Catalyst

Journal of the Amateur Yacht Research Society

NUMBER 57 OCTOBER 2020

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As examples, the polar diagram p16 of *Catalyst 28* was re-created from a photocopy, photos of shunting in the Champion article in *Catalyst 27* (pp 19-21) were screen grabs from a video supplied on DVD. The rest of the images in that article were scanned from photographs, and the text was OCRed (Optical Character Recognition software) or keyboarded.

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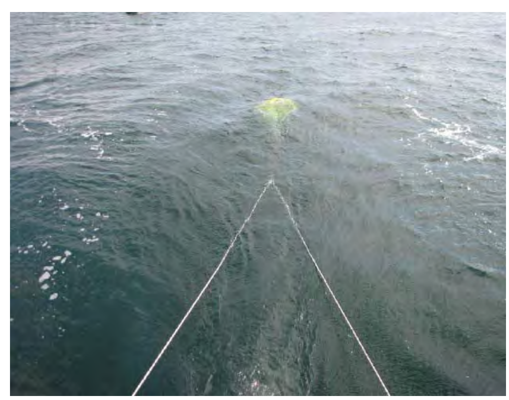
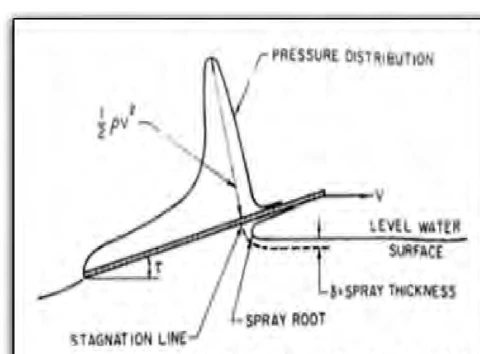
Features

Regulars

Cover Picture:

Michael Keyworth experiments in steering using a drogue





Typical pressure distribution on flat planing surface

Catalyst

Journal of the
Amateur Yacht Research Society

Editorial Team —
Simon Fishwick
Sheila Fishwick

Catalyst is a periodic 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 occasional 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.

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

Website: https://www.ayrs.org

Online Discussion Forum:
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ISSN 1469-6754

We're Zooming!

In these times of pandemic, face-to-face AYRS meetings are out of the question.

Since April though, our Chairman John Perry has been organising online meetings using a Zoom service kindly lent by member Jasper Graham-Jones from Plymouth University.

Initially a bit ad-hoc, they have now settled into a regular meeting at 19:30 UK time (GMT from Novenber) on the second Saturday of the month.

Details of future meetings will be found in the Catalyst Calendar, and on the AYRS website https://www.ayrs.org. As always these meetings are open to all, non-members too.

Members for whom we have a current (and working!) email address have been told about these (unless they have opted out) through an email list we have set up on the AYRS webserver. If you're not getting these messages, and want to receive them, then you need to contact the AYRS Secretary, email: secretary@ayrs.org, with your current email and ask to be added. The list is not being used for discussion – that is what the AYRS Forum is for – only for announcements.

The NW UK Local Group have also been organising Zoom meetings, and you can find a report on their activities in this copy of Catalyst. For more details of future meetings see the AYRS website, or contact john@alldred.me.uk

For those who are not familiar with Zoom:

Zoom's software is available for Windows, Macs, Linux and also Android and Apple phones.

You can get it at www.zoom.us/download – the software you need for a Windows or Apple computer is the top button in the list, it is labelled 'Zoom Client for Meetings'. Zoom can be used with almost any device capable of accessing the internet but it is probably best on a computer since a larger screen will give you a view of everyone present.

To join an AYRS Zoom meeting, wait until a few minutes before the start time then click the link provided on the AYRS website - look under Events. If you need the meeting reference number it is the ten digit number at the end of the link text.

If you already have Zoom software installed on your computer or other internet device it should load when you click the link to the meeting and you can then join the meeting. If you don't have the Zoom software installed then you will be prompted to download and install it before you can join the meeting. Installation takes several minutes so it is probably best to have the software installed before you try to join Zoom meetings.

Being in a Zoom meeting you can almost forget that you are not in the same room as the other participants. You see the other participants and can talk to them. The 'mute' facility is quite important. When you are not speaking to the meeting it is a good idea to mute yourself so that background noise from your environment is not transmitted to the meeting. Remember though to unmute yourself if you are speaking to the meeting. While a presentation is being given the host may choose to mute everyone except the person giving the presentation.

If you want to attract the Chair's attention, there is a facility to "raise a hand". It can be found in the "Webinar Controls" area if it is not on your main screen.

A few things to remember about Zooming (or any other video-conferecne system)

The basic Zoom client software is free, and at present allows you to attend and also to host short meetings e.g. with extended family & friends. It is worthwhile taking some care though when setting up your Zoom profile when you download it. (To access your profile either log onto the Zoom website, or click on the icon/picture at the top of the Zoom client window).

1. Make sure you enter your proper name in your profile, and include your surname as well as your personal name. It's more than a little annoying to be faced with two or three people whe one doesn't know by sight, all with the same personal name and no surname to dintinguish them!

2. Keep half an eye on the picture you're sending to the meeting. Remember that everyone can see you if you don't have your webcam turned off (and hear you too if your microphone is not muted). It's worthwhile taking some care about the background behind you, and if you must eat your dinner during a meeting remember everyone can see you! If you're using a phone, keep it at arms length, or use a wide-angle lens setting, as we don't all want a close up of your nostrils! (One reason why Zoom is better on a computer).

3. You can upload a photo of yourself (or of anything else) to your Zoom profile which will be displayed whenever you turn your camera off. This can be quite useful if you want to do something else but don't want everyone to know your attention is elsewhere. I use this quite a lot.

4. Zoom has a facility whereby you can share a window on your screen with the meeting. Necessary when wanting to show pictures or presentations. If you're going to use this, make sure you sort everything out in advance, and practice using a dummy meeting (which you can set up with the basic software so that you are the only attendee).

See you online!

Simon Fishwick

Meet the Chairman - John Perry

The sad news of the death of our chairman Fred Ball came in January this year. Only a few weeks earlier I had been one of a group of AYRS member s assisting Fred as he bravely launched his latest experimental boat in near gale force wind at Weymouth Speedweek. The boat was not handling well in those conditions but Fred was determined to learn as much as possible from testing it and I expect that as he packed everything away to go home he would have been mentally planning improvements for next time.

After the shock of losing Fred, there came a realisation that the AYRS was now in a difficult situation with Simon holding the fort alone. Some of us thought that it was time to plan a closing-down meeting for the Society, so I offered to chair such a meeting. Then a few messages came in urging us not to take that final step if it could possibly be avoided. So at the 2020 AGM I became Chairman with the aim of seeing if we can fill the vacant officer posts and place the Society on a firmer footing with more people involved in running it.

I think we had an impressive stand at the RYA dinghy exhibition, thanks to Simon, Kim and other volunteers; then came COVID and lockdown. Aware that some of our members would be missing the social life of their sailing club bars we commenced a series of meetings using the Zoom video conferencing system. It was committee member Marcus Lee who a few months earlier had first suggested video conferencing to the committee but I for one did not appreciate the potential this offered until we actually held our first Zoom meetings. I had not previously imagined that an on- line conference could be a proper substitute for a 'real' meeting but I quickly found that, for me at least, it can be pretty close. Sometimes I almost forget that we are not all in the same room. And of course it is a way to bring our geographically dispersed membership together, something that has not previously been possible.

Once the virus situation is behind us we intend to continue with Zoom meetings, probably on a monthly basis, as well as restarting our conventional meetings Although internet based technology has exciting possibilities for the Society, quite a large part of the AYRS membership does not admit to having access to the internet and we do need to offer value for all our members as best we can. This is a problem that many clubs seem to be facing. I can say that the committee has no intention to cease holding conventional meetings or publishing Catalyst within the foreseeable future. Indeed, I think it would be good if we could encourage the kind of meetings that cannot be held on-line – I am thinking of on-the-water gatherings, maybe workshop demonstrations and so on. I was hoping that some of our members might get together to watch the F50 hydrofoil catamaran racing that was planned to take place in the Solent this year, but COVID put a stop to that – maybe next year? Ideas welcome.

