Catalyst

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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Submissions must be the designer's original, previously unpublished work, and include lines, profiles, sections, table of offsets, an accurate weight study, and cost calculations.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**

The British "C"-Class Catamaran Invictus *passing under Newport Bridge at the 2010 C-Class Worlds.*

Photo Helen Darvelid

Catalyst

Journal of the
Amateur Yacht Research Society

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A shorter edition this one, reflecting the need to get it out as soon as I can. If I left it any longer it will be July! Nevertheless, we apologise that the Chasse Maree Design Contest has already closed before this Catalyst hits the streets. It will be interesting to see the results though.

Hidden away in a corner at the London Boat Show was the British C-Class catamaran *Invictus*. We had hoped to include a technical article from the Invictus Team in this edition, but it is not yet ready, and instead we have a nice cover shot by Helena Darvelid, and a short report from Paul Larsen on sailing it at the Weston Catamaran Open meeting in late 2010.

Part 4 of Michael Nicoll-Griffith's magnum opus is here, Part 5 will complete the series.

This edition also we intriduce (re-introduce?) a Members News page which is for you to provide quick updates on what you are doing, or other items and snippets of interest.

Finally, don't forget Broad Horizons, AYRS' sailing meeting in the UK, is set for the end of May. Details on the inside back cover. We look forward to seeing you there.

Simon Fishwick

AC45 "Smaller Model" Catamarans Launched

Crucial to the development of the big AC72 catamarans is a "scale model" version, "only" 45 feet long which will be used to give teams experience in sailing and racing large wingsailed catamarans. These boats - which will all be to the same design - are being constructed in New Zealand. Potentially more interesting - and certainly more affordable - than the big boats, the AC45s, as they are known, will be used for the America's Cup World Series (ACWS), a series of demonstration events and regattas around the world, and for the "Youth America's Cup" event in 2012..

The first of the AC45 boats was launched in January 2011, and trials have begun. Some of the results can be viewed on the America's Cup website, http://www.americascup.com, and we believe on YouTube.

DESIGN

The AC45 was designed and engineered by BMW ORACLE Racing on behalf of the America's Cup community. Manolo Ruiz de Elvira led the hull design development, Scott Ferguson the wingsail development, and Dirk Kramers the structures team.

Mark Turner and Tim Symth of Core Builders, Warkworth NZ, created production tooling for the hull platform and wingsail, and will produce the initial batch of boats in collaboration with other New Zealand marine industry specialists including Cookson Boats and Hall Spars NZL. Steering and daggerboard assemblies have been sub- contracted to C-Tech Carbon Technology and Craig Stirling Composites Engineering.

The AC45 is a versatile, one-design class with controlled costs and ease-of-maintenance a priority. The hulls and cross-beams are designed for simple and fast assembly to accommodate the active racing schedule.

The one-design wingsail consists of two elements. It is a scaled down concept of the 223-foot tall wing that powered BMW ORACLE Racing's trimaran USA to victory in the 33rd America's Cup Match.

The wing will have simple, manual control systems. There will be two headsail options, a gennaker and jib, but no Code 0 headsail.

"The AC45 is small enough that it doesn't need hydraulics. The loads drop quickly when you get down to a boat of this size," said Ian Burns, design team coordinator for BMW ORACLE Racing. "There aren't even grinder pedestals. The winches will be powered by top-handle grinding."

Keeping with the simplification theme, the AC45 will have straight daggerboards. No articulation beyond raising and lowering is permitted.

Crews are likely to number five at an average weight of 85 kilograms (approximately 187 pounds) to fit the AC45's future role in the Youth America's Cup.

CONSTRUCTION

Cookson Boats and other key suppliers have been engaged to work with Core Builders to ensure swift production of the first batch of boats at a rate of two a month.

After use next year in the ACWS, the AC45 will be used for the Youth America's Cup, a series to be run in 2012 in conjunction with the ACWS.

PUTTING THE "C" IN THE WESTON CAT OPEN 2010

6 November 2010, we finally got to line our C-class INVICTUS up against perhaps the fastest beach cats in the world at the Weston Catamaran Open.

For us it was a chance to do some good racing, show the boat to an enthusiastic audience and get a measure of her performance against the state of the art of the soft sailed competition. We had a mixed bag of results for one reason or another but overall we came away pretty happy with what had been achieved. Weston did a great job and the event was a pleasure to attend.

We had a few little jobs to attend to before the racing began such as fitting one of our old 2004 dagger boards to make up for the one we lost in Newport RI during the last LAC. We rigged up the boat on Friday with a very bleak forecast suggesting winds of over 30 knots during the day. It didn't look too bad out on Southampton water but there was a sense that there was wind out 'there' somewhere. We held back a bit not really wanting to test our luck... but still got as close to sailing as we could before making the final decision. We watched a small but quality fleet go out to race which included Will Sunnucks on his Texel winning Marstrom M20 which has been souped up with a wider than normal beam and a bigger rig. Also out there were some F-18's, Tornado Sports and even Phil Cotton's Seacart 30 which had been invited to play. We watched them do the first race and decided that despite the forecast we hadn't seen anything that we shouldn't be able to handle... so we should have some confidence in a boat that had recently proven herself to be very reliable. We pulled on the drysuits and went out to play. The start was just in front of the club-house and we joined the fleet on their second lap around a short windward-leeward course. Instantly Invictus shot to windward at a pretty high angle and began putting distance on all the boats. We took a little while to get comfortable as there were some fruity gusts coming through. We eased into our top-mark rounding's pulling out all the camber to turn off the power. We made gains by not having to hoist or drop kites at the marks and had plenty of grunt to do decent angles down-wind... so much so that we often underestimated our down-wind angles and came in to the leeward gates very hot. In these instances we would just pull the camber off again and try and make it a bit more manageable. Some of the gusts sure were punchy and we had one big 'stuff' where we thanked our stars for those two big, funky, retro bows. Invictus shook it all off and were around the leeward mark and into the next beat. The angles she does up wind really is rude compared to a soft sail... and it just seems to get better with the breeze. She just keeps climbing out. Gordon and I got more confident as the cobwebs rubbed off with every mark rounding. We began to undo the lap we were down on the fleet. Unfortunately Will had a problem and was back on the shore so we didn't get to line up against the M20. We had one more good hard stuff down-wind and decided enough was enough. We were happy with the boat and the performance she gave, but the wind did feel like it was building beyond 'C' class territory so we took her home.

T vs C vs Sea... big, bigger, biggest...

The dinghy park at Weston Yacht Club was a hive of activity in the morning as everyone else had turned up for the weekend. Besides Will's M20, we now had Peter Vink on the much hyped (and deservedly so) new NACRA F20c, and the mighty TEK KAT 23 to deal with along with a host of Tornado Sports and current F-18's. Overall, the event had managed to get a pretty high quality fleet of boats and it was great to see a big winged 'C' sitting amongst all the 'T' s, 'N's, 'V's and 'H's. The mornings wind though faded by race time. I don't think there

was much trapezing up the first beat and we came around the top mark hard on the heels of the TEK KAT with the F-20 another five boat lengths out front. Down-wind we just got crucified by the kite boats. We had some real issues with the amount of force it took to hold the full camber in the wing. We didn't have the system onboard which we had used to good effect in Newport and we paid the price. The wind was down around 4-5 knots and dropping. Our angles were terrible whilst the kite boats could still make a decent VMG. I know we can do much better than this so it was quite frustrating not to be able to find our 'Mojo'. In the end the wind died completely... but our race was effectively over half way along that down-wind leg. It was both frustrating but equally illuminating of an area we need to focus a lot more on.

