishes. Paul Larsen boarded her and almost disappeared from view in her forward cockpit; so much so that he was asked to pose half sitting on the cockpit rim.

The crane was then used to recover her and we were able to inspect her more closely and ask questions. A weight of 275Kg was mentioned; the rig was described as being more controllable with various segments able to rotate about the internal spar and controlled by moveable parts of the trailing edge.

I would describe her as a triple float proa, but I'm sure other people would disagree!

The main fuselage is supported by a planing float at each end the front one being steerable and having vertical blade; these floats are moderate "V" section with a shallow step, the forward section having a downturn at the chine to improve lift and reduce spray. To windward, opposite the lateral beam, is a sophisticated arched and inclined foil with a super cavitating section to oppose the heeling forces and provide most of the lateral resistance. As this foil will be taking most of the forces involved with sailing, it was provided with load cells to monitor what was happening. At the other end of the lateral beam was the third float, of similar size and design, providing support for this end of the beam under the main attachment of the wing sail internal spar. There is also an inclined strut between the wing sail at about mid-height and a slider on a track on the upper side of the lateral beam that holds the wing at approximately 45 degrees from the horizontal.

The wing itself includes a section which when sailing is parallel to the water surface, and has an adjustable trailing edge able to give positive or negative lift. This blends via a gentle curve into the main driving wing. The first five panels have no control surface; the next six panels have a trailing edge control surface; and the next seven panels have no control surface. The wing is topped by three more panels which are free to rotate through 360 degrees; the lower sections

are able to move through about 40 degrees to allow delicate control from minimal drag (i.e. feathered) to maximum power.

When sailing, her directional control will be mainly by sail trim until 25 knots is exceeded, when the rudder will take over to align the fuselage with the wind and reduce air drag as much as possible.

I think that she looks right and should be able to take records and demonstrate the way that forces can be cancelled out to give maximum forward motion.

Fred Ball

[Sailrocket is now in Namibia, where she has shown she can readily exceed 40 knots, thus becoming the second of the Bernard Smith inspired "40 knot sailboats".

- Editor]

Matt Layden's *Paradox* design and the cheap roller-reefing standing lugsail

Robert Biegler

The microcruiser *Paradox* is a 4.2 m long sharpie with a very simple roller-reefing lug rig, but without keel or boards. She uses chine runners instead. These are simply very shallow keels attached to the side instead of the bottom of the hull, as seen here.

As the boat heels, these chine runners provide some lateral resistance. However, they are, in themselves, not a replacement for a keel or board. Instead, the principle is the same as in a Hobie 14 trimmed for racing: put the centre of effort so far back that the hull provides only half or less of the lateral resistance, let the rudder(s) do the rest. Balance the rudder so that there is not a lot of load on the tiller. I became familiar with that possibility through sailing a Hobie, but Layden's inspiration seems to have come from other sources. He explains his thinking in more detail in issue 57 of Small Craft Advisor (back copies can be bought in either printed form or as pdf files from www.smallcraftadvisor.com), so I will not duplicate that here. Instead, I shall comment on my experience.

Picture 2

Picture 3

The Hobie can achieve the desired distribution of lateral load onto hull and rudders while upright. Paradox needs to heel a bit, both to immerse the edge of the hull and chine runners more deeply, which makes them more effective, and to create weather helm that transfers a greater proportion of the lateral load onto the rudder. I find that in really light wind, when the boat doesn't heel enough, there is lee helm and noticeable leeway, probably in the range of 15 degrees. Once there is enough wind to heel the boat about 20 degrees, leeway is pretty normal. So how does the boat go upwind?

My benchmark for that is the local Yngling fleet. The Yngling is an open keelboat with relatively long overhangs, a medium aspect ratio bulb keel, spade rudder and a very conventional sloop rig. They point about 10 degrees higher while moving faster. A new Yngling owner sailing for the first time, without instruction or experience, sheeted his jib to the centre, and still went faster upwind than I did in my Paradox. Of course, that might reflect my lack of skill, but I won often enough when I raced a Hobie that I think it's not only that. So what else is going on?

I am convinced the chine runner and rudder combination is not the problem. A well shaped rudder is a pretty efficient foil, and if it carries much of the load, the lift to drag ratio of the whole arrangement will be pretty good. I think the rig is responsible. Nevertheless, I think it's a brilliant design, and I could not improve on it for the boat's intended purpose. That may not have been the reason why Matt Layden named the design *Paradox*, but it is one more reason why the name fits. I'll explain.

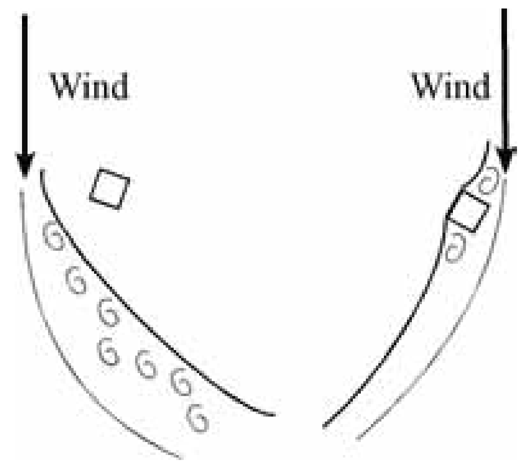
A shallow draft monohull with internal ballast needs a low rig. A boat that is to be sailed from inside the cabin needs a sail that can be entirely remotely controlled. A trailerable boat needs to be quick to set up, with as few strings as possible. The first two conditions would seem to call for a junk rig, but the many strings would make fast setup from a trailer more difficult. Layden's solution is a standing lug sail with a low-tech roller reefing mechanism that is sheer genius.

Layden avoids complicated joints between boom, and mast by attaching the boom only to a free-floating claw that is suspended between a line to the mast top and another line that leads through a hole in the deck to a cleat. In Picture 2 you see the claw before insertion into the boom.

And in Picture 3, the claw has been inserted, and the reefing line wrapped around the drum.

The sail is suspended between halyard, claw and sheet. Therefore reefing is less convenient than with a junk rig. I can't just drop the sail, I must match how quickly the halyard pays out with how quickly the sail furls around the boom. Nevertheless, I can completely furl the sail in about 30 seconds, a little more to tidy away the lines. That last job may not be necessary. With a 1:2 purchase on the halyard and the larger diameter I gave my reefing drum, the reefing line and halyard move at about the same rate. I plan to try rigging them as a single line, so save myself the bother of tidying away lots of line.

On the relatively rare occasions when it was blowing a bit, I noticed that the boat was faster and pointed higher when the mast was on the lee side, making a dirty great bulge in the sail. That surprised me a bit. I think I worked out why it happens. When the sail is on the lee side, the luff of the sail is rather cupped. I don't know whether that is inevitable with a lug sail, whether it means the sail is getting a bit old and I have just forgotten the profile it originally had, or whether it means the sail maker was just not familiar enough with lug sails. Whatever the reason, once it blows a bit and the sail is to the lee of the mast, to avoid wild fluttering of the luff I have to oversheet the sail so much that it is even worse than having a fat mast on the lee side and a bulge in the sail. At least the bulge



changes the angle of the luff to the point where oversheeting is not necessary. The last figure shows what I think the airflow looks like with the mast either on the windward or leeward side of the sail.

Despite this little problem, the rig combines simplicity, quick reefing and quick setup from a trailer in a way I have not seen in other rigs. In a larger boat, the forces on the halyard and reefing line could easily get out of hand, but the rig is certainly good for the 10 sqm on the Paradox. It would also make a pretty good rig for a sailing canoe or cruising dinghy. Perhaps the cut of the sail can be improved a bit compared to what I have now.

Robert Biegler, Trondheim

Sailing a Faster Course

Hypotheses from a study of polar performance curves
Part 5 - Downwind Calculation and Unsolved Mysteries

Michael Nicoll-Griffith

There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy – W. Shakespeare.

Downwind Analysis

Downwind is not just the place to relax after a strenuous upwind leg. There are places to be gained from those who are less alert, or from those who only have eyes for the *curl* of the spinnaker luff.

There are a number of important points to be observed downwind that are different from upwind.

