

Catalyst

Journal of the Amateur Yacht Research Society

NUMBER 45

OCTOBER 2012



3 News

L'Hydroptere.ch, Sailrocket

8 Letters

Ultimate sailing, Vortex plates, Yullahs, etc

11 *Final report on hinged foils*

Robert Biegler

14 *Are recent kitesurfer records being sailed at more efficient sailing angles than best recorded windsurfers?*

Dave Culp

16 *AYRS News – Meetings and other activities*

Fred Ball, John Perry, et al

28 *Catalyst Calendar*



L'Hydroptere.ch
Photo: © ADimages &
A Tinturier

Catalyst

Journal of the
Amateur Yacht Research Society

Editorial Team —
Simon Fishwick
Sheila Fishwick

Specialist Correspondents

Aerodynamics—Tom Speer
Electronics—Simon Fishwick
Human & Solar Power—Theo Schmidt
Hydrofoils—Joddy Chapman
Iceboats & Landyachts—Bob Dill
Kites—Dave Culp
Multihulls—Dick Newick
Speed Trials—Bob Downhill
Steam Power—Lord Strathcona
Structures—Keith Burgess
Windmills & Turbines—Jim Wilkinson

Catalyst is a quarterly journal of yacht research, design, and technology published by the Amateur Yacht Research Society, BCM AYRS, London WC1N 3XX, UK. Opinions expressed are the author's, and not those of AYRS. AYRS also publishes related booklets.

Contributions are welcome from all. Email them to **Catalyst@ayrs.org**, or send (at your risk) disks or typed copy with illustrations to the Society's office. AYRS can take no responsibility for loss or damage in the mail.

AYRS subscribers receive both *Catalyst* and the booklets. Subscription is UK£20/US\$30/Eur15 per annum for paper copies, (£10/\$15/•15 concession for the retired), £10/\$15/•15 for download copies. Subscription requests and all other queries to be sent to the AYRS Office, BCM AYRS, London WC1N 3XX UK, email: **office@ayrs.org**

AYRS is a UK Registered Educational Charity (No 234081) for the furthering of yacht science.

Website: <http://www.ayrs.org>

© 2012 Amateur Yacht Research Society
BCM AYRS, London WC1N 3XX, UK
All Rights Reserved
ISSN 1469-6754

The problem with being a volunteer Editor, with a business to run, is that, quite often, the business has to take precedence over the editing. That's why there hasn't been a *Catalyst* since last October. There wasn't enough material to do one last January, and once material started to come in, there wasn't the time to do one until our adventure centre closed for the winter. I am hoping I can do one now and one under January's date in fairly short order.

We do though now have a volunteer to help with the editing. He has a fairly steep learning curve to climb though as he is used to academic publishing tools not "journalistic" ones (which give vastly more control over layout and appearance); so I don't feel I can desert just yet.

On the other hand, the Annual General Meeting is on 27th January, and my current "tour" has run out so if people want to vote someone else into my office they can.

Once the January 2013 edition is done though, there is not enough material to do another; so please, send in some articles of good quality with interesting pictures. People frequently offer erudite articles that are just words, and we have to point out to them that pictures can tell a story much better than descriptions, and that no-one wants to read pages of undiluted text anyway! So don't forget the pictures!

Simon Fishwick

[And for those who must worry about the technicalities, we can now read almost any unencrypted file format, but we prefer MS Word .doc. Line drawings can be in the document file, but photographs should be sent separately from text as VERY high quality (8MB or better) .jpg or .raw files.]

l'Hydroptère.ch concludes a record-filled 2012 season

The experimental hydrofoil catamaran Hydroptère.ch has concluded its record-chasing 2012. Its results were excellent, including one of the best times of all times on the Ruban Bleu course despite adverse weather conditions.



l'Hydroptère.ch, the holder of the main speed records on Lake Geneva, is the Hydros project's flagship vessel. Note the retractable planing steps under the hulls just forward of the foils. Photo: Copyright ADimages-A_Tinturier

L'Hydroptère.ch, the revolutionary hydrofoil catamaran developed by the Hydros design team in Lausanne, concluded its record-chasing campaign at the end of a season packed full of experiences and achievements.

In 2012, *l'Hydroptère.ch* achieved the best times for all the records on Lake Geneva: hour, kilometer and Ruban Bleu (Bol d'Or course). It also beat the absolute one-hour record on July 19 with an average speed of 25.63 knots. *l'Hydroptère.ch* also posted the year's best time on the Ruban Bleu course on July 11 in 5 hours 11 minutes 46 seconds, beating its own record (from 2011) by 22 minutes, although still 18

minutes off the record itself. *[These records do not fall within the scope of the WSSRC – Ed]*

"We are proud of these achievements", says Daniel Schmaeh, helmsman of *l'Hydroptère.ch*. "Our overall performance has been excellent as we progressed on all fronts: we validated the changes to the boat's structure, progressed as a team, and improved our understanding of how hydrofoils work. On the other hand, the weather conditions proved capricious; there was hardly ever any bise (northern wind) and we feel there is unfinished business as the Ruban Bleu was denied us. We will resume our assault on the record next year; we know it's within our grasp."

The l'Hydroptère.ch team, comprising Daniel Schmaeh, Jérémie Lagarrigue, Stéphane Dyen, Gaël Ledoux and Guillaume Coyon made no less than nine attempts this season, trying their luck in sometimes adverse conditions. "These attempts allowed us to strengthen the team, and improve the handling of the boat and our knowledge of Lake Geneva", says Jérémie Lagarrigue, head of the Hydros project. "We also greatly improved the yacht's performance."

As a result, l'Hydroptère.ch managed to sail the Geneva – Le Bouveret course in 1 hour 44 minutes. On July 19, l'Hydroptère.ch was about to round the Bouveret mark, after 1 hour 20 minutes of sailing when its starboard hull broke, putting an end to the attempt. The hull then got repaired in a month by the Hydros team, the Décision SA and Multiplast boatyards thus demonstrating the Hydros technical team's formidable capacity to react.

Thierry Lombard, the initiator of the Hydros project and owner of l'Hydroptère.ch, has supported the development of flying yachts since 2005. Today the world's fastest sailboats, as well as the multihulls involved in the America's Cup, sail with foils, thus confirming his original vision. "It makes me very proud to see how far the Hydros team has come", he declared. "l'Hydroptère.ch has allowed us to learn more about the basic technology of flying boats. We are now at the forefront of developing these processes of the future, thus continuing our pioneering spirit."

l'Hydroptère.ch will have a few more outings up to the end of November to make some tests and some more progress for next season. It will then be stored until the beginning of next year's record hunting season on Lake Geneva, in March 2013.

About Hydros:

Hydros is a scientific research project devoted to sailing and has three parts: Hydro Cup (participation in the Little America's Cup), Hydro Contest (university competition), and Hydro Speed Tour (speed competition).

Hydros seeks to participate in initiatives that contribute to sustainable development. The scientific conclusions resulting from the research into sporting performance will be applied to industrial projects involving renewable energies.

In September 2013, Hydros will enter two state-of-the-art Class C multihulls in the Little Americas Cup at Falmouth, UK. The yachts are currently under construction at the Decision SA boatyard in Lausanne. They will be the first yachts ever built using the thin ply technology (TPT), an innovative Swiss invention which will result in a lighter and stiffer structure.

The rigid wing that will replace the sails is also under construction at Decision. Built with great attention to detail, it will be a model of precision and probably one of the most sophisticated wings ever made.

The first Class C crew will comprise Jérémie Lagarrigue and Billy Besson, who recently came third in the Formula 18 World Championships (sport catamarans) at Long Beach. The selection process is currently underway for the second catamaran crew.

At the same time, some members of the Hydros team are developing the HydroContest, a competition that challenges universities to find solutions to some of the issues maritime transport faces. The idea is to involve engineering schools worldwide along with today and tomorrow's thinkers in addressing a major problem: dwindling reserves of fossil fuels and the need to reduce their consumption by transport ships.

Davy Moyon, Hydros engineer, assisted by Robin Amacher, is coordinating the project in partnership with the Swiss Federal Institute of Technology in Lausanne and is working on the details of the competition. Starting in September 2013, universities will receive a starter kit in the form of a prototype, which they will be able to optimize at their convenience. The project will be piloted and closely monitored by Hydros, and the results will lead to specific applications that will eventually serve to improve the ecological balance of maritime transport.

Sailrocket in 2011... Knocking on the door but not through yet

Paul Larsen



Photo: © Helen Darvelid, Sailrocket

Well 2011's been a full old year in the world of VESTAS Sailrocket. This time last year I was using the quiet Xmas period in the build shed to get all the spray-painting of the wing out the way!

We launched on the 4th March and shipped the whole jam-packed container to Namibia a few days later. After some low speed teething issues we drank the 20, 30 and 40 knot bottles of champagne on consecutive days. Within 23 days from launch, this radical and highly compromised, one-off prototype boat was hitting over 50 knots. What's more, it was doing it using an unconventional ventilated foil section.

The VSR2 program is focused on making the breakthroughs necessary to overcome the conventional limits of high-speed sailing. These are all centred around the performance limits of conventional foils. The kite-surfers don't rely so heavily on these and therefore, as they have so clearly demonstrated, they don't have the same limits. In order to test and develop foils at very high speeds, you need to fund, design, build, develop, maintain etc a craft that will allow you to repeatedly enter the 'laboratory' in a safe and reliable manner. This year I think we demonstrated that we have the right craft. At the end of the last session a couple of weeks ago in Namibia, we had shown that VSR2 could drag almost any foil we bolted onto it down the course at speeds over 50 knots. We were constantly banging our head against the old limits. It does seem that many different craft and projects get stuck in the low 50's. We didn't make the breakthrough we were looking for this year but we are very definitely in the right laboratory with the right tools.

