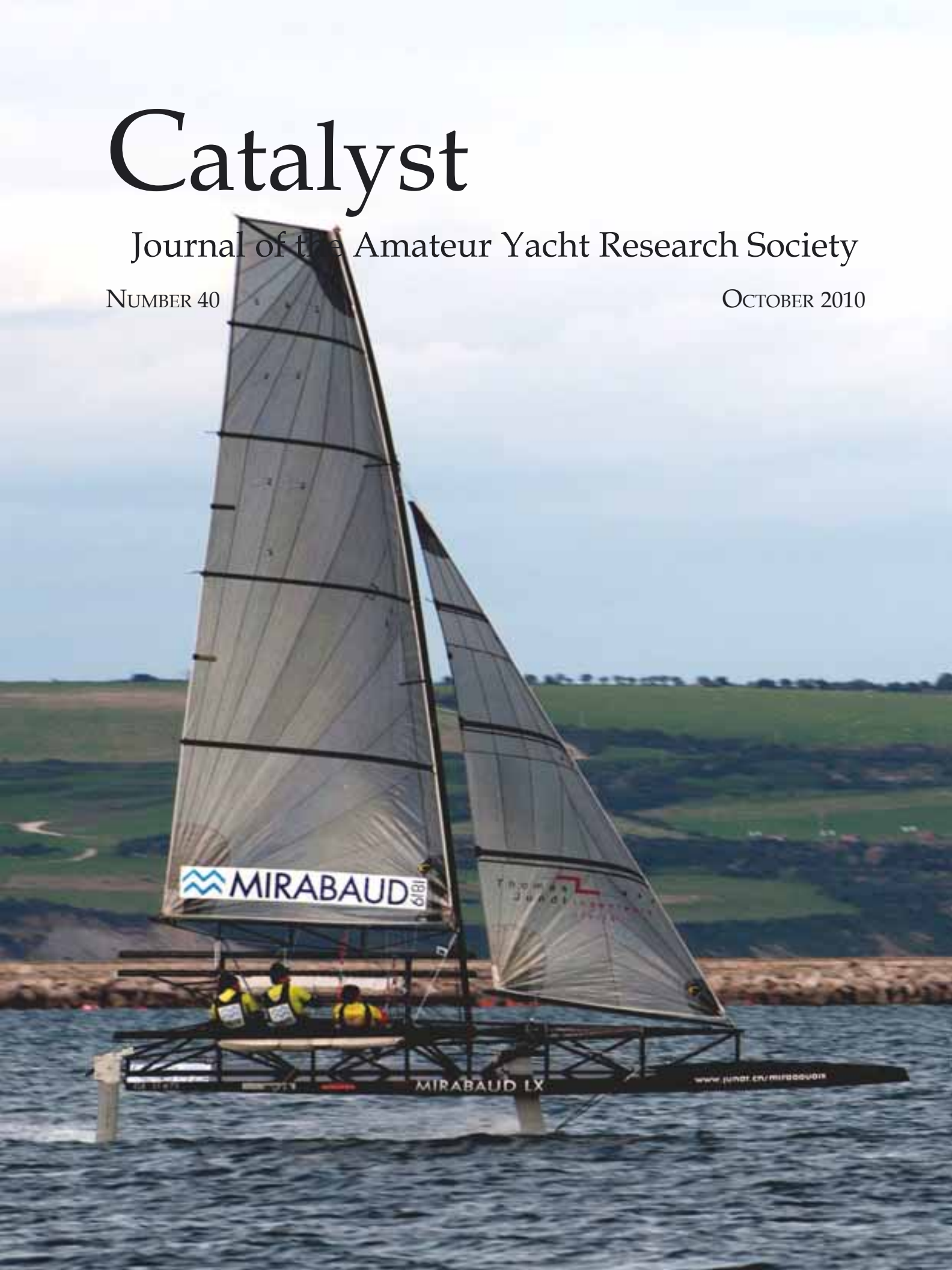
Catalyst

Journal of the Amateur Yacht Research Society

Number 40 October 2010



WoodenBoat and *Professional BoatBuilder* magazines'

DESIGN CHALLENGE III

A Fast Expedition Sailboat

Inspired in part by the worldwide popularity of raid-type events—multi-day racing and cruising expeditions sailed in small boats—we challenge you to design a new boat within the following parameters:

- Must be a new design produced after September 1, 2010.
- Fast, seaworthy, and simple.
- Must have spartan overnight accommodations for a minimum of two. These accommodations must include a cabin, cuddy, or boom tent; a port-a-potti; and a limited galley that includes a stove and water and food storage.
- Must be trailerable for affordable over-the-road transportation and storage. Maximum LOA must not exceed 40'; maximum over-the-road beam (with trailer) must not exceed 8'6"— although the rigged sailing beam may be greater. We'll look favorably upon designs that are easily launched, rigged and retrieved without outside assistance. Water ballast and adjustable keels are permitted.
- Maximum trailerable weight must not exceed 3,500 lbs.
- The boat must have positive flotation, watertight storage for gear, and mechanical or manual auxiliary propulsion.
- And, finally, the boat must have good seakeeping attributes with the ability to sail to windward in a gale (34–47 knots).

Above—Swallow Boat's Bay Raider 20, a water-ballasted yawl. For more information, see www.swallowboats.co.uk/content/view/115/110

Top—The 24' Kurt Hughes–designed trailerable trimaran MUFFOLO built by Luciano Romano and operated by Silentbay Charters in Sestri Levante, Italy. Photo: Andrea Sesta

Submissions must be the designer's original, previously unpublished work, and include lines, profiles, sections, table of offsets, an accurate weight study, and cost calculations. All designs will remain the property of the designers, although WoodenBoat Publications requests the right to publish drawings of the winning boats.

Submissions should be postmarked no later than April 29, 2011. Please send hardcopy only. Include your e-mail address if you would like to receive notification of receipt.

We will award $1,000 prizes to each of our first-place designs in wood, composites, and metal.

DESIGN CHALLENGE III
***WoodenBoat* magazine**
P.O. Box 78, Brooklin, ME 04616 USA

For more details email carl@proboat.com
or visit our Web sites at **proboat.com**

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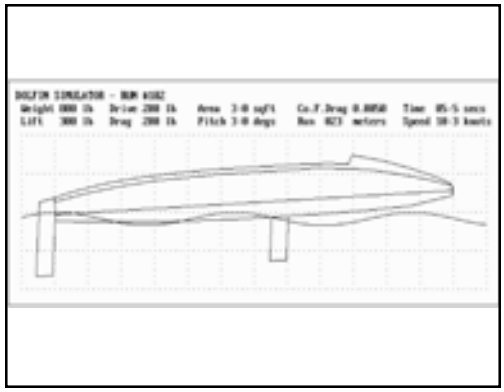

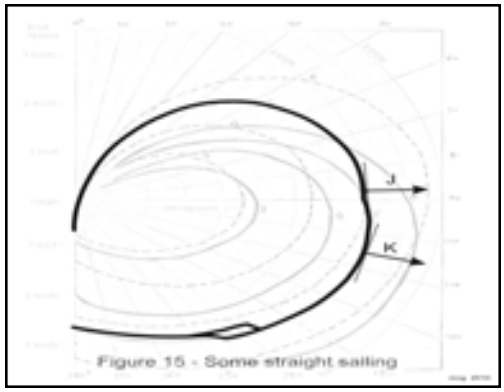

Cover:
Thomas Jundt's foiler
Mirabaud LX
at Weymouth Speedweek
Picture (c) Tim Daish &
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Catalyst

Journal of the
Amateur Yacht Research Society

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Simon Fishwick
Sheila Fishwick

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New America's Cup Rule

The America's Cup organisation has (October 2010) published the rules governing the design of the boats for the 34th America's Cup Challenge.

As expected in many quarters, the rule defines a 72ft (22m) catamaran with a wingsail, plus the ability to carry jibsails when wanted. As might be expected from a first foray (for many potential competitors) into multihull racing, it is fairly prescriptive – there are going to be no radically different boats amongst the fleet. To the casual eye, they are all going to look more or less the same, and are likely to have fairly well-matched performances. That will allow the AC community to ease into match racing in multihulls without major research investment (which would have been discouraging to many).

As a further easy entry, they are building a fleet of 45ft one-design cats, the first of which comes [came] off the line in December. These will be used for a regatta in 2011, and for the "Youth America's Cup" in 2012. Boats are expected to be produced at a rate of two a month, although they have not (yet) announced when challengers can get their hands on them.

All of which looks to be an interesting couple of years for students of big cats.

AYRS Editor

Broad Horizons –

AYRS Sailing Meeting and UK Home Boat Builders Rally – Norfolk

Every year for the past four years or so, AYRS UK has held a small gathering on the Norfolk Broads at Barton Turf. (The Barton Turf Adventure Centre is managed by Simon & Sheila Fishwick, Editor & Secretary of AYRS respectively). This takes place on the long weekend at the end of May (the last Monday in May is a UK public holiday). Usually people arrive on the Friday evening or Saturday morning and stay until Monday evening. It is an excellent opportunity to get together and look at others' boats, sail them, mess around, and share ideas and enthusiasms.

For the past couple of years, the meeting has been combined with a meeting of the UK Home Boat Builders Rally (UK-HBBR, see http://ukhbbr.wordpress.com) which gives us an opportunity to look at their boats and them an opportunity to see what ideas we have up our sleeves. The two groups have members in common and although the two organisations are very different in their history and constitution there seems to be enough common ground to allow a sharing of ideas and experiences.

Those who live within easy reach of the Centre (which is about five miles North of Wroxham – there's a map link on the AYRS website), tend to go home at night, others may stay in local Bed & Breakfast establishments, but most stay on site, either in their own tents, or sleeping on a bed in one of BTAC's tents (bring your own sleeping bag and pillow, but BTAC can provide extra blankets if you feel cold!)

Foodwise, either bring your own, or sign up for Sheila's cooking. It's becoming a habit for her to organise a barbeque on the Saturday evening (over 50 people last year!), and for some people to sail down to the pub at nearby Neatishead for

Sunday lunch. Otherwise she offers a full English breakfast, buffet lunch, and a cooked evening meal if ordered in advance. The Centre is not licensed to provide booze so if you want some, bring your own.

The Centre has a large meeting room-cum-dining room, toilets, showers and somewhere to dry your wet clothes if you fall in. There is also a workshop if you break gear. The main part of the site is about 4½ acres (1.8 hectares), but there is a further 12 acres (4+ hectares) of nature reserve attached.