While the Polar does dip in at 180º, there is no actual cusp and little discontinuity. The polar curve is essentially flat across the bottom all the way from 150º (port – on the right in Figure 1) to 150º (starboard – on the left). The flat base to the curve means that, provided the wind and the course are aligned, there will not be a serious loss from minor deviations of boat heading. Turning downwards within the cone, therefore, will not significantly affect our VmgW or VmgT. Instead, the key decision will become one of whether to gybe and when to gybe.

The direction of the true wind is not easy to establish. The reason this is difficult is that changes make the apparent wind haul forward so significantly. The Apparent Wind Angle *AWA* is extremely sensitive to changes in wind direction. The reader will recall that we looked at the AWA values in Figure A in Part 1.

A boat travelling at 180º at 3 knots, pushed by a wind of five knots from 175º, will have an AWA as low as 164º and 1.6 knots of apparent wind. If the same wind were coming from 174º, one degree different, then the AWA would become 161º. For each degree of true wind variation, the AWA changes by three degrees. This has a significant effect on the ability of the mainsail to retain its laminar flow.

As our boat moves towards and then away from the centre-line, we need to be focussing on steering progressively more down-wind, but how far down should we go? We saw in part 3 figure 14 when heading for D and getting out to the side, that it was far more profitable to have gybed and headed for EE. Now we can go into more detail on this point.

Downwind Schematic

An added difficulty with downwind is that angles are inverted. So you almost have to mount a new brain to deal with it. Accordingly, the diagrams here have been reversed. The wind now will blow up the page, as if it were from behind us. And, opposite to upwind, where faster velocity is found in sailing lower, the faster velocity now is found in sailing higher.

As far as shifting winds go, we now want to sail on *headers*, and gybe away from *lifts*.

When we start off from the centre-line at a windward mark, say, we still start on a "best angle" on what we think is the favoured (most headed) tack. We are starting at or near the centre-line so that means starting on the *BDA*. Then we expect to turn down gradually.

Some skippers have selected their downwind sailing angle by watching the apparent wind at the masthead. In fact, the author's wind-vane has angle markers at 100º from forward, which he uses to hold the wind at that angle and so hope to steer the boat on the needed 145º true heading. The masthead vane is often erratic at that angle. The suspicion is that this occurs when a *vortex* forms at the masthead and then fails. That might occur when flow over the mainsail stalls.

Unfortunately, Marchaj (Reference 5-1) does not deal with this angle. He jumps directly from the generation of Kármán vortices in figure 117 to the suction forces from a close reaching spinnaker in figure 118. So, in the transition and half-world between reaching and eddy creation, we are on our own. We need to do more near the boundary angles to determine the flow over the mainsail. Our only tool today is the masthead fly, fluttering in that masthead vortex!

By using the sector markers, which we established on deck for upwind, and the apparent wind angle at the masthead, we would like to sail the curved track while getting "automatic adjustment" in any wind-shift. The masthead fly is not as sensitive as genoa *tell-tales*, but, fortunately, as we shall see later, the relative angle to the target stays very close to a constant value. In a way, we will sail "around" the target, though the angle is quite fine. Here we do not encounter the same accentuated crossing and lifting that occurs going upwind.

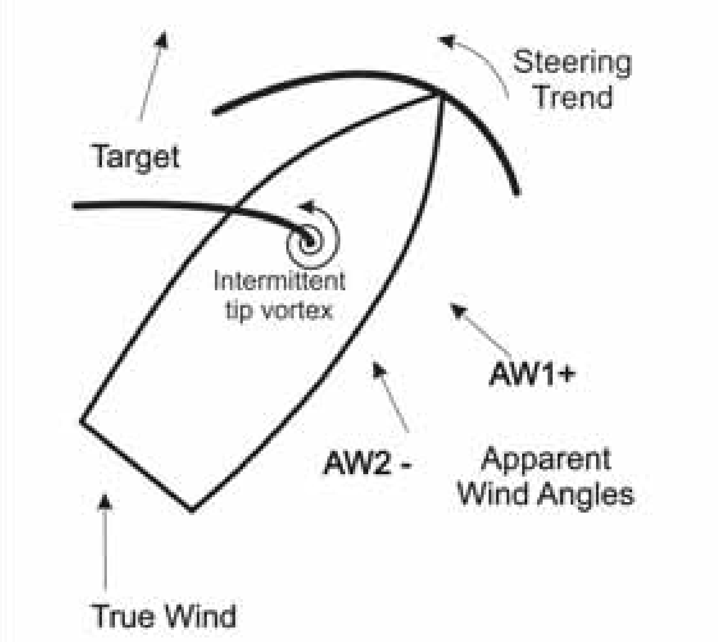


Figure 21 - Angles of Attack Downwind (Starboard Tack Schematic)

Tacking Downwind

For the reasons cited above, the geometric model for downwind is completely different. As shown in Figure 22 overleaf, the polar performance curve here is like an upside-down basket or a parasol that we can incline from side to side. It also looks somewhat like a gull's wing.

Also, this presentation has been done differently. Instead of moving the target and rotating its tangent, this diagram holds the target steady while rotating the polar curve. The two reasons for doing this are a) the target stays at a relatively stable angle, and b) wind direction is critically important..

While the wind continues to blow towards a point "aft" (i.e. behind the target, like the True Wind and the Target are in Figure 21), then we will want to continue on the present tack. We are then approaching the centre-line and therefore we are favoured. Without instruments, the way to detect this is to use the line of the ripples on the water. As the down-wind direction moves forward of the target it is time to consider gybing.

The gull's wing curve in Figure 22 is the bottom part of the performance curve, upside down. The light grey image shows this curve on the centre-line. The black curve is the same, slanted. The rectangles (the pinion feathers) at the ends are the estimate of the probable down-wind cliffs, copied from Figure A in Part 1. The two arrows reaching to the curve are the heading directions of the best downwind angle. You will also notice three lightly curved ring lines from the distant target.

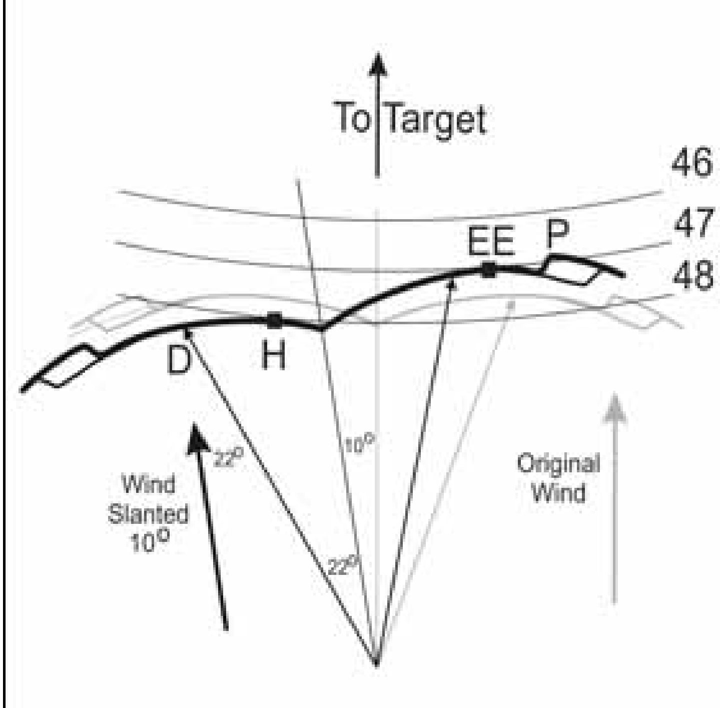


Figure 22 - Tacking downwind

Our boat manufacturer would want us to sail in the Best Downwind Directions, as to D. We can assume we got over here by sailing on port, in the direction to D.

Being out to the left, 10° beyond the centre means either that there has been a backing windshift, or we have crossed into the unfavoured zone. While we remains on port, the boat is on the unfavoured side. If we headed for H, we would be making better speed to target than the "best" speed to D gives us. But being on starboard would be better. We might still want to be on port, if we were heading into better wind on the left.

At this 10° point, the skipper needs to recognize that the black square H is the better direction to go. That is 15° down from D. The black square at EE is 35° further round. There being no, or little cost in changing tacks. Therefore there is likely no strong reason for staying on the unfavoured tack.