20/20 Hindsight

Now that I can look back, I can see where some of our assumptions were just plain wrong... but that's ok as our understanding of the bigger picture is right on track. The boat is great and it is only the highly modular foil that is wrong. It was our first shot at a ventilated/cavitating foil and assumptions had to be made. If we were just doing 60 knots then it would have been a lot easier. If getting through low speed transitions just involved pouring more fuel down the carburettor then it also would have been easier... but this is a sailing boat that has to accelerate from standstill using only wind-power so the problem is a whole lot more interesting. Now that we have a whole heap of experience we feel that we are much better placed to re-visit the problem. VESTAS Sailrocket 2 is currently sitting all nicely packed away down in Namibia and can be made ready to do 50 knots plus again within a couple of days. All our efforts now are focused on getting the foil right.



First shot at cavitating foil on left; proposed t-foil on right.

Solution?

After our design meeting hours after landing back in the UK, the current thinking is that we will scrap the L-foil configuration and go to a T-foil arrangement.

This foil does seem to have many advantages. We had discounted it previously as we thought that the end plate would need to be much bigger to enable us to generate the low speed side force to get started. This would have meant that we would have had structural issues around the junction... especially if the top tip of the foil popped out of the water, as this would put large torsional loads on the junction. Now that we believe we can go a lot smaller (as demonstrated by our 'chopped down' runs towards the end of the last session), we believe that the 'T' configuration has many benefits...

- We can use the existing composite 'head' of the foils.
- We can machine the new components out of metal which is far cheaper, quicker and will allow us to try many variations.

- We can make the foils much thinner as the bending loads are greatly reduced

However, there are issues that we need to resolve. Some of the aspects that need to be considered are as follows...

- What dimensions will we need to satisfy all criteria?
- What are the expected loads for all scenarios?
- What are the realistic performance expectations?
- How do we best gain the understanding of how the foil will perform and make the necessary flow transitions?
 - If we do still want to use ventilation as a means of creating the upper surface cavity on the foil, how do we ensure it can get down to the foil?
 - How do we maintain good ride height?

- How do we reduce the drag at the junction of the T as these junctions are always messy, especially when highly loaded.

There is just so much to learn. We have started by working on a 'T-foil' based spreadsheet that will show us the effects on the various balance/load/ performance factors from changing various inputs. This shows us the basics. From here we need to understand how the one foil solution will make the transitions from standstill to over 60 knots in a sailing environment.

The final foil solution needs to tick a lot of boxes. Whilst I have no doubt that our team could work through the problem if given the time and resource, I feel that it is time to start really bringing other brains in to help us solve these very particular problems. I know that our endeavours have been followed by some very clever people who are quite passionate about this dark corner of yachting that we are delving into. In many cases we have been contacted and this is much appreciated. If I have seemed a little slow in getting back it is only because we are trying to structure the problem so it can be best presented to fresh minds. There are many good ideas out there but first of all, the specific requirements need to be outlined. The spreadsheet will help us do this. If all the requirements are met to satisfy the basics, then we need to have a program that then allows us to verify this. That is still an open discussion as we don't know exactly what resource we can apply to the verification process i.e. CFD, model testing etc.

If the T-foil does make it through all this and the manufacture is as easy as CNC milling out flat foils, then this may well allow us to try many different shapes. We'll see.

So here we are, heading into a new year and getting right down to the 'nitty gritty'. A world record in 2011 would have been great but I can't allow that to overshadow what has been achieved this last year. Thank you to everyone who has supported and encouraged us near and far. We will continue to share the journey even through this 'techie' stage as it seems that many of you find this as fascinating as we do. We don't intentionally hold anything back. Some times we just don't put things forward until we have some structured understanding ourselves. We don't feel we have too much to protect just yet as anyone who copies anything may well be simply copying our mistakes. VSR2 is still very much a work in progress albeit one that is more ready than ever for the challenges that await.

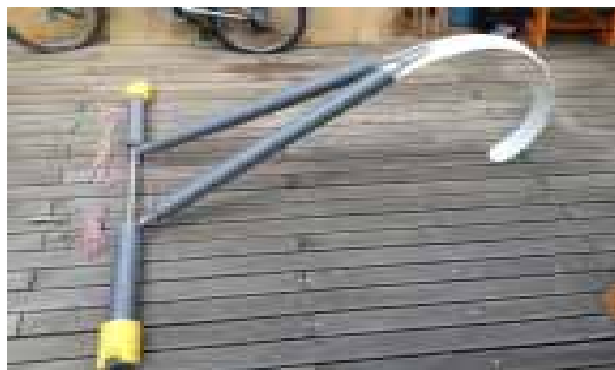


Photo: © Helen Darvelid, Sailrocket

Ultimate Sailing has arrived in Europe

Some of us have been trying for the last few decades to achieve Professor Hagedoorn's dream of human windpowered flight over water. This dream was finally achieved in August 2011 by a French team led by Stephane Rousson.

He used a hapa, that is to say an underwater kite or paravane, designed by Frenchman Didier Costes. You may remember Didier who came to Speedweek for many years with his Exoplane craft. You may also find details in Catalyst No 5 (on the AYRS website I believe).



The method of takeoff is like this. A kitesurfer using a standard kiteboard and a fairly standard kitesurfing kite, sails as normal but trails behind him in the water a hapa on a 30 foot line (attached to his waistbelt). The hapa clearly does not add to his speed but slows him down due to its drag.

The hapa is not an add-on go-faster gizmo and it is not designed for speed. The Hagedoorn sailor is not trying to break the kiteboard speed record. He is trying to fly, not sail.

The hapa has only a small working area and therefore does not produce sufficient lift or side thrust at low speed to permit flight. Therefore the flier has to sail, not fly, at low hapa speeds. When the flier reaches the hapa speed which produces sufficient lift, he takes off, still attached to his kiteboard.

By this time the hapa is well to the windward side of the course sailed, but always somewhat behind the flier. If the hapa came in front of the flier it would be a perpetual motion machine.

The flier rises until he is about 30 feet up. While the flier is flying, the hapa line is much nearer the vertical than the horizontal. See the films on the internet.

The hapa used by the French team in August 2011 could not tack autonomously. The flier had to descend, sail to the shore, adjust the hapa towpoint whilst stationary and thus not under load, and then sail off on the other tack, or rather on the other shunt. The hapa is a proa, that is, the hapa's bow is identical to the hapa's stern.

In November 2011 the French team achieved autonomous shunting with a new hapa. At the bow of this new hapa there is a flexible flipper which flips up when changing shunt. An identical flipper is fixed on the hapa's stern, which is now the bow. The change of shunt is achieved by the flier while under way without any help from outside.

There are excellent flying sequences on the website <http://www.vimeo.com/40450870>.



Owlone Seaglider hapas versions 4 (top) and version 5 (above)

It takes only an hour or two to train a kitesurfer to become an aquaviator. The hapas are available from Stephan Rousson for £830, delivery approximately month. I am trying to persuade the French team to come to next year's Speedweek. I have ordered one of these hapas myself.

Whether kitesurfers will be permitted to use hapas at the next Olympics is unlikely, since Olympic officials have never heard of hapas.

Roger Glencross

Vortex Eliminator End Plates

In 1979 or there about the AYRS newsletter had an article on 'Vortex Eliminators', which were wooden plates fitted horizontally to the aft end of a keel. This idea, I believe, was the forerunner to the USA America Cup winged keel. I had a 30ft Skua Trimaran, designed by Jim Ditchfield, called Tallata Du at the time I intended to place these on her but then moved to the Sultanate of Oman and sold the boat (does anyone know what happened to her?)

In 1995 I purchased African Ocean, a Flica 37 cat and sailed it to Dubai, Oman, Africa, Med, UK and back to the Med, and Turkey, where we stayed for 11 years, chartering and as my home. She had the standard Bermudan sloop rig and shallow keels, about 75cms deep with 5cm x 10cm wooden protection strips on the bottom. Draught was 1 meter. My only regret was her light wind

performance, especially windward; otherwise she was the perfect craft, full of simple, good ideas. (What other boat do you know has the 'wet' locker warmed by hot air from the fridge unit?) With 15 knots and more of wind she was in her element (17.5 knots whilst in the Red Sea) and I did not bother to reef unless there was 30 knots of wind. Thank you Richard Woods for undoubtedly the worlds best mid sized cat.

By 2001 I had lost the AYRS article but thought that I could remember enough to try these vortex eliminators for myself. I found an off-cut of 50 mm marine ply, enough to make 2 plates, each about 30cm by 60cm. After painting I screwed and glued them onto the aft end of the keels, so that they looked like two small wings. I had no idea as to the recommended size or the exact position but as the total cost

was less the 50p (for the SS screws) I was not worried. These plates were still on her, undamaged even after a 45 Knot blow, when I sold African Ocean five years later.

What a difference they made to African Ocean's light wind performance! I can conservatively say she pointed 5 degrees higher and increased speed by almost one knot. A Prout 37 belonging to an competitor no longer out-sailed me, which she did before. Once the wind increased over 10 knots and the waves built up there was no noticeable difference.

I would not hesitate to put the same vortex eliminator plates on any boat – and if I had the original article concerning dimensions and position maybe they would be even better!

David Jackson
africanoceansailing@yahoo.co.uk

Yullah for heavier twin-hulled craft.

Am I re-inventing the wheel? Before you go any further, please ebrowse to <http://www.youtube.com/user/MAYDRUMS2/videos> and look especially for the following videoclips: "AD-scul- high speed sculling" and "Sculling Lady Cath". then tell me honestly your answer! If it is 'Yes', then I'll suspend my work on what's below!