The Norfolk Broads are the result of mediaeval peat diggings that became flooded as sea levels changed. Barton Broad is the second largest of the broads, and is reputed to be the place where Nelson learned to sail! (Nobody knows if it's true, but he did spend a lot of time as a youngster at his brother-in-law's place about half a mile away). At its deepest, it's over 8ft (2.4m) deep, but parts are much shallower which is why we say visiting boats should not have a draft of more than about 4ft (1.2m). It is surrounded by reedbeds and alder carr (flooded woodland) and the River Ant, which now runs through it, provides access to the rest of the Broads and the sea. (Anybody coming or going by boat needs to be able to lower their mast to get under the bridge at Ludham).

BTAC has its own private slipway where you can launch your boat into a cut off the River Ant about 500m from the open water. Help is provided to launch heavy or awkward boats (the slipway is only 8ft (2.4m) wide), and Simon can take out one of the powerboats to be both a safety boat and a platform for experimentation. BTAC have fleets of dinghies that if a sufficient case is made may be used for trying out different rigs or means of propulsion. We encourage safe practices while experimenting, and the Centre has buoyancy aids, helmets, waterproofs, and wi-fi access to weather forecasts etc. We try and ensure that the phone number is in people's mobile phones so they can communicate with the Centre if they need to. (We don't use VHF to avoid interfering with the port activities).

This year we're hoping to have facilities to organise speed measurements if people want them. The Broad is not really big enough to lay a proper 500m course (we have to make allowances for other people passing through, some of them in hired boats, some of them maybe for the first time, also for the local sailing club who race and train on the Sunday). We should though be able to manage a 250m course on the Saturday and Monday.

The down side of coming to Barton Turf Adventure Centre is that Sheila will try to make sure that you recycle things into the correct bin, and expects you to share her enthusiasms for the

rare Swallowtail butterfly (if we have a warm week before the meeting they should be flying), otters, kingfishers, water voles, marsh harriers, bitterns and much more. Part of the site is a nature reserve managed to encourage wetland species, and as such is a source of much interest and photo opportunities.

The focus of the weekend though is to get on the water as individuals and groups, to try out things then come back and talk about it.

The 2011 Broad Horizons AYRS Sailing Meeting / UK Home Boat Builders Rally is planned for May 27th -30th 2011. Full information, costs, harbour dues ("Broads' toll") information can be found on the AYRS website at http://www.ayrs.org/Broad_Horizons.htm. We look forward to seeing you with or without your latest project.

Photos by Graeme Ward, S&S Fishwick, Fred Ball, Slade Penoyre & Bernard Rhodes

Speedweek 2010

1. Mirabaud LX (see also front cover) 2. Michael Barton's to supplement the two used by Speedweek 4 & 5. Roger

All pictures (c) Tim Daish

- a few pictures

new catamaran 3. AYRS hired an extra rescue boat
Dyer's boat Portland 77 showing the bow shape
& www.speedsailing.com .

Best boat speeds:
Mirabaud 23.248 kts (64th)
Intl Moth 3021 20.096 kts (87th)
Torix Bennett 12.657 kts (96th)
Michael Barton 11.322 kts (97th)
Portland 77 5.740 kts (98th)

The Dolfin Project

Part 1 - The Hydrodynamics Simulator

Peter Jefferson

Introduction

The Dolfin project aims to design a hypothetical sailing craft named *Dolfin* with the ultimate objective of challenging the world sailing speed record.

The Simulator

This simulator is a computer program designed as a tool for optimizing the hydrodynamic and foil parameters of the craft. The relevant parameters are entered and while the space bar is held down, the program runs at approximately real time, continuously recalculating the lift and drag of the hydrofoils, the speed and the distance run. The run can be stopped at any time to print the screen display as shown below.

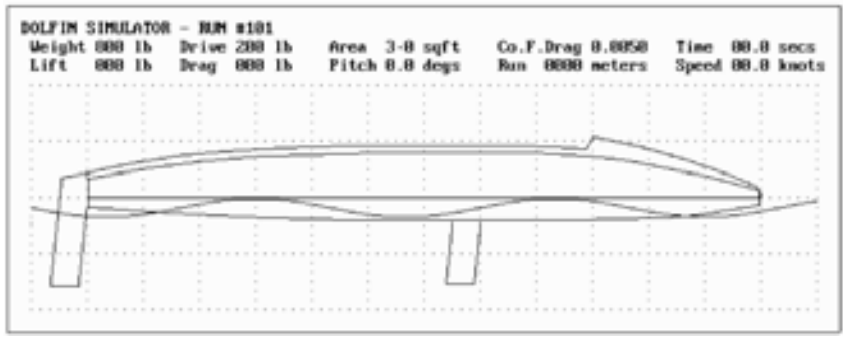
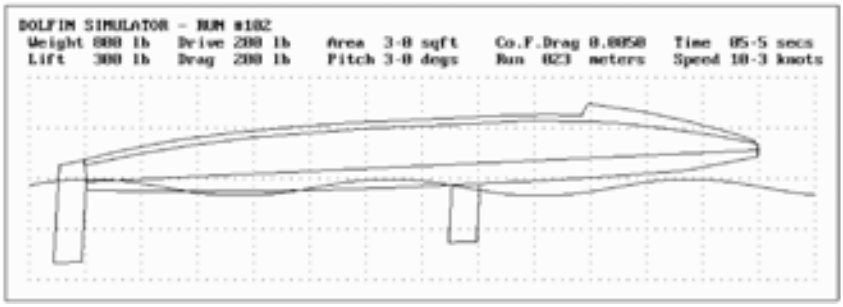


Diagram 1 shows the starting conditions. The gross weight of the craft is assumed to be 800 lb. The net forward component of the wing lift or "drive" force is assumed to be not less than 200 lb. We have not considered the rig design yet, nor specified the true wind strength, so this remains as a working assumption to be tested later. The total effective area of the hydrofoils is a critical parameter and needs to be entered before each run.. If the area is too small, the foils will stall, and the craft will fail to lift off. If the area is too large, the drag at high speeds will reduce the ultimate speed attainable. The area was initially set to 3 square feet.

The coefficient of form drag, which is the coefficient of drag when the angle of attack or "pitch" is zero, was initially set to 0 ·005. This figure was derived from published data for a foil with a 6:1 aspect ratio. The pitch, which in reality would be controlled by the pilot, is increased steadily until the lift equals the weight. Thereafter, the pitch is maintained at an angle such that the lift remains equal to the weight. However, the pitch may not exceed 3° as this is considered impractical. All the other parameters are computed.

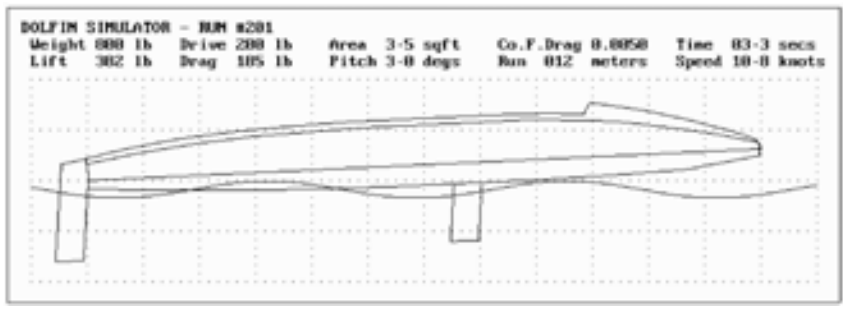
Run #102

[Note: the run numbers are arbitrary, and used here only to correlate with the diagram labels – Ed]

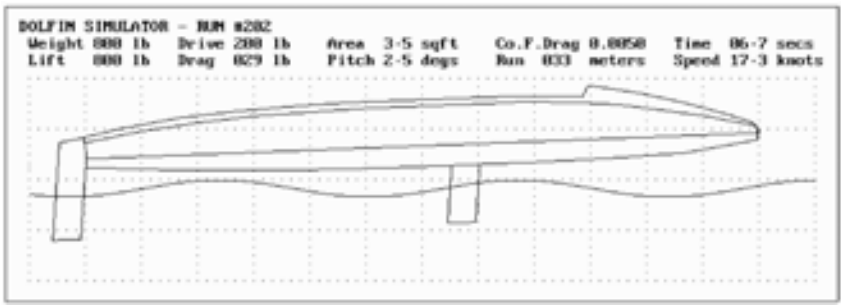


The program was run for 5 ·5 seconds by which time the speed had reached 10 ·3 knots. However, the drag has reached 200 lb – equal to the drive – and the lift is only 300 lb. The craft is stalled and will go no faster. The foil area is clearly too small.

Run #201 - #203 – effect of slightly larger foils

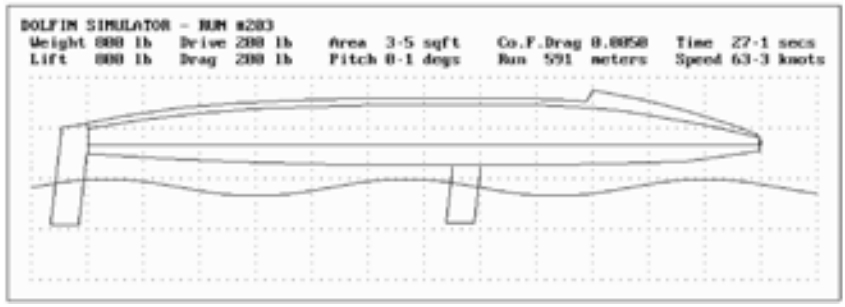


The foil area has now been increased so that the drag peaks at 185 lb. As the craft accelerates, the lift will increase until the craft is fully foil borne. The pitch will then diminish to keep the craft at the right altitude. The drag will rapidly diminish to a minimum.



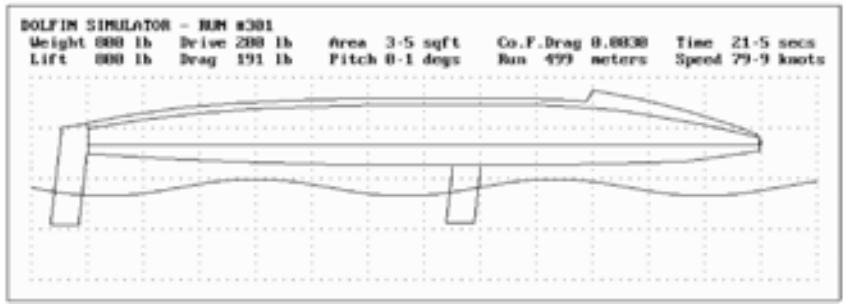
After 6 ·7 seconds, the speed has reached 17 ·3 knots. The pitch has dropped to 2 ·5 degrees and the hull is clear of the water so there is no displacement drag. The total drag has dropped to 29 lb.