A note about my own background: I studied mechanical engineering to Ph.D. level and worked in a number of different industries with both private companies and academic institutions. I have a lifelong interest in sailing although my sailing experience has been limited to a very few boats. Nearly all of my sailing has been with a 4.5 metre sailing dinghy that I designed and built. It was first launched in 1978. This is not a racing craft, it was designed for cruising, using a boom tent for overnight accommodation. During the 1980s I used this boat for a number of single handed cross-channel passages to explore the Normandy and North Brittany coast. I don't do that anymore, instead Josephine and I take the boat abroad on a road trailer and in recent years we have enjoyed lengthy retirement holidays coastal cruising in France, northern Spain, Ireland, the Netherlands, Denmark and most recently Croatia and the northern Adriatic.

Towards the end of the '80s and early '90s I also made a foray into AYRS style experimental work, building a couple of small sailing hydrofoils. The second one was probably the first sailing hydrofoil to 'fly' on only centreline hydrofoils, it was soon after overtaken by developments in the International Moth class. Then a few years ago we acquired a 10 metre trimaran yacht which we sailed a few times in 2017 and 2018 but it has been laid up since then. The switch to a much larger craft has seemed daunting and we find our little boats so convenient to use. However, we do intend to have another go at 'proper yachting' in 2021.

At about the same time that we acquired the trimaran I designed and built a 4.5 metre sliding seat rowing boat that can be carried on a car roof and which can carry two people and camping equipment. This has become our most used craft over the past two years; it is suitable for an impromptu evening row on local water or for a multi-day camping trip. The picture opposite was taken during a week Josephine and I spent rowing down the river Charente last year – this is passing through the town of Cognac. The buildings on each side of the river are historic distillery buildings although I think most of the production of the famous beverage is now carried out in more modern processing plants outside the town centre.

John's Bi-foiler taking off (photo: Josephine Street)

An oscillating fin propulsion device

Alan Craig

The Mirage Drive (MD) oscillating fin drive system is now well established as a method of propelling a small boat and has the advantage, compared to rowing, of allowing the user to face forward and have his/her hands free for other tasks. But my 14ft x 4ft rowing skiff has a rigid structural keel supporting the fabric skin which cannot be cut to allow placing of a MD, which would allow me to sit facing forward to enjoy the passing scenery rather than rowing in to it. So I have been experimenting with a transom mounted oscillating fin device with cords attached to foot pedals.

The device was mounted on an outboard tilt and clamp to facilitate easy fitting and removal and this also proved useful in the workshop as it could be clamped to a substantial piece of wood in the vice to allow adjustments, repairs and other work to be carried out. It started out with a single fin with the fulcrum at the top of the transom and an extension above the fulcrum attached by line and pulleys to the pedals.

As anyone who has tried sculling over the stern or yulohing knows, the single fin has a tendency to wag the boat in the opposite direction so I proposed to use the rudder as a secondary fin to get back some of that sideways energy and turn it into thrust by making the rudder "tack" between fixed points, although this would have reduced the effectiveness of the rudder in its primary task. The idea of a secondary propulsive fin on a waggling boat is still an area to be explored (by someone else!) but I soon changed to the more logical idea of two fins moving in opposition. So, the two fin levers now pivot near each extremity of the top of the transom,

and a hollow vertical shaft transmits torque from a wooden yoke at the top of the shaft to a double lever or yoke at the bottom, and this lever connects to the fin levers with struts fitted with spherical rod end bearings, like the steering linkages on a car. The rudder shaft is concentric within the torque tube, which keeps the device fairly compact.

So far, so mechanical. I had plenty of problems trying to devise fins which could incorporate twist, changing camber (which the MD does not have, the fins are symmetrical in section) and adjustable "tacking" angle and had to greatly simplify the construction, which was essentially a sail made from PVC coated nylon fabric of the type which small inflatable boats are made from. This fabric is routinely heat welded in production but I could not get enough control of a heat gun to get good repeatable welds, and adhesive specifically for PVC was also not quite up to the job and the seams could be peeled apart. Because of this difficulty I resorted to using fins from the MD 180, the reversible version of the MD, for the tests.

All tests were very disappointing. The boat moved at the speed of a tectonic plate even though the fins appeared to be doing the same as they would when fitted to the MD, appearing to twist correctly.

After much thought I decided to increase the angle through which the fins oscillate by both reducing the effective length of the upper yoke, which moves it through a greater angle for the same pedal movement, and by moving the push rod connection to the fin levers closer to the fulcrum. I also devised a simple way of limiting the "tacking" angle of the fins.

The next test was better at about 1.5 x tectonic plate speed but still not viable as a means of marine conveyance. I then made some much larger fins from the PVC fabric, wrapped around a solid ½" diameter aluminium spar and attached with pop rivets to an acrylic (Perspex) internal structure, which pivoted around the spar on thin sheet aluminium bushes riveted to the acrylic. The final test was the best of all at twice tectonic, but still not coming close to the speed of rowing, so there the experimenting stops, for me at least.

I haven't mentioned the pedals as I think they are very dependant on the preferences of the user but for the record, my pedals were on a pivot axis above my feet, which is several inches above the boat sheer line. This got my feet comfortably low in the boat. They were on a frame not unlike that of a garden swing, attached to the cockpit floor. I used snap connectors, small karabiners to quickly connect and disconnect the operating cords at the yoke.

I've squeezed the account of the testing into a few paragraphs but the reality as every experimenter knows is a bit more than that -- three long return journeys to a navigable river and three launch and license fees to be paid. But there is still potential for developing the device. In particular it might benefit from more deeply immersed fins or upper end plates as operating near the surface may be hindering efficiency. Someone else may also be able to come up with a true cambering fin, which is what all sails do when they tack.

So for the time being the device is retired and I am looking at other methods of forward facing human propulsion for my boat. But some clever thinking might make this device more practical so I may soon be offering it, minus the outboard tilt clamp, to members of AYRS.

A self trimming vertical axis windmill propelled catamaran

Giuseppe Gigliobianco

The possibility for a windmill powered craft to make progress straight into the wind was proved by Bauer [1], Barkla [2] and also by Reg. Frank in the AYRS booklet "Power from the Wind" [3]. In this same book John Morwood proposed the Voith Schneider propeller as a windmill but pointed out that "a complex mechanism would be needed to make the thing work".

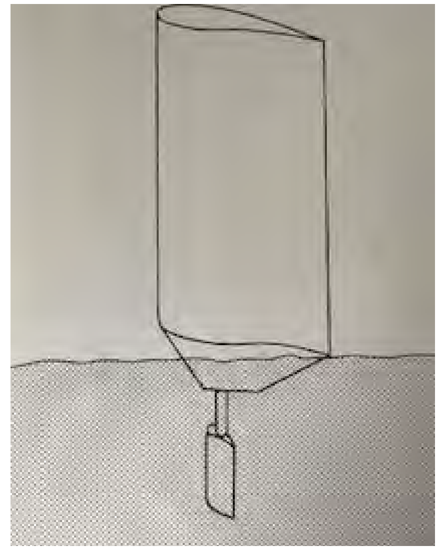
There are two kinds of windmill: horizontal and vertical axis. Sailing craft based on a horizontal axis windmill have been built, and an example was described in AYRS booklet No 105 in October 1989 [4]. Her name was *Revelation* and she was equipped with a horizontal axis windmill in the air and a conventional propeller in the water; the two being linked by a vertical shaft and two pairs of bevel gears.

The vertical axis windmill is less widespread than the horizontal axis type for terrestrial applications and even rarer in marine applications. I will mention two types of vertical axis turbine: the Darrieus and the Cycloturbine. The Darrieus has no separately moving parts within the rotor, whereas the Cycloturbine rotor typically has three vertical wings that are separately pivoted to trim their angle of incidence as the rotor turns. This trimming can be done either by means of an eccentric with rods and cranks, or by means of springs that keep the wing alignment almost tangential to the path of rotation (figure 4). An example of a rotor with springs is the Thom rotor (published by AYRS in the March 96 newsletter.)

Revelation

Similarly, there are vertical-axis propellers such as the Voith-Schneider (VS) propeller, widely used in harbour tugs. This is like a Cycloturbine in the water, the blades in the water being trimmed by means of an eccentric with rods and cranks such that thrust can be generated in any direction with variable force.

