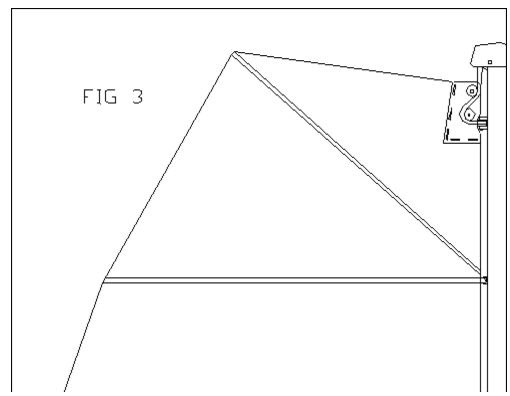
Catalyst

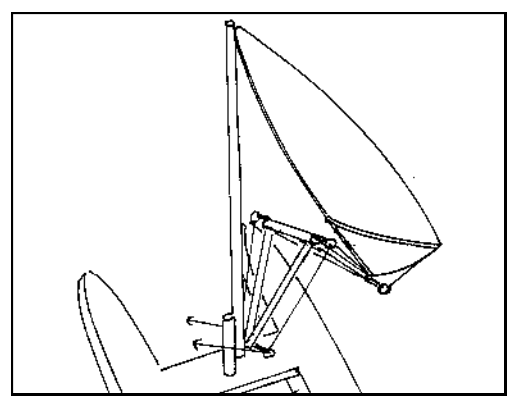
Journal of the Amateur Yacht Research Society

Number 14 October 2003

Features

Regulars





Cover Picture

RoCat offshore - probably near Penzance

Photo: courtesy Christopher Laughton/ Rocat Ltd

Catalyst

Journal of the
Amateur Yacht Research Society

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@fishwick.demon.co.uk**, 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.

AYRS subscribers receive both *Catalyst* and the booklets. Subscription is UK£20 or US$30 per annum for a Full Member, £10 or $15 for students and retired members. Subscription requests and all other queries to be sent to the AYRS Office, BCM AYRS, London WC1N 3XX UK, phone/fax +44 (1727) 862 268 or email: **ayrs@fishwick.demon.co.uk**

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

Website: http://www.ayrs.org

ISSN 1469-6754

Faster, faster . . .

In Europe at least, the equinoxes bring strong winds; and strong winds bring out the speed sailors. This year at Portland was no exception. AYRS members met there for a week in the Spring to prepare for speed trials, and then returned for Speedweek itself in the first week of October.

At the time of going to press, we do not have the formal collated results from Speedweek. It was however a well-attended event, with boats, windsurfers and kitesailors. People came tantalisingly close to Crossbow's local record of 36 knots, and it was clear that while the windsurfers still have a slight edge, the kite sailors are not very far behind. Perhaps once the kitesailors have had the time to bring their equipment up to the levels of technical sophistication that the speed windsurfers now employ, things may change. The kite and its lines are probably the biggest area for improvement now. It is clear that while the arch profile soft kites are now more controllable, they are also less efficient than semi-rigid designs. This is an area to watch.

Sometimes though, AYRS is criticised for giving too much attention to speed sailing at the expense of other things. To some extent, this reflects the topics that people write for Catalyst! However there is some defence in the thought that "speed improves the breed", and that the things that work for speed sailors will eventually make life more easy/effective for the rest of us. Perhaps a self-trimming sailboard sail, developed to allow speedsailors to handle larger sail areas in strong winds, would be useful to people like me who can only manage to stay upright on a board for a few metres!

Simon Fishwick

Weymouth Warm Up Week, May 2002

Bob Downhill

For the first time since the Castle Cove Sailing Club took over the site of Phil & Sandra Gollop's old Weymouth Sailing Centre, we sailed from that lovely spot. The Club bought the site after selling off their old premises for housing last September or thereabouts. (Phil and Sandra moved over to manage the Weymouth and Portland Sailing Academy on the site of the old Royal Naval Air Station on Portland, which is incidentally is the venue for Weymouth Speed Week in October.)

The Club members have made remarkable progress in refurbishing the main building, which had been derelict for a couple of years, and, through the good offices of Brian Wilkins, we were allowed the run of the place from the 12th to 16th May.

It was quite a good turnout of boats. Chris Evans had his latest trimaran *Foiled Again* fitted with stainless steel foils, Torix Bennett with his latest Cat/Trimaran. Alan Blundell came with his modified *Vari Scari*, Joddy Chapman with *Ceres*, and Cliff Glendenning with the Hobie Trifoiler.

Support was provided by Slade Penoyre, Arthur Lister, and Fred Ball.

Slade brought his ZapCat — a small inflatable cat about 2 or 3 metres long fitted with a 50 horsepower outboard. This was a really fearsome beast and should provide much entertainment for the towing trials in the future. Fred brought the Dory with a 28 horse engine, and a load of goodies, mostly hapa-based. (I think the lads are getting to grips with that technology). Arthur brought his RIB fitted with what I believe to be a 45 horsepower engine. Slade and Arthur also had standard Catapults, which always are delightful to sail.

Hapa towing trials

Fred Ball's circular boat

The purpose of the week was ostensibly to take out the timing gear we use in October and make sure it still works, so we were knee deep in computers and various gizmos, most of which hardly got an airing.

My main objective was to complete the towing trials on my "garage door" to obtain drag/speed readings to enable me to make an accurate stab at the design of what I hope will be the fastest boat in

Slade in full flight

the world. At last years outing I got the first part of the speed/drag curve but not the part where the drag decreases with speed when the door is up on foils. The Dory did not have sufficient power to complete the previous testing. I put this down to the foils not being big enough so, for these trials, I added 50 percent more tip area, which did the trick. At 16 knots the drag was 90 lbs, and at just over 16 knots the drag fell to 60 lbs as the door left the water.

There still is a problem with inherent stability - there is none -and human intervention is required. For a suitable test pilot you need someone who is intelligent has a good sense of balance, is fearless - oh and who wears a drysuit! Slade fills the bill admirably with his background of work at the Road Research Establishment.

We had a number of runs with Slade riding the door in the manner of someone breaking in a horse and providing suitable movements of the centre of gravity to get the right orientation of the foils.

After the first trials were completed we removed the foils and attempted to get speed/drag figures for the door without foils. Unfortunately a fault in the procurement of materials caused a failure of the cross beam and Slade disappeared through the crack in the middle of the door after failing to let us know his mount was suffering progressive structural failure. — I mean, be reasonable, how are we supposed to know that someone waving his arms and shouting is in the throes of sinking? He did not actually go under- well I didn't see him go under!

All in all very successful!

Those of us who remember the Weymouth Speed Weeks of the 70s and 80s will recall the sight of the powerboat *Lollipop*, with Brian Wilkins sitting in the back dispensing advice to all and sundry. Brian has had some problems since, but he appeared again in *Lollipop* when we were towing the garage door. The boat now sports a lovely blue canopy/windscreen, I suppose as a concession to advancing years.

Joddy Chapman demonstrated his GPS unit, which records positions every few seconds in latitude and longitude with the time from satellite positioning. This means that the track and speeds of a vessel can be plotted on a computer screen using software downloaded from the Internet. He was handing out an Aquapac waterproof bag with the gizmo inside for anyone to go out into Portland Harbour, then plotting the resulting track taken by the vessel on his laptop. Obviously the day cannot be far away when we will not need to measure the 500 metre course at the beginning of the day as it will be done for us each time a vessel crosses the start or finish line.

I gathered the GPS plotting system was part of the ongoing data gathering equipment that George and Joddy have been working on over the years to quantify the performance of their line of hydrofoils. That has now culminated in the beautifully manufactured hydrofoil *Ceres*, which I believe is a joy to sail although I have not had the pleasure myself.

Cliff Glendinning was tuning up his Hobie Trifoiler in readiness for Speed Week, when he hopes he will at least break the Crossbow record of 36 knots. I believe he clocked 32 knots in the relatively light winds we experienced during the week. It certainly is a spectacular sight whipping across the Harbour.

Alan Blundell has tweaked up his *Vari-Scari* and is looking forward to putting in some impressive runs in October.

Torix Bennett brought his latest design featuring steps under the centre hull of the trimaran. He

Torix Bennett's tri/catamaran

Trifoiler

sailed the boat a bit then turned it into a catamaran for more of the same.

Chris Evans and his *Foiled Again* now features stainless steel foils and rudder on a trimaran style hull.

The wind during the week was not to the liking of anyone but Nick Povey and Bob Spagnoletti, who spent a lot of time on their windsurfers taking in the air, getting the months spent stuck in their respective offices out of their systems.

Su Lewis held a class on the technique of tying a bowline in a manner more suited to the rigours of the sea. With a little more practice I may get the hang of it.

So the opportunity to test the timing equipment was not seized; but much discussion took place on the future requirements of our timing system. Indeed there was much discussion on all sorts of things, including life after death. With luck we may be able in the near future to get the efforts of the developments to date into making further improvements to our existing kit.

