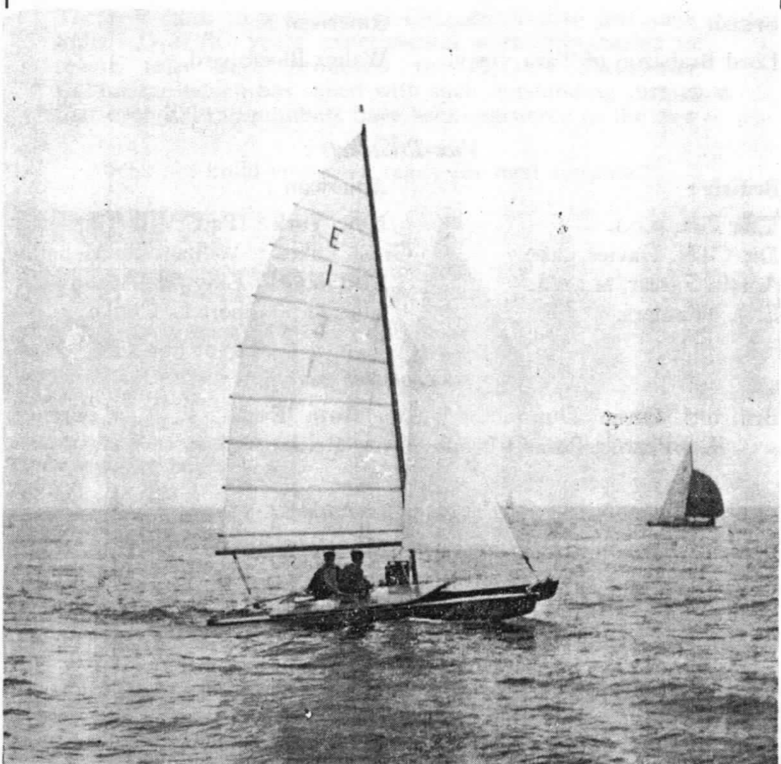
Douglas Harverson

CATAMARANS 1958

A.Y.R.S. PUBLICATION No. 22



ENDEAVOUR

CONTENTS

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EDITORIAL

December, 1958

I have recently bought another house but may not be moving into it for some months yet. The present address will still find me for some time as the Post Office will send on letters. The date when we move will be stated when this occurs.

My new house is set in five acres of woodland and there is a fast flowing stream. There is plenty of room for a wind tunnel large enough to test dinghies at full scale with a 20 foot mast and also for a test tank, either of the flowing water type or orthodox. The area is not scheduled for development under the " Town and Country Planning Act, " but I cannot think that either of these pieces of equipment could be included under " development " and permission to have them may be forthcoming.

If the A.Y.R.S. can get both a wind tunnel and test tank and also collect a library, we will have all the essentials for a " College of Yachting. " This could be housed on my property in a temporary set of buildings and, if it becomes obvious that such a " College " meets a need of yachtsmen, permanent buildings could later be erected in some place nearer the centres of English yachting, such as the Solent area.

A College of Yachting.

This could be the ultimate form of the A.Y.R.S. It would consist of :—

1. A wind tunnel.
2. A test tank.
3. A library.
4. Accommodation for members and their families.

Staff.

This would consist of " Director ", model making technician, editor, publisher, secretary and others. Some or all of these would be paid. Indeed, if anything more than a wind tunnel is put up at my house, such as a library, we will need someone other than myself to look after it.

Situation.

The permanent *College of Yachting* should be near enough to London so that lectures may be attended by people in the " Home Counties ". However, it should also be situated so that the families of the members can disport themselves in a wood or sea beach while the men carry out research. The temporary siting of the equipment or even the " College " near Folkestone meets all these needs except accessability. However, we will doubtless make mistakes in the construction of the apparatus and it will be better to do this on a cheaper scale than try at once for the full organisation (assuming that we could get the money to found the " College " right away).

THE IMMEDIATE ARRANGEMENTS AT FOLKESTONE

The Wind Tunnel.