Cycloturbine and Darreus vertical rotors



Norwood's "Ideal Yacht"

The Idea

My idea is to couple a Cycloturbine and a VS propeller in such a way as to get rid of the eccentric, rods and cranks. My Cycloturbine is of the type that uses springs to trim the wings and each wing is directly connected to one of the blades of the VS propeller. This provides appropriate angles of attack for both the wings and for the water blades such that thrust is generated in the direction directly into the wind.

To analyse the behaviour of a connected wing in the air and blade in the water, consider what Joseph Norwood calls "the ideal yacht" as described in his book "High Speed Sailing" [5]. This 'thought experiment' is a mast with sail and keel but without a hull - ideal for speed but not for the crew because there is no room for crew.

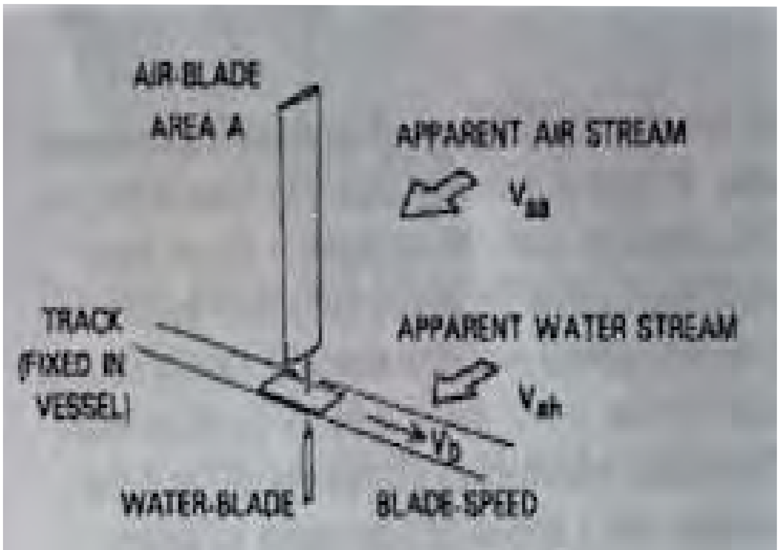
My idea originates from the 'Linear Wind-Water Mill' which was first presented by Professor H. M. Barkla in 1982 [6]. This is essentially the same idea as the 'ideal yacht', being composed of a vertical air foil (or wing) coupled to a water foil (or blade), both on the same freely rotating vertical shaft, with the wing set at an angle to the blade. Obviously this "thing" cannot float, so it is mounted on a truck and the truck runs on a rail above the surface of the water, the rail being set perpendicular to the true wind. This "mill" can yield a thrust directed against the wind.

In January 1984 Professor Barkla went on to propose the "Vertical axis turbine propeller for ship propulsion" [7]. In this paper Barkla proposed three "mills" rotating around a central shaft to make a vertical axis windmill, this windmill being coupled to a VS propeller via a central shaft, but the VS propeller diameter was to be five times smaller than the windmill, so eccentric, rods and cranks would be needed to control the blades of the VS propeller. You can see a sketch of this machine in AYRS booklet No 101 [8] – this sketch is copied as Figure 9.

Realisation

I and my friend Paolo Carotta built a full size catamaran (6 metres long and 8 metres height) initially following Barkla's proposal with a vertical axis windmill coupled by a vertical shaft to a smaller diameter VS propeller. This craft was presented in AYRS booklet No 102 (1986) and you can see it in the video here: https://youtu.be/IMmfteyIWEY. Thanks to Mario Tomatis for the videos and photos.

Since then I have worked to lighten and simplify the craft. I have eliminated the central shaft, eccentric, rods and cranks of the VS propeller by coupling each of three wings directly to a water blade located below it, the two sharing the same vertical shaft. Each of these wing and water blade combinations is self-trimming, the pivot axis being towards the leading edges of the wing and water blade so that the torque due to air pressure on the wing balances the torque due to water pressure on the water blade. A spring limits the rotation of each wing and water blade combination, keeping the wing and blade alignment near to the tangent of their circular path. These springs are also needed to help start rotation because the system is not self-starting. The



Barkla's Linear Wind-Water Mill

three wings are built into a truss having the form of a triangular prism supported by wheels at each lower corner, these wheels running on a circular rail at deck level.

The wind turns the windmill, and the water blades generate thrust to drive the craft against the wind: effectively we have three of Professor Barkla's linear water/wind-mills running in a circle. This craft was presented at the 17th AIAA symposium (Stanford, CA, 1987) and is described in AYRS 112, 1993. It is shown in the video at https://youtu.be/f1k1MAl3RkQ.

The latest version of the craft (2020) is equipped with six wings rather than three. The third video (https://youtu.be/LGn3uY2xCt4) shows this version being tested in the river Po (a very good tow tank). In this test, the current (about 3 knots) acts on the water blades turning the mill, similarly a suitable wind should make the wings rotate so that the blades yield a thrust directed against the wind. This six-winged craft showed no great improvement over the three-winged one and it is heavier, so in full scale I would prefer three wings. I hope to find a wind tunnel to prove this.

If the catamaran is equipped with rudders, as it must be, the craft may be steered on a course not directly against the wind but rather a close hauled course and there will then be an upwind drift (like a negative leeway!). Magnus effect can help if the windmill is turning in the right sense. For example, if we want to go close hauled with the wind on the starboard bow (i.e. on port tack) and the windmill is turning clockwise (looking down on the craft), the Magnus effect produces a thrust directed to the right of the direction of travel, which is beneficial. The windmill can be arranged to turn clockwise or anticlockwise but the operation of reversing is neither simple nor fast. If the wind is on the beam, the craft can sail conventionally by stopping the rotation of the wings and water blades, then uncoupling and trimming them so that each wing acts as a conventional sail and each water blade as a keel. So this is the first craft that can be operated in either windmill or conventional mode as required to achieve the best speed on every course. If the wind is astern a square sail can be hoisted. If the catamaran is moored in a current of water it can get energy from the water; if it is moored in the wind it can get energy from the wind. Crew accommodation could be included astern of the windmill.

I hope to build a full size craft in the future.

References

[1] A B Bauer: "Faster than the wind"; in Proceedings of the 1st AIAA Symposium on the Aero/Hydronautics of Sailing; American Institute of Aeronautics and Astronautics, 1969

[2] H M Barkla: "Downwind Faster than the Wind"; in AYRS booklet No 98, pp11-25; December 1983

[3] "Power from the Wind"; AYRS booklet No 91; March 1979.

[4] J Wilkinson: "Revelation"; in AYRS booklet No 105, pp12-25; October 1989

[5] Joseph Norwood jr: "High Speed Sailing"; Granada Publishing; 1979

[6] H M Barkla: "The Linear Wind/Water Mill Propeller"; in Proceedings of the 12th AIAA Symposium on the Aero/Hydronautics of Sailing; AIAA, San Francisco, October 1982.

[7] H M Barkla: "The Vertical Axis Turbine Propeller for Ship Propulsion"; in Wind Engineering Vol. 8 No 4; London, 1984.

[8] in "Windmills & Hydrofoils"; AYRS Booklet No 101, p25; 1985.

Top: The first boat
Middle: The second
Bottom: The latest version

A Guide to Steering without a Rudder

Methods and Equipment Tested

Michael Keyworth

This guide was the result of multiple tests conducted in the fall of 2013 off of Newport, RI. The test vessel was a modified MK I Swan 44, *Chasseur*. *Chasseur* has been modified in the following relevant ways; the rudder skeg was removed and replaced with a modern spade rudder which is carbon fiber with a Carbon fiber shaft, the keel has been modified to a modern shape fin with a shoe, the mast is carbon fiber and 6 feet taller than original. For the purposes of the tests, the rudder was removed and the rudder port was blocked off.

Purpose

The purpose of the tests was to determine the best method and equipment to effectively steer the vessel to a safe port in the event of catastrophic rudder failure. The goal was to utilize the equipment normally taken on the vessel on offshore passages or races. The overriding premise was, utilizing an efficient and controllable object to create drag and transmit to directional stability would result in the desired directional stability. It was my view that a drogue might be used to exert the appropriate drag. I further felt that a smaller drogue than would be used for a sea anchor might provide the needed drag but not significantly impede the speed of the vessel.