Starting in 1998, I have successfully sculled my 2-tonne estuary cruiser over some 2000 km of England's waterways. These include canals where the locks and bridges limit navigation to craft with a maximum beam of only 7 feet — not much over 2 metres. Details can be found by entering 'Michael Bedwell Yullah' in Google, or by referring to Catalyst 35.

The essential feature of the oar I have used is that the shaft is some 25% of the chord distance from the leading edge, and not 50% as in the conventional oars.

I hypothesise that 'my' design may be more effective, especially for heavier craft. The only reason to continue developing this design was to test that hypothesis.

Advantages of my present design

- 1) Track record
- 2) Upright when not in use, so leaving deck/cockpit clear of obstruction
- 3) Established Fluid dynamics cross section.

Disadvantages

- 1) Heavy; clumsy to ship/unship, sinks when accidentally dropped over the side

- 2) Aspect ratio low, and so efficiency is sub-optimal..

- 3) Requires fulcrum (crutch/ rowlock) to be some 30 cm above the waterline

I am preparing drawings for a paddle which

- a) is more suitable for rafts or catamaran hulls where the fulcrum is assumed to be about 10 cm above the waterline, and
- b) as far as possible avoids the disadvantages listed above while retaining the advantages.

... to be continued

Michael Bedwell
michael_bedwell@hotmail.com

A Plea for HELP

Some while ago I got an e-mail, from someone whose name I forget, which was extolling the virtues of Elmer, a finite element analysis package which can be downloaded absolutely free (<http://sourceforge.net/projects/elmerfem/>). Having been in the engineering business before I retired, I thought perhaps this may be of use to me. I downloaded it with a view to getting familiar with it over a period of time rather than trying to do something clever immediately.

I have picked away at it for about a month without finding out how to do *anything*. I'm especially interested in the stress analysis side of it. The way I normally get into these types of program is to get a sample input datastream which works, which allows you to familiarise yourself with the culture of the program. Elmer is far too clever for that, so what I need is a little guidance from an expert to help me over this first hurdle.

I'm familiar with Strudl, which had joint coordinates, member incidences, member properties and the like, and as I spent 30 years as a stress engineer I am familiar with stress analysis.

Is anybody out there who can help me?

Bob Downhill

Over the Rail ...

Frank Bethwaite author of "High Performance Sailing" and "Higher Performance Sailing" passed away suddenly earlier this year.

Seahorse magazine has run a resume of his work and life in the last two issues, and I can only marvel at his dedication to all things to do with modern sailing. I am sure that his final book "Fast Handling Technique" due to be published in October will be yet another indication of how effectively he perceived all factors affecting fast and efficient sailing.

Richard Boehmer, age 68, died peacefully with his family at his side, on November 17, 2011, following a lengthy illness.

Born and raised in Philadelphia, PA, he was the son of the late Walter R. and Helen (Cloeren) Boehmer. A graduate of The Ohio State University, Old Dominion University and the University of Rhode Island, Rich loved to learn and valued education. He was a prolific author, who published a book and over 100 articles for both the popular press and technical journals in the U.S., Canada, England, and South Africa, many of which were translated into other languages. He was also a nautical researcher and internationally sought after expert on sailing speed and performance, founding the Sail Performance Center. He served as a consultant to ocean racers and boat designers, and as the sailing record keeper for the Guinness Book of World Records. He also worked as an oceanographer with the Commonwealth of Massachusetts Dept. of Natural Resources, scientist at EG&G in Waltham, and instructor of graphic design at the Mass. College of Art in Boston. Rich was an avid collector, genealogist, and sailor. He also enjoyed sports cars, rollercoasters, math, computers, music and anything to do with the ocean - swimming, scuba diving, and shelling. He is survived by his wife and daughter.

Rich Boehmer was also a very good friend to AYRS. He published numerous articles on speeds of sailing boats and has a lasting legacy in the TRIPP method of analysing times for distances and deriving likely maximum speeds. He also encouraged and contributed to the US New England Group of AYRS, and attended many of its meetings. He will be missed

Final report on hinged foils

Robert Biegler



Fig 1

I built two model sailing boats with a hull length of one metre, and as close to identical as I could make them except that one has hinged foils, the other a keel. Figure 1 shows the configuration of the foiled model during the initial test. Note that the hinges slope up at the aft end. It would have been better if they also had toe-in, meaning the forward ends are closer together than the aft ends. Then when the boat heels, on the windward side the aft end of the hinge rises and moves in more than the forward end. The same applies to the aft and forward ends of the foil, with the result that the windward foil pitches down and angles more to windward as the boat heels, helping the foil to hook in. Meanwhile, on the lee side the aft end of the hinge moves down and out more than the forward end. The lee foil pitches up and angles more to windward. That should assist the lee foil in riding up.

Note that the resultant force from the lowest or hook part of the foil must pass above the hinge axis. Then when the foil is on the weather side, the downward force from the hook balances the lift from the middle part of the foil, the wing. When the foil is on the lee side, it should ride up, contributing little to lateral resistance. That should give the wing enough ground clearance that if a wave struck the boat, the lee foil only pops out further instead of digging in and tripping up the boat. Exactly how the hook gets the required angle relative to the hinge is not so important. I might have used a straight wing, and an angle of about 75-80° between hook and wing portions of the foil. I used a 90° angle and bent the wing only because I changed my mind partway through, abandoned a more complicated configuration with a 90° as unnecessary. I was stuck with the angle, and the need to extend the wing.

*Figure 2*

At full size, it would be possible to introduce another hinge at the bend in the wing. It would be locked while sailing, and used only to fold up the foils when in harbour. The relative lengths and angles can be adjusted so that the hook folds under the bottom of the boat, and the lower part of the wing is parallel to the side of the boat. I didn't bother with this at model scale.

Figure 2 shows the boat moving upwind. It demonstrates that the wings are not wide enough. The outer part of the windward wing is at an angle steeper than 45° to the horizontal. With a 90° angle between wing and hook, that means the hook is too shallow. Edmond Bruce's work indicated that such foils should have an angle of at least 45° to the horizontal. If the wings were wider, the hooks would be closer to vertical. Even so, the boat sailed, and seemed fairly stable.

Nevertheless, I lengthened the hook by 50% before I next sailed the boat. That seemed to give more stability. Even in gusts, the boat rarely heeled more than about $20 - 30^\circ$. I had the impression that the foils did provide good stability.

That impression was confirmed the first time I got both models onto the water. A member of the local sailing club came to the harbour to sail one of the boats. Unfortunately, the rudder servo on the foiled model failed, so we couldn't compare the boats properly. It was still remarkable that even when stationary, the foiled model was more stable

than the keeled model. The lengthened hooks had enough area to work even without water flow along the chord.

Then I had to wait for quite some time again. I can only test in the harbour if there is a West wind of $8 - 10$ knots, so that even if there is some failure, the wind blows the model against the current and back to me. When I had a Southerly, I went to a reservoir up in the hills. I found I really could not simultaneously steer two models on two separate radio control. I asked a couple who were passing by and looked interested whether they were willing to help out. I gave them the keeled model, which turned much more easily. They had fun, and got a bit carried away. I had to ask them a few times to sail besides the foiled model. Once more, it was clear that the foiled model sailed more upright, even though the static stability provided by its entirely internal ballast was less. However, the foiled model was not faster. If anything, the trend was for the foiled model to be slower. The reason is not quite clear. It is true that the testing conditions were not quite right. The foiled model should only be faster when it can exploit its greater stability. Wind was mostly light enough that even the keeled model only heeled $20 - 30^\circ$, so most of the time the conditions were not right for the foiled model to exploit its greater sail carrying power. When a gust came, the keeled model would heel over 60° or more and slow down, while the foiled model only heeled to

about 30° and kept going. There were only a few such occasions, all when the models were sailing directly away from me, making speed difficult to judge. I did not get the impression that the foiled model speeded up a lot the way a multihull would, but I don't really know. I had only one pass across the line of sight with both models sailing in the same wind, and the foiled model was slightly slower. Conditions were just about optimal for the keeled model at the time. The trouble with testing (apart from persuading my helpers to test the models instead of having fun sailing) was that the interesting conditions occurred in a very narrow band of wind speeds. The stability range of the keeled model was such that mostly it sailed optimally, but was totally overwhelmed in gusts. The interesting condition would have been with the keeled model pressed just a bit too hard. I never got that. Some of my conclusions are therefore tentative.

1. The total beam of the foils depends on how high the hinge is above the water. The higher the hinge, the wider the foils must be to avoid the problem illustrated in Figure 2. On the other hand, the lower the hinge, the less stability the foils provide (see my previous article in *Catalyst* on hinged foils). Even on a boat with a low rig and hinges not far above the gunwales, the hinged foils are very wide when deployed for sailing. On my model, they are already wider than the boat is long, but still not wide enough, as seen in Figure 2. I had only eyeballed the beam with the boat upright, and noticed the problem with the windward hook's too shallow angle to the horizontal once the boat was sailing.

2. The foiled boat was less manoeuvrable than the keeled boat. That probably has to do with the beam.

3. In conditions when the greater sail carrying ability did not matter much, because the keeled boat had enough stability, the foiled boat seemed a bit slower. It is not clear why. My best guess is that the wave drag from two extra things breaking the surface slowed down the foiled model.

4. The foiled boat may still get a speed advantage from greater sail carrying ability, but only when there is enough wind that an otherwise equivalent keel boat would have to reef.

5. The foiled boat should have better roll damping than an equivalent keel boat, because the foils try to make the boat turn around a point well away from the centre of gravity. That should both increase the effective rotational inertia, and the lateral

movement of the hull should more effectively disperse the energy. I have not tested this, so I don't know whether my expectation is correct.