As a boat on port tack, our polar curve velocity just touches the "48" ring at H. If we were on starboard, then our velocity would be touching the "47" ring at EE. This is an improvement of 0.4 knots in VmgT for the Tanzer 22 in 5 knots of wind. For the Bénéteau 36.7 in 10 knots of wind the gain would be 1 knot. For the Farr 40 it would be 1.3 knots.

Because the slant is 10° unfavoured, the WTA (Wind / Target Angle) is 190°. Thus the above figures can be taken from Tables 5-2. and 5-3. Those tables in turn are based on the published curves in References 5.4 and 5.5.

The Cliff Effect

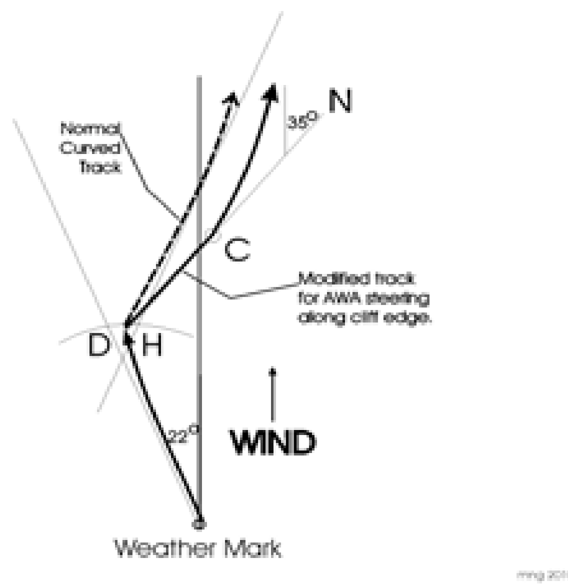
The diagram Figure 22 illustrates a few other points.

1. If there is a cliff, assuming it is of the shape I have suggested, then it is at P. As drawn, it is the fastest downwind angle, beating the curve (at EE) by a small 0.02 knots. P is

not a pimple, though. It is really just the end of the reaching section of the performance curve. P is where the reach ends and we hypothesize it is where the laminar flow over the mainsail fails.

2. If heading for P, the skipper must hold the boat at the correct angle and not "fall off" and "lose it". No research has determined how high the cliff is, nor how deep the fall! If he can stay up, though, our helmsman will benefit from the way the cliff dominates the bottom 15 degrees on the favoured side. Notice that the cliff is only relevant on the favoured side: here the starboard tack. It is clear that the port tack cliff is not in a helpful direction.

Figure 23 - CLIFF EFFECT ADJUSTMENT



3. The effect of the cliff is to make the desired track between D and C straight for some distance and at a higher angle. Figure 23 shows this. This straight section terminates in an abrupt downward change back to the curved course. This must be done close to when the boat reaches the centre-line. (When exactly depends on the height of P.) If she elects to continue on starboard, then she should sail the curve. If she gybes, then she can either follow the opposite curve or sail the port cliff-edge..

Figure 24 - CITIZEN'S CUP

4. The skipper who is not alert or not informed might continue to sail along the line from C to N. This could happen if focussed exclusively on sailing the AWA method or even sailing "Target Boat Speeds".. (For detail on this method, see Section 1.4 and Reference 1-10).

Sailing to hold on to Target Boat Speeds can result in serious outcomes. There is a real-life event that will illustrate this for us,

Figure 24 is the plot of the courses of the America-3 syndicate's "Mighty Mary" and "Stars and Stripes", when competing to defend the America's Cup in 1995.

The text block says: "Americas Cup 95 Copyright Free courtesy of Louis Vuitton. Mighty Mary lost the race and the Citizen Cup to Team Dennis Connor on the last leg. The America-3 afterguard chose a course for speed but that took them away from the mark. They lost by 52 seconds."

The circle highlights how, in the quest for higher speed, Mighty Mary (dotted line) headed too high – and sailed away from her target. We can suppose that she was helming to hold a target boat speed, while the wind was dropping. As a consequence, she found herself unable to reach that target speed, however high she headed.

Meanwhile, Stars and Stripes always was focussed on the Finish. She followed tracks that hug the rhumb line. These tracks are decidedly curved! However, these curves are not the shape they would have if responding to windshifts. It can remain our curiosity whether these curves were stimulated by instrument readings, by some innate skills, or based on some pre-calculation, such as we will do here.

One gets a feeling from this that the safer and easier solution may be to just ignore the cliff, if any, and sail the curve. In trying to sail the cliff, one could just get into trouble.

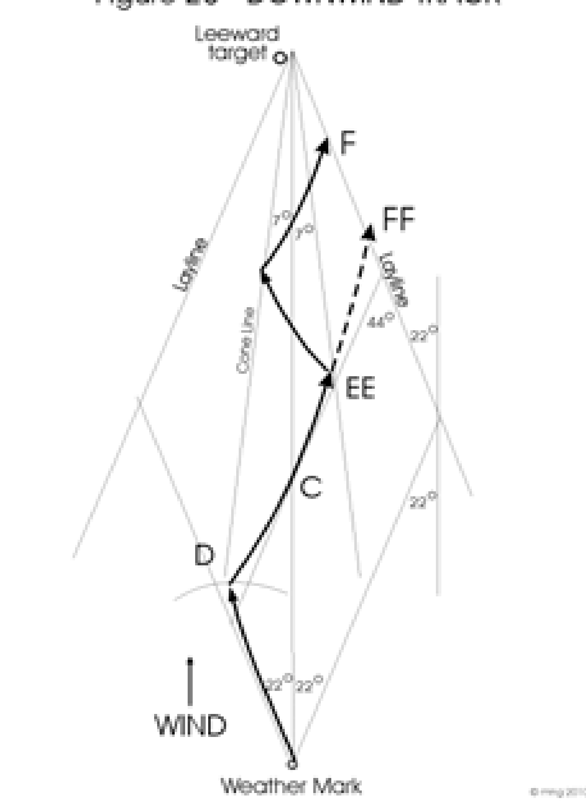


Figure 25 - DOWNWIND TRACK

Downwind Strategy (Fig 25)

Armed with all this knowledge, we are going to start from near D. In the first part of the leg, from D to C we are on the favoured tack, but as soon as the boat crosses the centre-line, then she is unfavoured. When we were heading upwind, we tolerated the unfavoured tack out to the cone line because of the cost of tacking. Now the cost of gybing being so much less, we will want to switch more often, and sooner.

In addition, the down-wind track lines are narrower. For reasons of anticipating windshifts our cone lines should be near half that, so 7º to 10º seems appropriate.

In the sector from C to EE, our track will need to be curved down, below the former Best Downwind Angle, which the guidelines show.

When sailing downwind, the VmgT progressively decreases as we approach the target. Unlike upwind, it never reduces to zero because the target will never get to be abeam of us. You will find the values of these descending VmgT numbers in Column B of Table 5-1.

The crew must be alert for lifts, and gybe back across the centre-line as soon as a lifting direction is detected. If a header becomes apparent, say near EE, then she could continue along the dotted line to FF, the former layline. This will have become more distant since it will have rotated counter-clockwise.

Tabulation of Angles

The tabulation of numbers that follows gives us the sense of speeds achievable on downwind legs and the angles involved.

A detailed explanation of the tables will be found following the tabulations.