Thankfully there was a bit more breeze the following day. It was a cool and patchy, Northerly which varied between 5-15 knots. I got down there early and simply pulled the wing up, clipped on the trapezes and threaded the mainsheet.

When the racing started, I think we had some issues on the first start where we got stuck in irons spinning before the gun (sound familiar)? We were left behind effectively starting over a minute late. Despite this we still came around the top mark up at the sharp end of the 20 foot plus fleet. Once again we struggled down-wind. I was trying to sail a bit hotter down-wind with more weight to windward. My theory being that it was quite patchy and we might be able to stay hooked up with apparent wind for longer. When we were hooked up, we weren't that far off the pace. The trouble was we were mostly not in the groove... or all over the place chasing it. The boat didn't feel as slick down-wind as she was in Newport. We got hit by a gust whilst heading for the leeward gate and did stuff but the big bows saved us again. Whilst rounding up around the leeward mark, I heard a noise I knew meant trouble. Our new/old 2004 dagger board had snapped. We still had enough down to be effective upwind so we pushed on. We had lost about 50% of our area. It wasn't so bad as long as we 'footed' off and kept boat speed. In the fresher breeze, Ol' INVICTUS began to flex her 'C' class guns and do that cool upwind thing where she just goes substantially higher and faster than anything else. We would get left behind downwind... and find ourselves coming back into the top mark with the front runners.

We had great starts on the third and fourth races and gave everyone a good look at how a wing-sailed catamaran can go to weather... even with only half a dagger-board. Towards the end of the third race I began to move further to leeward down-wind and trade speed for depth. It worked a lot better and when in the groove we could almost... but not quite hang on to the good guys. Whenever we lost it we would get rolled by anything with a kite including the Spitfires from time to time. I bet they liked that. We can really screw some boats up as we do big dial ups in search of apparent and force everyone above us up... way up. Sorry guys/girls... that's what we need to do. The more we sailed the sharper we got. Equally we became aware of the performance killing issues that we were carrying. The broken board contributed to a couple of blown tacks which cost us around 30-40 seconds each time (feels like an hour when it happens), the slot was a total mess as the controlling fingers had opened up and in the end we even got one of the fingers stuck in our second element. This final piece was the equivalent of getting a jib batten stuck on the mast and not blowing through (for those of you who have sailed on Hobie 16's a bit). We had to carry that for all of the fourth race..

CONCLUSION

What a fantastic weekend. It was so much more fun to be out there sailing with friends old and new

Seacart versus C class

than playing around by ourselves down in Weymouth... and 10 times more valuable. Nothing improves the breed like racing. You can't hide from your weak points and god knows we have some. We had some glaring issues but then many of them can be resolved. I think it was easy to see where we could gain big chunks around the course with more practice and tuning. It was fantastic to line up against the cream of the modern beach cats. We got to see firsthand just how quick the NACRA F-20, 'Sunnucks special' M20 and TEK KAT could be when they hit their stride. Equally they got glimpses of what a 'C' could do in its stride. Knowing our own issues, what I had recently seen of the best 'C' classes in the Little Americas Cup and what I saw on the week-end, my gut feeling is that a good crew on the latest tweaked 'C' i.e. Fred and Magnus on Canaan... would come out on top.

Some people took a cheeky shot at our downwind performance but then you have to respect the 'C' class rule. Sure, we could put a kite on our boat and have the same advantage down-wind as we do upwind but that (well, let's be honest... that would make for one very cool and wickedly fast boat... as we will soon see in its 45 foot form)... where was I? Oh yeah, that... would not be a 'C' class. The fact is that we could put a kite on a C and go fast down-wind... but there is nothing so simple you could put on any of the other boats to go so fast upwind... except a wing of course. The challenge of a C is to design and build 300 square feet of sail area which flies upwind and gives power beyond its area limitation down-wind. It forces you to sail extremely efficiently and quite often in a unique 'C' specific manner. They are great boats and the more we can go and play in fleets like this, the better we will become. Funny enough, both the F-20 and the TEK KAT had to retire at the end of the day due to broken kite poles! Hmmmm;)

Cheers, Paul Larsen.

Pictures by Helena Darvelid.

If you look hard up in the left hand corner...

Lightweight Boat Design Contest

Chasse-Marée
(freely translated by Simon Fishwick)

Introduction

In designing his "Rob Roy" in the mid-nineteenth century, John MacGregor invented a unique form of boating, closer to men and nature. One hundred and fifty years later, his ideas have not lost their strength, quite the contrary, and Chasse-Marée, in conjunction with the "Wooden Village" (wooden boat area) of the Grand Pavois de la Rochelle Boat Show, have decided to revitalize it with the launch of a new design competition.

The increasing popularity of sea kayaking exemplifies the desire of part of the public for "*alternative boating*", avoiding the technical and logistical burdens of conventional vessels, but benefiting from lightweight technologies, saving both in space and in material resources. Unlike larger vessels, lightweight and trailerable vessels can be launched from any dock, however small, without handling or complex equipment. Winter storage is just as simple and economical under a tarp at the bottom of the garden or in a garage. The construction requires, indeed the lightness dictates, that only a minimal quantity of materials and energy be used, but the journeying possibilities are not minimal for all that! River navigations are not difficult, you can go all along the coasts of France and Europe. Long passages are now much safer and comfortable that boaters now have many autonomous facilities to aid navigation and safety – GPS, VHF, satellite beacons, etc. The possibilities are enormous, whether you are a lover of sporting raids where speed comes first, or prefer discovery and quiet trips along backwaters where the scene is at least as important that the time spent on the water with sails, paddles or oars. Besides the special attention that the wanderer must pay to the weather, the price of mobility is a necessarily limited carrying capacity, which in turn requires a change in our lifestyle: in 1865, MacGregor toured Europe with four kilos of luggage only!

Provided you pick your craft and its equipment with care, modern technology can do even better and with a comfort level much higher than in the nineteenth century. Likely to interest a wide audience, the plans for this sort of craft are few and far between and often inadequate. To stimulate the creativity of each individual, professional or amateur, Chasse Marée have prepared the specification for a program that would give complete freedom to create unique shapes and innovations to meet the relevant requirements of the lightweight way, and reinvigorate the principles of "*alternative boating*."

Contest Rules

Article 1

Chasse-Marée and the "Wooden Village" of the Grand Pavois de la Rochelle Boat Show are organizing a competition to design coastal excursion boats. This contest is open to all, with the exception of the organizers. Each contestant may submit multiple original projects that will be judged separately. Competitors will be classified into two categories: amateurs and professionals.

Article 2

The application must be received by April 30, 2011 at the offices of Chasse-Marée. All the documents should be marked with the project name and the name and address of their author(s). The application must include:

• A clear definition of the characteristics of the vessel which must contain necessarily the following points: length, width, capacity, freeboard amidships, draft, displacement, estimated weight, materials, sizes, and any other information element deemed useful by the designer.

• A lines plan at 1/10 scale.

• A plan of elevations and sections at 1/10 scale.

• A sail plan at 1/20 scale.

• A budget forecast document containing, firstly, the costs of each material used, and, secondly, an assessment, item by item, of time needed for construction.

It is also possible to present a half-shells, models, sketches, watercolor views, etc.

All the documents must be provided on paper. A digital version will also be appreciated.

Chasse-Marée and the the "Wooden Village" of the Grand Pavois reserve the right to reproduce and publish the plans submitted to the contest together with an edited project descriptions; a participant must grant the organizers a free right to do this for every item submitted (plans, specifications, etc.).

Article 3

The project must meet the following conditions:

• The boat will allow touring the Coast, for two days or more, for a crew of one to four people, as chosen.

• While touring, any shore handling, needed for the safety of the boat and its crew, must be practical for the crew to perform alone, without external assistance or equipment.