As the craft continues to accelerate, the pitch diminishes to point where the incidence drag is insignificant compared to the form drag. With the coefficient of form drag set at 0.005, the craft can accelerate to 63 ·3 knots before the form drag rises to 200 lb, equal to the available drive force.

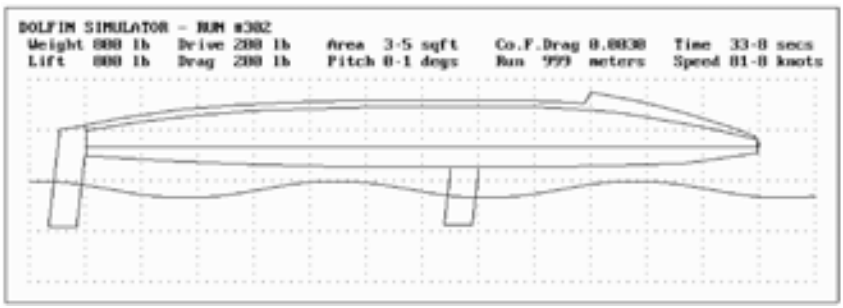


Runs #301 & #302 – effects of thinner foils

The form drag is roughly proportional to the thickness of the foils. The figure used so far applied to a foil with an aspect ratio of 6:1. If thinner foils are used so that the coefficient of form drag is 0·003, the craft will reach almost 80 knots after 21·5 seconds, having run almost 500 metres.



If the craft then continues at its top speed of about 80 knots for a further 500 metres, (the official sailing speed record course length) the extra time is 12·3 seconds. This translates to an average speed over the course of 40·6 metres per second, which is just under 80 knots.



Caveat

All this presupposes that the forward drive of the wing can be maintained when sailing at perhaps four times the true wind speed, and that the form drag, which must include the drag of the hydrofoil mounting struts, can be kept sufficiently low. The effect of the side force from the rig, which must be resisted by the hull or by some other device, has also to be considered. The aerodynamic factors and the whole question of control of the craft, are subjects for future chapters.

Peter Jefferson
<pjjefferson@sympatico.ca>

Sailing a Faster Course
Hypotheses from a study of polar performance curves
Part 3 - Integrating Results to Whole Legs

Michael Nicoll-Griffith

Say not "I have found the truth": but rather "I have found a truth". - Khalil Gibran

The weather leg as a whole

In Parts 1 and 2, we looked at the polar curves of our boat and the way these could show us the optimum course to sail to reach our target.

We can now integrate this into the full weather leg. If we are sailing to a target direction in an ocean race then the wind will not usually be blowing exactly from it. As is usual, we pick the tack that enables us to head closer to the target. If the wind is, say 23° to the left of the line to the target, then we should be on the port tack and sailing, for maximum VmgT, a little lower than close-hauled. If and when we pass the centreline point where the wind is lined up with the target, we should be sailing the Best Upwind Angle as in the direction to A. (See Figure 10)

As the target starts to "move" to the left in the wind, (given a steady wind direction), we need to tighten up. In practice, we will go on a little and then tack. How much to tighten, and for how long, depends on the shape of the polar curve for upwind in the current wind. At some point, the jib will start to luff increasingly, as the curve turns down to "C" or beyond. At this point, we will be starting to "pinch". The boat will eventually be unable to maintain enough speed at the angle wanted. It is like the end of the benefit. We will be calling this the Limit Line, although it is not a hard, fixed limit.

The polar diagram that we are using, for a 5 knot wind, suggests that the limit line angle is close to 23°. The choice of 23° is arbitrary, but believed reasonable. It is half the layline angle. At our current level of analysis we can assume something between from 20° and 30°.

Note however, that any boat sailing away from the centreline is on the unfavoured tack. Theoretically, if there were no cost to tacking, she would have been better to have tacked as soon as she crossed the centreline. She has to go some distance out to the side, but going to the lay-line could be too much. (See also figure 11).

When the jib starts to luff because we can't pull it in any more, that will be the time to tack. After tacking on the limiting cone line at L, we lay off to the opposite B angle at, say, 23°, now on starboard, to maximize progress into the rings. After the initial few moments, we must gradually tighten the sheets up to the A direction

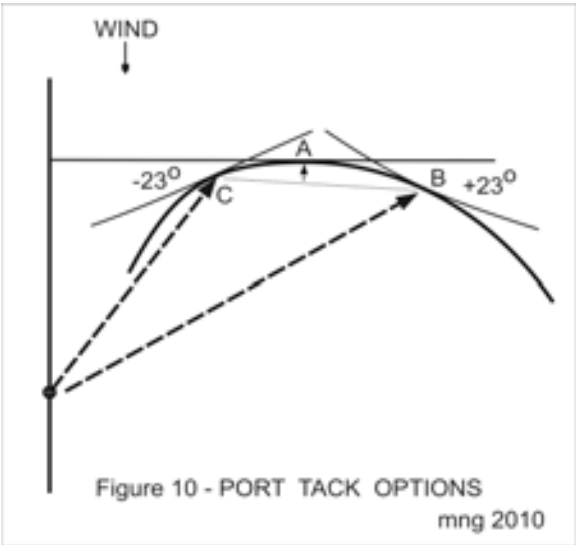


Figure 10 - PORT TACK OPTIONS
mng 2010

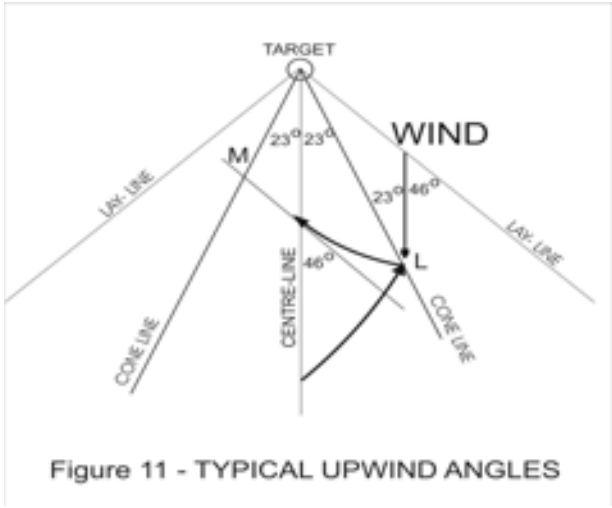


Figure 11 - TYPICAL UPWIND ANGLES

as we cross the centreline, and continue to tighten until we reach M and are heading in the C direction on starboard.

When the boat is on the cone line of 23°, then the angle seen at the boat between the target and the wind will also be 23°. This is going to be useful! It will assist our navigation.

Stuart Walker's Safe Zone, selected for windshifts, is 30° each side (See Reference 2-4, page 170). But if the target is extremely far away, as in an Ocean Race, then the rings will be much larger. A boat could then sail in the B direction indefinitely.

Weather Leg Summary

A weather leg summary diagram can now be drawn (Figure 12).

Sticking solely to a spiral track as the circle gets narrower will involve excess tacking near the end. So for the final approach we would use a couple of straight lines. The first takes us out, at the limiting angle, to the layline. After overstanding it a little, we can tack for the mark and clear it, hopefully ahead of all the other boats in the race!

So here it is! I will call this a "Mindemoya Track" (after my yacht!).

Here the skipper has avoided going beyond the cone line. The reason should be because he knows he cannot take advantage of a curved track that far out. He knows he cannot sail effectively outward in the layline area, although he can be effective coming back. Tabulation of the gains and the angles involved will be found later.

This Mindemoya track is submitted as valid when the wind does not change its direction. When a wind change does happen, as Dr. Joachim Schult confirms (See Reference 3-5, page 64) boats in the middle that follow a safe course will get there first. However, nothing stops our informed skipper of getting back onto his curved track, once the windshift has stabilized.

While staying within the cone is the safest and most defensive way to protect against windshift, Schult (Reference 3-5, p36), Ross (3-2) and Skjönberg (3-6) all remind us that, in significant fleets, wind in the centre is often blocked by other boats.

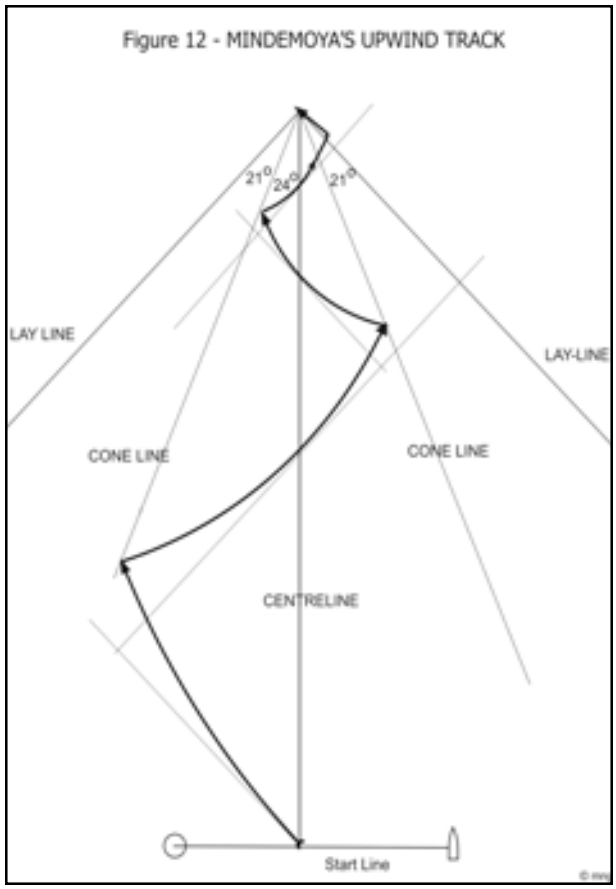
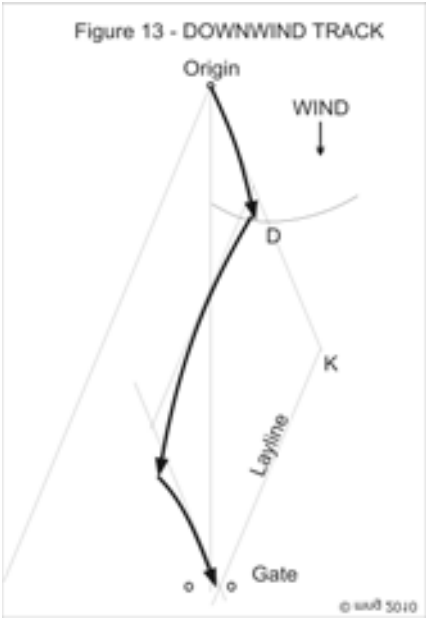


Figure 12 - MINDEMOYA'S UPWIND TRACK



Downwind

Similar arguments apply in sailing downwind as those already discussed for upwind. One difference is that there is virtually no cost to gybing when changing tacks. This makes downwind gains more consistently achievable than upwind ones. The equivalent diagram of the track is Figure 13. The laylines are tighter compared with upwind (at 22° as opposed to 46°). There is a similar adjustment to velocities in moving a little off the Best Downwind Angle.