These tables are not as difficult as they look. They merely show what the actual track curvatures should be and the resulting speed benefits. The lines show tracks before the centre-line (in the favoured sector like D to C) , and after the centre-line (in the unfavoured sector, like C to EE). These are compared with the speeds along the straight “best downwind”

Table 5-1 — Tanzer 22 — Downwind 5 knots — No cliff

	Off True	WTA degs A	Normal VmgT B	Tighten angle C	Heading re Wind D	Heading re Target E	New Vb F	New VmgT G	Benefit Gain knots H	Benefit Gain % J	Observations AWA K	VmgW L
Favoured	45	135	2.92	36	123	12	3.99	3.91	0.99	33.9%	73.1	-2.18
	40	140	3.02	33	126	14	3.94	3.83	0.81	26.7%	76.0	-2.32
	35	145	3.10	30	129	16	3.88	3.73	0.63	20.4%	79.2	-2.44
	30	150	3.16	27	132	18	3.82	3.63	0.48	15.1%	82.7	-2.56
	25	155	3.19	24	135	20	3.75	3.52	0.34	10.6%	86.5	-2.65
	20	160	3.20	20	139	21	3.65	3.41	0.22	6.8%	92.1	-2.76
	15	165	3.18	14	145	20	3.51	3.30	0.12	3.9%	101.5	-2.88
	10	170	3.14	11	148	22	3.45	3.19	0.06	1.8%	106.7	-2.92
	5	175	3.07	5	154	21	3.31	3.09	0.02	0.5%	118.4	-2.97
Non-favoured	**0**	**180**	**2.98**	**0**	**159**	**21**	**3.20**	**2.98**	**0.00**	**0.0%**	**129.4**	**-2.98**
	-5	185	2.87	-5	164	21	3.09	2.88	0.01	0.4%	141.3	-2.97
	-10	190	2.74	-8	167	23	3.02	2.78	0.04	1.5%	148.7	-2.94
	-15	195	2.59	-12	171	24	2.93	2.67	0.09	3.5%	158.7	-2.89
	-20	200	2.41	-17	176	24	2.82	2.57	0.16	6.7%	170.9	-2.81
	-25	205	2.22	-21	180	25	2.73	2.48	0.26	11.6%	180.0	-2.73
	-30	210	2.01	-21	180	30	2.73	2.37	0.36	17.7%	180.0	-2.73

mrg 2010

line (marked with double border). When a boat changes from sailing a straight line philosophy to a curved track philosophy, then gains will be made as shown in columns H ans J.. These tables tell us the amount of those gains.

The tables also show us that these gains exist for new (Bénéteau and Farr).as well as for old designs (Tanzer). All boats sailing below "hull speed" will benefit with similar effects.

With no cliff effect, the target should be placed at a relatively constant angle from the bow of the boat. This is particularly so for the Tanzer 22 with a very steady 21-22º. (Column E in table 5-1). In the case of the Farr and Bénéteau designs, 25º proves to be a better average choice.

Angles and speeds for Tanzer 22

[See Table 5-1 overleaf]

The double-bordered line is the centre-line "best angle". This is the BDA (Best Downwind Angle).

Column C contains upwind adjustment angles, i.e. the angle to sail above the "normal" BDA, which appears on line 0 – 180.

Table 5-1c — Tanzer 22 — Downwind in 5 knots — Assumed Downwind Cliff

	Off True	WTA degs A	Normal VmgT B	Tighten angle C	Heading re Wind D	Heading re Target E	New Vb F	New VmgT G	Benefit Gain knots H	Benefit Gain % J	Observations AWA K	VmgW L
Favoured	45	135	3.58	23	122	13	4.03	3.92	0.34	9.6%	72.0	-2.13
	40	140	3.62	19	126	14	3.95	3.83	0.21	5.8%	76.0	-2.32
	35	145	3.64	14	131	14	3.86	3.75	0.11	3.0%	81.3	-2.53
	30	150	3.62	7	138	12	3.75	3.67	0.05	1.3%	89.4	-2.79
	25	155	3.58	3	142	13	3.69	3.59	0.01	0.4%	94.7	-2.91
	20	160	3.51	1	144	16	3.66	3.51	0.00	0.1%	97.5	-2.96
	15	165	3.42	0	145	20	3.64	3.42	0.00	0.0%	99.1	-2.98
	10	170	3.29	0	145	25	3.64	3.29	0.00	0.0%	99.1	-2.98
	5	175	3.15	0	145	30	3.64	3.15	0.00	0.0%	99.1	-2.98
Non-favoured	**0**	**180**	**2.98**	**0**	**145**	**35**	**3.64**	**2.98**	**0.00**	**0.0%**	**99.1**	**-2.98**
	-5	185	2.79	-17	162	23	3.10	2.85	0.07	2.5%	137.0	-2.95
	-10	190	2.57	-23	168	22	2.96	2.75	0.18	6.9%	151.7	-2.90
	-15	195	2.34	-30	175	20	2.82	2.65	0.32	13.5%	168.6	-2.81
	-20	200	2.09	-34	179	21	2.76	2.57	0.49	23.4%	177.8	-2.76
	-25	205	1.82	-35	180	25	2.74	2.48	0.66	36.4%	180.0	-2.74
	-30	210	1.54	-35	180	30	2.74	2.37	0.83	54.2%	180.0	-2.74

mrg 2010

Table 5-2 — Beneteau 36.7 Downwind in 10 knots

	Off True	WTA degs A	Normal VmgT B	Tighten angle C	Heading re Wind D	Heading re Target E	New Vb F	New VmgT G	Benefit Gain knots H	Benefit Gain % J	Observations AWA K	VmgW L
Favoured	45	135	6.02	21	130	5	7.09	7.06	1.04	17.2%	85.1	-4.56
	40	140	6.15	20	131	9	7.07	6.98	0.83	13.5%	86.2	-4.64
	35	145	6.23	18	133	12	7.02	6.86	0.63	10.1%	88.5	-4.79
	30	150	6.27	15	136	14	6.93	6.72	0.46	7.3%	92.2	-4.98
	25	155	6.25	12	139	16	6.83	6.56	0.31	5.0%	96.3	-5.15
	20	160	6.19	10	141	19	6.76	6.39	0.20	3.2%	99.2	-5.25
	15	165	6.08	7	144	21	6.64	6.20	0.12	1.9%	103.9	-5.37
	10	170	5.92	5	146	24	6.55	5.98	0.06	0.9%	107.3	-5.43
	5	175	5.72	3	148	27	6.45	5.74	0.02	0.3%	111.0	-5.47
	0	**180**	**5.48**	**0**	**151**	**29**	**6.27**	**5.48**	**0.00**	**0.0%**	**117.1**	**-5.48**
Non-favoured	-5	185	5.19	-3	154	31	6.09	5.22	0.02	0.4%	123.5	-5.47
	-10	190	4.87	-17	168	22	5.35	4.96	0.09	1.8%	154.9	-5.23
	-15	195	4.51	-25	176	19	5.09	4.81	0.30	6.7%	171.9	-5.07
	-20	200	4.11	-29	180	20	4.96	4.67	0.55	13.5%	180.0	-4.96
	-25	205	3.68	-29	180	25	4.96	4.50	0.82	22.2%	180.0	-4.96
	-30	210	3.23	-29	180	30	4.96	4.30	1.07	33.2%	180.0	-4.96

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The values there show that, in the favoured section, the boat should be sailed above the BDA line. The gains resulting are shown in column H.

The values of Column C show that, in the unfavoured section, the boat should be sailed below the BDA line. The gains from this are again shown in Column H.

Tanzer 22 with Downwind Cliff

Table 5-1c below is constructed on the basis that there is a downwind cliff. The table has been calculated from the curve of Figure A which appeared in Part 1. It shows how the cliff monopolizes the bottom 15 degrees of the favoured part of the polar curve. The height of the cliff will dictate how many degrees of curved track it actually supercedes.

The author's experience in using his masthead marker set at 100º (here seen as 99.1º) was that sometimes that seemed fine and at other times, seemed to be too high, compared with the fleet's direction. The newly found understanding is that, at some point, a 17º turn downwind would be necessary has yet to be tried in practice.