• The propulsion will be exclusively derived from human force and that of the wind, a smooth transition from one to the other must be practical without coming ashore.

• The safety and stability characteristics must meet the requirements of the European Design Category C (force 6 wind and wave height of 2 m) or D (wind force 4 and waves of 0.30 m) and those of the French coastal navigation class (which is up to 6 miles from a shelter).

• The craft will need to carry safety equipment suitable for the navigation category or the boat design.

• Road transport should be accessible to holders of the Class B car license*. Particular attention will be given to adaptation of the boat for trailing and all devices used to facilitate handling. Note also that the jury will pay attention to the performance criteria in both modes of propulsion, which must be of the highest possible standard. Finally, given a free choice of the materials and construction techniques, the emphasis should be on using them in accordance with the principles of sustainable development.

Article 4

The prizes, including help to realise the winning project, will be awarded by a jury of architects, builders, navigators, enthusiasts and journalists.

The awards ceremony will be held Thursday, September 15, 2011 at the "Wood Village" of the Grand Pavois de la Rochelle Boat Show.

Download the entry form from http://www.chasse-maree.com/images/stories/pdf/Rglementnaviguerleger.pdf.

To register, simply print it, then sign and return it to the mailing address of Chasse-Marée:

Chasse-Marée
Abri du marin
29177 Douarnenez
FRANCE

* Allows towing an unbraked trailer not exceeding 750kg or a braked one up to 2 tonnes or so depending on the weight of your car.

Sailing a Faster Course

Hypotheses from a study of polar performance curves
Part 4 - Upwind Calculations and Practical Methods

Michael Nicoll-Griffith

There is no result in nature without a cause. Understand the cause and you will have no need of the experiment. – Leonardo da Vinci

This section of the paper deals with measuring dynamically curved courses and how to set and to sail them. We examine mathematically the theories described in Parts 2 and 3. Those who need assistance in interpreting these pages can refer back to earlier parts for a more descriptive explanation.

In summary: The velocity that a sailboat travels towards its destination depends on a capability expressed by

1) a polar performance curve for the wind,
2) the angle of the boat's heading to the wind, and
3) the angle between the wind and the direction to the destination.

The third element, the angle between the wind and the direction to the destination has usually gone unrecognized. It is equal to the angle that the boat is "off to the side". Here we will call this the Wind / Target Angle or *WTA*. The WTA experienced depends only on the location of the boat – neither on its attitude, nor on its speed.

Can we determine mathematically whether there is a faster way to get to a windward target than there was using the 45 degree square method? – Yes, I think we can.

Recap - Polar curves and wind ladders

Current literature normally looks at a windward leg "playing field" as a diamond - a square mounted on one of its points. The sides are inclined at 45° because it has been observed that most boats sail near an angle of 45° when close-hauled. Authors allow that boats sail better if they bear off in light air, and need to point higher in heavier air. But we never see the diamond stretched sideways for light winds or squished inwards for heavy. Clearly, the standard presentation is to treat it as square, even though that may be a little less realistic.

Across the diamond, horizontally, is a set of parallel lines. These are the rungs of the wind ladder. Boats climb upwind from rung to rung. Authors explain that wind shifts cause the diamond and all its rungs to be slanted. What this suggests for the weather leg is that the best VMG upwind could use the 45 degree philosophy throughout. Following this logic, going all the way out to the lay-line before tacking would not be an unreasonable track to follow.

When we consider polar curves, we learn that the fastest track upwind must be correlated with a circular ring line, centred on the target and, like a tangent to a polar curve, perpendicular to the direction the sailor wants to go. When the wind shifts, say to the right, then the polar curve has to be rotated right, under these rings, through the same angle. If the changing wind is now more favourable to our course, the polar curves would tell us to foot

off on starboard and go faster. If on port we would need to tighten our rig and take the new wind tighter. On whichever side of the wind-direction the target lies will be the way we need to slant the curving tangent. Where this touches the performance curve will be the heading with the best velocity towards the target (VmgT).

It is not only the wind that shifts. When we sail on a tack, and the wind is constant, the target moves progressively behind us, relative to where we are heading. That has some equivalence to facing a wind that increasingly heads us. In part 2 of these papers, we reached the understanding that the fastest track sailed would be a spiral, defined by those changing angles.

Because one needs a different mind-set in considering downwind as compared with upwind, I will deal with these two directions separately. This part only deals with Upwind. We will not get to downwind until Part 5.

Upwind Analysis and WTA

We can now define our Playing Field differently. We should not think of it as a flat square, resting on its point with its lay-lines and ladder rungs. Instead, it will have a circular nature. It will be defined by 1) a point, the target, at the centre of a set of ring-lines, 2) a centreline extending exactly downwind from that target, and 3) when there is a boat on the field, a cone line beyond which it is not-so-profitable for that boat to sail.

Please refer to figure 18. When approaching the centreline, a boat is said to be on the "favoured tack". Perhaps it would be better to call this the "favoured sector". When a boat passes the centreline, she moves into the unfavoured sector. A sector is defined by the Wind to Target angle (WTA). This angle is that subtended at the target by the boat not being at the centreline. Both of the boats shown here are sailing in their favoured sector(s).

The cone line exists on the far side of the centre-line for a boat travelling towards it. The angle of this line varies according to the boat's sailing characteristics. This is the line at which, when sailing the curved course, the boat will be "pinched" with her genoa set as tight as possible. A boat can sail beyond the cone line, but at no higher an angle. She may want to do this when close to the target; while when further away from the target, she will be better off tacking.

Usually, angles on a boat are reckoned from ahead. That is, the wind is said to be coming from the "True Wind Angle", (TWA - Port or Starboard), or the "Apparent Wind Angle" (AWA – Port or Starboard). Because of their general usage, we will retain these abbreviations.

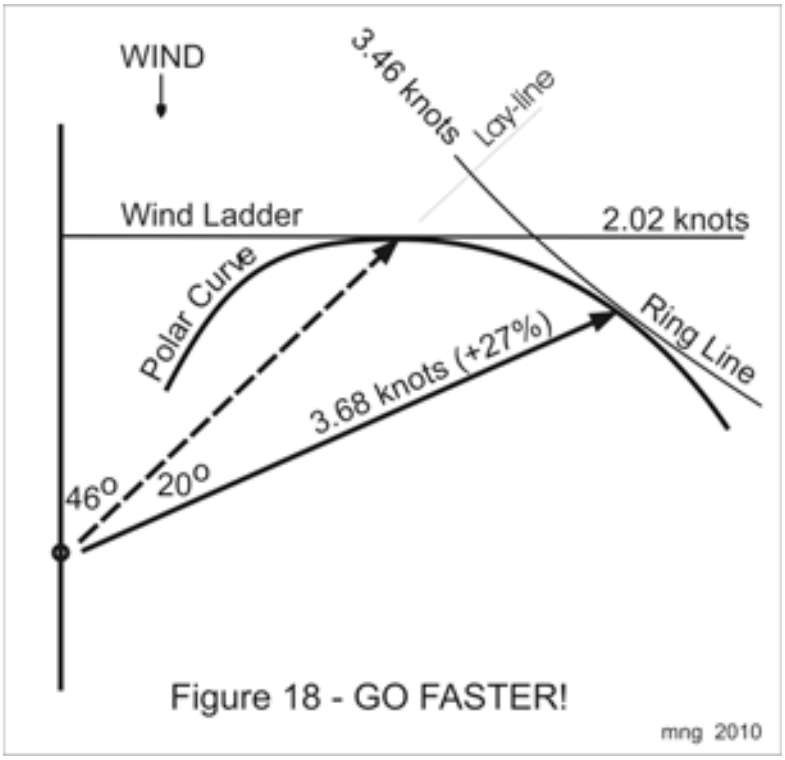

Figure 18 - GO FASTER!