I was familiar with and had onboard *Chasseur* a “Galerider” made by Hathaway, Reiser & Raymond of Stamford, Connecticut. I contacted Wes Oliver at Hathaway and he arranged to make several prototype drogues for the tests. We were equipped with: a 12inch (30cm) diameter drogue with a 3 part bridle, a 12inch diameter drogue with a 4 part bridle, a 18 inch (45cm) diameter drogue with a 4 part bridle, a 30 inch (75cm) drogue with a 4 part bridle and a 36 inch (90cm) drogue with a 4 part bridle.

The purposes of the tests were to establish whether control could be attained under the following “underway” conditions

- Controlling direction with sail trim alone
- Controlling direction while motoring using a drogue
- Controlling direction while sailing upwind using a drogue
- Controlling direction while sailing downwind using a drogue
- Controlling direction while motorsailing using a drogue
- Controlling direction while being towed using a drogue

Size of drogue proved to be very important. The findings were definitive:

- The two 12 inch drogues provided no directional stability.
- The 18 inch drogue provided marginal control in winds under 10 knots
- The 30 inch drogue was very effective in all conditions that were tested and resulted in approximately 1 knot reduction in boat speed. In wind conditions over 20K a chain pennant needed to be added to reduce cavitation.

The 36 inch drogue worked similarly to the 30 inch drogue but affected boat speed by approximately1½ knots.

Rigging

Two spinnaker sheets were used. The sheets were led as two sides of a bridle (port and starboard) from amidships and clipped into the swivel at the lead for the drogue. The tails were lead aft to the primaries in the cockpit. It is important to rig this so as to provoke the least amount of chafe as these lines will become your steering cables. We found that the leads need to be led to the axis of the keel as the boat will rotate on the keel. This point is probably somewhere near amidships.

Note: The afterguy block may be ideal for the bridle lead. Some prior guidance suggested that a lead to the quarters of the transom is the best. Our findings are that this restricts the transom from swinging, therefore preventing the desired change in course.

During rough and/or windy conditions it may be necessary to add weight to the drogue to keep it from cavitating. Using the concept of being limited to equipment that is already on board, we were able to use various lengths of chain attached to the swivel at the lead for the drogue. At the other end we effectively used a spare swivel shackle and attached one end to the forward end of chain and the other to the bridle from the boat. It is important to have swivels at both ends as the drogue will tend to rotate as it is pulled along. The bridle may get twisted up but this does not seem to affect the control. During our tests the length of “scope” of the bridle/drogue did not seem important. The nominal distance aft from the transom varied from 50 feet to 120 feet. It may be necessary to add scope in extreme conditions. I found that reference of the drogues position was valuable information. I whipped colored marks at 10 foot intervals on both bridles which gave a quick reference; this could be done with tape or magic marker.

Findings

- Controlling direction with sail trim alone - Not Possible!!!
- Control direction while motoring using a drogue - This is the easiest scenario. A wide range of control is available. This can be done with only one person, easily. While testing we were able to execute multiple 360degree turns with full control. Doing 5.5 knots a full 360 can be executed in 4-4 ½ boat lengths. While motoring, adjustments of 2-3 inches (50-75mm) results in 5-10 degree course change.

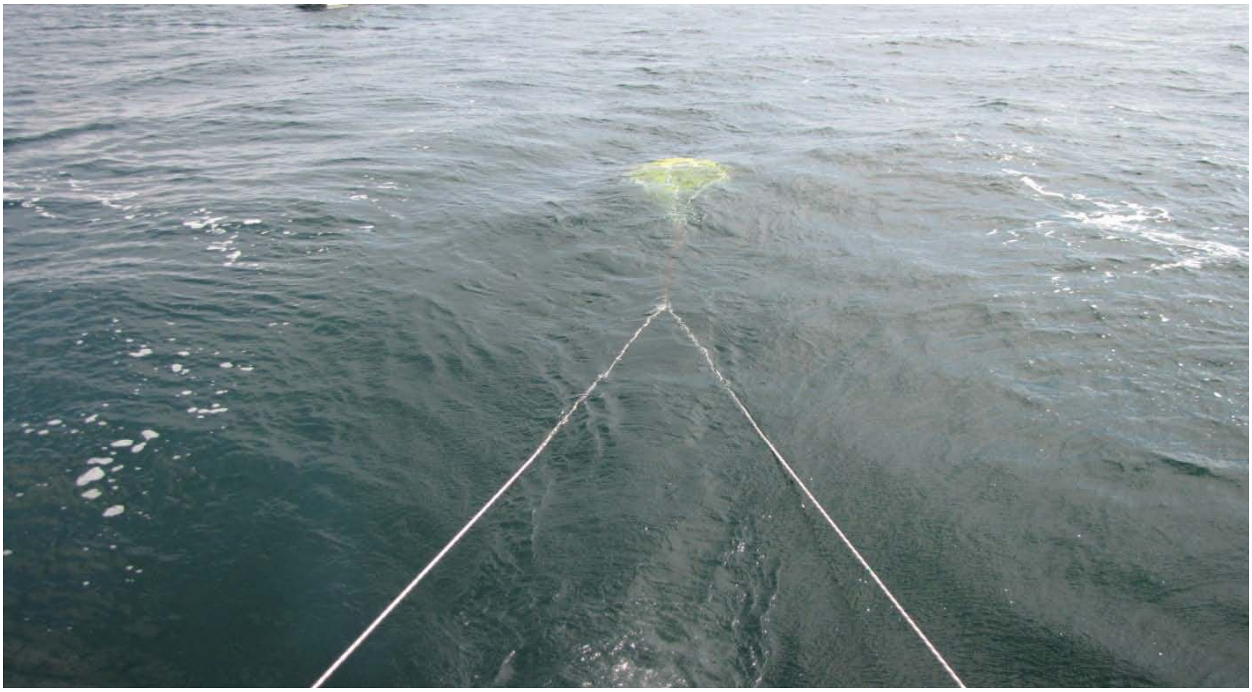


Fig 1 bridle set up

• Controlling direction while sailing upwind using a drogue - The same principals apply except that there needs to be cooperation between the sail trimmers and the "helmsperson". In this scenario the main must be up, even if reefed, the jib may be overlapping, but more control may be achieved with a non overlapping jib. Tacking takes coordination but, once you get the hang of it, no problem- traveler up, back the jib and come on to the new tack. We were able to achieve 30-35 degrees apparent. In large seas wider angles should be expected.

• Controlling direction while sailing downwind using a drogue - When the wind is aft of 90 degrees apparent it is necessary to take the mainsail down and sail under Jib alone.

It will be necessary to have an attentive jib trimmer in addition to a helmsperson on the drogue controls. The size of the jib will have to be factored in based on wind and sea conditions. We also found that the deeper the angle the harder it was to have fine control of direction. Jibing is pretty straightforward by easing the jib and rotating the drogue.

• Controlling direction while motorsailing using a drogue - The same principals apply as in sections on upwind and downwind sailing.

• Controlling direction while being towed using a drogue - This test, I felt was important because most successful results of rudder loss has a component of a tow of great and small distances to a safe harbor. In this situation we were towed by a 27' Protector with two 250 HP outboards. A towing bridle was made up on Chasseur and attached to the tow line from the Protector. At 3 Knots the bow was swinging from port to starboard to the end of the tether. At 4 knots it was very difficult to stand on the foredeck. We deployed the 30 inch drogue as rigged for sailing and motoring. The results were immediate. Towing at 7 knots was comfortable and straight, requiring very little input from the helmsperson.

This is an important finding as it suggests that a drogue should be carried at all times so that assistance can be rendered safely, even inshore.

Additional Findings/ FAQs

• If you lose your rudder- first confirm that the rudder port is not leaking- if it is you must first deal with the flooding issue. Once the flooding issue is stabilized move on to the next step of getting home or assistance.

• Communicate with Race Officials if you are racing or with those onshore who will worry about your situation.

• Choose your safe harbor destination based on wind direction predictions, ease of access, proximity, repair facilities, etc. Do not feel that you need to end at the original destination port.

• If you lose your rudder, it is likely that you either hit a submerged object or that the conditions were severe. Remember that you have time. Relax, storms don't usually last more than a couple of days. Deploy your drogue/sea anchor and get some rest.

• Each time that we went testing we learned something new. Don't be afraid to try something that you think might help, i.e. longer scope, move lead of bridle forward or aft, larger/smaller jib, reef/no reef, etc.