Table 5-3 — Farr 40 Downwind in 10 knots

	Off True	WTA degs A	Normal VmgT B	Tighten angle C	Heading re Wind D	Heading re Target E	New Vb F	New VmgT G	Benefit Gain knots H	Benefit Gain % J	Observations AWA K	VmgW L
Favoured	45	135	6.96	26	124	11	8.41	8.26	1.29	18.6%	71.2	-4.70
	40	140	7.10	23	127	13	8.32	8.11	1.01	14.2%	73.9	-5.01
	35	145	7.18	20	130	15	8.23	7.94	0.76	10.6%	76.8	-5.29
	30	150	7.21	17	133	17	8.10	7.75	0.54	7.5%	80.0	-5.53
	25	155	7.18	12	138	17	7.88	7.54	0.36	5.0%	86.1	-5.86
	20	160	7.10	9	141	19	7.74	7.32	0.22	3.1%	90.2	-6.02
	15	165	6.96	7	143	22	7.65	7.10	0.13	1.9%	93.2	-6.11
	10	170	6.78	5	145	25	7.53	6.83	0.05	0.8%	96.5	-6.17
	5	175	6.53	2	148	27	7.35	6.55	0.01	0.2%	102.1	-6.23
	0	**180**	**6.24**	**0**	**150**	**30**	**7.21**	**6.24**	**0.00**	**0.0%**	**106.2**	**-6.24**
Non-favoured	-5	185	5.91	0	150	35	7.21	5.91	0.00	0.0%	106.2	-6.24
	-10	190	5.52	-4	154	36	6.86	5.55	0.03	0.5%	115.9	-6.17
	-15	195	5.10	-27	177	18	5.50	5.23	0.13	2.6%	173.3	-5.49
	-20	200	4.63	-30	180	20	5.41	5.08	0.45	9.7%	180.0	-5.41
	-25	205	4.14	-30	180	25	5.41	4.90	0.77	18.5%	180.0	-5.41
	-30	210	3.61	-30	180	30	5.41	4.68	1.08	29.9%	180.0	-5.41

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Sailing along the cliff is a straight-line proposition. Because the cliff lies along the line of the BDA, no gain over the BDA shows up. Where the cliff route finally gives way to the curved section of the Polar, (due to the rotation of the polar curve) it promotes points that were lower down. This happens at line -5 and is emphasised with a box. The abrupt downturn of 17° necessary to rejoin the curved track after abandoning the cliff edge is shown.

It is worth remembering that we read these lines down from the top. We "picked up" the cliff at the 15 (165°) line, and held it as we approached the centre-line "borrowing" as it were from the curved track. A review of Figure 23 will help make this clearer.

Column L is negative because the boat is going down the wind ladder.

Angles and speeds for Bénéteau 36.7

Notice that the heading re target in the favoured part, which used to be 21° for Tanzer is 21°-27° for the Bénéteau here in column E. What does this say? It says that the Bénéteau is relatively faster on the broad reach; likely due to her more modern hull design.

The Bénéteau and Farr tables are based on the performance curves of Reference 5-4 and 5-5.

Angles and speeds for Farr 40

Note that the Farr 40 should be using 22° to 27° as her heading re target, when sailing the favoured tack.

Explanation of Tables 5-1 through 5-3

Columns:

Off-True = This is the angle seen between the direction the wind is blowing towards, and the target. Negative values mean the wind appears backed (left), when on port, or veered (right) when on starboard. Added to column A this equals 180°. Line 0 is the centre-line.

A = The angle between the upwind direction and the target.

B = The Vmg to the target that would be achieved if the boat was sailing on the Best Downwind Angle. The BDA is found in Column E of the "0" - 180° line. Formula for B = (Vb) per line 0 * cosine(BDA-WTA).

C = The angle to tighten up above the BDA to sail the heading now yielding the best VmgT. Positive is upwind, negative is downwind.

D = New optimal heading relative to the wind direction.

E = New optimal heading relative to the target.

F = Vb: The speed of the boat at her new angle. (Velocity at the old angle is shown on line "0")

G = VmgT. The new Vmg to Target = Vb * cosine(column E).

H = The gain in VmgT in choosing the curved track (knots).

J = This gain shown as a percentage of the original velocity.

K = This is the apparent wind angle AWA to be expected on the new heading.

L = Velocity made good downwind when sailing the best VmgT.

The last lines of these tables are constrained by the fact that the polar curves are not compiled below a TWA of 180°. Such a compilation would contain velocity data for when the boat is sailing by the lee. Such velocities might be estimated by extrapolating the curves we have, but that is outside the scope of this paper.

Practice afloat

Deck markers

The deck markers we mounted on the cabin top as our pelorus can be used now. We would have set these up per Part 4, Table 4-4. Tanzers will need the front one – that pointed at 22°. Bénéteau and Farr will need the second one at 23°-28°.

Progressive use

Using Table 5-3, a Farr 40 starting from windward, assuming the target is exactly downwind, will read the 0 Line "180". This line shows (in Column D) that she should start heading at 150° true, and she then will have an AWA of 106.2°. If she does this, then her VmgT to the leeward target will be 6.24 knots (Columns B and L).

As she moves out to the side, the difference between the target direction and the wind direction (WTA) increases slowly from 180°

until she gybes. If she gybes at the -10 line, then she will continue on the next tack on the 10 line, at the angles and speed shown there. This is per the "Off-true" column. After the gybe, the reduced WTA will start at 170º and then increase progressively.

The potential velocity gain of VmgT is greatest at the edges, but is unlikely to exceed ¼ knot at angles recommended. That is, of course, compared with the Best Downwind Angle. For boats finding themselves at an extreme lateral displacement where the wind is 30º off-true, a 7.5% gain can be expected. This might not mean that we should sail in those areas, but more likely it is that those areas are the ones most disadvantaged by use of current and traditional philosophy.

Wind-shifts

The situation of figure 22, when we are at 10º left on the cone, is exactly the same as if there had been a lifting windshift of 10º while on the centre-line. Therefore we can manage the windshifts by keeping watch on the alignment of ripples downwind.

The strategy for handling these wind shifts should be:

a) for Lifting wind

The apparent wind moves aft – respond briefly by coming up.

If this tack is still favoured, then continue. Otherwise gybe immediately.

b) for *Heading* wind

AWA moves forward. Adjust sails to suit. Keep heading 22-25º above the target.

c) for Sailing the cliff-edge

Either the boat is being sailed on the apparent wind angle (like 100º), or she is using target speeds.

When the wind changes either way, the heading is changed by the skipper to bring the AWA back to 100º, or the target speed back to the norm. When the line of the wind shows that the boat has crossed the centre-line, a gybe is indicated. By referring to tables like 5-1 through 5-3, the navigator can request the appropriate new AWA, and the helmsman should change to that.

The navigator must monitor the angle to the target on a regular basis, so that he does not miss the next windshift.

Unsolved Mysteries

The Cost of a Tack Upwind

How much does a tack cost? And did we need any extra ones?

Whether curved tracks necessarily result in added tacks is not at all obvious. It is also not obvious whether they could result in added distance sailed.

The cost of a tack, measured as lost distance, needs to be assessed for a determination to be made of this balance. I hope the tabulations developed here can serve as a starting point for such investigations.

The Downwind Cliff

A significant unknown in the downwind tacking exercise is to what angle the mainsail can maintain laminar flow. That is the point at which the reach ends. Curved tracks downwind will always find their place, but they could be overridden by an unexpected retention of laminar flow at deep angles. All polar curves have been published assuming there is no discontinuity at the broad reaching angles. Most of this paper's discussion has been based on a smooth performance curve downwind. For such polar curves, the optimal tracks that result will always be curved.

The most critical question downwind is whether or not there is a cliff at P, and what its shape might be.

Summary & Conclusion

Calculations have confirmed the hypothesis that the fastest path for a sailboat between two locations is along a curved track, not along straight lines from point to point. The potential gains in velocity, when compared to a "Best Angle" method are greatest near the edges of a course. These gains are possible because published theories do not recognize transverse displacements and the consequent separation of the wind direction from the line to the target. The displacement results in the wind blowing from an angle significantly different from the original direction to the destination.

Upwind, the condition for a boat to use the traditional "best upwind angle" is when and only when the wind is blowing directly from the target. When out to the side and sailing towards the course centre-line, boats should sail more in a reaching direction. When sailing away from that centre-line, boats should sail closer and slower. This could suggest turning back towards the centre-line (back onto the "favoured tack") sooner than is done today.

This article does not address the trade-off between faster velocity and possible additional tacking. It is shown that boats can turn through normal tacking or gybing angles, though the axis of such a turn will be slanted towards the destination. Thus headings before and after a tack should not be mirror opposites.

When making the final approach to a windward target, there is value in sailing a little beyond the traditional lay-line. Having done this, a boat can lay off to a more effective heading. This offers the added insurance of extra space in hand to lay the target if the wind should start to oppose.