6. It should be possible to fold up hinged foils so that they are pretty much out of the way in harbour.

7. If a full-sized boat with hinged foils were to be rolled more than 90° by a breaking wave hitting from the side, I expect the foils would take down the rig. That may not matter so much, because it seems rigs are usually lost anyway under such conditions. Further, when a model of Fritz Roth's proa design with a hinged foil was sailed through breaking surf, the crests only pushed the boat sideways. As long as a breaker doesn't somehow get underneath the hook portion of the windward foil, any lateral force on either the wing part of the foil or on the hull will only make the hook dig in deeper. I don't know whether there are conditions under which breakers can unhook the windward foil.

8. Something not relevant at model scale is that the whole boat effectively hangs from the windward foil. Any rolling of the whole boat means large structures move relative to each other with great force. Any body part that gets in the way is likely to be crushed. That seems to be an inherent safety risk. People and foil could be fairly reliably kept from each other if the hinged foil were used on a multihull and netting separated crew from foil. My hope, though, was that hinged foils could give a monohull better average speed while maintaining the self-righting ability and compact size of a monohull. I failed to demonstrate the hoped-for speed advantage, and I failed to get around the limb crushing potential on a monohull. Therefore I will not pursue this idea further, and will not scale up to crew-carrying size. The advantages I pursued can probably be realized with less complication by either a lifting keel with ballast in a bulb, or by the twin canting keels I have seen on a French design.

Even though I did not end up with a design I consider a success, I don't feel my experiments were a waste of time. I learned something, and had fun thinking up the designs and trying them out. I thank Paul Ashford, whose model experiments reported in AYRS 114 inspired me to pursue this idea. I am now building a new model to test an idea for a new proa rig. I will report on that when I have data.

Robert Biegler,

September 2012, Trondheim, Norway

Are recent kitesurfer records being sailed at more efficient sailing angles than best recorded windsurfers?

Dave Culp

At first glance it would seem so. Recent kitesurfer records have been very high, reliably 10 knots higher than windsurfer speeds sailed on the same course at the same time (Luderitz, Oct '08). Higher maximum speeds suggest higher beta angles, but might it simply be that, on a given course and day, one boat-type excels over the other, and it might go the other way on another course or another day?

However I've done some calculations which suggest that no, kitesurfers are in fact sailing at lower beta angles than recent record-breaking windsurfers; meaning lower aerodynamic and/or lower aerodynamic drag angles, thus at higher Lift/Drag ratios.

Presumptions:

Boat speed = 50 kts for either boat type

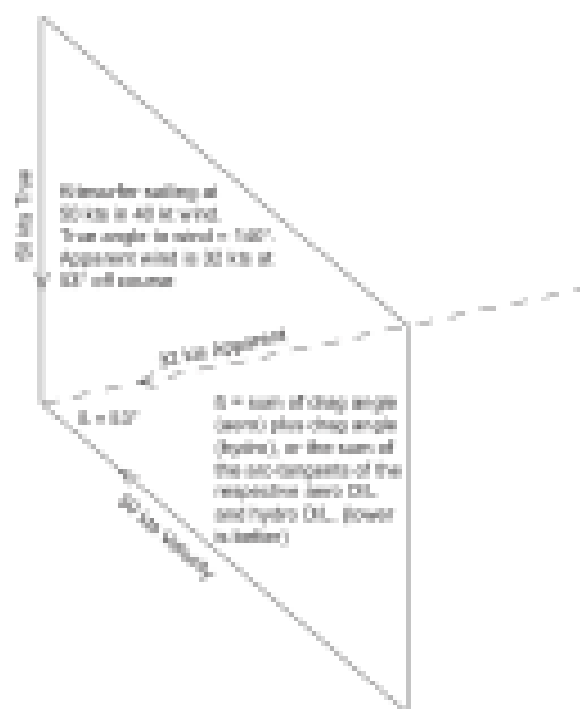
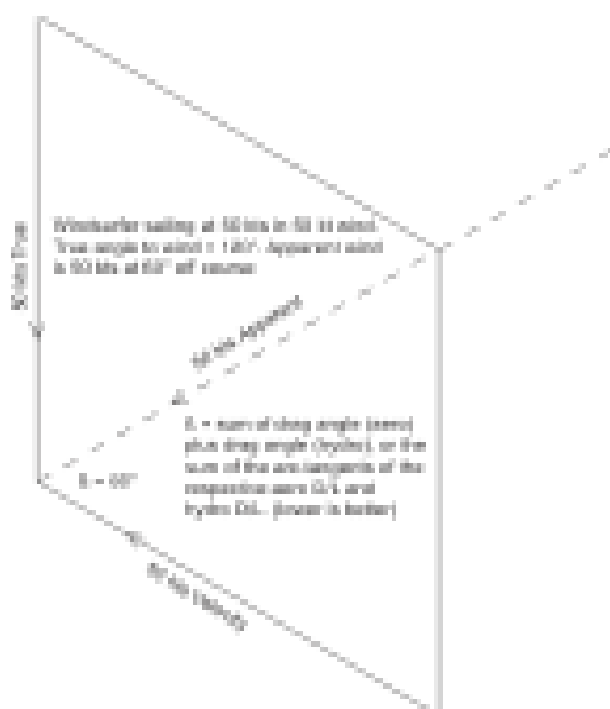
Wind speed = 50 kts for the windsurfer;
So $V_b/V_t = 1.0$

Wind speed = 40 kts for the kitesurfer;
So $V_b/V_t = 1.2$

True wind angle for kitesurfer = 140°

True wind angle for windsurfer = 120°





Each of these presumptions is based in published statements regarding windspeed, boatspeed/windspeed ratios and true wind speed during record breaking attempts. I would appreciate additional input. I have heard anecdotal evidence for windsurf ideal true angles from 115° to 125°, and V_b/V_t , again for windsurfers, of from 0.90 to 1.10. The numbers I chose represent average and also mean published values. The kitesurf data was taken solely from the Luderitz speed site at: <http://www.luderitz-speed.com/default.aspx>

Analysis

Using the online apparent windspeed calculator at: http://www.sailingusa.info/true_wind_calculator.htm and also shown graphically above, I learn that the windsurfer experiences apparent wind of 50 kts at a beta angle of 60°, while the kitesurfer experiences apparent wind of 32 kts at a beta angle of 53°.

Two interesting things jump out:

- 1) Though kitesurfers are using narrower boards and canting them at higher angles, suggesting they are using more inefficient board sideforce and less more-efficient skeg sideforce, Kitesurfer beta angles are lower than windsurf beta angles. This suggests that current kites are relatively much more efficient at these speeds and loads than are windsurf rigs. This may be due to the relatively much lower apparent winds experienced by the kites.
- 2) Kitesurf speeds are being achieved in apparent winds of only 65% the apparent wind velocity of windsurf speed records – at identical board speeds. The difference in energy in the available wind stream is huge; nearly 250%. There is an expected inequality in sail sizes: windsurfers using approx 5 sq meters at record speeds, and kitesurfers using approx 12 sq meters. Interestingly, this disparity yields nearly identical sail force figures, at record speeds, for each craft type.

AYRS News – Meetings and other activities

Note: because of the delay in producing this Catalyst the first few items really do relate to 2011!

2011 Southampton Boat Show

I enjoyed visiting the Southampton Boat Show and as usual was “impressed” by the juxtaposition of fabulous power crazed exhibits with the more humble human powered ones. There were several boats I could only dream of owning, power boats I couldn’t imagine the cost of filling the tanks (I suspect that many are status symbols and only occasionally go voyaging) and quite a lot of designs suitable for ordinary people. There were also some good ideas which included:

1. A mast climbing aid “MastaClimba” best described as a self clamping pair of stirrups on a bar that can ratchet up a tight wire so your legs can push you up the mast so reducing the load on the bosun’s chair hoist. You could even use a prussic knot or a climbers ascendeur on the hoist tail and climb by yourself. Email welcome@artitus.co.uk for details.

2. Floating guides to help line the boat with trailer when recovering. (They float up on bolt-on guide poles to help you see them when the trailer is immersed) Called “Floatem Poles”, further details on www.floatempoles.co.uk.



AYRS SpeedWeek Evening Meeting October, 2011

As usual, the AYRS Speedweek meeting was held in the Royal Dorset Yacht Club on the quayside at Weymouth. We noticed some recent changes at that club; the downstairs bar area is no longer part of the club and the upstairs room has been redecorated and furnished as an open plan bar/lounge which can also be used as a meeting room. Now set out with easy chairs, the seating capacity as a meeting room has been reduced, but it was still adequate for our purposes. We did have a bit of difficulty in that another group was booked to hold a meeting simultaneously with the AYRS meeting in the same room – we probably annoyed them by clapping and cheering when they were trying to converse, and vice versa, so this is something to try to avoid another time.

The meeting was chaired by AYRS Chairman, Graham Ward, and as usual the format was a series of short presentations by Speed Week participants, with the emphasis on projects and technical matters.

Fred Ball – Fred gave an overview of his boating activities during the year. He started with the Beale Park Boat Show competition that required entrants to complete a course on the Beale Park lake in a boat powered only by rechargeable hand tools. Fred’s entry was about the simplest concept one could imagine for this competition – two battery powered drills, one in each hand, with a rod in each chuck driving a propeller dipped in the water ahead of the drill. Could this be a back up system for getting ashore from your yacht if your tender outboard is not working? The ‘platform’ that Fred used for the competition was a small catamaran adapted from previous projects, whereas some other competitors had taken the trouble to build purpose designed lightweight monohulls and to develop specially efficient propellers. Faced with such competition, Fred did not make it to the prize list but Slade Penoyre also entered the competition and won the prize for ingenuity with his paddle wheel canoe.