• An unanswered question is how a drogue will work with different types/styles and underbodies than Chasseur. My personal view is that a drogue will be an effective tool to have on any type of boat and its deployment can be adapted to the type of vessel that uses it.

• Offshore you will have room to manoeuvre. Take your time and don't stress about steering an accurate course.

• The engine is your friend. You will find that under engine will provide the greatest degree of control-speed and direction. Use the engine to deploy sails, to get rest, or to retrieve the drogue- retrieval is easiest when the boat is stopped. Be careful to not tangle the bridle in the prop. This was never a problem during our trials. This was probably because; towards the end of trials we used a 5 ft chain pennant to help the drogue from cavitating. The chain component is an important one. I chose the use of chain to weight the drogue because ISAF Offshore Prescriptions require that an anchor with appropriate ground tackle be carried, so it need not be carried as additional gear. Others venturing offshore tend to take ample ground tackle to accommodate the use for other purposes. On a practical matter, I think that it makes sense to have different lengths of chain for required circumstances. It makes sense that a longer chain can be made shorter using the rig cut away tools as required by the rule. A shorter chain can be made longer using shackles to join shorter lengths.

• How heavy is the Galerider? A standard 30 inch drogue weighs in at 9 lbs and is stored in a bag that is 15 inches in diameter and 5 inches thick. The standard 36 inch drogue weighs 13.2 lbs and stores in a bag that is 18 inches in diameter and 4 inches thick.

• One of the difficulties that you will face and will determine where the helmsperson is stationed is access to heading or a compass. Something that you may want to consider, as you equip for an offshore passage is the purchase of a backup compass which can be remotely mounted. Boats equipped with modern electronic packages may have the option of display of heading for both helmsperson and trimmer/s.

• It would be prudent for any offshore sailor to practice the deployment of a drogue as sea anchor and to rig and use as a means of steering. This would help to identify the gear necessary to deploy and provide a ready plan to implement if necessary.

• The transition from drogue steering to drogue/sea anchor or vice versa may be easier than you think.

• What I learned from the extensive testing is that you can achieve a great deal of control using a drogue. I would bet that if any sailor is able to sail 100+ miles without a rudder to a safe port the crew will want to take a victory lap around the harbor to "show off" the newfound skill and seamanship ability.

One last thought.

Having sailed over 150,000 miles at sea I have seen many things and have been able to overcome all adverse conditions, I still have many concerns and reservations. One concern is that of rudder loss and how to deal with that possibility. This test should help all who go to sea with that possibility. The other concern that haunts me each time I go to sea is the amount of floating debris and other objects that may affect the ability of even the most seamanlike sailor to safely passage from place to place. The possibility of being holed or sunk from collisions with floating debris is real. Most of the stories I have heard about boats at sea that have become rudderless have resulted in the abandonment of those vessels. These abandoned vessels represent a threat to those fellow sailors who put to sea and put them unnecessarily at risk.

A theoretical model of a flat planing surface to determine lift and drag forces and the centre of effort

Steven Lynch

1. Introduction.

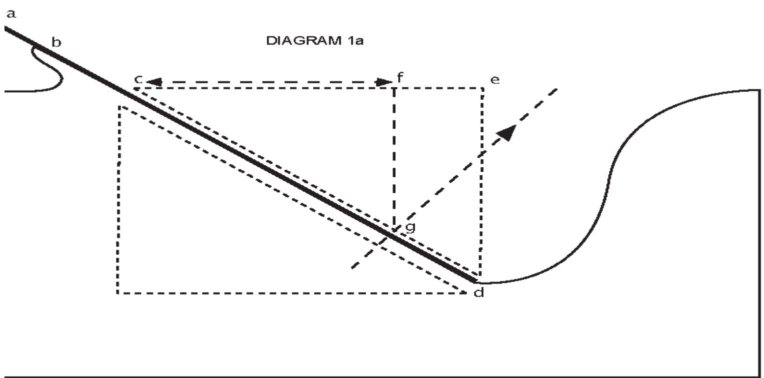
In the process of designing a new kind of sailing craft which relies in part on a flat planing surface, I was unable to find explanations and mathematics that could explain the observations I was getting. Most of the research being more relevant to powered motorboats with chined hulls. See Refs [1] [2] [3] [4] [5]. The motion and physics of surf boards, kite boards and skim boards, the more obvious planing surfaces, seemed to fall outside of any research. All I could find was explained only by casual observations and rules-of-thumb, so I decided to delve into the problem myself and see if I could develop some system that would allow me to predict the lift forces of a planing surface in relation to angle of attack, area and velocity. As I am, at the time of writing, locked down in a country the other side of the globe and can't return because British Airways have cancelled all my flights, I have had time to hone the theoretical side of my invention and write it up.

I have discovered a number of interesting concepts which apply to what I am doing and I hope other designers here may benefit from these as well, or wish to investigate them further or verify them with practical experiment.

2. Analysis.

A planing surface is one which generates lift from a fluid on one surface only, unlike a foil which has fluid on both surfaces. The following is a simplified, physical and mathematical analysis of the important aspects. This analysis is theoretical and deals with the tight issue of the forces generated by a non-buoyant planing surface, and with the position of the centre of effort. Consideration of buoyancy is not needed as this deals with a non-buoyant thin plate. Any reference to drag is referring to "induced drag", parasitic drag is not included as its effects are minimal except at very high speeds and requires separate mathematics that could be added later if necessary.

So associated issues have been stripped away to reveal the basics of planing force in order to create a relatively easy-to-use mathematical model to predict the performance of planing surfaces.



attack (AoA), and varies between 50% of the total length at 90º AoA to $\sqrt{2}/_2$ [9], (approximately 71%), and it appears to vary according to:

$$cg = \tfrac{1}{2}\,Sin^2Ø + (\sqrt{2}/_2)Cos^2Ø$$

where: Ø=AoA
and cg = distance of the CoE from the front of submerged planing area.

The second series of diagrams 1b shows this in stages. The first represents a horizontal planning surface, (impossible but is the start point of the mathematics). As soon as it is given an AoA the CoE is governed by the expresion above and appears at $\sqrt{2}/_2$ where the area of the triangle is equal both sides and hence the plane remains stable. As the AoA increases, the triangle becomes "shorter" and the $\sqrt{2}/_2$ distance shrinks too and in the next two diagrams, the CoE moves towards half way. This is difficult to see on the diagrams but you can count the dashes if you like. At 90º AoA the CoE becomes halfway, which is easier to imagine intuitively.

The low angles of attack are the most useful for most craft and situations and the CoE is then very near 70% of the overall length of the planing surface from the front.

I did a couple of simple experiments to verify this and it seems to be borne out in reality. This is however, completely at odds with accepted knowledge [1] [2] [3] [4] [5] as shown in diagram 3.

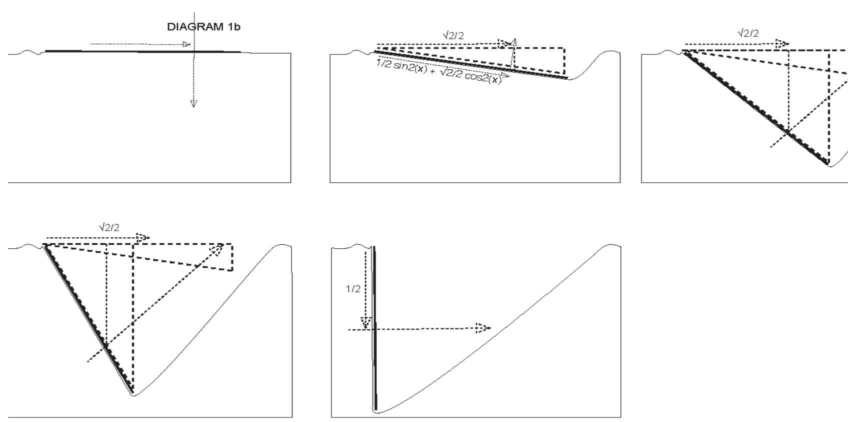
As far as my research goes, this latter pressure distribution curve seems to have been assumed from wing theory more than quantitive results, but it must be accepted that all the research I found was concerned with buoyant, complex hull shapes powered by motors. A rigorous test of my

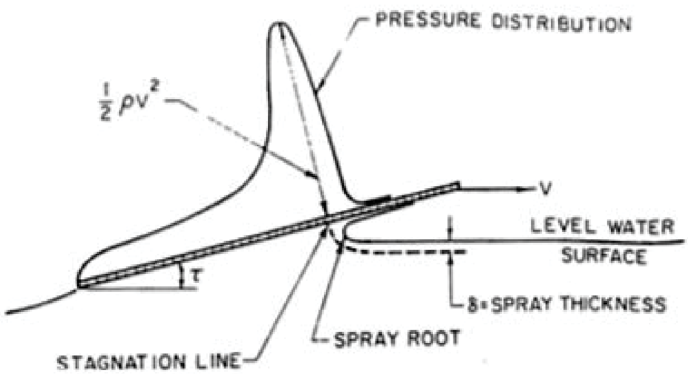
2.1 The centre of effort of a planing surface.