Downwind, the potential benefits of curved tracks are better than upwind. Gains of the order of 10% are to be expected at displacement angles typically worked (approximately 20º). A boat will not suffer much loss of distance when gybing. Therefore she can respond to changes in wind angle which are *lifts*. Significant gains in velocity downwind to a target can be achieved by skippers who are alert to the angle between the wind direction and the direction to the target. Some knowledge of the shape of the boat's polar performance curve is useful. Use of the popular Target Boat Speed method may incur hidden risks which the literature has not normally quantified.

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Kingston, Canada, 2010

About the author

Michael Nicoll-Griffith sails out of Kingston Yacht Club, Kingston, Ontario.

He has sailed his Tanzer 22 competitively since 1971.

He has a degree in Naval Architecture from Newcastle, UK.

He serves as a Canadian National Judge, assisting with sailboat races in North-East North America.

He is a past-President of the St Lawrence Yacht Racing Association.

You will find him involved in the administration annually of the CORK regattas held at Kingston.

Glossary to Part 5

AWA Apparent Wind Angle. The direction, measured from the boat's bow, from which the wind comes.

BDA Best Downwind Angle The angle that gives the best downwind speed – i.e. top VmgW.

Curl The turning inwards of the luff of a spinnaker that indicates the sail needs tensioning of its sheet.

Header Change in wind direction that is towards the front of the boat. A disadvantage upwind but an advantage downwind.

Heading The direction that the boat is pointing.

HrT Heading with respect to the Target. This the angle that would be observed on the pelorus sighting to the target with the boat on the correct heading. This can be the deviation angle on a GPS set with the target's location.

Lifts A shift of the wind direction towards the stern of the boat. Opposite of header.

Luff The leading edge of a sail. The part that the wind encounters first.

Tell-tales Ribbons on the leading edge of a genoa or jib that enable the helmsman to steer very precisely. Used when going upwind.

TWD True Wind Direction, measured as a relative angle from the heading of the boat.

Vortex A circular motion in a fluid, such as wind, caused by the moving from a high pressure side to a low pressure side. Often exist at the end of wings and similar lifting foils.

References

5-1 C.A. Marchaj: Sailing Theory and Practice. Dodd Mead, 1964

5-4 Bénéteau Velocity Prediction Program "Performance Curve" data http://www.blur.se/polar/first367_performance_prediction.pdf

5-5 Farr 40 Velocity Prediction Program "Performance Curve" data http://www.vossassociates.com/farr40/farr40vpp.pdf

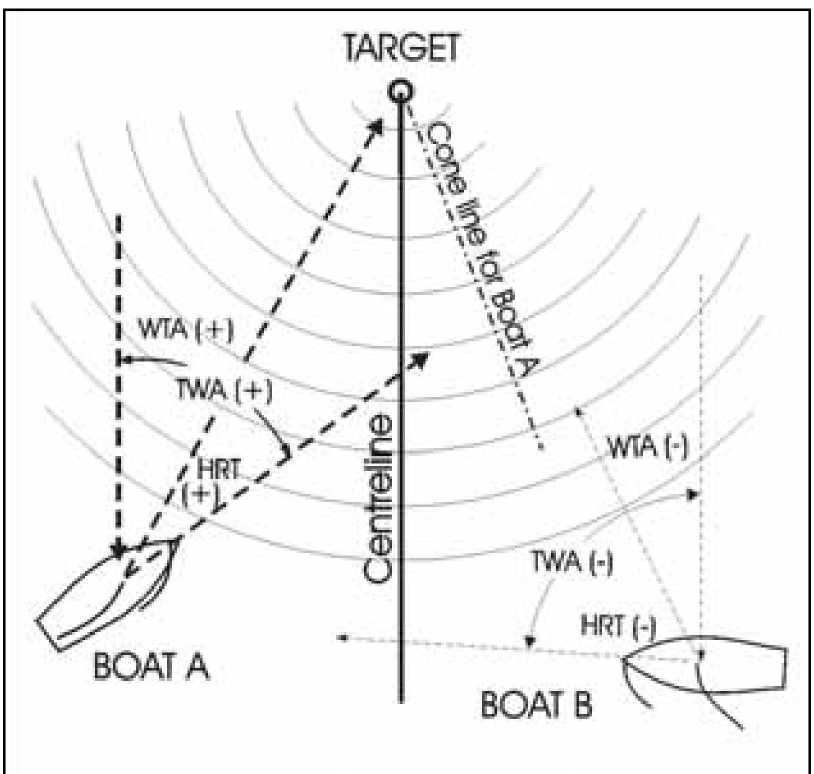

Figure 18 - KEY ANGLES

It was unfortunate that Figure 18 in Part 4 (Catalyst 41) was inadvenrtently replaced by an older version.

I apologise to the author.

This is the correct diagram.

- Editor

Sailing a faster course – go straight

Paul Ashford

The first three parts of Michael Nicoll-Griffith's paper published in Catalysts 38, 39 & 40 are full of fascinating insights into the use of polar curves and new ideas, all presented with great clarity and providing food for hard thought. It is only after reading it at least three times and prolonged head scratching that I venture to comment.

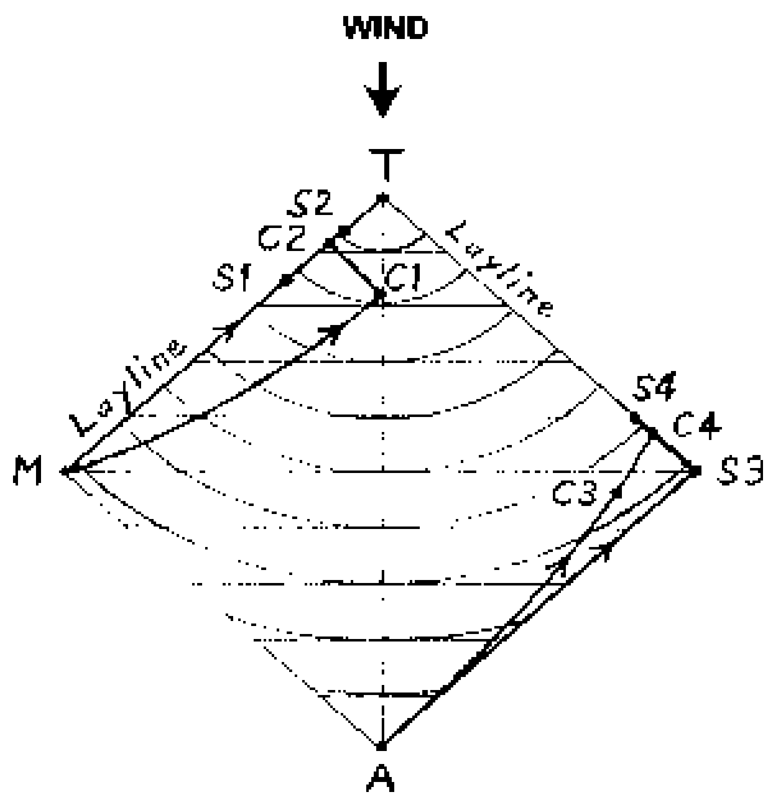

Figure 1

I am sorry to conclude that his elegant curved paths will not deliver a faster course in the theoretical conditions of constant wind speed and direction. My reasons can be simply stated. Consider two identical boats starting together on an upwind leg. Boat C sails the Curved courses. Boat S sails in Straight lines at best upwind angle, which delivers best possible VmgW, velocity made good to windward up the wind ladder. Because the curved paths depart from best upwind angle, it is clear from consideration of the polar curve (e.g. see Michael's Figure 3) that they must deliver a lower average VmgW. Therefore after any interval of time boat C will not have climbed as far up the wind ladder as boat S. When boat S reaches the target, boat C must be lower on the wind ladder and so cannot have arrived at the target.

This argument is valid if the boats start from any single starting point within the laylines, or from separated points on a starting line square to the wind. It is also valid for any pattern of tacks, assuming no tacking penalty (time lost in changing tack) or that both boats make the same number of tacks.