The reader will not find anything surprising in this track diagram. Downwind the optimal track is pretty much as one would expect. The lay-lines are narrower, because the angles are smaller. The curved tracks exist when we respect the angle that the target direction makes with the wind.

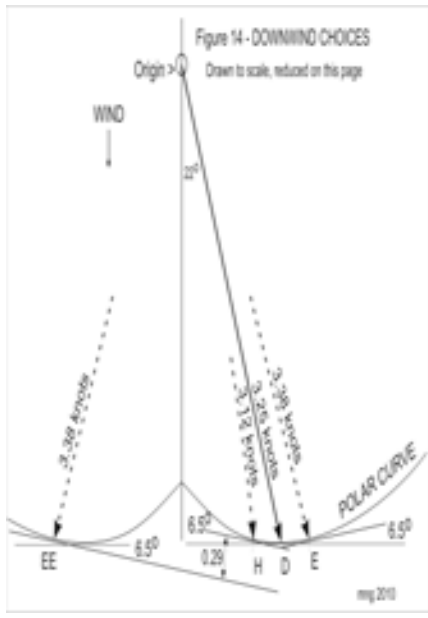
Because the angles are narrower there is less ground to be gained. A danger is that the desire for reaching and speed can encourage sailors to sail more broadly than is desirable. The wind angles are harder to read, and therefore the potential for error is greater. In one famous case in the Americas Cup, reaching on a downwind leg resulted in the competitor actually sailing away from the target. The results of excessive reaching are difficult to undo.

Let's have a closer look at point D. The curve seen there is the envelope of the polar curve. Figure 14 is an enlarged detail of this area.

On originally leaving the Origin (e.g. the weather mark), the boat sets off towards K along the Best Downwind Angle in the direction to D. This angle (22°) is equal to that of the layline. As she moves to the right (her left) of the centreline the leeward gate is no longer straight downwind. When she would have reached "D", as drawn here, just over one quarter the way down the leg, the target has "moved" 6.5° to the right.

The generally accepted technique taught has been that, having headed steadily for D, at some point the skipper would sight across towards the gate, recognize that the line to the target is getting close to a relative 44° on starboard (that is 2 times 22°). Then she or he will gybe to head directly for the target. To allow for the time preparing and actually gybing, make the move a little early. This is now seen clearly to be an over-simplified method which does not use all of the information contained in the polar curves.

We realize now that whenever the target is not exactly downwind of the boat's location, then the tangent must be set at a right angle to the direction to the target. That is always the case. The best VmgT direction point, is now at H,



where the boat would be headed if she were sailing a curved course.

To continue: the tangent must be raked 6.5° to the right, so the boat will be sailing her best Vmg towards the gate. In pointing further down like that (to "H" instead of "D") she has lost 0.13 knots, and is now at 3.12 knots. She should have progressively reached this angle by gradually squaring the rig.

But in the meantime, something else has happened! Although the leg is fair, she is no longer on the favoured gybe! She can recover her lost 0.13 knots. By gybing and heading for EE she will add an additional 0.29 knots. . This will take her back across to the centre-line, where the situation will start to repeat itself on starboard tack.

Cross-wind

While the author has approached this subject from the point of view of the cusps in polar curves, that was not the only approach possible. Because of the cusps, the full polar curve is roughly in the form of two ovals, joined at the lower belly. One covers the port tack and the other the starboard tack. These ovals co-exist with the cusps, and jointly create the need to divert from the rhumb line to achieve higher velocities.

There is one angle per sail set, in a reaching direction, where the tangent on the polar curve can be exactly aligned with the target destination. A boat aiming in this direction will be able to sail straight without losing anything. It need not sail a curved track.

Above that direction, it pays to sail below the rhumb line to the target, while below this direction, it pays to sail above the rhumb line. A boat that has a target exactly on this direction will be able to sail straight, indefinitely, at the best available velocity. A boat on such a course is exempted from the arguments in this paper!

Figure 15 illustrates the points "J" and "K" for the Tanzer 22 in 5 knots where this is true. However, we would not want to sail exactly in the "J" direction, because it lies within the reaching cusp.

GPS

Clearly, current instrumentation is not sufficient to provide the processing necessary to implement the suggestions made here. Nevertheless, the arrival of GPS with its continuous tracking of our angle to a fixed destination and its ability to display VmgT is clearly a contender as a component of the solution we are seeking.

The present GPS units are of limited value, however. After setting on a track, the crew has to adjust the sails for the direction. Then they have to wait for the boat to stabilize its speed. Current GPS units do not store comparative readings between "a little higher" and "a little lower" and do not log whether this is better of worse than the last reading. So maximums are hard to capture. The filtering out of transient velocity peaks from puffs of wind or wave surges must be available. But current Marine GPS can be a start.

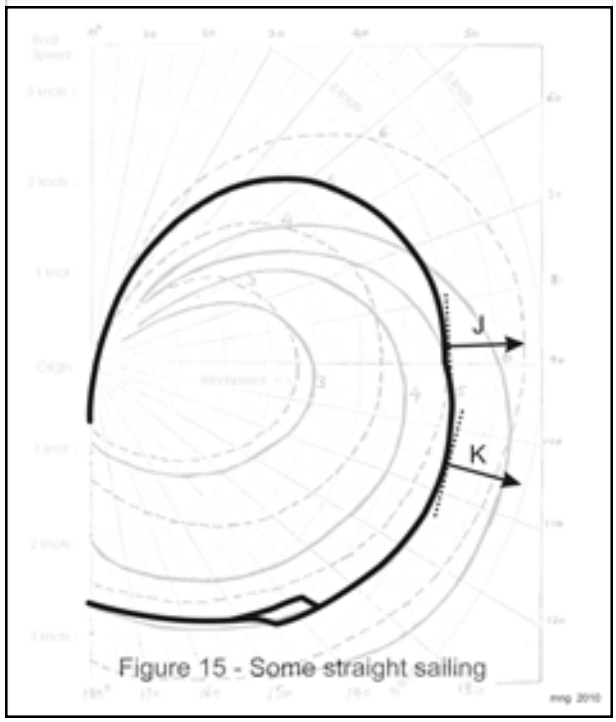


Figure 15 - Some straight sailing

After inputting the location of the target, the GPS will display our VmgT at whatever angle we are sailing and in whatever wind. In Parts 4 and 5 of this paper we will examine tables showing the calculated VmgT velocities, and get an understanding of how much advantage can potentially be gained.

Differing Opinions

Beyond their Horizon

No sailing book that I have ever seen, and no article on the Internet that I can find, has ever suggested that the track to be sailed is other than in straight line segments. Are we then at a paradigm shift in understanding? If so, then many readers may find they want to dispute the findings of this paper.

They may be hard put to argue that a track with VmgT better or equal to that from any other heading, at almost every instant, will not get us to the mark first. Yet something suggests a flaw, not least, the wisdom of ages and the writings of many sailing scholars.

Typical authors are Dr. Stuart Walker who, in *Wind and Strategy* (Reference 3-3, page 27), adjusts upwind angles to cope with wind-shifts, but takes no recognition of the change in the angle between the target and the wind. Such authors restore their "Best Upwind Angle" philosophy after any wind change. Even the great sailing scientist C.A. Marchaj seems to have not gone quite far enough in his analysis. Is his book the reason we have missed understanding this correctly?

Let's look at a few authorities.

C.A. Marchaj "*Sailing Theory and Practice*" (Reference 3-1)

It is on his figure 193 that Marchaj very correctly establishes the idea of Best Upwind Angle. There is a suggestion in figure 204 when he is plotting boat speed against wind speed that he may latch onto the idea of curves. But in figure 243 he has not gone that way. Instead, he examines two tacking legs for what their added length might be, but he does this exclusively with straight lines. The "Ah-ha" has eluded him. These are the straight lines that have been with us ever since.

Stuart Walker "*Wind and Strategy*" (References 3-3 and 3-4)

Dr Stuart Walker, in "The Tactics of Small Boat Racing" (Reference 3-4) diagrams a windward leg on Page 64, and emphasizes straight line legs. Again, writing the chapter "Utilization of Wind-shifts" in the other reference by him (Reference 3-3, page 27), Dr. Walker repeats the right-angle treatment. He even locks in the right angle by specifying 90º for the start line tacking angle on Page 27.

Joachim Schult "*Tactics and Strategy in Yacht Racing*" (Reference 3-5)

Dr. Schult's book treats racing tactics as a matter between two competitors, as in a game of chess. Page 75 has figure 2-211, which looks at distance to the weather mark but gives equality to boats on the same rung of the ladder. Joachim always assesses working upwind as all taking place along right angled legs. In Figure 2-213 he shows a long starting line and three weather marks approached from either end. All are equal: All lines are rectilinear. In 2-215 he shows that a slanted start line will benefit the boat most upwind, mainly because the tracks are all straight. What happens when the tracks are curved?

Wallace Ross "*Sail Power*" (Reference 3-2)

Wallace Ross opens Chapter 20 on page 424 with "Polar Plots, Sail Selection and VMG". This is a broad coverage. The diagram on page 427 shows the first good polar curve we have encountered so far. The relative angles where each of his headsails is effective is well shown. This diagram also shows the "reaching" cusps between the sails chosen. Mr. Ross does not draw any conclusions about the performance implications of those cusps.

Skjönberg "*Regatta Sailing*" (Reference 3-6)

Per Skjönberg covers the issues of competing in regattas in the absence of other boats. However, his treatment of track headings in tidal current is thorough and excellent (Page 83). I prefer to focus on the charts on page 25, where he is concerned at pointing too high, thereby increasing the angle of incidence of the keel. This can build turbulence and result in leeway. We will return to this later.

In page 103, there is a diagram that looks exactly like a copy from Joachim Schult. Diagrams F108 and F109 show that Mr. Skjönberg also sails in straight lines.

Anonymous - "*VMC Sailing in Shifts*" (Reference 3-7)

It is unfortunate that he is anonymous: for this writer has got the closest to the curved lines of this paper. Even so, he does not get it quite right!

He presents a diagram most interesting which I have copied and display here for us to interpret. (Figure 16).

For a method he has a transparent polar curve which he moves around over the chart where he is sailing. In the diagram, he is explaining how Boat A that sails the BUA (on the right) will lose out to one that foots off towards a new windshift.