It really was a very social week in the Castle Cove Sailing Club for the 25 or so people who attended especially the evening dinners in the various excellent restaurants in Weymouth. We owe a vote of thanks to Norman Phillips for his organisational skills and his ability to make endless cups of tea and coffee; the lardy cakes were provided by Cliff Glendinning. When questioned, Cliff said he was concerned that someone else would turn up with a faster boat than his, so his idea was to handicap any opposition with Lardy Cakes.

ROCAT Update

Here is a long overdue update from ROCAT … I'm very sorry it has taken so long to get in touch.

Hot on the heels of the London Boat Show (where I was encouraged by an extremely positive response to the boat) I took the ROCAT to the Boat, Caravan and Outdoor Exhibition at the NEC, where I discovered that caravaners (who comprised the majority of the visitors to that show) are not generally so well disposed towards exertion!

As you know, I had hoped to get the boat into production this summer ... unfortunately, I was out of action for a while following the NEC show, and this will no longer be possible. We are now making very good progress though, and will have a production boat on the ROCAT stand at the 50th Anniversary London Boat Show next January, at (its new venue) Excel. *[London Docklands' new exhibition centre - Ed]*

I will keep you posted …

Christopher Laughton
ROCAT Ltd

Weymouth Speed Sailing Seminar 8th October 2003

John Perry

Weymouth Speed Week is an annual event with speed trials for sail boards, kites, multihulls and all types of experimental craft. For the 2003 event we had good conditions with quite strong winds through most of the week. As usual Michael Ellison chaired an AYRS meeting on the Wednesday evening at which a number of entrants briefly outlined their projects. A time limit was in place for the speakers but this was waived for Cory Roeseler so that we could hear more from one of the pioneers of the sport of kite surfing. My notes on this meeting are as follows:

Slade Penoyre

Slade continues to work towards his ultimate aim to fly clear of the sea using a kite and hapa combination. A hapa is a wing, or hydrofoil, towed underwater to generate a force in the towing line, which resists leeway and can also be arranged to resist heeling. A hapa could be used with a monohull or multihull sailing boat but Slade's main aim now is to apply the hapa to kite surfing, and so fly the kite surfer clear of the water. Slade has several prototype hapas of alternative design and intends to refine these further. He is keen to enlist kite surfing enthusiasts as collaborators in his project, the development of such a system would require skill on the water as much as imagination at the drawing board.

Joddy Chapman

Joddy returned to Speed Week with his hydrofoil sailing catamaran *Ceres* which proved so successful in the light winds we had last year at Weymouth. *Ceres* now has a new rig with carbon fibre mast but was not much sailed during the first part of speed week due to strong winds and due to Joddy helping with timing the runs on the speed sailing course.

The subject of Joddy's talk was 'Flying displacement', by which Joddy means sailing a hydrofoil equipped craft using the hydrofoils to generate part of the lift required to support the weight of the craft and hull displacement to provide the balance of the required lift. Joddy sketched some typical drag vs. speed graphs to show that there can be a range of boat speeds over which the hull and hydrofoils used in combination can give a lower total drag than either used alone. This fits in with the experience of those who are experimenting hydrofoil equipped International Moth dinghies in Australia. Off the wind these boats will fly hull clear of the water in quite light winds. Upwind the hull is normally in the water but the hydrofoils are still providing much use full lift as well as stabilising the boat against excessive pitching.

Ron Davis

Ron showed us a video about the 'Roda' seaplane for which he is intending to become the UK distributor. The 'Roda' is based on a RIB hull fitted with a delta shaped 'weight shift' style microlight wing and an engine and airscrew of about 60hp. It can carry two persons and judging from the video it performs well both in the air and on the water. When on the surface it is a seaworthy speed boat with or without the wing in place and being airscrew driven it has shallow draft capability. Apparently the main problems he is having are legal ones, UK harbour masters have so far been sceptical.

Tony Morris

Tony gave us an over view of the development of the sailboard from the pioneering days of Chilvers and Schweitzer onwards. The trend for board hulls in recent years has been towards wider beam – which has in turn encouraged deeper fins. A deep fin is not practical on a narrow board since the sailor cannot get his feet far enough off the centreline to counteract the lateral water force on the fin. The wider boards start planing at lower speeds and are also easier for less expert sailors to handle. As for rigs, the main trend has been toward ever-larger sail areas, made possible only by designing the sails so that the upper part of the leech twists off in gusts to relieve heeling moment. The result is a large but controllable sail, ideal for early planing while still keeping control as the board speed and apparent wind speed build up. However, Tony noted that in the specialised discipline of speed sailing there is now a return to rather smaller and more rigid rigs having efficiency and power optimised for just a small range of high wind speeds.

Cory Roeseler

We were delighted to have kite sailing pioneer Cory Roeseler participating at Speed Week this year. Cory gave us the story of his part in the development of the sport starting with early experiments by his father and himself back in the 1980s. As long ago as 1976, Cory's father, Billy, had a vision of a hydrofoil boat being towed by an efficient sail plane to achieve speeds in excess of 40 knots with the pilot on board the sailplane. In 1984 Cory adapted a hang glider by fitting floats and the first trials were on a lake towing the hang glider with a skiboat. In 1986-87 Cory built a purpose made kite to replace the hang glider, this being constructed using a pair of Hobie Cat rigs and a tail plane. It crashed. 1988 saw a change in concept to place the human operator at the water born end of the system rather than the airborne end.

In 1989 Cory competed as a kite surfer in the Columbia Gorge race, beating all windsurfers to finish in 56 minutes. In 1992 Cory started his own company to promote kite surfing and to manufacture kitesurfing equipment but later withdrew from this as bigger players took over the commercial side of the fast growing sport. In 1994 Cory set a world kite surfing record at 37 knots, only this year superseded by Robby Naish at 38.5 knots – still significantly behind the windsurfing record, but the gap is closing.

Kite surfers achieve their performance by being able to deploy larger effective sail area for a given total weight and being able to position that sail area where the wind is stronger and steadier. Over the years Cory has experimented with numerous options for both the air- and the water-side of the system. On the water-side the main options today are water skis, either single or a pair, or a specially developed bi-directional ski which allows the kitesurfer to 'shunt' in the manner of a proa. Indeed it is a proa.

Cory favours the unidirectional ski for ultimate speed but the bidirectional skis are more suitable for general use, and, being more manoeuvrable, they enable the kite surfing speed sailor to make more speed run attempts in any given day. With both types of ski it is a difficult matter to counteract the huge side pull of a kite. Cory has measured the drag angle of the alternative ski types under tow from a power boat at speeds as high as 50 knots. Drag angles are typically around 45 degrees over the speed range 20 to 40 knots.

Another possibility is to use a fully submerged lifting hydrofoil, such as the 'Airchair' device, this can give a better drag angle than planing skis but only over a fairly narrow speed range and it has not worked well beyond 30 knots.

As for the air side of the system, kites have improved greatly during the short history of kite surfing and recent developments are aimed at improving ease of use and launching rather than efficiency. The lift to drag angle of kite-skiing kites remains in the 2:1 region, which is not good in aeronautical terms. Cory does still wonder about the possibility of one day returning to his father's original concept of using a high efficiency sailplane, perhaps with a radio control system so that the pilot can remain at water level.

Bob Date

Bob Date representing the Bristol Speed Sailing Team explained that due to various members family commitments they had been unable to bring a boat to Weymouth this year but they do hope to be back in due course.

Graeme Ward

Graeme assisted the organisers at the first event of the world speed sailing challenge, which was held in the Canary Islands earlier this year. Further events will be held next year in France and New Zealand. Graeme told us about the "chop breaker" device in use for these events. For sailing fast you need strong winds, and sailboards in particular need very strong winds to reach their maximum speeds. But strong winds are associated with rough seas, and although sailboards can cope with rough seas they reach their highest speeds in flat water. The chop breaker is a way to get flat water while still being exposed to strong steady winds. Graeme felt that this was something we will see widely used in future speed sailing record attempts. The chop breaker for the Canaries speed meeting looked like a long series of trampolines floating flat on the sea; their metal frames being strung together and anchored in position along the windward side of the course. It appeared to work quite well apart from the anchors, which were of a small grapnel type that did not hold adequately.

Graeme also mentioned another technical problem experienced at this event. The speed timing system used was developed from that used in snow skiing events. Video cameras are set up at each end of the course; the pictures form each are combined, and fed to a common monitor/recorder, where each video frame is time-stamped using a single clock. The system worked fine; however taking up the cable after each days sailing and setting it out again in the morning wasted a lot of time. Also at one point the event was disrupted when part of the cable was removed by thieves. Graeme considered that a video link which did not depend on a cable would be much better. He feels that this was of such importance for future events that he is prepared to help finance such a development to the tune of £1000. Offers of assistance to AYRS, please.