This is actually amphibious, it crawled down the slipway into the lake on its own paddle wheels and with Slade on board, all under the power of a couple of battery drills.

Fred continued with some slides showing the boat he tested at the AYRS Weymouth get together in May. This is based on hulls from some of Fred's previous projects but arranged as a catamaran with a bi-sail rig – one sailboard rig on each hull. Fred finished with some slides taken at the Seawork exhibition, these showing some impressive powerboats for commercial use, for example pilot launches and work boats such as those used for maintaining the offshore wind farms.

Alan Blundell – Alan had a good Speed Week, achieving a 500m run at 24 knots average and with a 27 knot peak speed, the best performance he has yet achieved with the craft that he has been developing step by step over many years. For previous Speed Weeks this has been a three-hulled craft with an inclined rig and having a variable geometry such that on either tack two of the hulls are in line with each other and are both to leeward of the third hull, which carries the crew weight. This has now been simplified to an arrangement of two inline hulls, stabilised at rest with a small outrigger that is normally clear of the water when the craft is at speed. The two inline hulls are nose to tail, so I think they are intended to function in a similar way to a single stepped planing hull. On completing his presentation, Alan received the D H Ward Memorial Cup for Innovation from Graham Ward.

Roger Dyer – Roger continues to develop his 14foot monohull sailing dinghy that he regards as a demonstration of how to design a product for efficient manufacture. This year he has been concentrating on the single sail rig with full length battens, a sleeve luff and an unstayed mast. He provided the costs of several currently available rigs of this general type. He then explained how to produce a sail and mast combination that would be cheaper than the lowest cost option currently available while having a performance competitive with the highest cost option, that highest cost option being a Julian/Frank Bethwaite designed rig with a custom carbon mast. Roger's prototype is based on a three-piece mast, the lower section of aluminium, the middle section of glass-reinforced composite and the upper section of carbon fibre-reinforced composite. Within the sleeve luff, a series of overlapping flexible plastic sheets are sprung into position to maintain an aerodynamically-effective leading edge geometry.

These flexible sheets are actually adapted from polyethylene kitchen chopping boards – I have seen plastic chopping boards about 10mm thickness but these ones are much thinner and more flexible. They act in a somewhat similar manner to the camber inducers fitted to some sleeve luff sails, but they shape the whole length of the sleeve rather than just controlling the shape at the level of each batten. Being a series of separate parts, they also allow the mast to bend, so they remind me of one of the features of Peter Goss's 'Team Phillips' rig.

Tim Glover – This year Tim has been considering the restoration of an old day sailing catamaran that was marketed under the name 'Supercat'. This catamaran has much better load carrying ability than most modern beach cats and also has comfortable wooden benches to sit on. Tim considers that these features make it an ideal boat for sail training since two instructors can sit on one hull while two trainees sit on the opposite hull. The boat sails on one tack while the instructors explain sailing technique, then the boat is tacked so that the trainees can take over without anyone having to move around the boat. However, Tim's planned restoration is held up by the fact that he does not have a complete Supercat to work with – his one is missing both hulls. He asks if anyone can suggest how he might acquire two Supercat hulls.

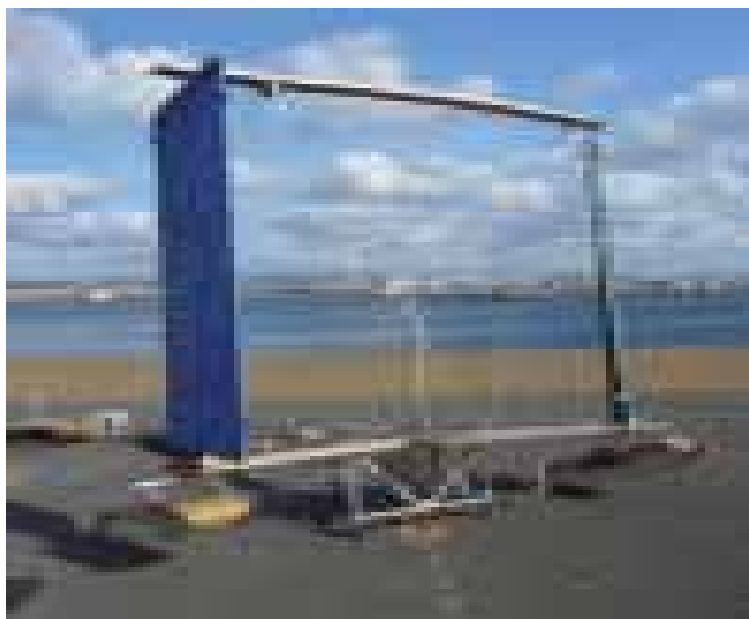
During gaps between the presentations, a couple of members mentioned publications that they had read and found interesting. Tim Glover mentioned a book about the 'Flying Flea', a remarkably tiny French light aircraft, and Michael Barton mentioned 'The Marine Quarterly' – as one might expect, a quarterly publication on marine matters.



*Roger Dyer's boat
More on this in the next Catalyst*

Jonathan Barton – Jonathan continues to develop his three hulled craft that has a fast reefing biplane rig, the angle of incidence of the rig being controlled not by conventional sheeting but by rotating all three hulls relative to the framework that supports the rig and hulls. Separately rotating one of the three hulls relative to the other two steers the craft. This is quite a complex project, seeking to develop a whole range of novel features on a single prototype craft. There must be many aspects of the craft that Jonathan could have explained in detail, but to fit his presentation into the tightly scheduled program, he concentrated mainly on explaining how he produces structural members that are light in weight and strong in compression. These members combine sheet aluminium with separating layers of foam plastic and they can be further reinforced using a lattice work of highly tensioned Dynema ropes. That is a rather over simplified synopsis of Jonathan's eloquent presentation, perhaps more detail will follow in future AYRS publications and meetings.

Neils Haarbosh – Neils spoke on behalf of the team from Holland that has attended Weymouth Speed Week year after year, bringing new ideas and new hardware every year. This year, yet another newly built craft arrived from Holland ready for testing in Portland harbour, and if necessary further modification ashore during the week. Unfortunately, both the two cross beams that connect the hulls of the craft fractured soon after the craft was launched, so its performance remains unknown. I did not get to see this craft, but from Neils' explanation it has a long narrow displacement hull to windward and two small planing hulls to leeward. Each of these small leeward hulls carries a low aspect leeboard that can



be canted while the craft is sailing (i.e. tilted about a fore and aft axis of rotation). As one of these leeboards is canted to a more horizontal angle it generates greater dynamic lift and reduced horizontal leeway resisting force. This allows the craft to be steered by independently adjusting the cant angles of the two leeboards, while adjusting both leeboards in the same sense controls total dynamic lift on the leeward side of the craft. These leeboards are of low aspect ratio and they are intended to be fully ventilated on the low pressure side (i.e. windward side), so they generate lift only as a planing surface. As such, they would seem to share something in common with a kite board ski, which has of course been a very successful development in recent times.

At the end of Neil's talk, Nick Povey, Weymouth Speed Week organiser, presented Neils with the 'Portland Pot', in recognition of the Dutch team's longstanding support of Speed Week and their endless innovation.

AYRS North West UK Area Forum - Eighth Meeting November 2011

It was almost a full house for the final meeting of the year for the North West Local Group, with eight members attending out of a possible nine. Adrian Denye sent his apologies for absence.

After a champagne toast (courtesy of John Morley) to the success of the Group and good health to all its members, everyone enjoyed a buffet lunch prepared by Mike Howard's wife, Colette (thanks Col for a wonderful spread). The members

then settled down to hear details of several active projects being worked on by the members.

Colin McCowen outlined the background to his project to build a rotor powered sailing boat. The inspiration for his idea came from Lord Brabazon of Tara's Bembridge Redwing, which in 1933 was powered by such a device. He explained how he was going to adapt a stunt bike front fork rotary joint to control the propeller pitch. Lots of discussion ensued

with regards the cross sectional profile of the blades with John Alldred relating his experience of building an autogyro.

John Morley outlined the progress being made on the Morley Kite Sail Project. He told the members that the rig was 90% complete with only a small amount of welding/metalwork being required to complete it. It is hoped to have the full size demonstrator in the water before Christmas and start sailing trials in the New Year, weather permitting. Mike Howard expressed the hope of getting some of the younger members of Southport Sailing Club involved in actually manning the dinghy and stated he hoped to take part in the Spring Handicap Series of races in order to gain performance related data.

An interesting discussion on canoe sailing invoked four of the members, who have experience of this thrilling sport, to relate their experiences. The merits of various rigs were discussed, including junk, lug and lateen. This discussion was followed by one on electric powered and human powered boats with such topics as propeller shape and design, the Cordless Canoe Challenge at the Beale Park Boat

Show and stated battery capacity (amp hours) in relation to the endurance of a battery under working conditions.

Mike Howard asked the members whether they wished to stick to the same format for meetings in 2012, or to include visits to other member's areas. The consensus was to have both (time permitting) with possible venues to include Sunderland Point (the ancient port for Lancaster, Peter Gilchrist's home area, Beale Park Boat Show and a possible canoe sailing day. Another idea, was to invite a 'guest speaker' to make a presentation on his/her chosen subject. Mike Howard said he would look into this idea.

The members of the North West UK Group have lots of interests besides AYRS type activities and, inevitably, conversations between individuals and the group range far and wide. Over the last two years we have all found these divergences both interesting and informative. The atmosphere is always very relaxed and as a result everyone participates in some way.