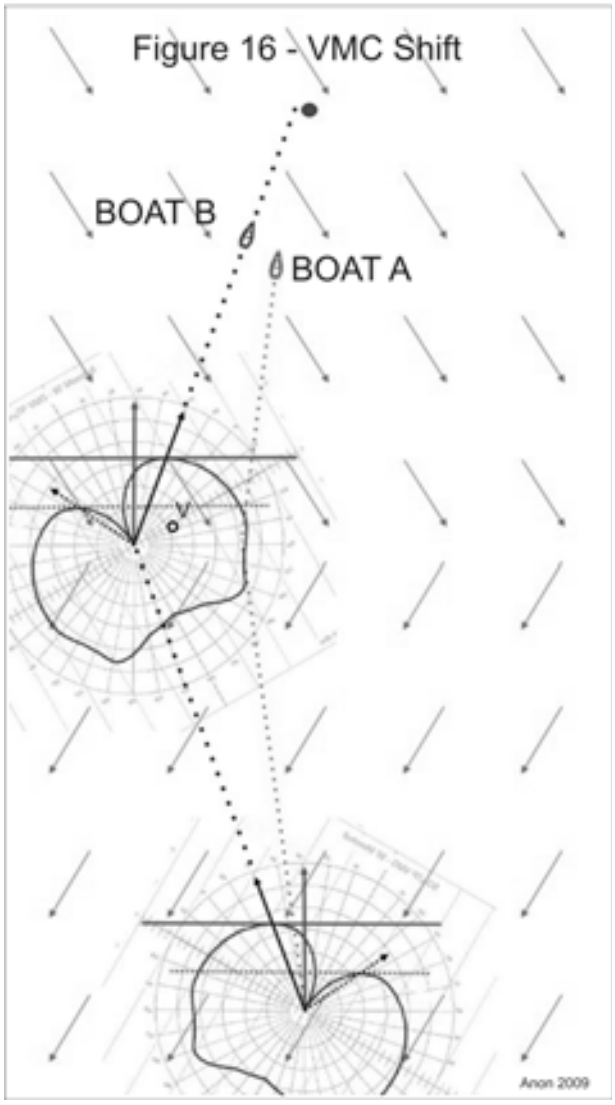
So, half way up the leg to the mark, a 60º left windshift conveniently appears. (Most shifts are not that big). Immediately, he rotates the polar to the new wind direction and sets a new, straight track to the finish point.

When he set out from the start, he did set his polar transparency correctly, and correctly set the initial tangent for the VmgT to the target mark. Meanwhile, Boat A sailed the BUA for best VmgW. The favoured tack was picked for both boats. Boat A was not fetching the mark, until the windshift came. Notice that the mark is just inside the layline, but Boat B is heading outside it. That is naughty! It is almost the new method now proposed!

We would have preferred if the tangent were reset a little right every 100 metres or so, keeping it aligned to the target. That would have defined a curved track. The correct tacking point would then have been between the tracks shown, near "V", a point which is actually slightly closer to the mark than where Boat B tacked.

For the second part, the symmetry of the diagram proves its inaccuracy. Notice the new alignment of the tangent. It actually points up the sheet of paper - at nothing! Not at the wind, and not at the mark. It points up the direction of the paper. And why? Answer: because that was the direction to the mark at the start. Now it is not relevant to anything. This is a very common error.

With a better tangent, our onward track to the mark would start near 4.8 knots, rather than 4.5; that difference in speed gradually reducing;



but we might finish below the mark, requiring a tack for the starboard rounding. It does look like we would catch Boat A because she is closehauled. If we required a tack for the starboard rounding, would we have enough in hand to do that, and still beat him?

The Commercial Bias

As manufacturers start to make electronic instruments, some feel they have an inside path to fame and fortune in entering the sailing world. For them, it can be very convenient to have all boats sailing straight lines. How else will they convince the public that they can predict arrival times, and show those who buy their products that they know the way to faster results?

The "*Changing VmgT*" argument

It is hard to credit that the noted authors of past-published sailing books can be wrong, and to have missed the arguments presented earlier. But indeed, many current authors, such as John Navas, even with GPS to help, staunchly avoid the concept of a curving route.

John Navas writes in "*Why VMG matters*" (http://knol.google.com/k/john-navas): "VMG to a mark ("VmgT") is clearly important, but is not a useful measurement because it is constantly changing". The absence of the necessary "ah-ha" then results in his publication of: "The discussion above focuses primarily on the instability of VMG to the mark when a mark is not far away. For example, when a boat is going upwind over on the left side of the cone, VMG to the mark on starboard tack will be worse (because the boat is heading more away from the mark) than on port tack, even when both courses are equally good." (John's emphasis).

John's measure of "being equally good" is when the VmgW is the same on both tacks. Some would see that as a wrong conclusion being used to invalidate the line of argument towards it. It is the use of a pre-conceived conclusion to justify the denial of a possible truth. It is reminiscent of how the Inquisition treated Galileo's discovery of the solar system and the moons of Jupiter!

I think we now fully understand that the two tacks should be yielding different values of both VmgT and of VmgW. Also we can appreciate that these values will be continuously changing as we move through the leg of the course we are on.

The "*Target is Unimportant*" argument

Some authors suggest the use of GPS in a different way, Captain Roger Strube writing "VMG for Dummies" (www.wingsailor.com/html/vmg_gps.htm) avoids the curving track this way: "What you really want to know is your Velocity Made Good TO WINDWARD, not just to the mark. This is done by setting the GPS so that the direction it sees to Windward is always parallel to the center line between the start and the mark. This is done by determining the direction of the wind (30°) and then, on the "Map Page" of your GPS, moving the curser (sic) a couple of thousand miles directly up wind. Then "Go To" this phantom windward mark. With your GPS in this setting, your upwind VMG will be consistent anywhere on the course and your direction to the mark will remain consistent at 30°."

Clearly Captain Strube believes that the wind direction and his centreline between the start and the mark are parallel. Not only parallel, but always parallel! Many Race Committee chairmen I know will be delighted. Aside from this trust in the wind direction, some commentary by Italian readers shows that they were alarmed that it would never tell them when they reached the layline. Captain Strube's solution denies navigation. It has no idea where the mark is. It thinks it is 2,000 miles away.

Recent Electronic GPS Devices

A company that manufacturers a device to measure VmgW will require that the device be pre-loaded with waypoints, one directly upwind of another (or equivalent), and, using these points, it displays VmgW for the helmsman. That is fine. If it were accurate, it would be more economical than a masthead kit with known boat speed that can display the true wind continuously.

Both require the boat speed to help establish the best track when the wind is changing.

The author has not yet encountered an instrument that integrates the location of the mark and the direction of the wind. Therefore, manufacturers, agents and distributors may all have a vested interest in maintaining that VmgT is something to be opposed.

Sentences found on commercial forums may, through prior mind-sets, render the subject more obtuse. For example, one such commercial support site has:

"Sailboats have sweet spots where their velocity made good upwind and downwind are optimal. This is what every racing sailor wants to know. This is very easy to obtain with the xxxxxx products. This is very difficult to obtain with a standard GPS that provide VMG to a user specified point. "

Others may still be in the process of developing new products. The Application for a US Patent 20090287409 by Craig Summers in late 2009 is for "A method that resolves a long-standing seafaring problem of how close to the wind to sail". The method claims to predict travel times before the trip, even without knowledge of wind velocity. The software (it says) will "calculate tacking time to destination before departure." In support, the inventor writes: "Because they are powered by lift, not windspeed, modern sailboats often have their their fastest point of sail approximately 45 degrees into the wind. This is often the top speed on a polar plot. Boat speed would be zero (stopped) when aiming at the wind, often reaches its maximum around 45 degrees off the wind, and then decrease somewhat when sailing downwind." No wonder some sailors are confused!

Many of the ideas expressed on the web are written by persons without qualifications, often using pseudonyms, or by those having a strong commercial interest. Those who read and submit responses may be misled by the often low level of technical expertise. Therefore one cannot always trust the ideas expressed.

Chart Plotters

While hand-held devices seem to have focussed on VmgW, one complaint about chart plotters is that they focus too much on geographic waypoints, without respecting tacking angles or wind directions. We cannot be satisfied with them until they can calculate curved tracks.

A person writing as "Russ" in www.altendorff.co.uk/ archives/704 (Reference 3-8) presents a good analysis of what he sees as present problems. The VMG he describes is always VmgW, but the plotter only gives VmgT. Russ observes that, in tidal current, laylines will be curved. That will be true if the current varies across the course plan. A current that is even will only slant the laylines. Russ suggests tacking when VmgT drops to 30% of its maximum value. When we examine our performance table in Part 4, we will see how well our assertions match.

Russ continues to write on the subject of routing. The site www.altendorff.co.uk is instructive and the reader is referred to it for further study. You will need to read the commentary with discretion. Do not expect to find any curved tracks there, however.

Possible Real Flaws

This author believes that there could still be real flaws in the hypotheses here proposed. Because it is a major change in thinking, this paper needs to try to find any flaws which could prove its invalidity.

The AVERAGE VmgW Flaw

Perhaps there is a flaw associated with the fact that sailing to B and then sailing to C, (please refer to figure 17), in any ratio, is bound to cover less upwind ground than sailing to A. (The line joining B and C passes below A). If the wind is steady in direction, we need to reach A eventually. On the other hand, once having got to B, perhaps there is enough time gained to sail towards A from B, or even finish higher than A. Otherwise, tacking into a now-favouring wind shift at BB would certainly help!

Another argument is that, since speed to B are faster than speeds to C, we will spend more time in the C direction and lose out through more time spent at lower speed. (See Figure 17).

In this diagram, the tracks to B and C here are at angles left and right 23° from the BUA tangent. These are the angles that the author suggests when arriving and leaving the cone lines, sailing upwind. All other upwind tracks between the cone lines will lie between these angles.

There is a dead zone downwind of A through which boats will pass and from which A cannot be reached. A boat heading in the direction of B could tack when she reached BB and still fetch A, although she would clearly be behind. Final assessment of the author's curved track to A remains a possibility, but it requires mathematical curve fitting and integral calculus which are beyond the scope of this paper. At the time of writing, this author sees no reason why the curved track line should finish below A. Why not at A? Or even above it?

If we were to receive a 14 degree left windshift when starting at the port lay-line, then all of the added speed to B would be applied along the line to A. That is certainly the best of all worlds. Wind-changes are to be expected racing offshore. Rarer in course racing, they render the latter more challenging!

The UNEQUAL DIRECTIONS Flaw

Mathematical analysis will never make a case against an argument that some directions are not equal. i.e. that the distances have uneven character. Thus, it does not matter how close a boat is to the target if the target is directly upwind, since the boat will simply blow away from it. She may be geometrically close, but she is at an infinite time from it, while the wind remains in that direction. Downwind this argument is somewhat less convincing.