Bjorn Dunkerbeck

Bjorn Dunkerbeck made a brief speech, saying how pleased he was to come to Weymouth Speed Week and how he would like to see this event become better known and better attended. These are encouraging comments coming as they did from the holder of 12 successive Professional Windsurfing Association world championships and current holder of the windsurfing world speed record. Achievements speak louder than word,s and perhaps Bjorn felt that that was enough words for the time being; but a member of the audience encouraged him to briefly speculate about the developments which might take the windsurfer to 50 knots and beyond. He emphasised that any speed over 40 knots was no trivial matter, even for the supremos of the sport. For 50 knots he would be thinking in terms of 50 to 55 knots of steady true wind 35 degrees aft of the beam, dead flat water and not more than 5m^2 of sail area. Clearly he is going to need those chop breakers that Graeme told us about.

Alex & Jon Montgomery

At Speed Week two years ago, Alex showed us an amazing scale model of his concept of a catamaran for non-stop round the world races ("*Quattrofoil*"). The quality of construction of that previous model was quite fabulous, this year he showed us a larger scale model which is built to the same professional quality of model construction but is at least twice the scale of the previous model, and additionally is a working model with all the main functions operated by radio control. The underlying concept remains similar –a 40m overall length catamaran with hinges at the four hull to cross beam connections so that the structure can be skewed to place the lee hull ahead of the windward hull to avoid lee bow burying. Four identical freestanding balestron rigs are carried, each mounted above a hull-to-cross-beam hinge, and since these operate independently there is a high degree of redundancy. The lifting boards and rudders are all designed to swing back if they hit an obstruction and are accessible for repair if they do get damaged. The crew would be housed in a central accommodation pod, is well clear of the water, and passageways through the cross beams allow the crew to operate the vessel with minimal exposure to the elements. All aspects of the design appear to be aimed at durability and reliability, a craft for the toughest of the long distance challenges.

Torix Bennett

Torix Bennett's current development is a catamaran with stepped planing hulls. This gained several of the 'fastest boat' cups at this Speed Week. Each of the custom built GRP hulls has three prominent steps in the underside to give planing surfaces, which operate at a closely controlled angle of attack. The reason for three rather than two steps is mainly to reduce the risk of keel ventilation by providing a wetted surface in the right place to mount the main skegs. The rig is a sloop and an interesting feature is that the foresail is a complete sailboard rig suspended between the forward cross beam and the main mast. This works well and it provides a foresail which can be controlled with a single sheet and will not flog when let fly, also an efficient foresail shape can be maintained without the need to load the main mast and rigging by having high forestay tension.

Jonathon Barton

Jonathon showed us a simple model to illustrate his current thoughts for a speed sailing hull. The idea is a rectangular craft with fences underneath at the sides and sealed flaps at back and front so as to trap air beneath the craft to reduce skin friction. This is in effect a 'side wall' hovercraft but I don't think it was intended to include a powered fan, I assume the idea was that the air cushion would stay in place for long enough to complete a single speed run.

Nick Povey

Nick Povey is now the main organiser of Weymouth Speed Week and he concluded the meeting by thanking all the participants and helpers and confirmed the determination of the organising team to be back next year.

Text by John Perry; Photos by Bob Downhill

Speedweek 2004 will be held from 2nd-8th October. The results of Speedweek 2003 were not available in a collated form at the time of going to press.

Other On-going Projects ...

I have several ongoing projects at the warehouse my wife refers to as my "Museum of Unfinished Projects".

I am just finishing mounting hardware and rigging on my third small (5 meter) trimaran. I will be initially generating polar diagrams for a soft sail rig while I build a wing for the boat. The mast step for the Hobie 14 mast and the bearings for the wing are now mounted. I have some pictures on the SnapFish web site of construction of the hulls and sailing pictures of hulls one & two. It will probably take me another 6 months to complete the rigid wing.

The second project is a self bailing 14 foot Catamaran/ Trimaran dinghy for my large cruising catamaran, "Millennium Dragon". This project must be finished to make space to build the wing for the 5 Meter Trimaran, "FloWinGo". The dingy is essentially a catamaran with an enlarged skeg/transom for the 25 HP Mercury and a short central hull forward with an underwater viewing port (like a glass bottom boat) forward for checking the big boat anchor. The configuration should offer enough central compressible air space to soften the ride.

I now have the Mercury on a logic 12' dinghy and it will do 25 knots on flat water. The boat is uncomfortable, hard riding, wet, heavy and not self bailing. I hope the dinghy I am building ("Family Dinkster") will be the opposite. I also have construction pictures of this project on SnapFish.

My cruising catamaran, "Millennium Dragon" has an experimental rig. She is an Ocean Catamaran 48.8 and has a 25 foot beam. The air draft is 62 feet and the mainsail hoist is 50 feet. The mainsail foot is 20 feet and the sail has a large square top. The traveler runs 24 feet side to side, on a Harken high load traveler track with a 19 foot radius. The boom is directly lashed to the traveler yoke. The mast rotates. Positive mast angle control is by hydraulic pistons (Navtec). There is no gooseneck. The boom rotates on a bearing on the same tube and center of rotation of the mast. Boom vang and mainsheet have been eliminated. The main is controlled using a hydraulic outhaul and traveler lines that lead to a Lewmar electric winch. The boat is set up for single handing. Let me know if you think our membership may have interest in this experimental rig.

Roger H Strube, MD (retired)
Punta Gorda, FL 33950

DWFTTW

As a physicist (or I should say an ex-physicist, now long retired) I took a particular interest in the contributions to Catalyst 12 about Down-Wind-Faster-Than-The-Wind. I was ready to deride the whole notion as smoke-and-mirrors, and was on the verge of picking up my mouse to do so.

Then I re-read Jon Howes contribution more carefully. And then again. He has convinced me that the notion is valid, at least for a low-friction land yacht. It works (and Mario Rosato's dismissal of the possibility, in Catalyst 11, fails) because Howes gets the direction of energy-flow right, taking energy from the fast motion of the craft against the ground, and delivering it to the slower motion of the craft with respect to the wind, using an air-propellor. Using Howes' notation, it's possible (in principle, at least) to get a larger drive thrust T from a lower drag force F, because of this difference between the two speeds; even though the power abstracted from the wheels is greater than the power delivered to the propellor, making up for inefficiencies in the system.

In the case of the land-yacht, Howes has been able to assume that the drag F on the vehicle is entirely available for generating input power P(in) to his power system. Though this might be a fair approximation for a low-friction land-vehicle, it will certainly not apply to a watercraft, in which hydraulic drag on the vessel will be an important factor. It remains to be shown whether DWFTTW will ever be possible for a watercraft.

Jon should be congratulated for a simple and practical tricycle design for his land-yacht. If any vehicle will do the job, it will look very much like that one. At the low (relative) airspeeds that will be involved, the propellor would have to be a large-area flimsy thing. Perhaps what's needed is a radio-controlled model to avoid the weight of a human pilot.

Jon finishes off with the tantalising statement "if the braking losses are very much smaller than the drive plus aerodynamic losses it works just fine". Not, you will note, "would work just fine". Did he intend to convey that there existed a real device that had been tested? Or was that no more than an aspiration? I only ask...

George Huxtable,
Southmoor, GB-OX13 5HX.
george@huxtable.u-net.com

“*Alice May*”

S Newman Darby

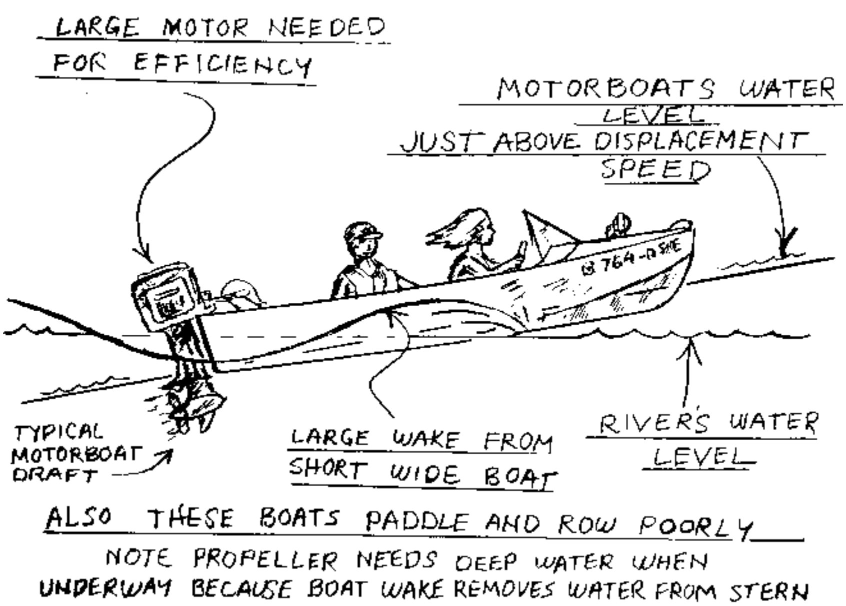
[Photo: Hal Raker, c. 1960.]