When we add a boat like A, key angles concerning it can be added to the diagram. While we assume the wind to hold its direction, the target's angle HRT will increase, as the boat moves across. Concurrently, the boat can turn up to suit the rings.

The convention used in the tabulations that follow is that angles are reckoned positive clockwise from the wind source. (This is so as to be consistent with the compass). Therefore a boat on port tack, like Boat A here, sails in a positive direction. When the target is to the right of the wind source, the wind / target angle (WTA) is positive. The boat's heading with reference to the target (HRT) is positive when the target is seen to port.

Starboard tack boats are sailing in directions treated as negative. Therefore, all of the angles shown for Boat B would be negative. Boats in other attitudes could have a mix of positive and negative angles.

Previously, we have learned that windward progress "*VmgW = Vb* * cos*(TWA)*".

(Speed made good to windward equals the speed of the boat multiplied by the cosine of the True Wind Angle.) *[Italicised items are explained in the Glossary]*. The function "cos" merely expresses the new reduced velocity arising from not pointing exactly at the target.

But when the wind does not blow directly at the boat from the target, the tangent to the polar curve is slanted, and the velocity towards the destination is: "*VmgT = Vb* * cos(*TWA – WTA*)". (Speed made good towards the target location equals boat speed multiplied by the cosine of the difference between the true wind angle at the boat and the target's angle from the wind.)

This value (TWA-WTA), here called "HRT", is equal to the target's angle to port of the boat's heading. We do not combine those two elements initially, because the first component (TWA) is controllable by the helmsman, while the other component (WTA) depends on where the boat actually is. Additionally, TWA is needed separately to get the value of Vb from the polar performance curve.

WTA is the angle that the wind direction is to the left of the target. The cosine of a smaller angle is a larger number, therefore as WTA increases, the velocity made good towards the target increases. When the wind comes from exactly the direction of the target, WTA is zero.

HRT, being the divergence of our heading from the direct line to the target, can be readily displayed on most GPS units.

To find the optimum VmgT in practice, it is necessary to evaluate all likely angles and pick the most favourable. Knowing the wind-speed, we can do this for that wind's specific polar curve. The author has done this for various different values of WTA.

Figure 19 shows how it will feel to be proceeding on a curved track. We start off sailing broad so the apparent wind comes from AW1 while the target is seen in the direction to T1 at the angle of HRT1. The plus signs remind us that these angles have higher boat speed. By the time we reach the limiting cone line, heading up to 20º higher, the wind will be coming from AW2 and the target will be in a direction like T2 or HRT2. The minus sign reminds us that boat speed is reduced. We can expect the direction to the target to change from near 30º to near 60º.

During the "plus" phase, we find the target direction is forward of the TW (True Wind) and we are in the *favoured* sector "on the *favoured* tack". In the "minus" phase, TW is ahead of the target direction. We dropped from favoured into *unfavoured* as we crossed the centre-line.

Tabular Analysis of Angles

How can we proceed practically so as to find and sail on the best angle?

a) Transcribe the performance curves into a spreadsheet showing the speed at each heading angle.

b) For each Wind Target Angle of interest, evaluate the formula for VmgT.

c) Select the heading that yields the maximum VmgT.

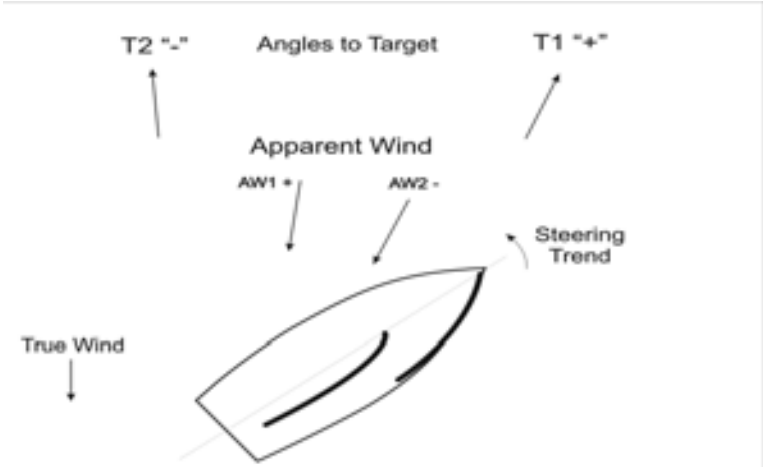

Figure 19 - Angles of Attack Upwind (Schematic)

Now knowing the desired heading, can we learn how to steer the boat accordingly?

Following the transcription into the spreadsheet of performance figures for Tanzer 22, Bénéteau 36.7 and Farr 40, (the latter using the material from References 4-2 and 4-3, with permission from Farr Design Group), the author has calculated the resultant VmgT and other indicators for a number of WTA values. These calculations are shown in Table 4-1 and those following.

The reader can skip the rest of this section on first reading and jump to the tables. Use it for reference as required.

Notes on Columns:

A = The angle between the wind and the target WTA. This will depend only on the location of the boat. The tighter sectors (with the wind more heading) show as negative angles.

B = The VmgT (to the target) that would be achieved if the boat was sailing on the Best Upwind Angle ("BUA"). The BUA "owns" line "0". The formula for column B = (Vb on line "0") * cosine(BUA-WTA).

C = The Angle in degrees to lay off from the BUA to sail the track with the best VmgT.

D = Resultant heading relative to the wind direction. Also called True Wind Angle TWA.

E = Resultant heading relative to the target. Also called HRT.

F = Vb: velocity of the boat at this position in the curve. (Velocity at the old angle is on line 0)

G = The new VmgT = Vb * cosine(col E).

H = The gain in VmgT from adjusting the track. Knots. Columns G-B.

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

K = AWA: Apparent wind angle to be expected now.

L = Velocity made good upwind VmgW, when sailing now for the best VmgT.

Notes on Lines:

<S = The situation at entry into the cone. This is the lettering introduced in Figure 10.

<U= The line of the Best Upwind Angle, the traditional beating line.

<P= The situation as the boat is leaving the cone. From this line on, the boat cannot achieve any improvement in VmgT because the angle is too tight. She can still sail at the angle shown on this line in column D. There is nothing to be gained by trying to head higher.

Tanzer 22 (Table 4-1)

The WTA is zero when the boat is on the centre-line. The WTA is 23º when the boat is on the 23º cone line, and the WTA is 46º when a Tanzer 22 is at her "lay-line". Figure 9 in Part 2 was drawn for a boat sailing up the port lay-line. Therefore it corresponds closely (within the 1° difference) to the top line in this table.

A boat sailing across from one side (or cone line) towards the other will be able to read down this table line by line, as she sails across the wind and gradually tightens up. A boat will typically start at the line marked "<S" and finish at the line marked "<P". So, as she crosses the wind, she can work down line by line. The tacking angle is the sum of the headings in Column D on the B and C lines. In the above case, (both taken from the 30° cone), it is 59°+35° = 94°.

To understand these tables, it is best to start with the line "0" near the middle. These numbers may be familiar to you by now. They appeared in Figures 3 and 9 of Part 2 when we were working just with the geometry. Reading across, this line says: when the wind is coming directly from the target's direction ("0") the velocity made good towards the target (VmgT) will be 2.02 knots. We will not do any layoff from the Best Upwind Angle (Column *A*), so, sailing the BUA we will travel at 2.91 knots at a true wind angle of 46º. This will also be the angle to the target's direction. We will gain no track adjustment benefit. So we will go upwind at 2.02 knots with the wind apparently coming from 29.4º, as in column K.