AYRS Meeting 6th November 2011 held at Thorpe Village Hall, Surrey, UK

Our November Thorpe meeting was enjoyable but poorly attended I hope that more of you will come in January. John Perry kindly wrote a report:

Again, thanks are due to Fred Ball for organising this meeting. The attendance was only about 10 members, but despite that, it was an enjoyable meeting with some lively discussion.

Fred started the meeting with a set of slides covering his sailing season, including the May get together at Calshot, the Beale Park Boat Show and Cordless Canoe Challenge (CCC), a south coast cruise in his son's yacht, assistance with Slade Penoyre's floating windmill project, the Seawork exhibition and Weymouth SpeedWeek. This was essentially as Fred presented it at our Weymouth meeting, but the Thorpe meeting offered more time to fill in the details.

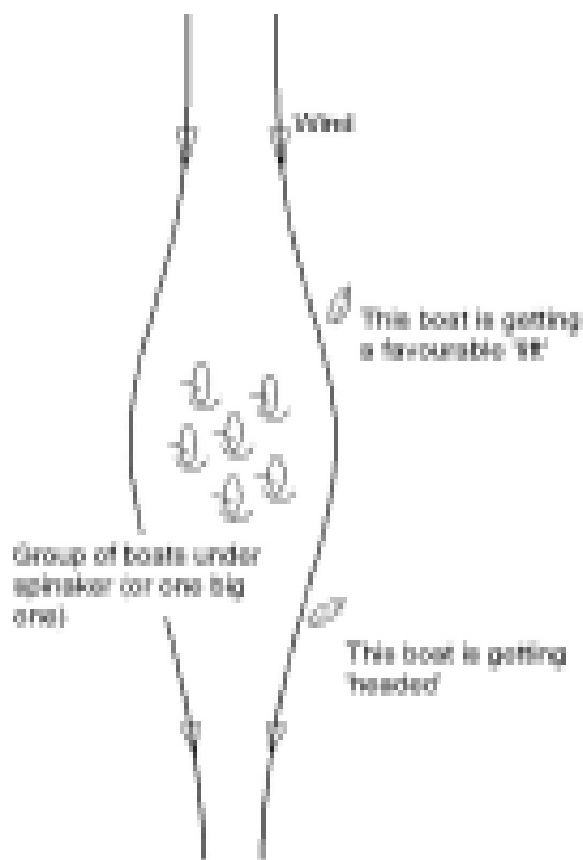
Fred's presentation initiated discussion about the possibility of an AYRS team entry in a future Cordless Canoe Challenge, and just what form such an entry might take. I have to say that, to me, the Cordless Canoe Challenge is about as sensible as using a canoe paddle to drill a hole in a wall. However, I am more than happy to give free advice, albeit probably also worthless advice, most of us like doing that I think!

Assuming that the CCC is repeated, there does seem to be interest from some of those present at the November meeting, and also some relevant expertise. AYRS Chairman, Graham Ward, works in a tool hire shop so he knows what you can get out of a cordless drill before the motor melts or the battery dies. The rules limit the money that can be spent on the cordless tools and Graham's recommendation was to go for a tool in the middle to upper price range. He thought that would provide more power and energy for the money than buying dozens of £9.99 cordless drills and somehow ganging them all together.

The results of this years CCC suggest that a simple, low drag, monohull and an efficient propeller well matched to a powerful cordless drill will give the best chance of success. Some contestants did a lot of work to build hulls specifically for the competition but several members made the point that any long narrow canoe hull should be almost as good. The simplest approach might be to mount the propeller shaft directly in the drill chuck(s) and dip the propeller(s) over the side of the boat, as Fred did this year. However, the winning contestant this year used a conventional shaft arrangement with the propeller shaft running in a gland through the

bottom of the hull. (See Catalyst 44) Fred did not get onto the prize list, but Slade Penoyre won the innovation prize with his paddle wheel canoe, the paddle wheels also being land wheels to make it amphibious. Fred showed video of Slade's cordless canoe motoring down the slipway into the water - it may well have been the fastest contestant at that point.

An efficient propeller that is matched to the available power source seems to be crucial to success. At least one contestant used an outboard motor propeller but these are designed with small diameter and broad blades to avoid cavitation when the power input is high for the available disc area. Several members suggested that the best propeller for the CCC might be a bit similar to the propellers used for human powered boat records, with large diameter and high aspect ratio blades, a large model aeroplane propeller possibly being not far from what is needed. Slieve Galliard pointed out that good manoeuvrability is also required, i.e. an effective rudder or vectored thrust, since he thought that many contestants wasted a lot of time making the turns round the buoyed course.



After the morning coffee break, Michael Nicoll-Griffith, who was visiting the UK from Canada, talked about the optimisation of windward courses. Michael has written a series of articles in recent issues of Catalyst in which he puts forward a theory that the best course to windward, even with steady wind and no current, is a series of curves between tacks. However, Michael explained that he has revised his thoughts on that subject following discussion with other AYRS members at the AYRS Barton Broad meeting earlier this year. He now accepts that straight courses between tacks are best, at least as long as wind and current remain constant, which of course they mostly do not.

Thinking about the effect of wind shifts on the optimum course, Michael went on to tell us about an interesting observation he made during a yacht race in which he was sailing to windward and a group of yachts ran past under spinnakers. He noticed that when he was downwind and to one side of this group of yachts, and on a tack that would take him away from the yachts, he was slightly 'headed', so he tacked onto what appeared to be a more favourable tack, heading towards the group of yachts. Then as the group of yachts went past, he noticed that he was again headed, so he tacked once more and gained some advantage over competitors that had stayed on the same tack. He attributes this to the wind bulging out sideways as it flows round the group of spinnakers - as the diagram.

I would add that it is known that wind tends to deflect sideways in preference to deflecting in a vertical plane, this being at least in part due to temperature stratification. For that reason, wind tends to flow down valleys rather than taking short cuts over the hills between valleys. Perhaps it is plausible that wind will divert sideways round a group of spinnakers more than it diverts in a vertical plane.

Roger Dyer was the next speaker, talking about his project to develop a low cost single-handed racing dinghy and adding further detail to the talk he gave at our Weymouth meeting. Roger's work this year has mostly involved the rig. He has developed a sleeve luff una rig which has a series of semi-flexible sheet plastic formers inserted into the luff sleeve and linked to full width sail battens. This gives an effect similar to the camber inducers used in some wind surfer sails, but since these plastic formers extend the whole length of the luff they better control the luff shape all the way along the sail. John Perry showed some photos of the sail taken with the boat afloat

and these did show that the leeward side of the luff pocket, which is perhaps the most important part of the sail for developing lift to windward, was smooth and blended nicely into the rest of the sail. Roger said that the main problem is that it is a fiddle to assemble. At Weymouth Speed Week Roger was able to fit the formers into the luff sleeve with the mast and sail indoors, then take the rig out to the boat at the slipway. Roger is now thinking about how to simplify assembly so that the boat can be more easily rigged out of doors.

Roger Dyer's talk was followed by lunch and chat. Margaret Ball kindly provided teas and coffees from the village hall kitchen, but one should remember to bring a packed lunch to these meetings. The lunch break also provided an opportunity to browse through some sailing and technical books that Fred and other members had brought along.

The presentation following lunch was by the author of this report. One of the main sailing interests of both Josephine and myself is coastal cruising in a small cabinless sailing dinghy – we use a tent hung from the boom as a cabin at night. I showed some slides from our cruise earlier this year, I thought it would make a change from talking about designing boats and modifying boats to talk about actual sailing. Earlier this summer we attended the popular biennial sailing festival, Semaine du Golfe, at the Morbihan, and after that festival we cruised along much of the southern Brittany coast, one of my favourite sailing areas. This is also the heartland of the French multihull ocean racing fraternity and I talked a bit about the 'City of Sails' at Lorient, a permanent exhibition of modern sailing craft and sailing achievements.

To include something that might be considered yacht research, I also mentioned some tests I carried out on two small solar panels that I am thinking of fitting to our sailing dinghy to help keep various hand held electronic gadgets charged while we are away cruising. I have a device made by a company called Power Traveller, this containing a Lithium Ion battery and electronic circuitry to allow it to deliver current at a selectable voltage to charge different electronic gadgets. I think there are comparable devices made by at least one other company. The device has about 10amp hour capacity when set to 12v output, so it is about 25% of the capacity of a typical car battery, but it is considerably smaller and lighter than a quarter of a car battery. The device can be charged from the mains or from a solar panel, a 10W solar

panel being the recommended minimum. I acquired two small 5W nominal output solar panels designed for marine use, thinking that it would be easier to mount two small panels clear of shadows rather than one larger one. I tested the panels in the garden around noon on a clear sunny day in May, using a pocket multimeter to measure voltage and current. Even with the load reasonably well matched to the output of the panels, under these near ideal conditions the panels delivered only around two thirds of their nominal power and one panel consistently produced more power than the other which seems strange. Shading even part of the panels, as is inevitably likely to happen at least some of the time on a sailing boat, could reduce the output to next to nothing, although this seemed to depend quite a lot where the shadow fell on the panels as well as on the percentage area that was shaded. I think I need to do some more tests next spring before deciding whether it is worth using the panels on the boat. Since we plan a cruise in Dutch waters next summer, and there are plenty of marinas in Holland, it may actually be more practical to charge up every few days from a marina power point.

I also demonstrated our water-resistant smart phone loaded with the Navionics chart 'App'. We needed a new phone anyway and the Navionics App costs only about £20 for detailed charts covering a large part of Europe. Since the smart phone has a built in gps, this gives us a chart plotter at a fraction of the cost of a proper yacht style chart plotter. During our cruising this year, we found the smart phone generally more practical for use at sea on an open boat than paper charts have been in the past. There are some limitations though, for one thing, dollops of seawater splashing across the touch screen make it unusable since the screen cursor jumps about, it needs to be kept away from heavy spray and the screen wiped dry from time to time. It is also a bit hard to read in bright sunlight, and some of the text on the charts is too small to read when your eyes are tired with the glare of sun on sea. Even so, it is remarkable technology and, sadly perhaps, it greatly de-skills the work of a small boat navigator.