This is a photograph of Newman Darby driving a catamaran he designed and built just before he built his first sailboard in 1963. Note the hydrofoil in the stern. This was a motor-sailor, but the sail rig was left off for doing photography and escorting sailboards. *Alice May* could seat four adults, and used 15 hp and 25 hp engines. Later, it also had a 3 hp paddlewheel between the hulls for use in shallow rapids.

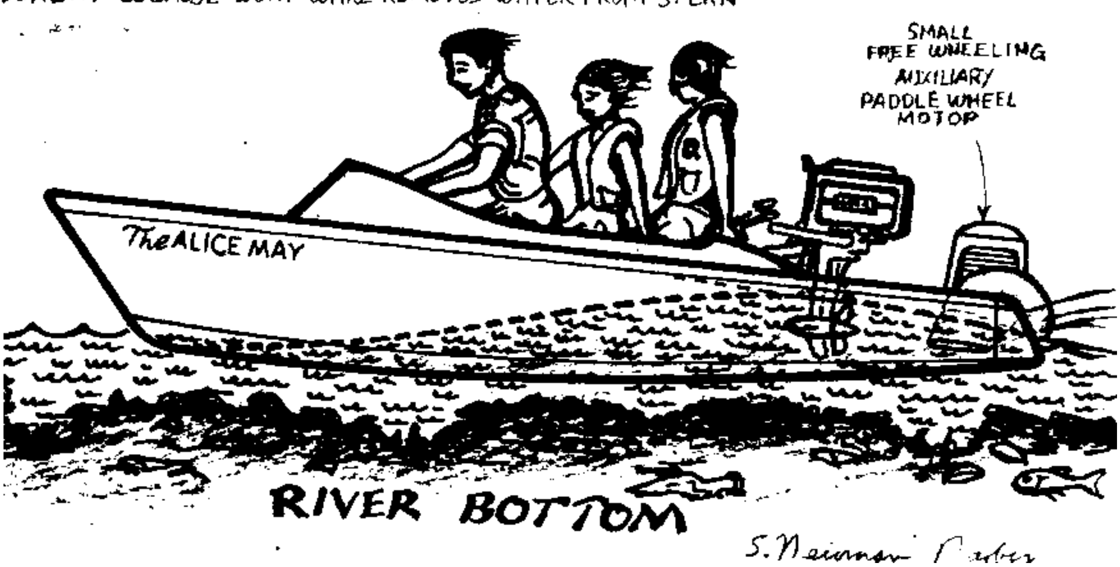
Note that with the hulls close together the sailors could put a leg in each hull and sit up like riding on a motorcycle. When hydroplaning in shallow water, it is important to be able to sit up front high like this so you can see rocks, logs, sunken boats, etc. The two hulls were pointed at both ends with a little rocker in the bottom so it could row easily and sail well. The big motor could take you far away, but sometimes it would just stop, and it was good it rowed easily!

The hulls of *Alice May* were close together so they could form a high mound of water at the propeller. This way the boat could run in very shallow water. The motor mount was adjustable so it could be lowered in rough seas to prevent cavitation when the boat jumped out of the water. In most inland wave conditions, the propeller could be kept above the bottom of the boat.

The *Alice May* was 14 ft (4.2m) long, made of wood and could be carried on a trailer. We would motor in tight narrow rivers or when there was no wind; but when the wind blew, the fun started when we turned off the motor and hoisted the sails on the big water. It never tipped over, even in high winds; it was just a fast sailor. Later the hydrofoil slot was used to hold the paddlewheel unit.



Planing powerboats with outboard motors on the stern have their propellers very deep and they often cut or hit manatees, dolphins, alligators, whales or even swimmers. I live on a tidal waterfront in Florida, and have lost count of the motorboats and PWC jet boats we rescued because they drew too much water. The jet PWCs need about two feet (60cm) to start and about a foot (30cm) while going. Most motorboats need about 3ft (90cm).



A cutaway view of the *Alice May* shows the water mound formed by the wakes from the twin hulls. The hulls were close enough so the mound was high enough at the propeller so it could be well above the bottom of the boat. The draft when going would be about $4^1/_2$ – 7 inches (12 – 18 cm) depending on load. The water was squeezed up, not sucked up like today’s PWC water jets, so it never picked up rocks or shells.

The small paddlewheel could also act as a brake.

Alice May could seat two riders like a motorcycle. It also had removable jump seats on the side for others. It could hydroplane with two people with the 25 hp Mercury two-stroke motor. The two hulls had flat bottoms so they act like two big water skis. I did not have enough money to buy a bigger motor which I am sure would have been much faster.

Over a period of seven or eight years we travelled hundreds of miles up through rocky swift and shallow rapids in the Susquehanna River in Pennsylvania. We *never* damaged a propeller or sheared a pin. On the river we would leave the sail rig behind because the trees and cliffs blocked the wind. Out on the big lakes and on Chesapeake Bay we would sail. I always enjoyed sailing the most, and still do.

S Newman Darby sailing Alice May *on Harvey’s Lake [Photo: Hal Raker]*

It is very dangerous to go more than 10 miles per hour in these rapids. Jet powered PWCs should not try this!

Alice May would tack upwind even in vary shallow water because the flat sides gave it the lateral resistance it needed. In high winds, it tacked even better because the water mound gave it as much lateral resistance as a deep daggerboard. The water came up against the boat instead of putting a centreboard down.

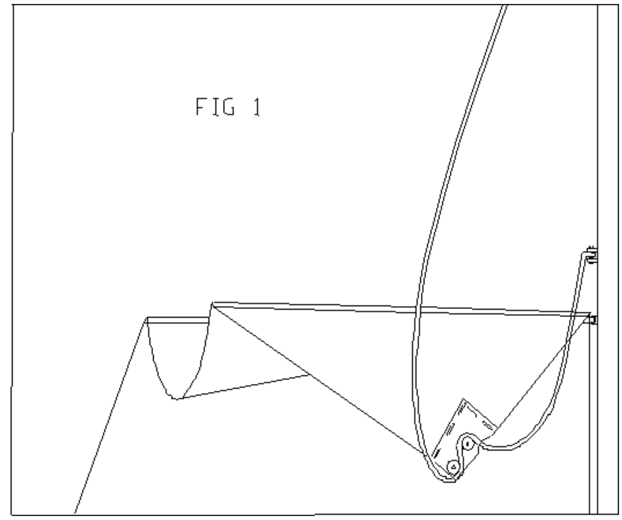
S Newman Darby
Jacksonville, FL32208

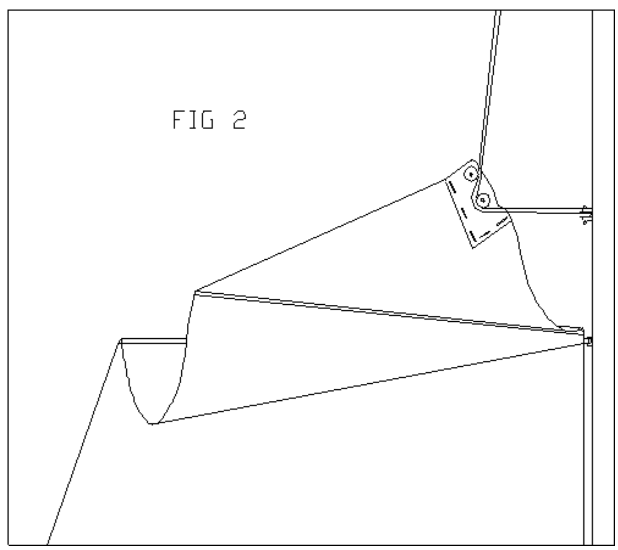
Automatic headboard for square headed sails.

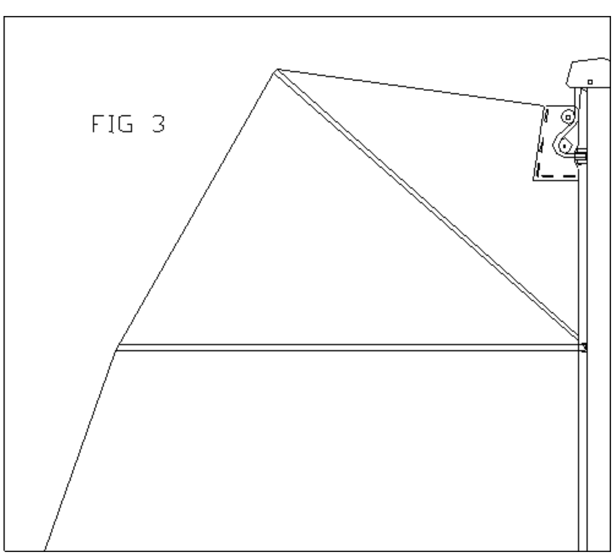
Jack Goodman

The majority of cruising catamarans suffer from too much weight and not enough sail area. The easiest way to increase sail area on a boat without a backstay, is to switch to a square headed mainsail. The problem is that square headed sails normally require installing or removing the top diagonal batten when raising or stowing the sail. While this is okay for the racer with a crew and a fairly low boom, it is not okay for short handed cruisers with a boom at eye level. When our catamaran became loaded down with a water maker, dinghy, and other miscellaneous necessities, we added a radical, square head sail that looks much like a gaff rig. The performance increase is spectacular, especially going to weather.