The centre of effort (CoE) is the point on a planing surface through which all the forces of the surface can be said to have their effect. The position of the CoE is important so moments of force can be calculated and the support structures can be positioned efficiently.

Diagram 1a above shows a planing surface a-d, moving from right to left, planing on a fluid: a-b is an area not involved; b-c is an area of wave-rise and not considered here; c-d is the planing area.

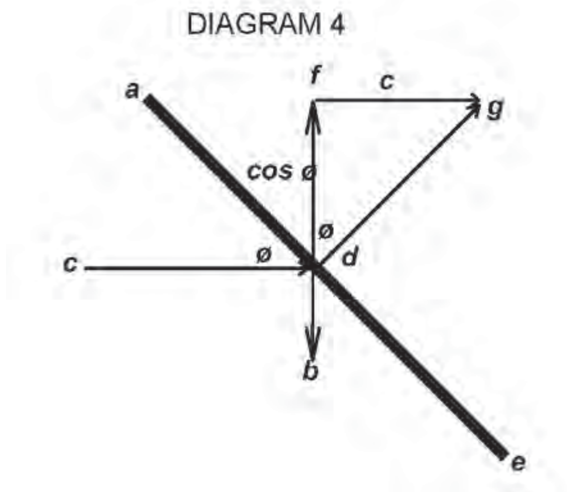
To understand what is happening, you must imagine a stream of water flowing along, and a planing surface lying flat on top with no angle of attack. If the surface is given a positive angle of attack then it will generate an upward force conventionally through the CoE, somewhere between the leading and trailing edges. To keep the planing surface steady, this needs to be balanced by a downward force also acting through the CoE. Now if you can imagine the waterstream now has a triangle of water "missing", this represents the momentum given to the planing surface by the water, and as a force will be equal and opposite to the force pressing down. The dotted triangle c-d-e represents the water that has been deflected down after ∂t and this triangle will represent the force created by planing. g-f is the line where the area of the triangle has been halved, where the area of water giving the momentum is equal on either side, ie Area(cfg) = Area(fedg). Trigonometry shows the distance c-g is the length we are really interested in, and is variant depending on the angle of





Typical pressure distribution on flat planing surface

Diagram 3



conclusions needs to be performed by someone with the right know-how, and that could form the basis of some interesting research and confirm some new knowledge.

2.2 Forces

A planing surface (see diagram 4) a-e progresses forward (left) towards c at an angle of attack of Ø, water is incident on the ski along vector cd. The water that strikes it has a mass flow rate (there is no solid object here whose mass and velocity can be easily defined so the mass flow rate is used), which is:

ρ (the density of water) x V (the velocity of the water) x A (the area of the submerged surface).

Because of the angle of the planing surface this produces a redirection of momentum along dg which can be resolved into two force vectors as shown: a lift vector (df) and an induced drag vector (fg).

Newton's second law, F = ma is used extensively throughout physics when dealing with a moving object, but this equation is not really in the right form for addressing the planing surface's reaction with the water. The flowing water is not an identifiable object but rather it is a mass of water per unit time that is being thrown down, ie the mass flow rate. Fortunately, Newton did not actually state his second law as just "F = ma". Newton's actual equation was that force is equal to the change in momentum divided by a change in time. So where momentum is replaced by its equivalent: mass multiplied by velocity, [6]

$$F = d(mv)/dt.$$

This equation expands to:

$$F = v(dm/dt) + m(dv/dt)$$

or $$F = v(dm/dt) + m.a$$

Now unless we go to the atomic level there is no identifiable single mass of water that the surface is reacting with and so the 'm.a' term of the equation is zero. What remains is the equation that we desire.

$$F = v(dm/dt)$$

Now, (dm/dt) is the mass flow, so along each vector the upward mass flow = r.VA.cosØ, and the backward mass flow = ρVA.SinØ.

So substituting into Newton's equation, the Lift force becomes V.ρVA.CosØ or ρV^2A.CosØ, and the Drag force becomes V.ρVA.SinØ or ρV^2A.SinØ

However, the amount of water hitting the surface is governed by the angle of attack Ø which is a minimum at 0^o and maximum at 90^o, and varies as SinØ, so the formulae becomes:

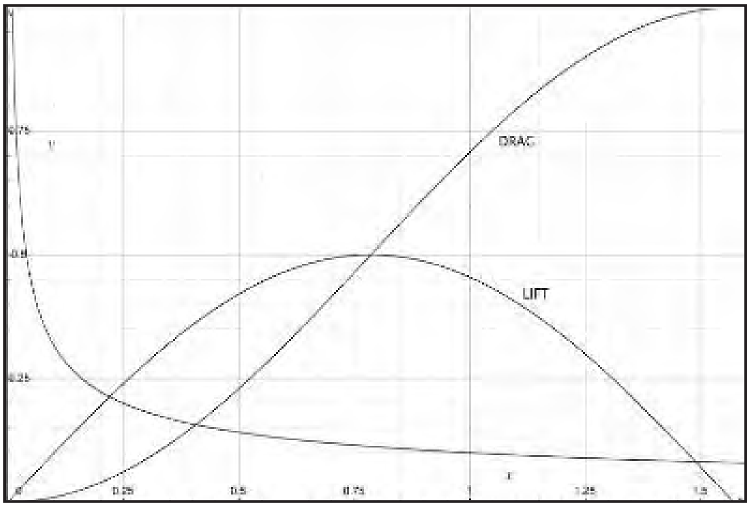
$$\text{LIFT} = \rho V^2 A.\text{Cos}Ø.\text{Sin}Ø$$

and $$\text{DRAG} = \rho V^2 A\ \text{Sin}^2Ø$$

2.3 Edging.

A planing surface in a wind powered vessel is not only angled in the direction of travel but to the side to prevent side slip, seen easily in a kite boarder. The surface is not horizontal to the water level, in the axis opposite to the direction to travel, and not perpendicular to the vertical weight force. Consequently, the lift has to be the sine of the angle of skis to the vertical (Θ)) so the actual vertical lifting force produced is identified by the expression.

$$\text{Lift} = \rho V^2 A.\text{Cos}Ø.\text{Sin}Ø.\text{Sin}\Theta$$



can travel [7] [8]. But which is the best way to keep it high? Angle of attack or area of foil?

Now we have already shown that:

$$\text{LIFT} = \rho V^2 A.\text{Cos}Ø.\text{Sin}Ø$$

and $\text{DRAG} = \rho V^2.A.\text{Sin}^2Ø$

so the Lift/Drag ratio:

$$L/D = \rho V^2 A.\text{Cos}Ø.\text{Sin}Ø \;/\; \rho V^2 A.\text{Sin}^2Ø$$
$$= A.\text{Cos}Ø.\text{Sin}Ø \;/\; A.\text{Sin}^2Ø$$
$$= A \;/ A.\text{Tan}Ø$$

From that it can be seen that the changing the area in the water makes no difference to the L/D. Indeed a planing foil will, with increasing speed, rise out of the water, reducing the area, whilst making no difference to the L/D. But decreasing the component TanØ *does* increase the L/D ratio, and TanØ is decreased by decreasing the Ø, the angle of attack.

3. Examining some consequences.

Diagram 5 above is a graph showing these functions. Firstly, a general exponential line shows lift/drag increasing exponentially with velocity. The drag line shows drag ($\text{Sin}^2Ø$) decreasing as the angle of attack approaches zero from 90° (1.56 radians on the scale); and lift (CosØ.SinØ) peaking at 45° and decreasing with reduced angle of attack.