The ARRIVAL AT TARGET Flaw

Please refer again to Figure 17. This flaw concerns the idea that the method of assessing the layoff angle deems that the boat arriving at BB is assessed to have covered the distance to arrive at A. i.e. that it has arrived at A when it is still downwind of A.

The ADDED LEEWAY Flaw

The Tanzer curves we have been looking at were compiled without taking leeway into account. Being unaware of the methodology applied in developing other common performance data for public consumption, we cannot comment on cognisance being taken of leeway. One would suppose that it has usually been ignored when plotting curves.

Is reduced keel lift on the track to C a significant factor in invalidating this direction? Per Skjönberg (Reference 2-6) sees keel slippage leading to leeway as significant on Page 25 diagram F23.

The RISK OF WINDSHIFT Element

Finally, it could be a question of risk. "Going down, err of the side of being down, and going up, err on the side of being up." With wind being variable as it is, it might be prudent to hold the faster reaching directions in hand for later. Those who have taken the lower reaching directions first could suffer more from a header than those who head high first. The inability of boats to sail straight up-wind and to sail quickly across the wind, places a bias of benefit in being on reaching angles. So it could be deemed prudent to work towards positions that are across the wind for reaching to the destination. That would also support the "leeward circle" — heading low on the first reach of a triangular course, especially when such legs are broad.

The STALLED MAINSAIL Issue

This applies only on downwind legs. If there is a Downwind Cliff at "P" (as in Figure A in Part 1), then repeating adjustments of track angle downwind before the centre-line may be affected.

Parts 2 and 3 Summary

We have examined what it means that the polar performance curves are in the form of ovals. Using geometrical analysis it has been

established that this sets a bias to the velocities boats should use in heading to known targets. This bias continuously changes as a boat moves across the wind. Therefore traditional methods of setting tracks in straight lines, though they are convenient, are not optimal. By knowing the importance of the angle between the wind direction and the heading to a target sailors can improve their focus and achieve better results.

About Part 4

In Part 4 we will examine tabulations of speed and angles for the Tanzer 22, Bénéteau 36.7 and the Farr 40. Using these, we will devise methods for sailing curved tracks upwind without instruments.

Michael Nicoll-Griffith

Revised to 10 05/06 © mng@kingston.net

Glossary

BUA. Best Upwind Angle. The angle that gives the best upwind speed - top VmgW. This is the standard measure of performance.

Course, Track Track is used here for the immediate section of sailing we are doing. The word course is used more generally as an intention, or as a collection of tracks.

Course racing Racing round buoys in protected waters. Contrasts with "offshore" racing, normally international.

Favoured The tack that takes the boat more closely towards its target than the opposite tack.

GPS Global Positioning System.

Leeway Slippage of the boat sideways due to water eddying around the keel.

Lift A force at right angles to the direction of the flow of the surrounding liquid.

Offshore See Course Racing.

Reaching Sailing across the wind, close to right angles to the wind direction.

Rhumb line The straight line from one point to another.

Squaring The process of letting out sails so that they lie across the wind.

Tack A track where the wind comes from one consistent side. To change the tack, the process is called "tacking".

Unfavoured A tack that does not take the boat in the best direction to its destination. Its use is often dictated by wind conditions, but may be sailed due to inattentiveness. See also "Favoured".

VMG Velocity Made Good. The effective net speed achieved in a certain direction. When not qualified, means "up" or "down" wind, depending on context.

VmgT Velocity made good towards the current target, or some specific location.

VmgW Velocity made good with respect to the wind direction. Up or down.

Windshift A change in Wind direction.

References

2-4 Stuart Walker. The Tactics of Small Boat Racing. Hodder and Stoughton, 1966.

3-1 C.A. Marchaj. Sailing Theory and Practice Dodd,Mead, 1964

3-2 Wallace Ross "Sail Power" Alfred Knopf New York, 1975 (many reaching cusps shown e.g. Polar diagram p427)

3-3 Stuart Walker: "Wind and Strategy" W.W. Norton and Co., New York, 1973

3-4 Stuart Walker: Tactics of Small Boat Racing. Hodder and Stoughton, London , 1967

3-5 Joachim Schult: "tactics and strategy in yacht racing" Nautical Publishing Company, Lymington, UK, 1970

3-6 Per Skjönberg, "Regatta Sailing" Adlard Coles, London, 1969 ISBN 0-229-98664-1 (figures F-108-F109)

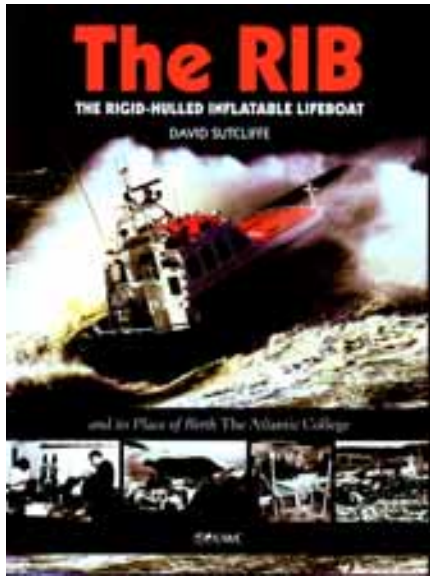
3-7 Anonymous "VMC Sailing in Shifts" http://76trombones.wordpress.com/2009/10/21/vmc-sailing-in-shifts/ October 2009

3-8 "Russ": "I want my VMG" why are we in Dire Straights. http://www.altendorff.co.uk/archives/704 November 2009.

3-9 Craig Summers. Application for US Patent 2009/0287409. November 19, 2009

The RIB
The Rigid-Hulled Inflatable Lifeboat and its place of birth – The Atlantic College

David Sutcliffe
Granta Editions, Cambridge, UK
ISBN 978 1 85757 103 5 (paperback) £15.00



The Atlantic College lies on the south coast of Wales, at the west end of the "bulge" to the west of Cardiff. From the west to the southwest, there is no land until you come to the shores of America, some 3000 – 4000 miles away. It's open to all the Atlantic storms that are funnelled up the Bristol Channel, and is completely without any harbour protection. So when the College opened in 1962, and proposed that its students be able sail off the beach five or six afternoons a week, every week, it was clear that something special in the way of safety boats was going to be needed.

The first rescue boat was a 12ft6 (3.8m) RFD inflatable with a 20hp outboard engine, capable of 17 knots. (Remember that in those days, only the French rescue services had any experience of inflatable craft, and the British RNLI was unconvinced that they had any use.) This small start was augmented by other, similar, boats; but it rapidly became clear that soft skin inflatables were not durable enough to survive being hand-carried across the rocky beach, nor structurally stiff enough to be sufficiently seaworthy for the task. The cure was to progressively replace folding segmented floors by rigid plywood sheets (the fact that the College boats were deflated only for repairs helped here), and then to dispense with the soft floor skin and bond the plywood sheet directly to the inflatable tubes, something that had never been done before and required much experimenting with glues and the preparation of the plywood surface.

By late-1966, when I became a student at the College, the next step of building a hollow vee-shaped hull onto the plywood sheet was well-practiced, seven boats had been built, (one was exhibited at the London Boat Show in January of that year), and all but the oldest two were in active service supporting the College sailing activities and providing an inshore lifeboat service along 20+ miles of coast under an agreement with the RNLI, who had used the College as a test station since 1964.

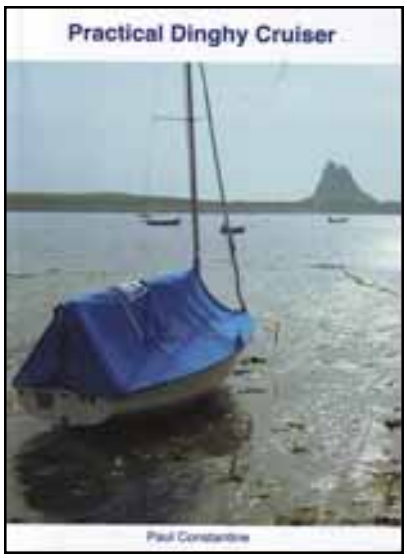
Development continued, longer hulls, wheel steering, the abandonment of the transom so that water that came in over the bow went straight out the stern, and some eight further boats were built before the first prototype of what became the Atlantic 21 ILB was handed over to the RNLI in 1971 for the sum of £1.00.

The man who made all this possible was Desmond Hoare, retired Rear-Admiral, and the Headmaster, later Provost, of the College from its inception until 1974. Without his political skills, drive, technical knowledge (he was an engineer), and guidance this advance would not have happened and the RIB would not be the commonplace safety and inshore rough water craft that it is today. I am proud to have been one of his students.

This book is the story of this development, written by an insider (David Sutcliffe was on the staff of the College from the beginning and succeeded Desmond Hoare as Headmaster from 1969 to 1982). He was in a position to record not only the development of the boats themselves, but also the things that went on behind the scenes that we students never knew about. I found it to be well-written, indeed even without my personal interest in the subject I think I would probably have read it from cover to cover without problem. Well-illustrated too, Sutcliffe obviously had access to Desmond Hoare's extensive photographic records, as well as the College archives. Recommended.

Available from booksellers and through http://www.atlanticcollege.org/news-1/2010/05/25/the-rib-by-david-sutcliffe/.

S Fishwick



Practical Dinghy Cruiser

by Paul Constantine
Moonshine Publications;
ISBN 978-1-907938-01-6
(paperback) £9.99

There are probably not more than half-a-dozen books available on the pastime of dinghy cruising (of which Margaret Dye's is probably the best-known) and this is a worthy addition to the canon.

The author is one of the leading lights of the UK Dinghy Cruising Association (DCA).

This is not a prescriptive guide, in the sense of a how-to-do-it manual; it is more a record of experience and lessons learned. The author has a Torch class dinghy, built in the early 60s (and designed, I was happy to find out, for the sailing centre at Barton Turf where I currently work – not that we have any now), some 13 feet (4m) long, 5ft1 (1.55m) beam, i.e. beamy and deep for its length, but not very large. This he has fitted out for cruising, and the story is in this book.

However there is more than just his story, he also goes into all the questions that anybody fitting out a dinghy for cruising will need to answer for themselves, such as where to sleep, or to cook, or how to handle toilet arrangements, etc.