I collaborated with Dave Berig, of Dave Berig Sails in North East Pennsylvania, USA. We came up with a novel and trouble free head board, that automatically attaches and detaches itself from the mast when raising or lowering the sail. The halyard from the top of the mast goes through the headboard, around two pulleys and is attached to a special mast slug with a pin for the eye of the rope. The top pulley is there to keep the halyard close to the mast to reduce chafe when the sail moves from side to side. When stowed the headboard lies along side of the boom. When the halyard is pulled, the headboard moves to its place at the mast slug, and the sail is hoisted in the normal manner. After two years and four thousand miles of cruising, there is no chafe or other problems. The only difficulty is using the halyard for other things, like going up the mast. It is a little trouble to disconnect the halyard from the slug, and pull it through the headboard.







Jack Goodman is an inventor that lives on the Chesapeake Bay, and often winters in the south with his wife on their 35 foot catamaran.

Self-Stabilising, Variable-Geometry Kite Sail System

Dr J. G. Morley PhD

[In AYRS, we frequently observe that ideas have their time. No sooner does one inventor produce something but that we find others who, quite unknowingly, have been working on the same idea at the same time. David Duncan made and wrote up a dinghy with a captive kite sail in Catalyst No 7. Now we find that, quite independently, Dr Morley has been working on the theory of such sails. The two papers form an effective complementary pair, and we are glad to have both of them. - Editor]

Summary

The potential advantage of a Kite Sail system is well known. The sail is set at an appreciable angle to the vertical so that the aerodynamic force generated by it can be resolved into two components of comparable magnitude, one vertical and one horizontal. By a suitable choice of geometry heeling can be eliminated and the boat is partly lifted out of the water by the vertical force. This reduces hull drag. The sail forces can be increased up to the point at which the magnitude of the vertical component approaches the total weight of the boat and crew. At this stage the drag of the hull becomes negligible, the residual hydrodynamic drag being generated by the resistance of the keel and rudder. Very high boat speeds are therefore potentially available A theoretical analysis has been carried out which indicates that the speed of a "Tornado" catamaran could be increased by a factor of two over a wide range of course angles by the use of a kite sail of the type described here.

These characteristics have indeed been observed in a full-scale system[1]. It is reported that, at a particular apparent wind speed, the experimental design in question would accelerate and become virtually airborne with a six-fold increase in boat speed. As the boat speed increases so does the apparent wind velocity and thus the vertical lift generated by the sail. If the corresponding reduction in hull drag (due to the reduction in displacement) is greater than the corresponding increase in hull drag (due to the higher boat speed), then the boat speed will continue to increase until the drag of keel and rudder equals the forward component of the horizontal sail force.

Although the sail geometry was arranged to be adjustable in this early design, it is reported that it suffered from serious control problems due to "its unpredictable response to gusts from the wrong angle" This issue is clearly of vital significance in the successful practical application of the concept.

The design described here meets this need by incorporating self-stabilising features which enable the sail to respond automatically to changes in wind velocity and direction. This requirement has not previously been addressed. The theoretical analysis outlined here has been confirmed experimentally using one tenth scale models of the sail subjected to steady air flow and turbulent air flow conditions. The design described here is very simple structurally and is based on existing technology. One patent has been granted a second one is pending.[2]

[1] C A Marchaj pp. 725 - 727 in Aero- Hydrodynamics of Sailing, Second Edition, Adlard Coles Nautical (London) 1993

[2] UK Patent No 2,341,371 Wind Powered Vehicle, has been granted. International (PCT) Application No PCT/GB 2002/003683 ex GB Patent Application No 0208206.6 is in hand.

Outline of the Design

In its simplest form the structure consists of a vertical mast about which the sail and boom can rotate freely. A batten supports the foot of the sail and is attached to the outer end of the boom. [Fig. 1]. The sail is inclined at about 45 degrees to the vertical and can be rotated about an axis defined by its upper point of attachment to the mast and its lower point of attachment of the batten to the boom. If this axis passes near to the Centre of Effort of the sail the forces required to rotate the sail about its own axis are not excessive.

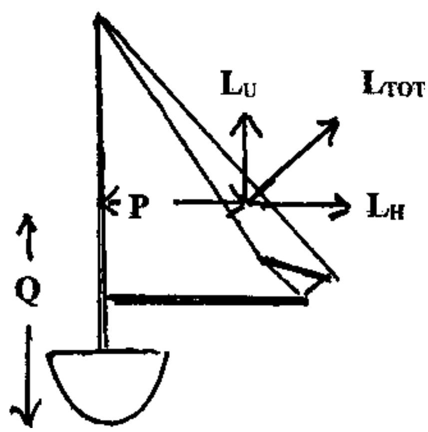


Fig 1

Action of the Sail

The apparent wind produces an aerodynamic force on the sail perpendicular to the plane of the sail and to the direction of the apparent wind. In Fig. 1 this is designated L_{TOT} and can be considered to be acting at the Centre of Effort of the sail. L_{TOT} can be resolved into two components - L_U acting in a vertical direction and L_H acting horizontally. L_H is used to propel the boat through the water. Since L_H acts at the Centre of Effort of the sail, which is some distance above the water line, it produces a heeling effect. This can be balanced by the righting effect due to the vertical component, L_U. Balance will be achieved when L_U times P equals L_H times Q. [Fig. 1] The elimination of the heeling effect is independent of the relative alignment of the sail and the hull and thus operates on all courses. The vertical force generated by L_U partly lifts the boat from the water thus reducing hull drag.

The action of the sail in reaching its equilibrium position in rotation about the mast is illustrated in Fig.2. We first consider the batten aligned parallel to the boom. [Fig.2a]. The sail now functions as a wind vane and turns the boom downwind. V_A indicates the direction of the apparent wind. Only the aerodynamic drag force, D, is operating. In Fig.2b the sail is shown rotated about its own axis by a small fixed amount, ϕ, in a clockwise direction. A side force, perpendicular to the direction of the wind, will now be developed on the sail in addition to a drag force acting parallel to the wind direction. The side force on the sail causes the boom to rotate in an anticlockwise direction about the mast. Since the batten is set at a fixed angle, ϕ, to the boom, the angle of incidence of the sail, α, falls as the boom rotates thus reducing the aerodynamic side force on the sail. It follows that the boom will rotate to an equilibrium position at which the couple generated by the side force, tending to rotate the boom in an anticlockwise direction, is balanced by the couple produced by the drag force, tending to rotate the boom in a clockwise direction.

If the angle, ϕ, is increased further to a new setting, the boom will rotate further to a new equilibrium position and the angle of incidence of the sail, and correspondingly the aerodynamic force generated by it, will increase. (See Fig. 2c). The rotation of the boom will reach a maximum value when the corresponding angle of incidence, α, is such that the lift to drag ratio of the sail has a maximum value. This depends on the sail characteristics but will generally produce a rotation of the boom of between 70 and 80 degrees from the wind vane position. Further increases in ϕ will increase the value of α at equilibrium but will reduce the amount by which the boom has been rotated if the lift to drag ratio of the sail is now reduced.

In Fig.2d the boat is shown in elevation looking downwind. The configuration corresponds to that shown in Fig.2c. The sail makes an angle approaching 45 degrees to the vertical so that the heeling effect can be balanced by the righting effect as outlined above. It is apparent that this situation will be maintained as the wind direction changes because of the corresponding rotation of the sail assembly about the mast to the new equilibrium position. The horizontal component of the aerodynamic force on the sail acts approximately along the line of the boom and is used to drive the boat forwards with the conventional use of keel and rudder. The vertical component is used to eliminate the heeling effect and to reduce the boat displacement and hull drag.