This graph illustrates that the lift is always greater than the drag at the low angles of attack used by most craft so lowering angle of attack as the velocity increases reduces drag, theoretically approaching zero.

3.1 Lift/Drag Ratio

From above the L/D Ratio becomes

$$L/D = V^2A.\text{Cos}Ø.\text{Sin}Ø \;/\; V^2A.\text{Sin}^2Ø$$
$$= \text{Cos}Ø/\text{Sin}Ø$$
$$= \text{Cot}Ø$$

So L/D ratio becomes infinite as Ø decreases!

3.2 Angle of attack and area.

The lift to drag ratio is very important in sailing: the greater the lift to drag ratio the faster a sail boat

4. Conclusions.

The formula predicting lift seems to be accurate from the observations I have made of water skiers, and maybe next a reader needs to devise some tank tests to find more corroborating or contradictory evidence.

The predicted reduction of drag at very low AoA is best illustrated is the motion of skim boards. As their name suggests they move fast and effortlessly almost without drag at very low angles of attack in all depths of water and with hardly any draft.

I think the maths here holds some interesting insights for the would-be fast sailing boat designer. The centre of effort is not in the same place as wings and it moves about. Planing surfaces need to be as low an angle as possible, and, unlike other things, size doesn't matter; which should be of interest to those designing fast planing sailing boats.

References

[1] Daniel Savitsky and P. Ward Brown: Procedures for hydrodynamic evaluation of planing hulls in smooth and rough water. Marine Technology 1976

[2] Kenneth L. Wadlin and Kenneth W. Christopher: A method for calculation of hydrodynamic lift for submerged and planing rectangular lifting surfaces

[3] Daniel Savitsky: Hydrodynamic design of planing hulls

[4] P Ward Brown, BSc: An Empirical Analysis of the Planing Lift Characteristics of Rectangular Flat.Plates and Wedges

[5] National Research Council. 2003. Twenty-Fourth Symposium on Naval Hydrodynamics. Washington, DC: The National Academies Press. https://doi.org/10.17226/10834.

[6] https://www.grc.nasa.gov/WWW/K-12/rocket/newton2r.html

[7] Stephen Bourn: A Fundamental Theory of Sailing and its application to the design of a Hydrofoil Sail Craft, October 2001

[8] Stephen Bourn: Hydrofoil Sail Craft,. https://patents.google.com/patent/ EP1127002B1/en?oq=EP1127002B1

[9] http://jwilson.coe.uga.edu/EMAT6680Fa07/Gilbert/6690/Essay%201/ Half%20the%20Area%20of%20a%20Triangle1.htm

Record of ZOOM Meetings held by the AYRS North West UK Local Group

Due to the Coronavirus Pandemic it has not been possible for members to attend our regular meetings which were scheduled to be held on the 14th March 2020 (Spring Meeting) and the 13th June 2020 (Summer Meeting.

Instead, the North West Local Group has followed the example of our Chairman, John Perry, in arranging to use the free ZOOM video conferencing service. John Shuttleworth volunteered to set up the meetings which he has continued to do. As a result ZOOM Meetings have been held on the following dates: 14th March, 13th June, 11th July, 8th August, 4th September, and 2nd October.

Attendance at these ZOOM meetings has been excellent, with seven/eight members participating on each occasion, out of a total membership of twelve. Three members have also not been able to participate; however, we have been able to welcome back Roy Anderson, who has not attended our regular meetings for some years. His contribution has been well received. The forty minute time limit imposed by ZOOM has severely restricted our discussions.

A number of the members of the North West Local Group have also participated in the ZOOM Meetings arranged by John Perry.

The North West Local Group continues to be actively engaged in personal projects. Having the ability to report on and receive a regular appraisal of their projects from other AYRS Members has greatly encouraged the participants. The following subjects have been presented and discussed at our ZOOM Meetings:

- John Alldred's FLIP FLOP propulsion fin.
- Mark Hillmann's self righting proa scale experiments.
- Richard Fish's development of an efficient home-made oar and Japanese yuloh.
- Adrian Denye has kept us up to date on progress within the America's Cup teams.
- Colin McCowen has reported on his experience with a single scull ALDEN rowing shell.
- Mike Howard gave a short talk on 'The Future for Plastic Yachts'.

Sadly, no official minutes have been taken of these meetings so a full description of the activities undertaken and the member's comments cannot be provided. The North West Local Group intends to continue to hold monthly ZOOM Meetings. Our contact is John Alldred. (john@alldred.me.uk)

ZOOM Meeting, Friday 2nd October 2020, hosted by John Shuttleworth

Mike Howard presented the first section of his research entitled, 'The Future for Plastic Yachts'. During the second part of the meeting a great deal of discussion took place on ways of deconstructing GRP yachts and ways in which funding could be set aside for deconstruction at the end of life. Secondary uses of chopped up or ground up GRP were also discussed including plasma incineration, as a filler in concrete and recycled plastic imitation timber for the construction of park furniture. These subjects will be dealt with in more detail as Mike's research continues and is written up.

John Alldred told the meeting about progress with his FLIP FLOP project. He showed a photograph of his 'production unit'. He is currently constructing a small catamaran from plywood which will be used as a stable platform to demonstrate his unit.

Adrian Denye offered to lend a variety of moulds with which members of the NWLG could quickly construct a small catamaran or floats in GRP for their experimental projects, rather than each developing their own plywood versions which was far more time consuming. He had developed three different moulds while constructing the AYRS

MicroTransat Challenger trimaran, all of which are available. One member commented that he had no experience of moulding GRP. Adrian offered to any of the NWLG members, who were interested, to arrange a visit to his workshop where he would instruct them on producing a GRP hull, typically in a time scale of one or two days, utilising one of his moulds. John Alldred backed up Adrian stating that he had produced a simple GRP float from one of Adrian's moulds in just a day.

Mike Howard suggested that anyone wanting to build a cheap and cheerful canoe look at Mik Storer's Quick Canoe (www.storerboatplans.com). Constructed from two sheets of plywood with a flat bottom and vertical sides, either double ended or shortened in length with a transom stern, it would provide a stable platform. If necessary a pair of stabilising floats could be constructed using four, two litre Coke bottles and some lengths of 25 mm diameter uPVC tube.

In the third part of the meeting Richard Fish showed several photographs of a simple canoe hull which he had constructed from scraps of plywood. It had a shallow vee bottom and about 50 mm of rocker. He had added a float and a redundant Firefly jib to create a simple proa. It was steered by adjusting the angle of the dagger board which was pivoted centrally on the inside of the main hull.

Colin was curious to know how he could make his outrigger sailing canoe come about without the use of a paddle. Adrian suggested he needed more rocker to the main hull and lifting the outrigger floats or cranking the float arms so that the floats sit just above the waterline, causing less drag. Mike suggested he move forward when tacking to alter the position of the CLR. For the ultimate in steering, avoiding leeway, etc, Mike suggested to members they watch videos on YouTube of the West Mersea Duck Punt being sailed by middle aged men wearing green wellies. (For information and videos type into your internet browser - West Mersea Duck Punt).

Colin McCowen asked Richard where he had sailed his proa. Richard replied that it was Doddington Lake near Nantwich. Colin expressed the desire to find a more suitable sailing venue than the river Mersey, preferably somewhere he could sail back and forth with a beam wind. Richard stated he had approached his sailing club (Nantwich Sailing Club) about hosting a NWLG Summer Outing and had received a favourable reply. (The AYRS NWLG had intended taking up this offer before the outbreak of the Coronavirus pandemic).

John Shuttleworth related a tale of how he had joined Colin McCowen in a row along the upper stretches of the river Mersey. Colin had installed a sliding seat in his canoe, but John was not trusted to row Colin's single scull.

Mark Hillmann reported that he had not made much progress on his self righting proa scale experiment. He was currently sorting out the pumping system.

The meeting closed with Adrian Denye giving a brief but interesting update on the state of play of the teams competing in the run up trials to the next America's Cup Series in New Zealand. Adrian suggesting entering 36th Americas Cup – Latest News, into your internet browser which would keep members updated and lead to several interesting videos showing the new craft now afloat in New Zealand and being test sailed..