The line two-above that one, says: if the wind was coming from 10º better, favoured (that's left if we're on port; right if we're on starboard) then the straight-line skipper would have increased his VmgT to 2.35 without changing his heading. For our curved track, we want to lay-off 4º. Then we will make 2.38 knots towards the target. We will have gained 0.03 knots, which is 1.2%. Our speed upwind has dropped from 2.02 to 2.00 knots. Because the apparent wind angle is now 31.2º, we need to let off some of the genoa sheet to make these numbers.

You may have been surprised to see the apparent wind angles in column K. But there are no unknown angles now. The three elements of velocity (Polar Curve, True Wind Angle and Wind Target Angle) fully define the geometry. You can read in column B the decay of VmgT as a boat moves out to the side, until it approaches zero at the bottom near the lay-

Table 4-1 Tanzer 22 Upwind 5 knots Faired curve

	WTA degs A	Normal VmgT B	Layoff angle C	Heading re Wind D	Heading re Target E	New Vb F	New VmgT G	Benefit Gain kn H	Benefit Gain % J	Observations AWA K	VmgW L	Notes
Wind favouring	40	2.89	19	65	25	3.66	3.32	0.43	14.8%	38.1	1.55	
	24	2.70	10	56	32	3.36	2.85	0.15	5.5%	34.0	1.88	
	23	2.68	10	56	33	3.36	2.81	0.14	5.1%	34.0	1.88	<S
	20	2.62	9	55	35	3.32	2.72	0.10	3.9%	33.5	1.90	
	15	2.49	6	52	37	3.20	2.56	0.06	2.4%	32.1	1.97	
	10	2.35	4	50	40	3.11	2.38	0.03	1.2%	31.2	2.00	
	5	2.20	3	49	44	3.06	2.20	0.01	0.2%	30.8	2.01	
	0	**2.02**	**0**	**46**	**46**	2.91	2.02	**0.00**	**0.0%**	**29.4**	**2.02**	**<U**
Wind non-favouring	-5	1.83	-1	45	50	2.85	1.83	0.00	0.1%	29.0	2.02	
	-10	1.63	-3	43	53	2.73	1.64	0.02	1.0%	28.1	2.00	
	-15	1.41	-4	42	57	2.67	1.45	0.04	3.0%	27.7	1.98	
	-20	1.18	-6	40	60	2.52	1.26	0.07	6.3%	26.9	1.93	
	-23	1.04	-8	38	61	2.36	1.14	0.10	9.8%	26.0	1.86	<P
	-25	0.95	-8	38	63	2.36	1.07	0.12	13.2%	26.0	1.86	
	-30	0.70	-10	36	66	2.18	0.89	0.18	26.0%	25.3	1.76	
	-33	0.56	-10	36	69	2.18	0.78	0.23	40.7%	25.3	1.76	

line You will recall that when sailing a straight line, the VmgT progressively decreases. We can read the exact gain and percentage improvement in VmgT that curved tracks provide. Given our position across the field, we can read the direction we should be heading. Figure 11 in Part 3 shows some of these angles.

If you recall paragraph 6.2.1, John Navas complained of VmgT "because it is constantly changing". We need not be concerned at continuing change if we know what it means and how to handle it. Russ, per 6.2.4 suggested tacking when VmgT drops to one third of its maximum. We can read from these tables that this would be on a cone line of 25º (Tanzer), 28º (Bénéteau) and 30º (Farr). That is all quite reasonable.

As to the question: "Can we answer mathematically whether there is a faster way to get to a windward target than there was using the 45 degree square method?" Yes, I think we have done so!

There follow now upwind tables 4-2 for Bénéteau 36.7, and 4-3 for Farr 40, both sailing upwind in 10 knots. These were derived from published tabulations of a Velocity Prediction Program (*VPP*). To view those tabulations on the internet, please see References 4-3 and 4-4.

Table 4-2 Beneteau 36.7 Upwind 10 knots VPP

	WTA degs A	Normal VmgT B	Layoff angle C	Heading re Wind D	Heading re Target E	New Vb F	New VmgT G	Benefit Gain kn H	Benefit Gain % J	Observations AWA K	VmgW L	Notes
Wind favouring	46	6.09	17	59	13	7.05	6.87	0.78	12.8%	35.1	3.63	
	42	6.10	14	56	14	6.96	6.75	0.64	10.6%	33.5	3.89	
	40	6.10	13	55	15	6.92	6.69	0.59	9.6%	32.9	3.97	
	30	5.97	10	52	22	6.81	6.31	0.34	5.7%	31.3	4.19	<S
	28	5.92	9	51	23	6.76	6.22	0.30	5.0%	30.8	4.25	
	20	5.66	6	48	28	6.58	5.81	0.15	2.7%	29.2	4.41	
	10	5.18	3	45	35	6.37	5.22	0.04	0.8%	27.7	4.50	<U
	0	**4.54**	**0**	**42**	**42**	6.10	4.54	**0.00**	**0.0%**	**26.3**	**4.54**	
Non-favouring	-6	4.08	-1	41	47	6.00	4.09	0.01	0.2%	25.8	4.53	
	-10	3.76	-3	39	49	5.78	3.79	0.03	0.8%	24.9	4.49	
	-15	3.32	-4	38	53	5.65	3.40	0.07	2.2%	24.5	4.45	
	-20	2.87	-5	37	57	5.51	3.00	0.14	4.7%	24.0	4.40	
	-25	2.39	-7	35	60	5.20	2.60	0.22	9.0%	23.2	4.26	<P
	-28	2.09	-8	34	62	5.03	2.36	0.27	13.2%	22.8	4.17	
	-29	1.99	-8	34	63	5.03	2.28	0.30	na	22.8	4.17	

Table 4-3 Farr 40 Upwind 10 knots VPP

	WTA degs A	Normal VmgT B	Layoff angle C	Heading re Wind D	Heading re Target E	New Vb F	New VmgT G	Benefit Gain kn H	Benefit Gain % J	Observations AWA K	Observations VmgW L	Notes
Wind favouring	40	6.86	17	57	17	7.96	7.61	0.75	10.9%	32.0	4.33	
	30	6.76	12	52	22	7.72	7.16	0.40	5.9%	29.6	4.75	<S
	29	6.74	11	51	22	7.67	7.11	0.37	5.5%	29.1	4.83	
	28	6.71	9	49	21	7.56	7.06	0.35	5.2%	28.1	4.96	
	25	6.63	9	49	24	7.56	6.91	0.28	4.2%	28.1	4.96	
	20	6.45	6	46	26	7.37	6.63	0.18	2.8%	26.7	5.12	
	10	5.94	3	43	33	7.15	5.99	0.05	0.9%	25.2	5.23	
	0	**5.26**	**0**	**40**	**40**	**6.86**	**5.26**	**0.00**	**0.0%**	**23.9**	**5.26**	**<U**
Wind non-favouring	-10	4.41	-2	38	48	6.63	4.44	0.02	0.6%	23.0	5.22	
	-20	3.43	-4	36	56	6.36	3.55	0.12	3.6%	22.1	5.14	
	-25	2.90	-7	33	58	5.89	3.12	0.22	7.6%	20.9	4.94	
	-28	2.57	-8	32	60	5.72	2.86	0.29	11.3%	20.5	4.85	
	-29	2.46	-8	32	61	5.72	2.77	0.31	12.8%	20.5	4.85	
	-30	2.35	-8	32	62	5.72	2.69	0.34	14.4%	20.5	4.85	<P
	-35	1.78	-10	30	65	5.34	2.26	0.48	27.0%	19.7	4.62	

Summary notes on the tables

The gain achievable in progress to target at sideways displacements near the cone line, is of the order of 0.1 knots for the Tanzer 22 in 5 knots of wind, and 0.25 knots for the Bénéteau 36.7 in 10 knots of wind. The Farr 40 shows 0.33 knots gained there at the same wind-speed. Thus gains can be of the order of 10% when at the cone lines.