In order to change tack the angle ϕ is reduced to zero so that the sail returns to its wind vane

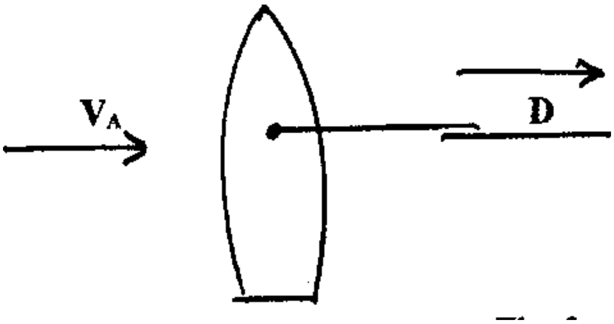


Fig 2a

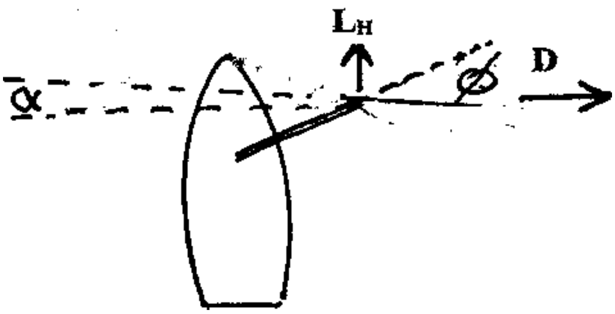


Fig 2b

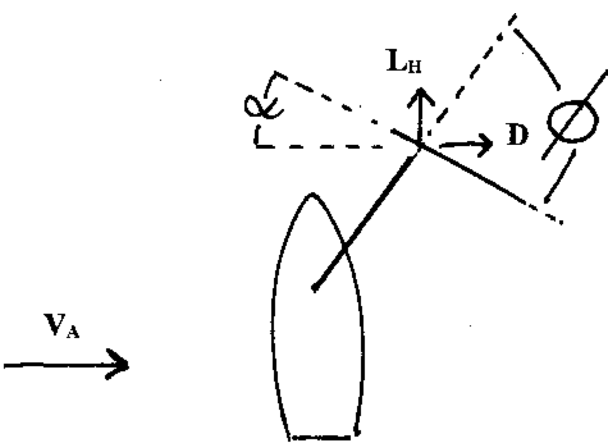


Fig 2c

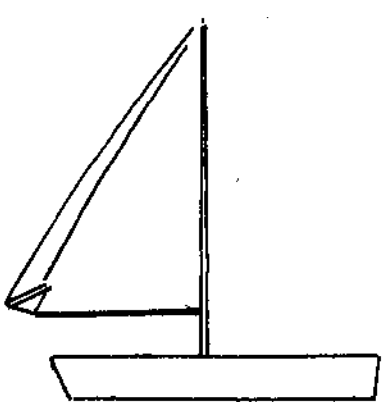


Fig 2d

configuration. If the sail is now rotated about its own axis in the opposite direction to that previously considered, the sail assembly will now rotate about the mast in a clockwise direction to a new equilibrium position. A course can now be set on the opposite tack by the conventional use of keel and rudder. The factors controlling the equilibrium position of the sail assembly, with respect to the apparent wind, apply equally to upwind and downwind conditions. On downwind courses the aerodynamic drag on the sail contributes to the forward driving force. The sail assembly thus maintains register with the apparent wind whilst the boat is sailed on various courses. In appropriate circumstances the sail can be used, in effect, as a spinnaker.

Because the heeling effect is eliminated, the sail force (sail area) can be increased up to the point at which the vertical component of the sail lift L_U approaches the total weight of the boat and crew. The sail is arranged to be self regulating to prevent the development of excessive lift. Since the sail automatically maintains a constant angle of incidence to the wind, fluctuations in the direction of the apparent wind do not induce changes in L_U. However fluctuations in the velocity of the apparent wind would induce changes in the values of L_{TOT} and L_U. This can be controlled by arranging for the angle of incidence of the sail to fall as the values of L_{TOT}, L_H and L_U increase. A convenient way to achieve this is to arrange for the main sheet to be elastic so that it extends under load so reducing the angle of incidence of the sail. The elastic characteristics of the main sheet need to be such that a large increase in wind velocity results in only a minor increases in L_U. *[This is discussed in greater detail in a mathematical appendix, which Dr Morley provided but we do not have space to publish here - Ed].*

A Practical Design

Various structural arrangements to meet the above requirements are possible. One such is shown in Fig. 3. For clarity only the basic features are given. A large windsurfer sail is mounted on a small catamaran but could equally be used with a small sailing dinghy. The head of the sail is attached to the mast by a flexible joint. The boom is articulated being formed from two triangular components having a common base which forms a bearing. The triangular sections provide some flexural stability. The apex of one section is jointed to the base of the mast that of the other to the foot of the main spar

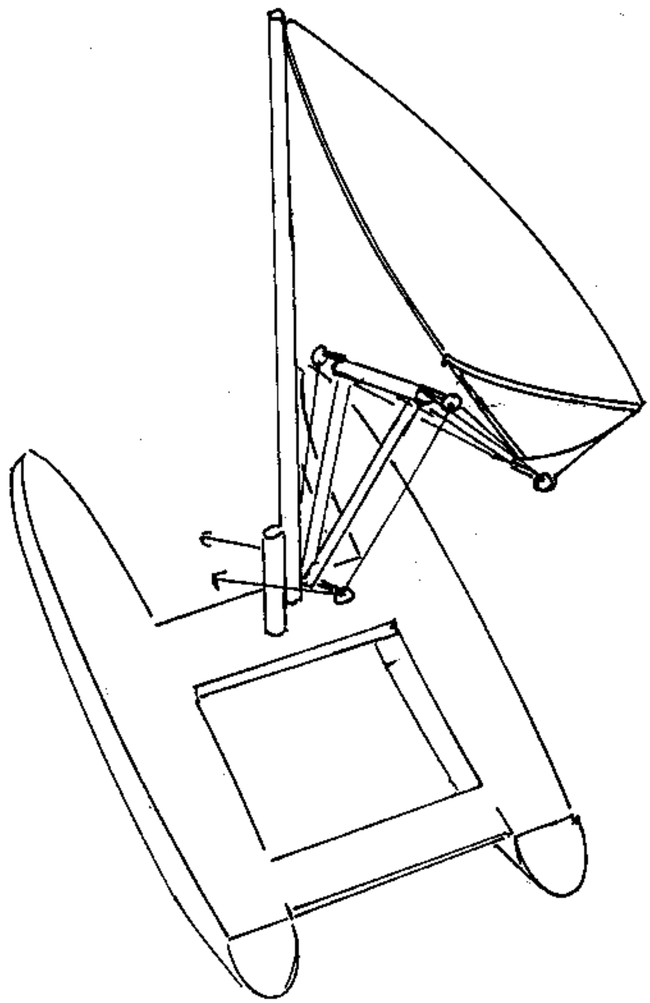


Fig 3

of the windsurfer sail. The two sections of the boom are of different sizes so that they can nest inside each other when folded thus allowing the sail arrangement to be transformed into a conventional rig. Calculations show that this would be preferable in light winds when the vertical lift which could be generated by the sail is insufficient to reduce the hull drag significantly. Under these conditions heeling is not a problem. The sail will be raised at higher wind speeds and the two sections of the boom will become more in line. This movement can be resisted by an elastic strop (not shown) so that the amount by which the sail is raised is governed by the aerodynamic load applied. In this way the proportion of the sail force utilised in the righting effect can be made to increase as the magnitude of the sail force, and heeling effect, increases. The aerodynamic force on the sail will be carried primarily by the articulated boom, the elastic strop and the main sheet so that the mast is called upon to resist little more than the gravitational weight of the sail. This facilitates the use of an unsupported mast. Fairleads are provided on each side of the points of articulation of the boom. These carry two mainsheets, one on each side of the sail. By this means the lengths of the mainsheets are unchanged during articulation of the boom. The sail is rotated about its own axis by hauling in one or other of them. Arrangements can be made by which the proportion of the sail load carried by the main sheets can be minimised in order to facilitate control of the sail.

It is proposed that the mast be mounted on a vertical assembly consisting of two concentric tubes separated by appropriate bearings. The centre tube is attached to the hull of the boat; the mast is attached to the outer tube. When sailing single handed it is clearly necessary for one individual to control both sail and rudder. This individual could be located conventionally at the stern of the boat or supported at the foot of the mast. In the latter position he would balance the gravitational weight of the sail. In either position the centre of the bearing supporting the mast provides a convenient passage for the control lines either of the sail or the rudder.

TABLE 1

Course Relative to true Wind	40°	60°	80°	100°	120°	140°	160°
Experimental Observations	0.82	1.175	1.37	1.39	1.3	1.0	0.6
Predictions, V_T=15 ft/sec	0.75	1.1	1.3	1.3	1.14	0.9	0.6
Predictions, V_T=30 ft/sec	0.6	0.86	1.14	1.28	1.3	1.0	0.6
Predictions, V_T= 40 ft/sec	0.45	0.68	0.9	1.1	1.26	1.12	0.6

Theoretical Analysis

A theoretical analysis of the expected performance of a kite sail driven boat of the type described here compared with the same boat using a conventional sail has been carried out. These studies have been based on the "Tornado" catamaran. The objective of the first part of the study was to verify that the analysis used was capable of predicting with reasonable accuracy the actual performance of a "Tornado" rigged conventionally. Published data[3] on sail and hull characteristics has been used in the analysis. Precise figures for the "Tornado" were not available to the author but the values used are thought to be reasonably representative. Table 1 gives the predictions of the analysis for various wind speeds and various courses compared with experimental data on a full scale catamaran. This was obtained at boat speeds ranging from 15 ft/sec to 20 ft/sec. The boat speed is expressed as a proportion of the true wind speed. At low wind speeds, similar to those used in the test, the predicted values agree quite well with actual performance figures. They are about 10% less than the experimental values. At higher wind speeds it was necessary to assume a lower angle of incidence for the sail to prevent overturning and the relative speeds are lower. Experimental data for these wind speeds was not available. The theory seems adequate to provide a preliminary assessment of the situation, particularly as it is being done on a comparison basis. It has been used to deal with the kite sail driven boat, the modifications required in the computation being of a simple geometric nature.