John Perry

Fred's Tip: DO IT NOW before you need the trailer

Boat Trailers are frequently neglected, even galvanised ones usually have unprotected brake and suspension units so corrosion is unchecked except by paint and maintenance.

Now is a good time to investigate, especially if it is old and spares are needed.

My one for Gwahir (Woods design catamaran which is for sale) I was asked if it was roadworthy so I checked; the brakes weren't releasing properly so I investigated further. One brake shoe had the lining detached and another pair were heavily worn; the actuating system was very stiff with corrosion and dried up lubricant; and there were signs of impending bearing failure on two sets of bearings.

I have always avoided immersing this trailer and wheels by unloading and loading on a hard at low water. (It's easier to fit the trampolines and raise the mast and vice versa at ground level and she is light and can be winched on and off the trailer)

Heavy wear is likely on boat trailer brakes as the inside of the drum is plain metal and any corrosion will act abrasively; brake lining separation is also related to corrosion gradually splitting the adhesive

The brake shoes and bearings were easy to obtain but new release springs and gaiters to protect the actuating system were not. The trailer is at least 20 years old and the brakes are obsolete.

Towbars and Trailers (www.towitall.co.uk) were very helpful and replied to my email with prices within 24 hours, the bits actually came from Peak Trailers (www.peaktrailers.com) and arrived 5 days after my original enquiry.

London Boat Show January 2012

While as usual I enjoyed the London Boat Show at ExCeL (one of the advantages of helping on our stand for several days is that you can have several trips around the show rather than rush to see everything in one day) it was noticeable there were less boats, particularly small boats and a large amount of space filled with Lifestyle exhibits.

Motor boats, especially large ones, dominated the boat hall and the marina where the really large boats and the brokerage ones were exhibited. One could only admire the "walk in garage" for the tender on two of the largest. The "dry" marina where many of the sailing cruisers were displayed was effective making it easy to view initially as if on the water. You could then invite oneself on board to inspect the layout below and on deck, and move on to the next.



Top: A work of art! Donated wood from interesting sources used to decorate the topsides with marquetry

Middle: Walk in Garage

Bottom: Halliard box Legend e33



Top: The Yachting Monthly crash test boat

Middle: BMF Innovations Stand

Bottom: Hanse 38 Life raft storage

Later at floor level you could have a look at the hull shape and appendages. I felt however that many of the boats were laid out for marina life and just gentle day sails. They tended to have extremely steep companionway steps and a lack of handholds below. Comfy beds and a good view out seemed to be all important.

The Southerly range, the Legend e33, Gunfleet 43, Feeling32 and Hanse 38 caught my eye for various reasons and each of the exhibitors welcomed me on board and answered my questions.

I even visited one of the less flamboyant motorboats – the MJM 29Z — which by having paid considerable attention to the engine and propeller installation, hull design and lightweight high tech construction had reduced fuel consumption to a claimed figure half of a similar sized competitor. www.keyyachting.com

The display that most impressed me was the Yachting Monthly Crash Test Boat, a 42ft Sun Fizz ketch which had been subjected to a series of eight controlled disasters and testing methods of coping, reporting on those that worked and the snags of those that didn't (monthly instalments!) the last of which was explosion. As the contact details are www.adlardcoles.co.uk (nothing on the site 10/2/12) I am sure that a book is on its way; [It's just (Dec 2012) been published – Ed]

The British Marine Federation also had two stands: one promoting training schemes for working in the industry, and the other displaying innovative new products. There appeared to be an emphasis on safety and rescue, personal AIS, the Spinlock Deckvest with light on a stalk (long life testable battery, also available separately to retrofit to other lifejackets) the latest version of Jonbouy, navigation the latest chart plotters from Raymarine.

I also am interested in models and engineering and went to two exhibitions one at Sandown Park early December and the other at Alexandra Palace late January where I saw a wooden “steam” engine — an oscillating design with about 70mm bore and 100mm stroke made entirely from wood, powered by a vacuum cleaner, it worked very well! Book being published later this year!

I was also intrigued by the air-propeller driven tethered hydroplanes: over 100mph from 2.5cc model aeroengines: three tiny planning surfaces and a tether to keep it on a circular course. The water-prop ones were equally fascinating but were allowed larger engines. Does anyone know if the air prop ones plane more easily because of the thrust line? And how much of the torque is taken by the tether?

AYRS Members Projects Meeting - January 2012, Thorpe Village Hall (South East UK)

Another enjoyable 'all day' meeting, again organised by Fred Ball. One thing that struck me about this meeting was that a good proportion of the attendees, at least 50%, did have AYRS style projects in progress at the time of the meeting. This was demonstrated by the short presentations and also by a number of physical models that were brought along to display at the meeting. If this is typical of the wider AYRS membership, there must still be plenty of practical work being carried out by members, so why is it that Simon is hunting round to find enough articles for Catalyst? Could it be that members are happy to chat about part completed projects at an informal meeting, but are reluctant to write about these projects until they consider them to be finalised? A technical research project often does not have a clear cut completion state, so this may well be a reason for projects not appearing in Catalyst.

With the above in mind, I will refrain from writing a detailed account of this meeting since I think that many of the projects would be better written about by those responsible for them, either in this newsletter or in Catalyst, or why not in both – electronic 'paper and ink' costs nothing. I will however include the following brief notes

Mike Simons gave a presentation of his continued development of an improved spinnaker. This project is being carried out mainly at full scale, so I don't have a picture of a model. The first prototype was conservatively sized for his yacht, he is now considering making a larger one. He is also setting up a fan and force measuring balance to assess the aerodynamics of his design at model scale.

I attempted to demonstrate that a 3D design program on a computer can be used to make a model to visualise a concept. This simple model was made during the course of a half hour demonstration, so it is probably a lot quicker than making a physical model, also much easier to make changes to it. You still have to build the real thing to try it out!

John Perry

More Hints and Tips

The mini hacksaws work best if used as pull saws except for cutting very thin sheet materials: the pull tensions the blade, if used the usual way they rely on frame tension to keep the blade tight and straight so unless one is very gentle the blade buckles and is

easily damaged. Some form of cutting fluid also helps eg soap or paraffin (it cools the blade and helps it stay sharp and reduces clogging with metal particles)

If you are doing a lot of metal cutting and drilling it is worth getting proper cutting fluid or lubricant from a specialist tool shop or on line eg Arc Euro Trade at www.arceurotrade.co.uk

Broad Horizons, May 2012

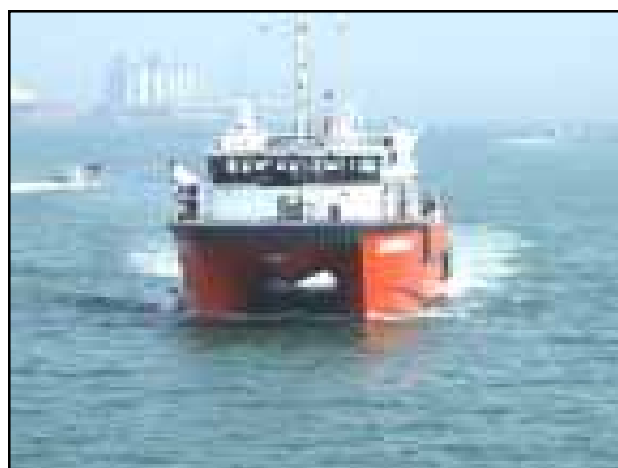
The Barton Turf weekend wasn't attended by the Home Boat Builders this year (they were cruising down the Thames) so there wasn't as much going on but Paul Ashford brought a model of his hapa-stabilised boat which enabled him to explain the principle to us, as well as some hapas which he was able to demonstrate from the Adventure Centre's launch on the broad. Peter Worsley had brought a radio controlled model of his self adjusting wing sail, a cam mechanism at the base of the mast controls a "tail plane" which then adjusts the wingsail's angle of attack depending on the heading of the boat. All he had to do was steer the model and it would then sail an appropriate course. He also had a working model of his next version where the power can be altered allowing various wind speeds to be coped with and even sailing backwards; I think it shows great promise.

I sailed the Minisail donated to AYRS by the late Su Lewis using my Topper rig (unfortunately the sail couldn't be found when I collected it). I thought I'd managed quite well but capsized when short tacking back from the Broad and had to be rescued! The following day I tried the sliding seat and found I just wasn't athletic enough to move around the cockpit and returned to base without venturing on the broad.

The Minisail is available to anyone who can find a use for it. Su left it to the society to be used for experiments; so if you have a project and it would provide a suitable hull let me know. (Email fball@ayrs.org)

The Saturday evening talk was given by Michael Nicol-Griffiths explaining how he uses the polar diagrams of his yacht to sail faster than his competitors when racing.

As usual the weekend was most enjoyable. Simon and Sheila made sure that we had all the support we needed ashore and afloat and Sheila earned a special "thank you" for catering for hungry visitors at almost all hours of the day and night!



Top: Powered bosuns chair being demonstrated by Harken

Middle: This RIB has a midships foil to improve the ride

Bottom: One of the many catamaran type Wind farm support vessels

Top: Demonstration of invertable outboards, it doesn't leak vital fluids and of course cuts out preventing intake of water.

Bottom: Greenbough Advanced Rescue Craft a version of Jet-ski designed especially for rescue work, The jet drive is safe for persons in the water and allows shallow water operation and the open flat stern deck simplifies and reduces effort to rescue a casualty and gives some dryish space for resuscitation.