"Steps" and plateaus in the numbers shown can arise from insufficient data points and/or insufficient fairing of the curves. The published predictions for the two Farr designs do not cover wind angles less than 30°. This could affect the last line ("-35")in those tables.

The apparent wind angle (AWA) when sailing the BUA per line <U shows as 29.4° for the Tanzer but as little as 26.3° for the Bénéteau and 23.9° for the Farr 40. Strictly, only the Bénéteau and the Farr are comparative, because of the different wind speeds selected for study. Nevertheless, these values suggest an opportunity for some experimentation.

On the Water

Some Data for Practicing.

Let's start a boat from the port lay-line! On her BUA, she would be pointing at the target. When she lays off she will have the target at her layoff angle to port. This direction gradually moves aft until, at the centre-line the bearing to the target equals her BUA. (Tanzer 46º, Bénéteau 42º, Farr 39º). In 5 knots, on a T22, the HRT changes from 22º to 94º from lay-line to lay-line. If she had tacked on the cone line, marked "<P", the bearing to the target would have reached 65º, and, after tacking it would be 29º on the opposite side. (That is the 94º tacking angle). These figures can be read from column (E) on the appropriate lines in Table 4-1. For Bénéteau, the tack should go from 68º to 19º (Tacking angle 87º). On a Farr 40, the tack goes from 65º to 19º (84º).

A boat that seeks to show smaller tacking angles is coming out of her tacks too tightly.

An Upwind Method

When we go to practice on the water, we will need a pelorus on the cabin top, or alternatively some "sector lines" marked or taped on the deck. These are to determine quickly the angle (relative bearing) to the target, port and starboard..

Traditionally, skippers have selected their upwind sailing angle by adjusting the closeness of the genoa to the spreaders. On a Tanzer 22 that is 3 inches. With the sail sheeted like that, the boat is then sailed on the luff tell-tales. So it should be possible to correlate the distance that the genoa is off the spreader with the Apparent Wind Angle. That AWA gives us an entry into the above table. Once we have defined that relationship between the genoa-spreader distance and the AWA, we will be able to sail curved tracks without instruments.

What is really exciting about this is that the wind-shifts take care of themselves! The method responds to the wind direction, and the target's direction, continuously. Nothing special is needed. It is the value of WTA that has to dictate the setting of the

genoa. WTA will change when either the wind direction changes, or when progress and the passage of time "moves" the target to a new angle. Change is certain. In the absence of a physical windshift this will come about through the gradual passing of the target. The new angle can be sighted along the pelorus. It can be the "movement" of the target into the next sector aft that triggers increasing the genoa sheet tension.

On port tack we can expect a reduction in the positive value of WTA if approaching the centre-line, and an increased negative value when moving away from it.

That is really not much different than the way a typical wind change might cause the angles to alter. If the wind should now head us, then the boat moves more rapidly to having the target in the next pelorus sector further aft. If the wind fairs, then the target stays in its present sector longer, and we might even need to ease the sheet in response. The steering adjustment follows from the helmsman then keeping the genoa tell-tales streaming.

To re-phrase that: The navigator uses reference marks (a "pelorus") on the deck or cabin top to sight the target within one of a set of angular sectors. The crew then adjusts the genoa and mainsail for that sector, and the helm sails on it in the normal way. Because the act of tightening the genoa results in the boat heading more upwind, the pelorus reading will go back a little, allowing a little more time before the line to the target from the boat changes again.

Genoa Settings

Figure 20 shows the set of scale drawings used to assess changes to angle of attack and therefore likely Apparent Wind Angles.

This drawing is for a genoa with 14% camber, flying off a Tanzer 22 head stay with a 4" sag. The genoa was redrawn each time by releasing the clew forward and letting the sail rotate until the spreader space was 1, 2, 3..., 8, 10, 12 inches. The chord angle was then measured. The author has made the arbitrary assumption that the AWA will lie 5.9º aft of the genoa chord at the vertical height of the *spreader*. This yields an "Assessed" AWA.

By working this through, and measuring the angles, we get Table 4-4 [overleaf]. These assessed angles serve as a matching key to relate the Genoa / Spreader distances with the Heading to Target (HRT) using column K of Table 4-1.

Genoa Correlation to Sector Limits

Table 4-4 shows a correlation of Genoa / Spreader distance and Apparent Wind Angles into Sector Limits. The assessed Apparent Wind Angles are the intermediate step in this conversion. The sector limits are listed here for setting up and marking the pelorus.

When the heading to the target falls within the sector limits, then the genoa should be set according to the distance measure in Column 1. The matching process here used the Tanzer 22 five knot polar performance curve.

These angles can be established afloat for specific designs. Having such a table, it becomes possible to

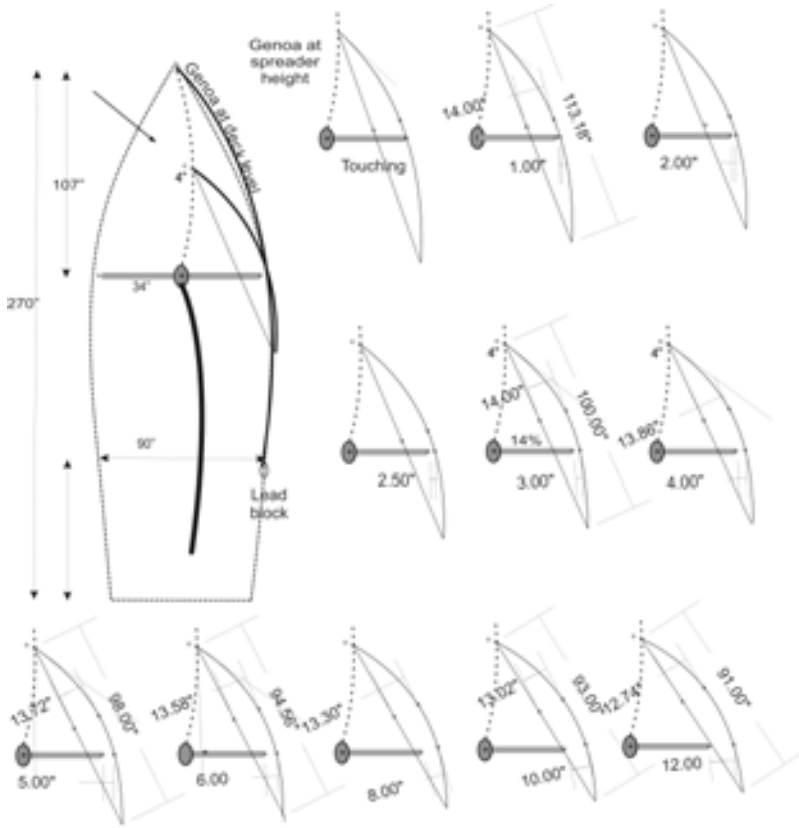

Figure 20 - GENOA ANGLES

Table 4-4 Genoa Correlation							
Genoa/ Spreader (inches)	Tangent to sail (degrees)	Chord angle (degrees)		Assessed AWA (degrees)		Mean HRT from column E	IndicatedS ector Limits
12"	62.5°	33.2°		39.1°		20"	Less than 23°
10"	59.6°	31°		36.9°		25"	23-28°
8"	56.8°	29.2°		35.1°		30"	28-32°
6"	54.1°	26°		33.9°		33"	32-36°
5"	52.7°	26.8°		32.7°		37"	36-39°
4"	51.4°	25.5°		31.4°		40"	39-43°
3"	50.2°	23.7°		29.6°		45"	44-49°
2.5"	49.7°	23°		28.9°		48"	49-50°
2"	48.8°	22.4°		28.3°		50"	51-56°
1"	47.7°	20.6°		26.5°		58"	56-64°
0"	46.7°	19.3°		25.2°		60"	64-67°

Table 4-5 Cockpit reference for setting Genoa based on boat's Heading re Target (HRT)							
	Eased sails			BUA	Tighter sails		
Wind-speed (knots)	HRT20°	HRT30°	HRT40°	HRT46°	HRT50°	HRT60°	HRT70°
2							
3							
4							
5	12"	8"	4"	3"	2.5"	1"	0"
6							
7							

make a tabulation for cockpit use, converting observed Heading re Target angle into a genoa / spreader setting.