[3] C A Marchaj pages 41, 82 - 87 and 550 in Aero-Hydrodynamics of Sailing, 2ndEdition, Adlard Coles Nautical (London) 1993

There is some uncertainty about the hull hydrodynamic resistance values at the high speeds predicted since no data was available to the author for these conditions. Calculations were based on a linear extrapolation of data for skimming form resistance. However the hydrodynamic resistance of the hull is only of minor significance at high boat speeds, most of the resistance being generated by the keel and rudder. Because of this the assumed area of the keel has been reduced from an estimated 5 sq ft for the standard "Tornado" to 2 sq ft for V_T =30 ft/sec and 1 sq ft for V_T =40 ft/sec for the predictions set out in Table 2. Further increases in boat speed above those indicated are predicted if the optimum keel area is used.

The computation predicts substantial increases in boat speed over a range of courses, particularly at higher wind speeds. The same sail area was used in the calculations for both the conventional rig and the kite rig. Since the kite rig eliminates the heeling problem, it seems reasonable to suppose that a larger sail area could be used with the kite sail giving further increases in boat speed over those indicated.

Experimental Studies

The behaviour of various model sail assemblies has been investigated in order to verify the validity of the theoretical analysis. These have been about 1m in overall dimensions and are therefore about 1/10 scale. They have been subjected to both steady air flow and turbulent air flow air conditions. Both rigid airfoil sectioned blades and cloth sails have been used. Radio controlled servo systems have been used to adjust the angle ϕ, see Fig 2, so that the tacking procedure could be verified as feasible. The angle was seen to vary with changes in ϕ, as predicted by the theory.

TABLE 2

Course Relative To True Wind. (Degrees)	Wind Speed 30 ft/sec. Boat Speed. ft/sec		Wind speed 40 ft/sec. Boat Speed. ft/sec	
	Conventional	Kite Sail	Conventional	Kite Sail
40	16	16	15	15
50	22	22	20	34
60	26	32	24	45
70	30	42	27	53
80	34	49	32	59
90	36	56	37	64
100	39	60	40	67
110	41	58	43	70
120	40	45	46	73
130	35	35	46	74
140	27	27	38	47
150	23	23	31	31

The Spar Buoy or A Thought Experiment in Flotation and Stability

Frank Bailey

I have seen quite a few can and nun buoys and also some other strange shaped buoys in Canada, but I have seen very few spar buoys. As you probably know, they are essentially a long pole weighted on one end that sticks up out of the water to a considerable, visible, height, and is marked appropriately. Although this subject may be a bit far afield from "Yacht Research", nonetheless, it offers an interesting thought experiment involving the relationships between displacement, density, center of gravity, and center of buoyancy,

While envisioning a log floating horizontally on my sailing grounds, I asked myself what would be the minimum weight to add to one end of the log to make it stand vertically. For simplicity's sake, see Sketch 1, which could be a floating object say 10 feet long and 1 foot square in the end view. We will also assume it will not roll around its long axis. It will float as shown at a draft such that the displaced water will equal the weight of the spar. As long as we have some freeboard, the spar will float. The less freeboard, the greater will be the specific gravity and density of the spar. The spar is in stable equilibrium since if we push one end of the spar down momentarily, it will return to its original position. The center of gravity of the spar is in the middle of the spar (and does not move) and the center of buoyancy moves to right or left causing a righting moment, thus stability.

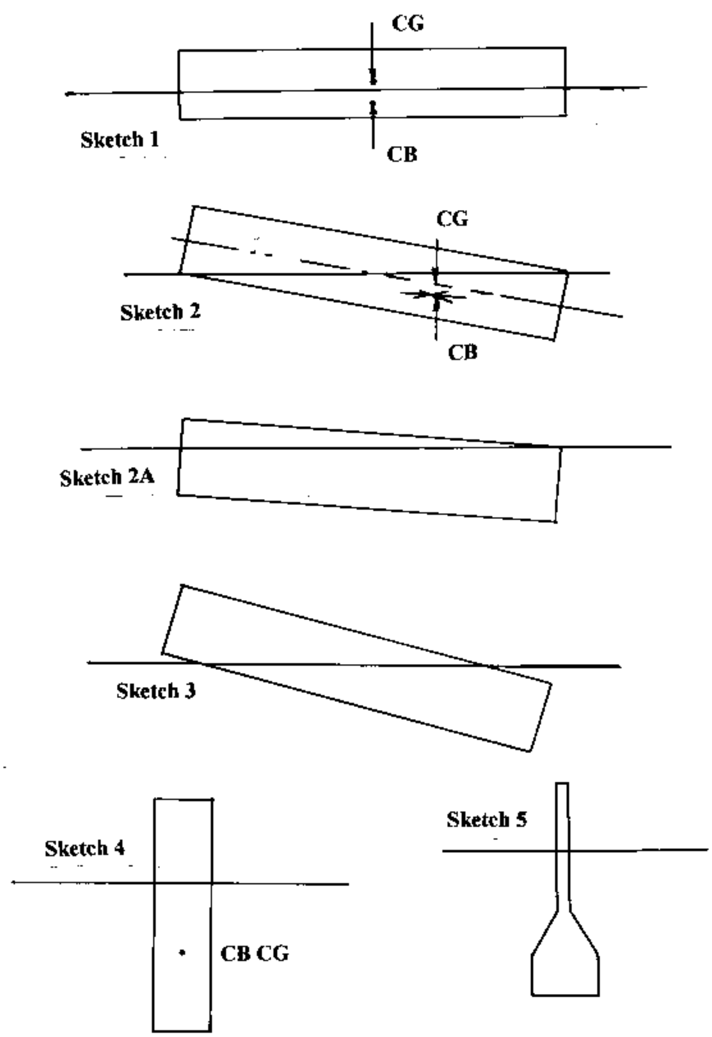
We will try to make our spar stand vertically in two steps. The first step will be to add a weight to the right end of the spar such that it will float as shown in Sketch 2, that is with the left end of the spar just emerging and the right end just submerging. This additional weight is added at the end of the centerline of the spar. It is realized that now the center of gravity of the spar has moved to the right on the centerline a certain amount depending on the weight we have added. It might also be apparent that if the spar weight itself is something more than shown in Sketch 2, the left end bottom edge could be a bit under the surface as in Sketch 2A. This may not be readily apparent but I believe it is true. So, for this spar to float as shown in Sketch 2, the density of the spar must be of a certain value and have some relationship to the added weight. We are not 100% sure this position is stable but we will for the moment assume it is, that is, the center of buoyancy can move, say, to the right or left for a restorative force. We might also note that the submerged part of the spar takes the form of a simple triangle so that if we wished we could find where the center of buoyancy was mathematically fairly easily. It is where the lines from any apex drawn to the midpoint of the opposite side meet. Thus we could visualize that the CB is below the CG. It is not necessarily a bad thing that the CG is above the CB perhaps. Indeed, it is quite common.

We can continue to add weights to the right end such that the spar might float as shown in Sketch 3. Now we are very uncertain if this spar can be in equilibrium when floating thusly. The center of gravity has shifted again to the right but we can get no clear idea where the center of buoyancy is and thus no idea if there is a righting arm available.