This conclusion leaves a paradox. Boat C at every point in its passage adjusts its course to give VmgT (velocity made good in the direction of the target) better or equal to that from any other heading. Yet its average VmgT over the whole passage must be less than the boat that started with it at the same place and arrived first. We can begin to understand this mystery by revisiting pages 20 & 21 of Catalyst 39 and the details of alternative paths from point M in Figure 8. Boat S follows the conventional path straight down the layline where VmgT is constant and equal to boat speed 2.91 knots. Boat C starts on a course 20º freer giving a boat speed of 3.68 and optimised VmgT of 3.46 knots, a gain of 0.55 knots. Now turn to my Figure 1 and see what happens when boat C reaches the centreline at point C1. Boat S is at point S1, further from the target but upwind of boat C. Both boats are now sailing at best upwind angle at 2.91 knots, but boat C is sailing at an angle of 46º to the radial line and its VmgT has fallen to 2.91 x cos46º, or 2.02 knots, a relative loss of 0.89 knots. Worse is to come. Whether it stands on or tacks will not affect the outcome, as these alternative courses are mirror images. Assume it tacks. By the time it reaches the layline at C2 its track is nearly tangential to the rings and its VmgT is almost zero. Boat S must maintain its windward advantage and so be further along the layline at S2 and closer to the target. Boat C now has the lower average VmgT since the start, in spite of having optimised its VmgT at all points on the passage.

We get a similar result with a centreline start at A. When boat S arrives on the layline at S3 boat C is at C3, somewhat downwind but closer to the target as intended. Then boat S sets off down the layline at VmgT equal to boat speed. Boat C is sailing at a lower speed and obliquely to the rings and so at much lower VmgT. Although it appears to take a short cut it gets to the layline at C4 still downwind of and so behind boat S. Again boat S has achieved the better average VmgT.

No boat can sail with VmgT equal to boat speed except on a radial line such as a layline, and comparing the progress to the target becomes more complicated if they tack closer to the centreline. However it seems safe to say that whatever tacking pattern is adopted, in parts of the passage boat C will make good the faster speed toward the target as intended, and in other parts it will fall behind.

To summarise, the boat sailing in straight lines at best upwind angle will make faster progress up the wind ladder than one which follows a curved course, and must therefore win. This implies that the boat that continually optimises speed made good toward the target (VmgT) actually achieves a lower average VmgT. This apparently improbable result occurs because the different strategies separate the two boats and there are times when their different positions and headings cause the optimised VmgT of the boat sailing on curves to be less than the VmgT of the boat sailing at best wind angle.

Paul Ashford

Author's Reply – Part 4½ – Sailing A Faster Course

Resolution of Flaws

Since the initial preparation of this material, it has been shown geometrically that a reality lurks amongst the flaw descriptions described above. The four rationales that described the hunt for flaws turn out to be different descriptions of the same basic situation.

Paul Ashford of Norwich, UK, to whom I am most indebted, has devised diagrams that show geometrically that, if the wind holds its direction, then the curved course will not be the quickest way to a windward target. That is, a boat sailing the straight line BUA will always be further upwind and therefore can always reach the target first.

Surprisingly, it is also true that, at all times while they remain on the same tack, the boat ("C") sailing the curved course will be closer to the upwind target than the boat "S".

We compare two boats: C - "Curvy" and S - "Straight". The diagrams which follow illustrate positions for the two boats as C approaches her cone line. Readers will notice that C is closer to the target in both cases, a while S is further upwind. This may clarify what seemed to be an impossible paradox.

Using speeds and angles taken from Table 4.1, the positions of the boats can be established with some precision.

If the boats start together from the centre line (Figure 17.1) and sail out in the unfavoured direction, then C is indeed closer to the target. She is also closer to the centre line. But S has acquired some "position-power" in sailing broader. That holds if the wind direction holds.

In the event of a lifting windshift both of the displacements (being closer to the target and also being further in) benefit C. In Figure 17.1 we can measure, when the windshift exceeds roughly 7.5º, the two boats would be equally upwind.

S was at risk from such a lifting windshift. If there was a heading windshift, however, S would gain. If she gets too close to the layline, however, she can lose whichever way the wind swings.

A second case assumes the two boats started together on a layline. Here they will be on the favoured tack. S will remain on the layline. C, freeing her sheets, approaches closer to the centre line and remains closer to the target, with S further upwind.

Figure 17.1 - OUTBOUND COMPARISON

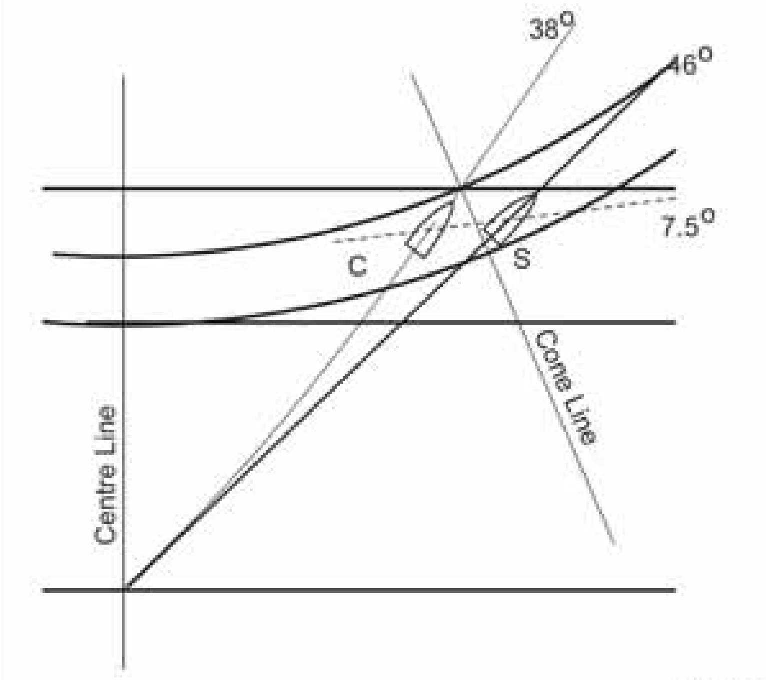

Figure 17.2 indicates that a header shift of approximately 17° is needed to equalize the positions. However, C will always be less at risk than S from any windshift. S will suffer a relative loss, whichever way the windshift goes. That is because a lift causes S to have overstood, while a header sets her down the revised wind ladder.

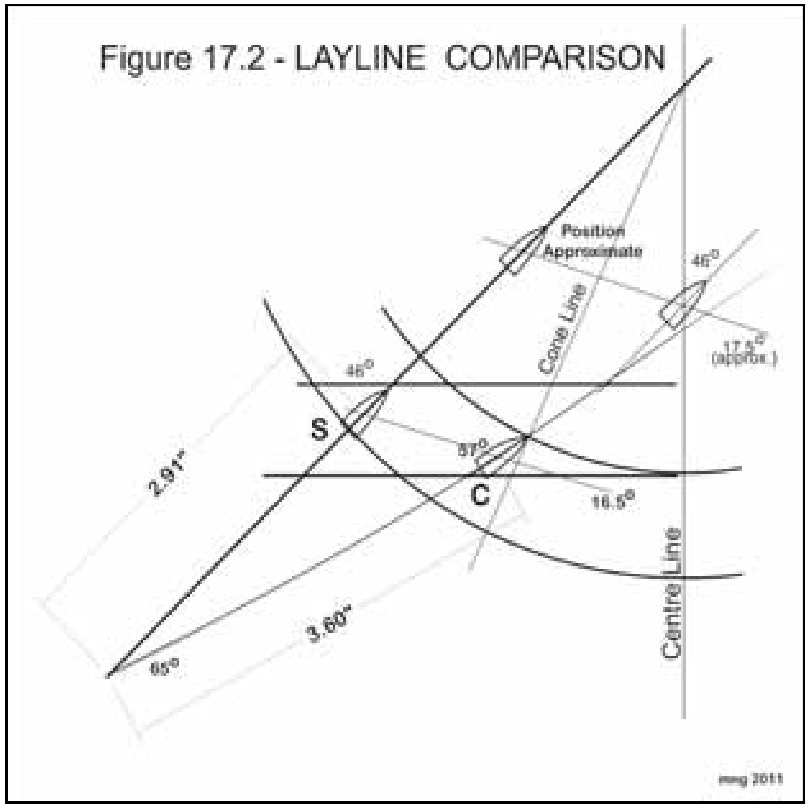

Figure 17.2 - LAYLINE COMPARISON

Unfortunately for C, though, she now has to make one or more tacks and therefore cannot realize all the benefits she might have assumed.