Table 4-5 is an example of such a tabulation. The author encourages the reader to consider how to fill in other wind-speeds besides 5 knots.

A boat which decides to sail in at the 70°+, 80° and 90° angles, will not be able to tighten the genoa to more than zero. In such cases, tacking could be a preferred course of action.

On the course

1. Point the boat upwind and start sailing. Come up to close-hauled.
2. Determine Heading re Target angle (using Pelorus or GPS, allowing for *leeway*).
3. Adjust the genoa sheeting to conform.
4. Sail to the tell-tales.
5. Return to 2. Repeat as necessary.

Summary and Conclusion of Part 4

Calculation gives consistent results concerning the gains possible in Speed Made Good towards a Target, when boats are sailed in curved courses having the appropriate angles. This can have significant influence on the design of sailing instruments, and could have implications for other fields, such as sail design, sheeting angles and racing rules.

For example, ISAF's Racing Rules of Sailing use the term "close-hauled course". We now know that, even within the cone lines, the optimum course can vary by up to 20 degrees. At the traditional "lay-lines" the differences are even greater. What will now constitute "causing a boat to have to sail above close-hauled"? Our findings suggest that the range of angles might lead to a set of "proper upwind courses".

To come – Part 5 - Downwind Calculation and Unsolved Mysteries

We will deal in the next part with fascinating downwind issues. How and when should we decide to sail "Target Speeds" at "Apparent Wind Angles"? Can we really control our running legs to get the best Vmg to target, even when there is a windshift? If target speeds are used, when should this strategy be terminated?

There are still some unanswered questions, which we will pose to you, the readers.

Glossary

BUA	Best Upwind Angle. The angle that gives the best upwind speed - top VmgW. This is the standard measure of performance.
Centre-line	The straight line in the wind's direction to the target. Not the rhumb line.
Chord angle	The angle between the wind direction and the line joining the luff and leech of a sail.
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.
Faired	Of wind: the opposite of "Header". Of designed or measured curves: a smoothing process.
Fairing	Depending on context, either a change of wind direction more towards the stern of the boat, or the act and process of smoothing curves that are rough or irregular.
Favoured	The tack to the target that is preferred over the other one, because the angle is more beneficial to getting there sooner.
Heading	The direction that the boat is pointing.
Header	Change in wind direction that is towards the front of the boat. A disadvantage upwind but an advantage downwind.
HRT	Heading with respect to the Target. The angle that would be observed on the pelorus sighting to the target with the boat on the correct heading. This can be the course deviation on a GPS when set with the target's location. Adjustment for leeway will become necessary.
Leeway	The slippage that occurs sideways, necessary for the keel to hold the boat on a track. This is dealt with when using GPS but is not identified when the heading is assumed from the boats attitude or compass.
Lift	Depending on context, either the side force generated by an airfoil in a fluid flow, or a shift of the wind direction towards the stern of the boat.
Pelorus	A form of protractor that is used to measure angles left and right relative to the bow of the boat.
Rhumb line	The straight line from the previous target to the next target.
Sector	A set of adjacent positions or directions limited by two radial lines. Here used with lines that intersect at the location of the windward target.
Spreader	A strut mounted on the mast that adds a lever arm to rigging that supports the mast.
Tacking angle	The angle turned through when changing from the chosen upwind angle on port tack to the chosen upwind angle on starboard tack, or vice versa.
Track	See course.
TWA	True wind angle The angle between the heading of the boat and the direction of the actual wind.
Unfavoured	The tack that is not the best choice. i.e. when it is known that the other tack, heading closer to the target, is the preferred or favoured tack.
Vb	The speed or velocity of the boat, measured in knots, or nautical miles per hour.
VmgW	Velocity (made good) measured up or down the wind, as in the wind ladder.
VmgT	Velocity (made good) in the direction to the current target.
VPP	Velocity Prediction Program. A computer program that predicts the speed of a boat based on its design, not on its actual performance.
WTA	Wind/Target Angle. The angle seen at the boat between the bearing to the target and the direction of the wind.

References to Part 4

4-2 Bénéteau Velocity Prediction Program "Performance Curve" data http://www.blur.se/polar/first367_performance_prediction.pdf

4-3 Farr 40 Velocity Prediction Program "Performance Curve" data http://www.vossassociates.com/farr40/farr40vpp.pdf

Revised to 10/12/09

The Members News Page

This is your page, where you can tell others things you want them to know, or ask them, or insert small ads for things you need or no longer want, or ask for/ offer help etc. Nothing commercial thank you, and keep it yacht related please!

While at the Southhampton Boat Show I visited the Royal Institute of Navigation stand and picked up a copy of "Fairway" the newsletter of their Small Craft Group and Marine Traffic and Navigation Group. There were several interesting articles and a long list of alterations being planned for lighthouses and major bouys and one about GPS jammers apparently frequently used by car/lorry thieves and other reports included the fact that in December 2007 a solar flare had produced enough radio noise to block GPS over most of the sunlit side of the earth and THV Alert had taken part in trials and a 1.5 watt jammer had successfully defeated GPS for 30 kilometres out to sea! Keep the deck log up to date and paper charts seems to be an important message

Water Craft Cordless Canoe Challenge. The magazine "Water Craft" is organising a competition at the Beale Park Boat Show 10th-12th June; Its not restricted to canoes but there is a maximum loa. of 5metres including steering and stern gear, and must be propelled solely using one or more cordless electric tools using their supplied batteries. A trial run of the course will be allowed on Friday 10th June after the show has closed and heats run on the Saturday morning with quarter finals in the afternoon, semifinals Sunday morning and the final in the afternoon. NB All entries will be checked for safety before launching. Entries to be made by emailing photos of the vessel preferably under way to ccc@watercraft-magazine.com Makita have put up a prize of cordless tools worth more than £1200 The article describing the competition can be seen at www.watercraft-magazine.com which shows the front cover of the magazine and a synopsis of the content, scroll down to the Beale Park paragraph and click on 'more' which will reveal a scan of the 2 pages, click on 'download PDF' for a legible version

At the London Boat Show in I found a "C" class catamaran well hidden, there was no mention of her in the catalogue, I suspect she was a last minute entry but was well worth looking at. She has a 12 meter tall wing sail (weight approximately 75 kilos) and an all up weight ready for sailing of about 180 kilos; less than that of her 2 man crew! She is called "Invictus" and is aiming to challenge for the Little Americas Cup in 2013, apparently she is the only wing sailed C class cat in Europe and is hoping to get more sponsorship and best of all some European competition before racing against the Americans and Canadians who have been actively racing these very high tech boats for several years.