Nautilus International www.nautilus-intl.co

Seawork 2012 Exhibition

Slade and I visited Seawork - an exhibition of workboats and tugs - and as usual found much of interest. See pictures and captions.

We were able to visit several windfarm support vessels and admire the lay-out of the bridge, excellent all round visibility and all the controls and instruments placed sensibly, we were impressed by the rugged utility of the construction and full

suspension seating for the passengers (wind farm technicians), most of these boats travel at over 20 knots so motion is lively to say the least.

Beale Park Boat Show June 2012

The Beale Park Boat Show suffered from the unseasonal weather we've been having in the UK, and was closed on the Friday, but Saturday was a much better day and as the forecast for Sunday was poor the Cordless Canoe Challenge was completed in one day. The winner was Joe Rutland with "Velociraptor" an open canoe based on a Selway Fisher design with a V4 arrangement of drills driving a model aeroplane propeller with the tips cut off to reduce the diameter (from 16 to 12 inches). In his first heat he was lucky as the bevel gears transmitting the power from the drills to the single shaft lost the locating circlips and could not transmit full power (ominous graunching sounds were heard on several occasions). However the fault was rectified before the quarterfinals. On the Sunday he converted it to pedal power and was seen progressing in fine style around the lake. Makita also offered two other prizes; one for the most innovative design (given to Alan Craig in "Four Candles" a outrigger stabilised kayak driven by air propellers) and the other for the most elegant and practical design went to Jeremy Harris with "Quackers" a composite version of a West Mersea duck punt powered by a Makita cordless drill driving a 13 inch home made stainless steel prop.

However I thought that the almost submarine was a brave design driven very slowly by a Sharks tail mechanism. The second picture shows the skipper (AYRS member Dave Smith) at work, lying on his back, travelling head first looking in a mirror with his drill the only thing well above the water!

While on the subject of electric power, I have come across some articles describing Electric Double-Layer Capacitor or ELDC (Supercapacitor, Supercondenser, Ultracapacitor) as a power source. Unlike batteries which store power using a reversible chemical reaction, EDLCs store electric charge. As a result the voltage is proportional to the amount of charge held in the capacitor which means you can display accurately power left. However it does mean that sophisticated voltage control of the output is needed to suit motors. The main advantage is extremely rapid recharging, and a long working life. Commercially they are already being used in trams: and a ferry boat in France (133 passengers) is working in Lorient. Apparently it can make two return trips and then recharges while loading passengers for the next trip. Maybe electric cars will soon be able to recharge quickly just like filling with liquid fuel. I'm not sure



Top & Middle: AYRS member Dave Smith's electric submarine propelled by an oscillating fin (fishtail)

Bottom: Alan Craig's Four Candles

that using the same refuelling centre will be wise as I can imagine the consequences of a big spark from problems with rapid transfer of electric power.

Some Thoughts from Bob Downhill

It occurs to me one of the primary objects of the Amateur Yacht Research Society is to forward ideas which will improve sailing in all its forms. There are three general types of boats that are powered by the wind. There are monohulls, there are multihulls, and there are hydrofoils. Of all the thousands of boats produced each year there are very few boats that have hydrofoils. Why is this I ask myself.

I suppose the main reason these people don't ask for them. If you walk through any boatyard and talk to the very eager salesmen and ask for a hydrofoil boat, they look at you as if you were from another world; their eyes go glazed and if they are under 35 they would probably say "Have you seen the Moths". At that point the conversation ceases, an awkward silence ensues, whereupon you walk out of the boat yard.

If you talk to the people who make the boats that are monohulls and multihulls they will tell you there is no real demand for hydrofoil boats. Of course there is no real demand for hydrofoil boats, because no one makes one which is suitable for the mass-market. Most of the boats made are for people who just want to go a bit quicker than your average dinghy sailor. So what you get is a moth with T foils, or you get specially-built single-seat foilers with a combination of surface piercing foils and T foils similar to Mayfly, Calliope, Icarus and the like. Nothing suitable to take the family for a day out or indeed to sail across the Channel for a weekend.



Dave Keiper's Williwaw - the only successful hydrofoil cruiser yet.

[That sounds as though Bob feels that AYRS Members ought to start being active with Hydrofoils again. AYRS publication 74 "Sailing Hydrofoils" shows we were keen in the 1960's (it was published in 1970) no longer available but if there was enough interest we would be prepared to scan it (290pages) as a searchable PDF.

If you want to see an example of what we can produce, have a browse through the AYRS web repository folder <http://www.ayrs.org/repository>. There are only a few files there at present, but more will be uploaded in due course.

– FCB]

Do's and Don'ts

I have come across yet another glue for fixing WET things together. It is called CT1!!!

Try this link: <http://www.ct1ltd.com/ct1.html> and see what you think. I have not tried it yet, but it would seem to be the answer to a boat builders dream. As I say if it works like the video there are just lots of jobs for it to do around my house and boat. Good luck and do please give me some feedback.

Now for the biggest DON'T that I have ever told you all about. This does need a bit of explanation. I was mending a 505 Rotax engine on my hovercraft that I had about 20 years ago. It was out on a beach and was all wet and covered in sand. There was trouble with one of the carburettors.

I took the air filter off and laid it carefully upside down on the side of the craft. Then I was looking for a good place to put some small parts in that I did not want to get all sandy; the up turned air filter looked a good clean place to put them (so far so good). I reassembled the carb including the air filter and started the engine. The good news was it started first pull. THE BAD NEWS WAS THAT THERE WAS THE MOST HORRENDOUS NOISE !!!!

YES I had left a nut in the air filter which went straight into the engine!!! It cost a lot of money to get it fixed, plus I needed a new piston!!!

So while it looked and was a good place to keep the parts clean, they did need all removing before starting the engine. SO DON'T DO WHAT I DID!!!

Tim Glover

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 2013

12th – 20th London International Boat Show and

17th – 20th The Outdoor Show
EXCEL Exhibition Centre, London Docklands. AYRS will be there on Stand A167, close to the Multi-Activity area, on the left as you come in through Door S4. 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

27th 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). Tea and coffee available but bring your own lunch. Donations invited to pay for hall. Further details from Fred Ball, tel: +44 1344 843690; email: fredcball@btinternet.com.

27th AYRS Annual General Meeting
4pm, Thorpe Village Hall, Coldharbour Lane, Thorpe, Surrey (as above). Details are on the AYRS website www.ayrs.org. Note: Items to be considered by the AGM, including nominations for the Committee MUST be received by the AYRS Secretary before 12th January 2013 (post to AYRS, BCM AYRS, London WC1N 3XX, UK, or email: secretary@ayrs.org)

March 2013

2nd – 3rd RYA Volvo Dinghy Show, Alexandra Palace London
Many sailing dinghy classes and beach cats will be on display, dinghy skill lectures and demonstrations, new fittings and bargain sailing kit. For details see www.rya.org.uk

9th (Provisional date) AYRS South West Area Meeting
Details to be arranged, there is a possibility to visit the Marine Dept of Plymouth University and see their facilities. Contact John Perry - 01752863730(L) 07729334325(M) j_perry@btinternet.com for more information

April 2013

28th Beaulieu Boat Jumble
The National Motor Museum, BEAULIEU, Hampshire, UK. AYRS will be there!

May 2013

Date to be arranged Boat trials, Weymouth
Probably at the Portland and Weymouth Sailing Academy. Contact: Norman Phillips email: wnorman.phillips@ntlworld.com; tel: 01737 212912.

Broad Horizons 2013

IF there is enough interest, we will organise a sailing meeting on the Norfolk Broads in late-May again. Email office@ayrs.org if you would like this to happen and would come (with or without boat)
Details will be posted on the AYRS website www.ayrs.org.

June 2013

7th -9th Beale Park Boat Show
As usual we will have a stand and would appreciate small exhibits and display material and of course offers of help to run the stand. Contact: AYRS Secretary, 01727 862268, email office@ayrs.org

October 2013

12th-18th Weymouth Speedweek
Portland and Weymouth Sailing Academy, Portland Harbour, Dorset UK See www.speedsailing.com

16th “Speedsailing” AYRS Weymouth meeting
19.30 for 20.00hrs, probably at the Royal Dorset Yacht Club, 11 Custom House Quay, Weymouth.
Map: www.rdydc.freeuk.com.
Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX; check the website www.ayrs.org or email: office@ayrs.org tel: 0780 820 0987 before going just in case the location changes!

ADVERTISEMENT

AYRS Annual General Meeting 2013

Notice has been given that the Annual General Meeting of the Amateur Yacht Research Society will be held on 27th January 2013 in Thorpe Village Hall, Thorpe, near Staines, England, starting at 16.00 hrs. All members and their guests are welcome to attend, but only paid-up members may vote on resolutions.

The business of the meeting will include the following, not necessarily in this order:

1. Receipt of apologies for absence
2. Minutes of the previous AGM
3. Chairman's Report
4. Treasurer's Report and Approval of Accounts
5. Election of Officers and Committee members
6. Appointment of a Reporting Accountant
7. Any Other Business

Relevant documents will be posted on the AYRS website www.ayrs.org.

Matters for discussion under Item 7 should be notified to the Hon Secretary as soon as possible.
Email hon.sec@ayrs.org

Any queries should be addressed to the AYRS Office, email office@ayrs.org.

Please note: The Annual Report is UNLIKELY to be published in Catalyst before the AGM.
It WILL be published on the AYRS website www.ayrs.org.

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

On the Horizon . . .

More sources and resources: reviews, publications and
Internet sites

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

Printed by Printflow, London EC1V 7JD