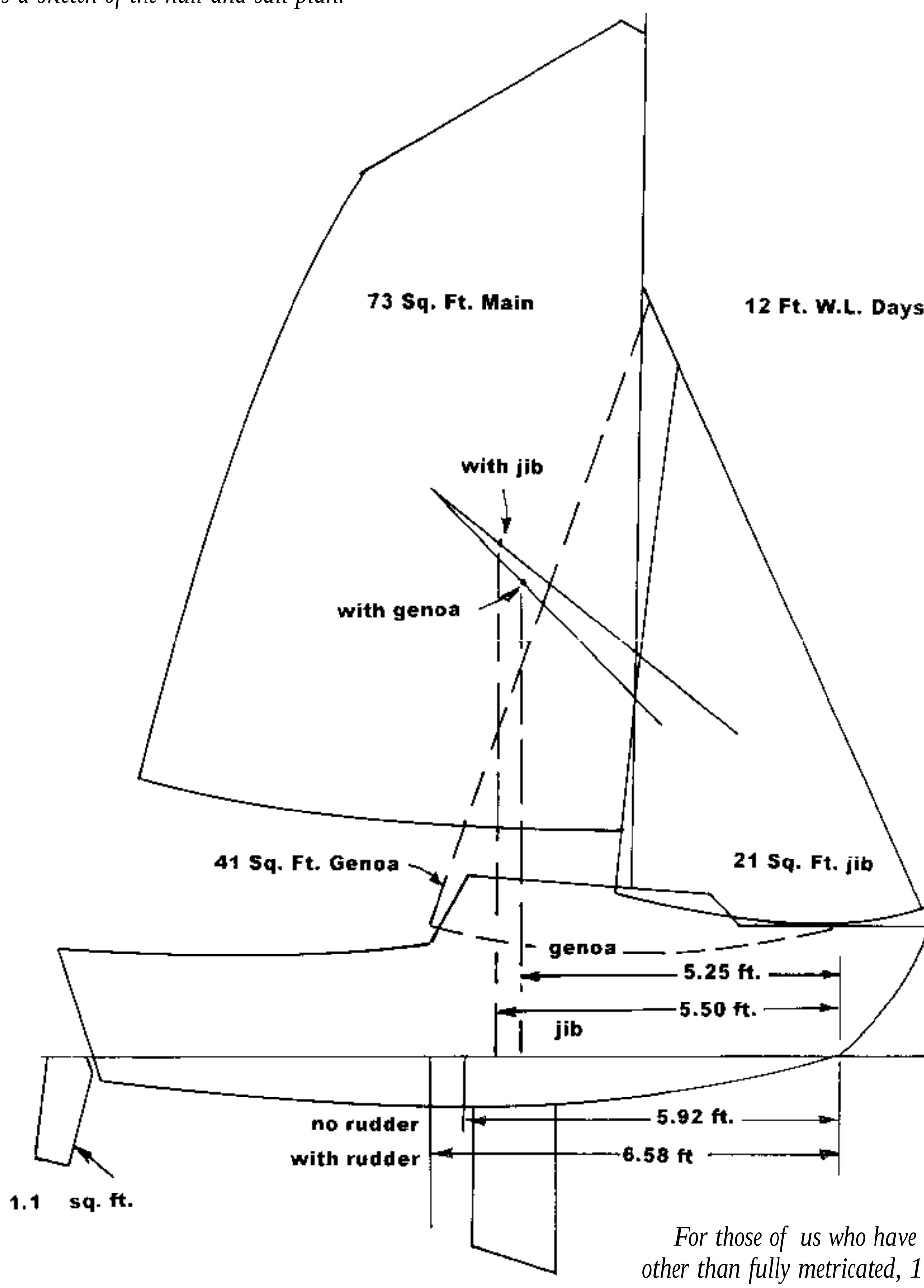
Finally, we realize that if we add enough weight, the spar will plop into a vertical position as shown in Sketch 4. That is, the geometry is such that there is no more righting arm available for sure. We could add enough weight to the end to make sure that the CB is above the CG but then this I posit would not be the minimum weight to add to make the spar vertical. Let us say the minimum weight to add is just enough to bring the new CG to the same point as the new CB. Can we not imagine that if the spar was standing vertically with only the two original weights and then we add a third weight to the bottom, the draft will increase, the CB will rise as measured from the bottom and the CG will migrate closer to the bottom and thus the two points can meet.

Any textbook on this subject will tell you how to figure out exactly the stability of each of the conditions above and will tell you how to find out the value of the righting arms, if any. The calculations are not difficult but wading through the geometry is tedious. I melded the arithmetic and the geometry along with an actual “spar”. My “spar” is 11x$^3/_4$x 3 $^3/_8$ inches. It is wider than deep to avoid it rotating during the experiment. It is a block of pine and I found it necessary to hollow out the block so that I could obtain a density of 20.75 pounds per cubic foot so that it would float according to Sketch 2. This is lighter than most woods. The spar was varnished (Spar Varnish — joke!) to avoid the wood absorbing water and the center of the spar has a flush plug of modeling clay to imbed lead shot to adjust the weight to the calculated weight as closely as possible using a gram scale. The other weights were calculated and turned out to be correct for Sketches 2 and 4. The weight of the block itself was 0.337 lbs. The weight added to float as in Sketch 2 was 0.168 lbs (interestingly half the original weight); and the final tipping weight was a mere 0.080 lbs. Sketch 2 and Sketch 3 turned out to be absolutely stable. It appears it might be possible to weight the spar so that it floats at any desired angle from the vertical perhaps to show direction of current flow but then we have the problem of the anchor cable weight, which is another can of worms. The end weights were pieces of lead weighed in water but weighing them in air would make only a very small difference. Even when working with these small dimensions and small weights, if the weights are very little different from those calculated, the spar will not float according to calculation and stability is easily affected. By this time, I was thoroughly tired of calculating. For you math whizzes, it is interesting to note that to figure out the draft of the spar as it floats in Sketch 4 involved two equations with two unknowns, that is the final draft and the final tipping weight. It can be noted that some interesting things happen when we double all the spar dimensions.

In these times of sailboards, centers of gravity in relation to centers of buoyancy might seem to have little value when there is hardly any displacement to reckon with. Nevertheless, once in a while we could review some basics to advantage. On the other hand, we can forget all of the above and make our spar buoy according to Sketch 5!



We were unable to fit these drawings into Frank's article on Sail Balance in the last Catalyst. On the left is the photo from which the hull lateral plane was traced, on the right are the cardboard cutouts and rectangles which were weighed to measure the areas. Below is a sketch of the hull and sail plan.



For those of us who have never been anything other than fully metricated, 1 ft is 30.6cm.

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@fishwick.demon.co.uk**

October 2003

4th - 11th Weymouth Speedweek
Weymouth & Portland Sailing Academy, Portland, UK, Contact: Nick Povey, tel: +44 (7713) 401 292; email: nick@speedsailing.com

8th AYRS Weymouth meeting
Speedsailing. 19.30 for 20.00hrs at the Royal Dorset Yacht Club, Upper Mall, Weymouth. Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX; tel: +44 (1727) 862 268; email: ayrs@fishwick.demon.co.uk

November

5th AYRS London meeting on *Ultimate Sailing with Philip Gooding* 19.30 for 20.00hrs at the London Corinthian Sailing Club, Upper Mall, London W6. Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX, UK; tel: +44 (1727) 862 268; email: ayrs@fishwick.demon.co.uk

December

3rd AYRS London meeting on *John Hogg Competition* 19.30 for 20.00hrs at the London Corinthian Sailing Club, Upper Mall, London W6. Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX, UK; tel: +44 (1727) 862 268; email: ayrs@fishwick.demon.co.uk

January 2004

8th - 18th London International Boat Show
New venue – EXCEL Exhibition Centre, London Docklands. Those who can give a day or two, from 15th December onwards, to help build/staff the AYRS stand (reward - free entry!) should contact Sheila Fishwick tel: +44 (1727) 862 268; email: ayrs@fishwick.demon.co.uk

17th AYRS Annual General Meeting
Venue to be announced!
Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX; tel: +44 (1727) 862 268; email: ayrs@fishwick.demon.co.uk. Additional notification has been sent to AYRS members in SE England, and will be available from the AYRS stand at the London Boat Show..

February

4th AYRS London meeting
Boat Design (methods & tools). 19.30 for 20.00hrs at the London Corinthian Sailing Club, Upper Mall, London W6. Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX, UK; tel: +44 (1727) 862 268; email: ayrs@fishwick.demon.co.uk

March

3rd AYRS London meeting
From sketch to realisation.
19.30 for 20.00hrs at the London Corinthian Sailing Club, Upper Mall, London W6. Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX, UK; tel: +44 (1727) 862 268; email: ayrs@fishwick.demon.co.uk

April

7th AYRS London meeting
Materials. 19.30 for 20.00hrs at the London Corinthian Sailing Club, Upper Mall, London W6. Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX; tel: +44 (1727) 862 268; email: ayrs@fishwick.demon.co.uk

25th Beaulieu Boat Jumble
Beaulieu Abbey, Hampshire - the AYRS stand will be in the usual place (so we are told!)

May

(Date to be confirmed)
Weymouth Warm-Up Week (Sailing Meeting) at Castle Cove Sailing Club, at the end of Old Castle Road, Weymouth; sailing in Portland Harbour, all boats welcome, but please note that neither AYRS nor the Sailing Club can provide continuous rescue facilities (just the RNLI), so please ensure that you and your boat are capable of looking after themselves. There will be a charge for temporary membership of the Club and use of their facilities (launching, changing room, showers, bar, etc). Contact: Bob Downhill; tel: +44 (1323) 644 879

October

2nd-8th Portland Speedweek
Portland Sailing Academy, Portland Harbour, Dorset UK. Contact: Bob Downhill; tel: +44 (1323) 644 879

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

On the Horizon . . .

John Hogg Prize 2003
Quatrefoil - Jon Montgomery
Gravity Shift Keel - M K Mitchell
Free Spirit, a trimaran for the less-able - Charles Magnan
Mini-Trimaran - S Newman Darby
Kitesail Power for the America's Cup - Dave Culp
Flying Proa - Roberto Rampinelli
More sources and resources: reviews, publications and Internet sites

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

Printed by Direct Image Systems & Communications, London N1 6DL.