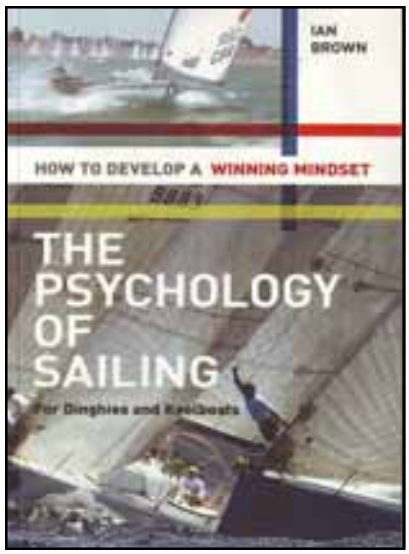
There are chapters on boats, picking one and what to look for, on modifying boats for cruising, making places to sleep etc, on sails and tents and spray deflectors, on cooking, eating, toileting, handling a capsize (the basic advice is "Don't!") At all times the emphasis is on the practical, what works, what doesn't, and what can work under certain circumstances.

A lot of use is made of quotes from the DCA Journal incorporating other experiences and views as well as his own. This gives a breath of vision, and a better idea of the various options. Stories range fromdrifting across the Swedish lakes, watching dolphins in the Irish Sea to thoughts of whether to wear a lifejacket in bed.

Available from the publisher – Moonshine Publications, www.moonshinepublications.co.uk/

The Psychology of Sailing

by Ian Brown
Adlard Coles Nautical
ISBN 978-1-4081-2447-5
(paperback) £14.99



Ian Brown (it says here) is a chartered sport and exercise psychologist and has worked with sailors of all ages and abilities . That is as may be, but he doesn't write a very readable book.

The first thing you have to realise is that this is not about sailing (the pastime), but about sailboat racing (the sport). That is not to say that it is inapplicable to those who sail for pleasure, especially those who regard sailing as a battle with the elements, but it is probably more useful to those who want to take on Ben Ainslie at his game.

The second thing is that, although it is not a readable book, I don't think it is meant to be. It's more like a teach-yourself manual – short bits of exhortation followed by exercises.

Those who have been exposed to "management training" may recognise a number of these, and will understand that though parts are "statements of the obvious" (picture of a capsized dinghy with the caption "Lapses of concentration can prove costly"!) sometimes those statements are needed to make people realise that the obvious can account for what they see and do.

There are other books around with similar aims and objectives. I suggest you need to look carefully to find one that has an approach that suits you

AYRS John Hogg Memorial Prize Award 2011

The AYRS announces another award of a £1000 Prize in memory of John Hogg, the distinguished amateur yachting researcher, who died in 2000.

The aim of this international award is to encourage and recognise important amateur contributions to the understanding and development of sailing performance, safety and endurance. Preference will be given to on-going work where the prize money is likely to benefit further development. Other than nominations for a "lifetime achievement" award, the work should have been performed within the last few years. Work that has previously been entered for the John Hogg Prize is not eligible, unless in the intervening period significant advances have been made.

Nominations, whether of oneself or another, should be submitted to the Honorary Secretary, Amateur Yacht Research Society, BCM AYRS, London WC1N 3XX, UK, to arrive by **30th October 2011.** Nominations may be made by or for anyone, whether or not they are a member of AYRS. Those nominating someone else must obtain the written agreement of the nominee and forward it with the entry.

'Amateur' in this context means primarily work done as a pastime and largely self-funded. Details should be given of any grants or other funding or assistance received. Work carried out as part of normal employment is not eligible, neither is paid-for research where the researcher does not own the results, but subsequent commercial exploitation of research need not debar work carried out originally as a pastime. Projects carried out as part of a course of education may also be admissible. A significant factor in determining the amateur status of such work is the ownership of the intellectual property rights in the results. Those with ongoing projects are as eligible to apply as those whose work is completed.

Whilst it is not essential that any innovations embodied in the work be demonstrated and "debugged", the work must have some practical application, which should be made clear in the entry.

The submission shall cover the following:-

- A summary, of not more than one page, identifying the nominee and the work submitted, and including a short statement of its merits to justify its submission.
- The description of the work itself, its novelty, its practical application, its degree of success to date, and (briefly) your hopes for the future.

The work will be judged on the results achieved to date. Please spare us a complete history of your researches except to the extent that they are truly relevant. The use of your already published material, whether or not peer reviewed, incorporated in an entry, is welcome.

- Submissions must be made in English, IN HARD COPY sent by post, to arrive by the due date. FOUR COPIES ARE REQUIRED – one for each of the three judges and one for the Secretary.

Electronic transmission, the use of website pages, and of direct extracts from patent applications (which are written by and for lawyers and can generally be shortened) have resulted in unsatisfactory presentation, hence the need for hard copy of a dedicated paper.

- Diagrams, graphs and photographs may be used, video material on VHS PAL videotapes or DVDs can be helpful supporting material. Programs and presentations on disk may be entered as part of a submission (accompanied by explanatory text etc). Appendices may be used, e.g. for mathematical workings. Direct reproduction of pages from an author's web site has generally proved unacceptable (due to formatting variations) and is not encouraged.

- Entries should be printed on A4/letter paper in a legible font. Successful short-listed entries to date have ranged from about 22 A4 sides of text with 6 of photos, to one winner with 5 sides, 3 of photos and one A3 drawing. Clarity, legibility and brevity pays!
- Separately, a brief biography of the nominee(s) should be included, and their amateur status and qualifications should be explained.
- Nominees may care to say how they will use the prize should they win.
- AYRS will wish to publish brief summary accounts of entries, and may also seek further articles from entrants. Grant of permission to publish such articles is a condition of entry. To this end it will be helpful if entries can (if necessary) readily be abridged for publication in *Catalyst,* and if a computer disk copy of the entry is included. However any information received as part of a submission will be treated 'In Confidence' if so marked.

The winner and runners-up will be announced at the London Boat Show in January 2012. All short-listed entrants will receive one year's free membership of AYRS and a certificate; the winner will receive a cheque for £1000 or equivalent.

The Judges, whose decision shall be final, will co-opt experts as required to assist their deliberations.

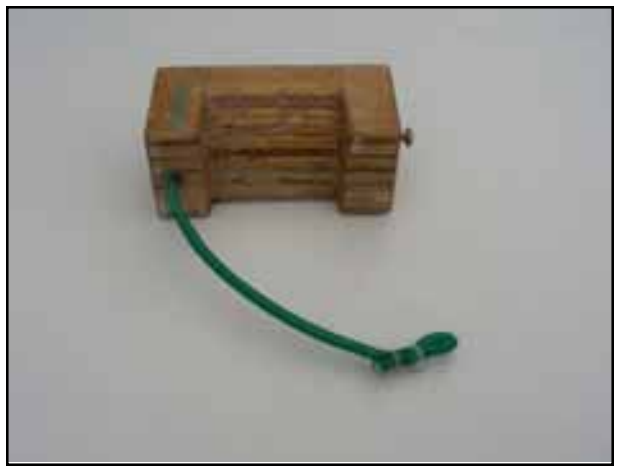
Submission of an entry will be taken as signifying the entrant's acceptance of these rules.

Queries concerning possible entries may be made by phone or e-mail to the AYRS Honorary Secretary on tel +44 (1727) 862 268; e-mail office@ayrs.org.

Tips for making your entry effective

1. Never forget that the winner of the John Hogg Prize is the entrant who can persuade the judges that his/her work is innovative, has merit, has practical application, and is the most deserving of the prize. Your idea may be the best, but unless you can bring the judges to realise that fact, it will not win.
2. Remember the judges have only a limited time to look at each entry. Don't expect them to wade through pages of dross to find the nugget that is hidden in them. Present your work clearly and concisely, and in such a way that they quickly understand it, its merits and its practical application.
3. Be sure your entry will stand alone. Don't expect the judges to come back to you for more information – they won't. By all means refer to books, articles etc, but make sure the judges can understand your idea without going and looking them up. If they are interested, they may do so, but first you have to get them interested!
4. The judges are all practical people. You don't need to "talk down" to them; but on the other hand don't force them to read pages of mathematics! (See 2.) Equations may be useful to demonstrate a particular point, but long mathematical derivations are best relegated to an appendix.
5. It helps, but is not essential, to have already demonstrated the practicality of your work. Theory is fine, but unless the judges can see the practical application, it will not get their attention.
6. Presentation ought not to win prizes, but it does help get a good entry noticed. Don't just send a collection of loose pages - put them in a binder and give them a pretty cover/front page.
7. Remember a picture can be worth a thousand words; and a picture in colour can be worth more.
8. Remember too that those pictures do not have to be static. One of the better entries to date sent a video, with an intelligent commentary on the sound-track.
9. You can add a sound-track to PowerPoint presentations as well, but if you send a PowerPoint file remember that not everybody has PowerPoint software, so use the "Pack & Go" feature so your presentation will run on any (Windows) system.
10. Don't expect the judges to go and read your webpage. They don't have the time. Use it as a supporting reference by all means, but if the information there is essential make sure it is packaged with your entry.
11. Remember to send enough copies of your entry – FOUR – one for each judge and one for the AYRS Office. The judges can view things like videotapes at their meetings, or they can pass them round; but they don't want to share paperwork, and the AYRS Office has neither time nor resources to do lots of photocopying.
12. Finally, don't forget to put in a disk (CDROM for preference) with all the printable material on it.

Outboard Tilt Lock



I have an old outboard which I use on a dinghy which when moving from the dinghy park to launch on a small wheeled trolley refuses to stay tilted for more than a few yards and then scrapes along the ground; I have made a small block to fill the gap between the shaft of the outboard and its mounting bracket and if you have similar problems you might like to copy it.

Dimensions depend on the model you have so check with scraps of wood before crafting to fit.

Mine was made from a three layers of 19mm external ply glued together to give a block of 50 by 57 by 110mm (2 by 2 $^{5}/_{16}$ by 4 $^{3}/_{8}$ inches).

A groove 10 mm ($^{3}/_{8}$") deep and 60mm (2 $^{3}/_{8}$") wide was cut into one of the 110 x 57mm sides and it was offered up to estimate the best shape to carve the groove extending into the adjacent side of the block as the casting joining the outboard leg to the mounting bracket was curved.

When it was a reasonable fit it was sanded and a hole was drilled in one end of the rebated side and a round -headed screw partly screwed into the opposite end. A piece of 6mm bungy cord glued into the hole with epoxy and the rest of the block coated with epoxy, using the protruding screw to dangle it all while the epoxy set.

When all was set it was offered up to the motor and an eye made in the bungy using cable ties so that the bungy would retain the block in place but could be eased on and off the protruding screw.

I hope the photos will make all clear.

Fred Ball
frederick.ball@mypostoffice.co.uk

Michael Ellison - Who he is, what he does, how he qualified for the AYRS Committee

Parents met on motor yacht cruise to Belgium and France 1934. Born 1935. 'Family member' Clyde Cruising Club to 1940. 1940-1946 boating restricted to trips on seaplane tenders and supply craft around Clyde. Cruising resumed 1947.