Other interesting projects include Project Torpedalo which is a pedal powered design intended to cross the Atlantic taking part in the Woodvale Challenge; a mock up of the pedalling arrangements and a solid model of the boat are on display, www.torpedalo.com

Also at the other end of the power range is the Maricuda Atlantic Challenge and also not yet built a twin gas turbine powered high speed trimaran hoping to win the Hales Trophy by crossing the Atlantic in under two days also in 2013 speeds of up to 70 knots are intended. www.maricuda.co.uk

I also found a small electric launch E~Cruise 13' (3.9m) Electric day boat with prices starting at £6950 claiming a cruise time of 2-3 hours, even the up grades, extra batteries etc didn't seem too terrible; an extra £2000 would give much increased range and a very useable river or canal day boat, I wonder if they are hoping to develop a hire fleet . www.thamesbrokerage.net

The very swish high tech. launch from Patterson Boatworks had two examples on their stand and it was being offered in three choices of power; Low power spec with a 4kw electric drive and 20kwh of batteries, High power electric spec. using 35kw and lithium battery pack, and a hybrid version with a choice of engines (biofuel, petrol or diesel)to charge a 15kwh lithium battery bank to drive a 45kw water cooled electric motor. www.elektramarine

Fred Ball

Sad news in the world of DDWFTTW.

From D Glover, Thin Air Designs.

We have learned that Andrew Bauer passed on Sept 6. As our blog followers will recall, Andrew Bauer was not the original inventor of the concept, but did build the first successful DDWFTTW cart that anyone seems to know of. He did this to settle a friendly wager with colleague and notable aero engineer A.M.O. Smith in 1969. As we understand, the wager was based on a claim in a student's paper, written 20 years before, that DDWFTTW should in fact be possible. In some small way we have tried to model ourselves after Andrew by doing the engineering and demonstrating the principle - rather than simply proving it on paper.

Over the course of the project we have been lucky enough to talk with Andrew's wife, some of his colleagues, and now his son. All have been extremely friendly, helpful, and enthusiastic. Unfortunately, Andrew suffered from Alzheimer's and was not able to participate in the current round of silliness. But I think he would have enjoyed it.

Andrew will be missed.

Meet the Committee - Robert Downhill

Robert Downhill has been a member of the A.Y.R.S. for many years joining while being a competitor of Weymouth Speed Week during the 1980s.

His background is in the engineering side of aircraft design where he spent 30 years followed by 18 years in the offshore oil recovery business as a systems analyst on IBM mainframe computers.

His retirement in 1992 coincided with the abandonment of Speed Week by the Royal Yachting Association. With Norman Phillips help, he resurrected Weymouth Speed Week at the Weymouth Sailing Centre. The event has been held every year since first at the Centre then transferring to the old naval air station that became the Weymouth and Portland National Sailing Academy.

WHERE can you get?

Canvas and sailcloth *Kayospruce Ltd* Has anyone used them and can comment on service etc.?

Plywood and timber *Robbins Timber* www.robbins.co.uk. I have used them and been pleased with the service and quality of timber and felt it worth the extra cost of delivery etc

Insurance for experimental boats While at the AYRS Boat Show Stand I was asked to write giving details of the insurance I am using.

It is the Basic Boat Third Party Liability Insurance under written by Royal and Sun Alliance Insurance Plc and is administered by Howe Maxted Group Ltd of 17 Hatherley Road, Sidcup, Kent DA14 4BP, tel: 0843 2081188

There are lots of exclusions so one does need to check the policy details carefully and these do seem to change from year to year! So far I have not had to claim so I can't comment on how well they handle claims!

There is a web site www.basic-boat.com, which does have full details of what they offer.

Fred Ball

AYRS Sweatshirts

AYRS Sweatshirts and other clothing items embroidered with the AYRS logo are once again available after a break of many years.

You get them, not from AYRS itself, but from Ocean World, the well-known Cowes-based branch of World Leisurewear..

Order through their website at http://www.oceanworld.co.uk/ayrs. The logo reference is AYR4153.

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**

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)

March 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).

18th – 19th Chesapeake Sailing Yacht Symposium
St. Johns College, in Annapolis, Maryland, USA. The world's premier technical forum dedicated to advancing the study of the art and science of sailing yacht design technology. For programme see http://www.csysonline.com. If any member is in the audience, we'd like a report please!

April 2011

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

Liverpool Boat Show has been cancelled!!

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 frederick.ball@mypostoffice.co.uk

18th AYRS North West England Group meeting
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, provionally at the Royal Dorset Yacht Club, 11 Custom House Quay, Weymouth. Location Map: www.rdyc.freeuk.com. Check with the: AYRS Secretary, BCM AYRS, London WC1N 3XX; email: office@ayrs.org tel: 0780 820 0987 before going just in case the location changes!

Broad Horizons 2011

27th - 30th May 2011

Barton Turf Adventure Centre

Norfolk NR12 8AZ, UK.

AYRS Sailing Meeting on the Norfolk Broads

Come & sail with us, or just come and look at other people's boats,find out what they are doing, chat comment, network, whatever.

Joint with a meeting of the UK Home Boat Builders Rally

Directions: From Norwich, take the A1151 through Wroxham and Hoveton.
About 2 miles after leaving Hoveton, turn right onto an unclassified road signposted Neatishead and Barton Turf.
Go through Neatishead (beware: blind double bends!) over the bridge and take the first turning right, signed Barton Turf.
On reaching Barton Turf, fork right beside the green (Hall Rd), signposted "Staithe", and continue straight on down Staithe Road.
The Barton Turf Adventure Centre Sailing Base is on the left, behind a pair of double farm gates, about 75yds past Bittern Crescent.

Costs per head: Day visitors FREE
Overnight Camping in your own tent/campervan - £5.00 a night
Bed in a BTAC tent (booking ESSENTIAL) - £10.00 a night
Food: Breakfast and lunch - £10.00 a head a day, or bring your own (dining space available)
Evening meal - £10.00 (booking essential), or bring your own, or eat out.
Launching includes Broads Authority Toll Fee for one day - Sailboats £5.20 if you book in advance,
small powerboats £15.50 - 20.00 (5mph speed limit!)
NB BTAC will provide a rescue boat and crew

Provisional Programme
Friday: Site open for arrivals, if you're early, you can eat at BTAC, if you're late, eat in the pub or wherever
Saturday & Sunday: launch, sail.
(Saturday's evening meal will be a BBQ if the weather is suitable)
Sunday Evening - discussion meeting with Michael Nicoll-Grifith ("Sailing a Faster Course" - see Catalyst)
Monday: more sailing, recover boats in the late afternoon, go home.

Barton Turf Adventure Centre (BTAC) is a 17-acre campsite and sailing school originally established for Hertfordshire schools' use. Now managed by Sheila & Simon Fishwick, it is open to everybody, but especially schools and youth groups, who are accommodated in tents and have access to a range of adventurous (chiefly watersports) and environmental activities using Barton Broad and the 14-acre private nature reserve. The Centre has its own slipway into an arm of Barton Broad, and can launch and recover boats of up to about 6m in length, 2m beam, 0.5m draught (keels up). Wider boats will have to be manhandled over the side of the quay, or launched through Cox's Boatyard (for a fee). Boats may be moored overnight.

Barton Broad is the second largest of the Norfolk Broads and arguably the best for sailing. It has been subject to substantial improvement project recently undertaken by the Broads Authority aimed at restoring the silting broad to clear water. The project on the whole has been a success and Barton Broad is once again a real boating paradise. The Broad is home to numerous wildlife, including many species of birds, fish and even otters who have returned to the Broad. The edges of the Broad are all nature reserve, and much of them are fenced off to provide fishfree areas where microlife can breed without being eaten. The Broad lies across the River Ant, and there is a certain amount of pleasureboat traffic moving through it. This should not be a problem in April. The Broad is about 2m deep at most. Power boats are subject to a 5mph speed limit.

BTAC will provide a rescue boat, and will, if necessary, tow boats between the slipway and the open broad.

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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