The Group have now proposed that AYRS support the purchase of a Pro version of the ZOOM video conferencing package at a cost of about £150. This would enable the Group to conduct their meetings in a more professional manner, without the need to interrupt the meeting to allow time for the members to rejoin every forty minutes or so. Mike suggested that, even when Covid-19 restrictions were lifted, it would be advantageous to hold four quarterly meetings interspersed with monthly ZOOM Meetings. He felt it was very helpful to those members conducting active projects to have regular sessions where they could discuss their progress and receive constructive criticism and advice at each step, thus avoiding going down a path others had trodden before them.

The next meeting is scheduled for 7.30 pm on Friday 6th November 2020.

The RYA releases access to the small craft standards relevant to the RCD

The Royal Yachting Association (RYA) is now able to provide monthly and annual online access to the small craft standards relevant to the Recreational Craft Directive (RCD).

The RYA, in consultation with British Marine, has grouped the harmonised standards into packages which are bespoke to Commercial Vessels; Dinghies; Motor Boats; Narrowboats; RIBs; Sailing Vessels; and the Supply Chain.

For those who work across multiple sectors a package including all RCD harmonised standards is available.

Thanks to an agreement the RYA has put in place with the British Standards Institute, they are now able to offer access to these standards on a monthly or annual basis through our RYA Books App. Those with annual access will be able to download and print the standards whereas monthly subscribers will be restricted to view only.

To view details of the standards included in each collection and to purchase a subscription please visit the Technical Standards Access page in the RYA Web Shop at https://www.rya.org.uk/shop/Pages/products.aspx?cat=rcd-standards.

Foiling Week Photos

These photos of some of the innovative boats sailed came from the Foiling Week held at Lake Garda in September.

Many more technical interviews are part of the Gurit Forum at Foiling Week, for a full list of topics, panelists and online streaming times please check https://www.foilingweek.com/pages/twenty20/2020-foiling-week-garda/gurit-forum/

Catalyst Calendar

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

November 2020

6th **AYRS NW UK Local Group Zoom meeting**
19:00 https://zoom.us/j/2536740617
Contact: John Alldred john@alldred.me.uk for programme details.

8th **CANCELLED - AYRS London Area meeting**
replaced by ...

14th **AYRS Zoom Meeting - America's Cup - review and discussion of the present contest, AC36**
19:30-20:30 GMT – non-UK members please note the time change; https://zoom.us/j/2536740617
Presentation by John Perry & others.

December 2020

12th **AYRS Zoom Meeting – Members Projects**
19:30-20:30 GMT; https://zoom.us/j/2536740617
An on-line replacement for the AYRS London Area Meeting that had been planned for November 8th - material to be provided by participants using the 'Share Screen' feature. Updates on projects, interesting news items, ideas for projects etc. Please contact zoom@ayrs.org to be added to the agenda.

January 2021

9th **AYRS Zoom Meeting – How AYRS should develop & other topics**
19:30-20:30 GMT; https://zoom.us/j/2536740617
An open discussion on the future development of the Society in advance of the January AGM

24th **(CANCELLED) All-Day AYRS Meeting**
Replaced by the above

24th **AYRS Annual General Meeting - online**
Registration from 19:15 for the meeting to run from 19:30–21:00 GMT,
https://zoom.us/j/2536740617

This year, because of COVID, AYRS is taking its AGM online. The timing, somewhat later than usual, is so that members in America and Australasia may participate without too much discomfort. Agenda, Committee report and other papers will be posted in the AYRS Forum https://www.ayrs.org/forum.
Note: AYRS desperately needs new Committee members, especially those with computer skills, to fulfil the roles of Secretary, and Treasurer/Membership Secretary! The work of each will be documented and published on the AYRS website, https://www.ayrs.org/about-ayrs/legal/
Volunteers please contact: AYRS Secretary; email: secretary@ayrs.org *before 25th December*; as should anyone wishing to raise any other business not on the Agenda. NB: General discussion points will be taken on 9th January (see above).

February 2021

13th **AYRS Zoom Meeting**
19:30-20:30 GMT; https://zoom.us/j/2536740617
Topic to be confirmed

28th **(TBC) RYA Virtual Dinghy Show**
The 2021 physical-presence Dinghy Show which was to have been held at Farnborough Exhibition Centre has been cancelled. The RYA expect to organise something online, but as yet we have no details. Keep an eye on https://www.rya.org/dinghy-show/ for latest details

March 2021

13th (TBC) **AYRS Zoom Meeting**
19:30-20:30 GMT; https://zoom.us/j/2536740617
Topic to be confirmed

April 2021 and later

If COVID permits, AYRS will start to organise physical-presence meetings from now on. See https://www.ayrs.org and the next edition of Catalyst for details.

AYRS Draft Accounts for 2019-2020

The AYRS AGM is to be held online – see announcement in the *Catalyst* Calendar. The full accounts, as part of the Report of the Committee, will be published on the AYRS website in due course. These are the draft accounts, which have not yet been audited and approved by the Committee, and which may therefore have errors in. However as there is unlikely to be another *Catalyst* before the online AGM, they are being published here for information of members.

2018-19			2019-20	
		Income (All Currencies, GBP)		
£ 3,822		Subscriptions	£ **4,101.13**	
£ 397		Donations	£ **617.00**	
£ 53		Misc Income (Loss) from US$ (Note 5)	£ **(26.04)**	
£ (2)		Misc Income (Loss) from Euros (Note 5)	£ **7.74**	
£ -		Boat Show receipts (Note 6)	£ **-**	
£ 28		Interest received	£ **53.08**	
£ 91		Sale of publications (incl. *Catalyst*) & stock	£ **10.50**	
	£4,389.41			£ **4,763.41**
		Less:-Direct Charitable Expenditure		
£ 808		Printing & copying publications & Catalyst	£ **1,482.00**	
£ 562		Opening stock	£ **311.60**	
£ -		stock purchase	£ **-**	
£ (312)		less closing stock	£ **(61.60)**	
£ 290		Postage on Catalyst etc	£ **559.78**	
£ 332		Meeting and room hire	£ **319.23**	
£ 84		Website & Internet Forum	£ **83.87**	
£ 447		Support to Speedweek	£ **354.60**	
£ -		John Hogg Prize	£ **-**	
	£(2,211.13)			£ **(3,049.48)**
		Other Expenditure		
£ 307		Administrative & office expenses	£ **507.76**	
£ 506		Boat Show costs (Note 6)	£ **409.59**	
£ 33		Accountancy & bank charges	£ **30.10**	
£ 297		Insurance	£ **297.00**	
£ 46		Misc	£ **26.00**	
£ -		Bad debts	£ **-**	
	£(1,189.02)			£ **(1,270.45)**
£ 3,400		**Total expenditure**	£ **4,319.93**	
	£989.26	**Surplus/(Deficit) of Income**		£ **443.48**
		Balance Sheet		
		Fixed assets		
£ -		Plant & machinery (Note 1)	£ **-**	
		Current assets		
£ 312		Stock (Note 3)	£ **61.60**	
£ 57,072		Cash and at Bank (UK£)	£ **57,939.66**	
£ 1,090		Cash and at Bank (US$)	£ **651.23**	
£ 328		Cash (Euros)	£ **335.81**	
£ -		uncleared cheques	£ **-**	
£ 40		held by officers	£ **165.50**	
£ 652		Payments in advance	£ **-**	
	£59,493.31			£ **59,153.79**
		Creditors: Amounts falling due within one year		
£ 756		Subscriptions received in advance	£ **716.38**	
£ 461		Sundry creditors (Note 7)	£ **106.48**	
	£(1,217.28)			£ **(822.86)**
	£58,276.03	**Net current and total assets**		£ **58,330.93**
		Accumulated fund		
£ 21,300		Balance as at 1st October previous (Note 9)	£ **22,289.38**	
£ -		Gain/Loss on currency transfers	£ **(406.47)**	
£ 989		Surplus/(Deficit) for the year	£ **443.48**	
	£22,289.38			£ **22,326.39**
		Restricted Funds		
£ 35,915		Balance as at 1st October previous (Note 9)	£ **35,986.66**	
£ 72		Increase/(Decrease) for the year	£ **17.88**	
	£35,986.66			£ **36,004.54**
	£58,276.04	**Total as at 06 October, 2020**		£ **58,330.93**

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

On the Horizon . . .

Nothing much really.

Would you like to write something?

Email it to catalyst@ayrs.org please.
Guidance notes are inside the front cover.

ISSN 1469-6754

57

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Printed by Rapidity Communications Limited, London EC1V 7JD