1950-53 Thames Nautical Training College H.M.S. Worcester then to sea in MN as cadet with Bibby Line of Liverpool. Passenger/cargo liners to Ceylon & Burma, troop ship Devonshire. Due to some time on troopship not counting as "proper" sea time took 3rd mates job without certificate on tramp ship "Yamaska" during Suez crisis - a three week voyage to St Lawrence for iron ore became six months during which I learnt more than in six years. When leaving I asked captain for a reference and he said "go and write it and I will sign." Never looked back !

1957 while strike bound in NZ I wrote to Slocum Society for details of the proposed "Single Handed Atlantic Race". The secretary was at USA embassy in Lima, Peru. There followed many letters and my entry for the race in 1960.

1960 I took extended leave, bought a 35' yacht and converted her for single-handed sailing. I went to Beaulieu to look at Francis Chichester's yacht. I asked several questions including "how much fresh water are you taking?" and the only answer was "If I tell you, you will know as much as I do", and that he had no intention of observing the rule requiring yachts to be a high visibility colour. This attitude was a surprise as Dr David Lewis had been and remained most helpful and gave a useful list of drugs to have and also not to carry on board. I was storm bound in Padstow when the race started and arrived in Plymouth a few days late. Arthur Piver had also entered a trimaran for the race and sailed from U.S.A. to take part. While sailing in Plymouth sound his yacht was dismasted and he did not have funds for a new rig. There was considerable pressure for me to sail but the self-steering I designed did not work with the wind aft and the deck leaked. Not to go was one of my most difficult decisions and it is probably lucky that I did not have a commercial sponsor...

In 1964 I again entered "Blue Haze" for the race but changed to "Ilala" a Nicholson 36 with junk schooner rig designed for a world cruise. She was this new glass construction which must surely break if you hit anything like an iceberg.. It seemed a good chance to find out and the yacht was lent to me for the race. Sad that loss of the foremast and mainsail slowed things down.

In 1996 my wife and I helped Michael Butterfield sail "Misty Miller" (30' cat) back from Newport RI where she had been laid up since OSTAR. I then sailed "Iroquois" (30'cat) in the first RWYC 'Round Britain & Ireland' race with my brother Peter. We finished third overall and won the handicap prize, which was the silver "Genesta" trophy.

In 1969 I obtained an offshore powerboat licence and entered "Iroquois GT" in the first Round Britain Power Boat Race: the first catamaran to race offshore, second in category "lowest powered boat", 21st overall from 64 starters.

Having been persuaded by John Morwood to join the AYRS Committee in 1968 I stood down in 1970 to become "Administrator". I produced various publications which John edited and then typed the AYRS Airs series of newsletters. Having helped to run the Weir Wood sailing meetings I visited the 1972 John Player sponsored RYA record attempts in Weymouth. After the event I wrote suggesting smaller sail area classes and said that AYRS would help run the event. I was added to the RYA committee and when this became the World Sailing Speed Record Council I simply changed my tie from RYA and am still a member of the Council.

March 2010 I bought one of the last Mk 2A Iroquois catamarans. After a refit in Cumbria I intended to sail to and land on St Kilda but the weather proved adverse and I returned to Plymouth. The hope is to sail North in May 2011. I have a bet with Paul Larsen (of "Sailrocket") that his new craft will get a record before I get to St Kilda. Having sailed the first ever hydrofoil in an offshore race (Mantis 1V 1974) for David Chinery I feel that I have some knowledge and experience which although now mainly of historic interest may be of use to someone doing research - if only to avoid repeating past mistakes....

John Perry

Have been interested in boatbuilding and sailing from early years, but I am not sure how that came about. My father was fond of camping, walking and mountains, but not particularly of boats, whilst my mother was dead against anything to do with the water.

My first boat was a Mirror dinghy, acquired second hand about the time that I left home. I soon started to explore the Essex and Suffolk estuaries using a camping tent rigged over the boom.

About 1974 I decided to design and build my own boat for dinghy cruising and having the use of a 'mainframe' computer at a college in London I wrote some software to generate a hull form and to develop the shapes for plywood hull panels. This was not CAD as we know it today. The computer had no screen to display drawings, all it could do was print numerical data, in my case dimensional data, on a line printer. I used this numerical data to mark out my sheets of plywood. I did do some 'back of an envelope' kind of sketches to work out how things could fit together, but there were no proper scale drawings and certainly no lofting, the design went straight from long lists of numbers to sheets of plywood that were then joined together by the same 'stitch and glue' method as on my Mirror dinghy. I should add that there were errors in the software that caused some funny bumps in the bow area, apparent on the finished boat to this day.

This must have been one of the very first uses of CAD in small boat design. I had a vague idea in my mind that I would use the finished boat to sail from Essex to Holland, probably returning by car ferry. With that trip in mind, I built the boat with a hull shape and a lead centreboard to encourage self-righting, although it probably need some assistance from the crew. I also gave it a self-draining cockpit and a large amount of dry storage so that I could carry plenty of cruising equipment. Since I then lived in a small flat in London, my only option for building a boat was to borrow my parent's garage and that dictated the 4.5m length of the boat.

I never did sail to Holland, at least not yet, but I/we have sailed that boat around much of the UK coastline as well as a number of passages across the middle section of the English Channel and along the coasts of Normandy and Brittany. When I built the boat I was thinking of it as a bit of an experiment and I anticipated that within a few years I would get tired of it and want to build something different and probably larger. However, the first boat I built seems to meet our requirements so well that I have never been able to justify another one. You can only sail one boat at any one time.

Despite the above, I have built a couple of other boats, but only as an experiment, not for regular sailing. I felt I should do some 'funny boat' sailing, so I built a couple of experimental hydrofoil sailing boats having just two hydrofoils one ahead of the other. This was well before members of the Moth class first tried that configuration. I think that the Moth sailors went this way through a desire to circumvent the class rules, whereas in my case the idea stemmed from thoughts about how bicycles have mainly superseded quadricycles and tricycles.

I built two hydrofoil boats, which by chance were about the same length and sail area as a Moth dinghy and the second one even had 'wings'. The first one had no wings and the idea was to sail it using a trapeze wire, 'water starting' it in the same way as does a skilled windsurfer. Unfortunately I had never sailed with a trapeze wire prior to building this boat and although I had tried a bit of windsurfing I had totally failed to execute a 'water start'. Hence it is not surprising that I never got that boat to become foil borne for more than a hop, inevitably followed by a big splash. The next version with wings did better and although I never practised enough to properly develop the technique I did get it to 'fly' for a reasonable distance on a handful of occasions.

The above covers my amateur boat design and building. My engineering career has included a large number of different jobs in many different industries, the number of jobs being mainly due to a succession of redundancies resulting from insolvency of small companies and the general collapse of manufacturing in the UK during my working life. I have worked in many different industries, eg construction, software, instrument making, vending machines, ship repair, orthopaedic implants, fibre optics and, yes, for short periods, yacht building. I designed some of the deck gear for a sloop of nearly 50m LOA, I also did hands on laminating of carbon fibre yacht masts and in recent years I have had occasional involvement in the construction of an amazingly powerful luxury motor yacht. The latter one is not the kind of craft I would want to see too many of, but it does throw up some interesting design issues.

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**

November 2010

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 frederick.ball@mypostoffice.co.uk

27th **NW UK AYRS Group Meeting**
12 the Boleyn, Lydiate, Merseyside. L31 9TP. Contact: Mike Howard for details Tel: 0151 531 6256; or email: ecotraction@aol.com

January 2011

7th – 16th London International Boat Show and
13th – 16th 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

29th **All-Day AYRS Meeting**
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 frederick.ball@mypostoffice.co.uk

29th **AYRS Annual General Meeting**
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 2010 (post to AYRS, BCM AYRS, London WC1N 3XX, UK, or email: secretary@ayrs.org)

February 2011

TBA **AYRS Southwest UK Area Meeting**
Details from John Perry, phone 01752 863730 email j_perry@btinternet.com (note the underscore in that email address).

March 2011

14th **AYRS North West England Group meeting**
Contact Mike Howard for details: Tel: 0151 531 6256; e-mail: ecotraction@aol.com

April 2011

17th **Beaulieu Boat Jumble**
The National Motor Museum, BEAULIEU, Hampshire, UK. AYRS will be there!

29th – 8th May Liverpool Boat Show
Albert Dock Liverpool, UK. See http://www.liverpoolboatshow.com.

May 2011

9th - 13th Boat trials, Portland Harbour UK
Location to be determined - probably the Sailing Academy. This year we will have our GT-31's for timing available on Tuesday, Wednesday & Thursday. We will also have a locally hired safety boat for those days. Cost possibly between £30 to £50 for the five days; but we need some feedback on likely numbers. 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. Details on AYRS website www.ayrs.org. Contact: AYRS Secretary,, BCM AYRS, London WC1N 3XX, UK; email: office@ayrs.org. Note: All boats limited to 1.2 metre max draft!

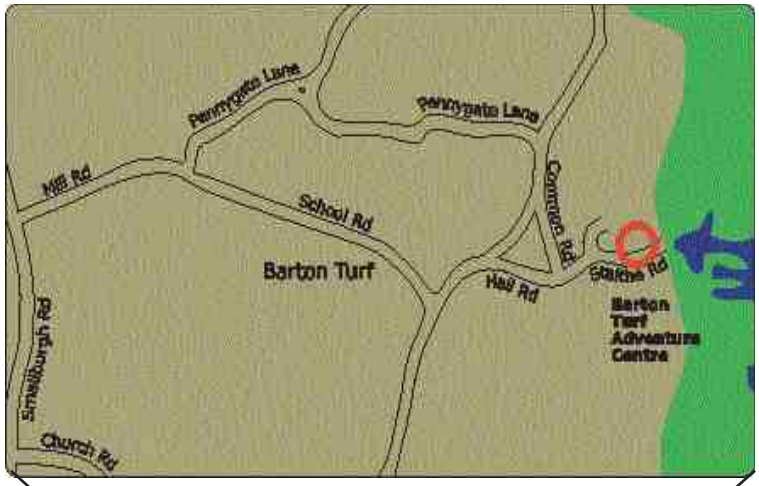
27th – 30th UK Home Boat Builders Rally – Norfolk Broads
Barton Turf Adventure Centre, Norfolk UK NR12 8AZ. Joint with the above. For details see http://uk.groups.yahoo.com/group/uk-hbbr/

June 2011

10th - 12th Beale Park Thames Boat Show
Lower Basildon, Reading, Berkshire, RG8 9NH, UK. AYRS will be there too!

15th - 16th Marine Unconventional Design Symposium
Trondheim, Norway. (Scheduled date - no details yet!)

How to get to Broad Horizons



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

On the Horizon . . .

More Howard Fund applications
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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