In short, when a header is expected and later realised, the boat that foots more benefits. When a lift is expected and later realised, then the boat that sailed tighter benefits.

Further Observations

In each case, C is closer to the windward target, but S is further upwind. This anomaly is possible only because the boats are displaced to the sides of the course where the target rings and the ladder rungs have separated.

Thus we see that S holds the advantage while the wind stays in the same direction. C's closeness to the target will benefit her in a changing wind. In a course race when S has tacked back into the middle, S may be closer to the centre line than C. That will give her back some windshift options.

Offshore, because of the wide distances, sailing to maximize VmgT (i.e. "VMC") is more relevant. However, because the targets are widely separated, the rings are large and do not have much curvature. This means that, while the track sailed should be curved, those curvatures are very gradual. More common will be changes to the wind direction, in which situation,.being closer to the target is more important. The geometry outlined here then makes a lot of sense.

Downwind, the arguments of whether the curve or the ladder should prevail, should apply similarly to the way they apply upwind. Therefore one might suppose that the ladder would always win. However, there is some experimental evidence that suggests that could be an over-simplification. The flaws are only valid when the apparent wind changes within a limited range. When there is lot of variability in its direction, perhaps the importance of the curve can be reassessed. I have dealt with this in Part 5.

Michael Nicoll-Griffith
May 2011

AYRS North West England Local Group

Well, we made it to our second year as a local group and our membership is still expanding! From a list of sixteen members that I regularly invite to the North West Group meetings, eight have attended at least one meeting - with one new member attending each of our five meetings to date. As the instigator and organiser of these meetings, I would like to say a big THANK YOU to all those members who have supported my efforts. To the other eight members who have not yet attended, I realise that some of you may be unable to attend due to health reasons. However if you are fit enough and able to make it to the next meeting, I am sure you will find a welcoming and interesting bunch of guys to share you afternoon with.

John Morley Tethered Kite Sail Project

After a series of minor gear failures (in my back garden) and a long cold winter, the Static Demonstrator was successfully "flown" for the first time on Saturday 9th April 2011. Following the addition of a "bowstring bowsprit" to aid tacking and the addition of a cross brace and brackets to strengthen the base frame, It has been trialled several times since in various wind strengths. The Kite Sail performed as predicted, self adjusting to the variation in the wind direction in a "hands free" manner. John and I are both very pleased with the outcome of this simple project which was achieved with the generosity in time and materials of three of our local members and for less than £100 in material costs.

Ongoing, as part of the Howard Fund Project, John and I have decided to manufacture a triple sail assembly which can be mounted on either the Static Demonstrator or on a sailing canoe. We hope to convince a couple of our local members to fit the rig to their existing canoes. We are suggesting a total sail area of about 5.4 square metres (58 square feet), being 1.5 x a normal canoe sail of 3.6 square metres (38 square feet). This will enable us to evaluate the handling of the Triple Tethered Kite Sail prior to manufacturing and sailing the full size demonstrator, which is to be mounted on an Enterprise sailing dinghy.

Michael Howard

MORLEY Tethered Kite Sail - Static Demonstrator "flying" in a 12 knot Southerly breeze on Ainsdale Beach, Merseyside - 18th April 2011

Snippets

Chesapeake Sailing Yacht Symposium 18th – 19th March

Did anybody go? If so, we'd love a report please! - Editor@ayrs.org

Fred Ball has a new email address - fredcball@btinternet.com. (Fred is contact for several AYRS' events)

Catalyst Calendar

This is a free listing of events organised by AYRS and others. Please send details of events for possible inclusion by post to Catalyst, BCM AYRS, London WC1N 3XX, UK, or email to **Catalyst@ayrs.org**

May 2011

9th - 13th Boat trials, Weymouth
Location to be determined.
Contact: Norman Phillips email: wnorman.phillips@ntlworld.com; tel: 01737 212912.

27th – 30th *Broad Horizons* – AYRS Sailing Meeting
Barton Turf Adventure Centre, Norfolk UK, NR12 8AZ. Contact AYRS Secretary AYRS Secretary, BCM AYRS, London WC1N 3XX, UK; email: office@ayrs.org. Note: All boats limited to 1.2 metre max draft!

27th – 30th UK Home Boat Builders Rally – Norfolk Broads
Barton Turf Adventure Centre, Norfolk UK NR12 8AZ. Joint with the above. For details see http://uk.groups.yahoo.com/group/uk-hbbr/

June 2011

10th – 12th Beale Park Boat Show
Beale Park, Pangbourne near Reading, UK. Open-air boat show with a number of boats available to try on the water. AYRS will be there again, selling publications. Extra attraction this year – the *Water Craft Cordless Canoe Challenge*. Contact: Fred Ball, tel: +44 1344 843690; email: fredcball@btinternet.com (new address).

June 2011 (cont)

18th AYRS North West England Group meeting
2pm, 12 The Boleyn, Lydiate, Merseyside, L31 9PT. Contact Mike Howard for details:
Tel: 0151 531 6256;
e-mail: ecotraction@aol.com

October 2011

15th – 22nd Weymouth Speedweek
Portland Sailing Academy, Portland Harbour, Dorset UK. See www.speedsailing.com.

19th *Speedsailing* – AYRS Weymouth meeting
19.30 for 20.00hrs, at the Royal Dorset Yacht Club, 11 Custom House Quay, Weymouth.
Map: www.rdyc.freeuk.com.
Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX; email: office@ayrs.org tel: 0780 820 0987 before going just in case the location changes!

November 2011

6th *Your Projects* – all-day AYRS meeting
9.30am to 5pm, Thorpe Village Hall, Coldharbour Lane, Thorpe, near Staines & Chertsey
Bring your lunch - tea and coffee available. Donations invited to pay for the hall. Details from Fred Ball, tel: +44 1344 843690; email fredcball@btinternet.com (new address).

January 2012

6th – 15th London International Boat Show and
12th – 15th The Outdoor Show
EXCEL Exhibition Centre, London Docklands. AYRS will be there. Helpers are wanted to staff the stand, sell publications and recruit new members. If you would like to help (reward: free ticket!) please contact the Hon Secretary on 01727 862268 or email office@ayrs.org

22nd All-Day AYRS Meeting
(provisional date)
9.30am-4pm, Thorpe Village Hall, Coldharbour Lane, Thorpe, Surrey (off A320 between Staines and Chertsey – follow signs to Thorpe Park, then to the village).
Details from Fred Ball, tel: +44 1344 843690; email: fredcball@btinternet.com (new address).

22nd AYRS Annual General Meeting
(provisional date)
4pm, Thorpe Village Hall, Coldharbour Lane, Thorpe, Surrey (as above). Details from the AYRS Hon. Secretary tel: +44 (1727) 862 268; email: secretary@ayrs.org
Note: Items to be considered by the AGM, including nominations for the Committee MUST be received by the AYRS Secretary before 22nd December 2011 (post to AYRS, BCM AYRS, London WC1N 3XX, UK, or email: secretary@ayrs.org)

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Connecting Boat Designers & Builders

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Think Outside the Box.

Please join us in Louisville, KY October 18, 2011 right after IBEX closes for the day.

At this time, we are asking yacht and boat designers to send us two slides plus a short design brief. We will select ~ 14 presenters. If chosen, you will speak about your design, and present 20 slides of it in a time of 20 seconds per slide. You may choose any of your designs, but we are most interested in learning about leading-edge modernistic designs.

We encourage you to give us a "concept craft" you are working on. There are no specific parameters. Power, sail, oar/paddle.

For more information, please email carl@proboat.com

[For those who, like me, didn't know what a PechaKucha event was: it is apparently a Japanese invention - a meeting in which a number of people are invited to presnt their ideas in 20 Powepoint slides with a strict time limit of 20 seconds for each slide. It has the merit of encouraging short, sharp, presentation of ideas with no time for waffle. Now if only we had thought of that at several international conferences I've had to sit though ... - AYRS Editor]

Catalyst — *a person or thing acting as a stimulus in bringing about or hastening a result*

On the Horizon . . .

Discussion on "Sailing a Faster Course"
Experimental platforms
More sources and resources: reviews, publications and Internet sites

Amateur Yacht Research Society
BCM AYRS, London WC1N 3XX, UK

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