This should be accompanied by a couple of small store rooms where members could sleep. Indeed, these should at once be made attractive enough for wives and children who could spend their time on the beach at Hythe about half a mile away, while the men do the testing.

Design.

The tunnel and store-living rooms would firstly have to be designed by the aeronautical members and it should be large enough to test at least a *Firefly* dinghy at full scale and preferably an International 14. I am not wise enough in these matters to prefer a " Sucker " or " Blower " tunnel but a choice between the two would be necessary. The fan could be driven by a Diesel engine and provision made for giving a wind velocity gradient and some " twist " to the air to simulate speed through the water.

When the aeronautical design has been completed, we would need the design redrawn by engineering and architectural members for presentation to the Ministry of Town and Country Planning, costing etc.

If we could have such a large wind tunnel, it would indeed be of great value to yachtsmen and it would, to my knowledge, be the first really useful wind tunnel available to the general yachting public for testing sails. Would members who wish to help in this most useful project please send me their ideas in time for discussion at the A.G.M. ?

The Value of a Wind Tunnel.

It might not be apparent, at first sight, just how a wind tunnel can help yachtsmen. But it will do this in two ways, first by helping the individual and secondly by increasing technical knowledge of sails.

A dinghy or catamaran sailor would trail his craft to the tunnel and be shown how to use it. He would then be given a paper with headings and columns on it for the various things to be recorded such as atmospheric pressure and temperature, windspeed etc. He would then record the course to the wind, angle of heel, thrust and side force until he had " sailed " on all courses and at all wind speeds.

Naturally, the yachtsman would learn how to rig his boat and trim his sheets to give the best figures. These figures could then be graphed and compared with those of other helmsmen with the same type of craft, thus letting him know how he compares with them. It is well to point out here that Sir Richard Fairey showed in a paper published in September, 1939 in *Flight* that a good helmsman will produce the best figures. Thus, the yachtsman will increase his skill by the use of the tunnel.

Duplicate copies of each test will be made and filed and would be studied by the more technical members to find the sail " coefficients " effect of windspeed and size of sail and many other things.

Because the objective of most yachtsmen is to win races and a wind tunnel would help them to do this, it is felt that such a tunnel will be continually in use and at the same time, it will be piling up information of a much broader nature.

Test Tank and Library.

These are not of such great urgency as the wind tunnel but we should also be considering how best to use the facilities available and whether a circulating water tank should be made before attempting the much more difficult orthodox tank.

Finances.

The Editors of the yachting magazines have already been approached and I have been advised that enough money will certainly be forthcoming from a public appeal, if it can be designed to cost about £500. At such a low cost, however, we would need some members to offer their services to do much of the erection work in a similar manner to that used by the Youth Hostels Association in its early days. However, if the appeal raises about £1,000, the whole wind tunnel should be put up for us.

MORE BURGEE DESIGNS

The final burgee design will be adopted by the A.G.M. in January next. Here are eight more to choose from. The first four are from G. Truzzi, Padova, Italy. No. 1 is a free interpretation of a trimaran system with lettering as the cross members. Colours : Black and white. Blue and white. Red and blue. No. 2 shows an interpretation of the symbol for infinity to convey the idea of endless progress. No. 3 is a " catamaran " system with colours green and white. Black and red. Red and blue. No. 4 shows the infinity symbol again, this time as a rope. Instead of the letters, a motto might be used such as " Why not, " or *Quaerere Verum* (" to seek the truth " Latin.)

The second four are more or less self explanatory and come from the late Peter Coley of New Zealand who was drowned in a tragic accident when taking two boys for a longshore sail. His catamaran capsized and he tried to swim ashore for help. One of the boys who

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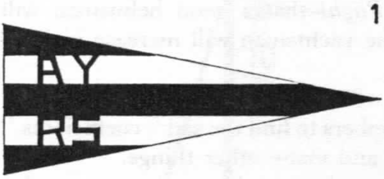

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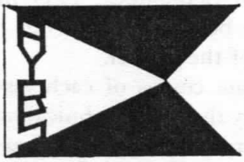

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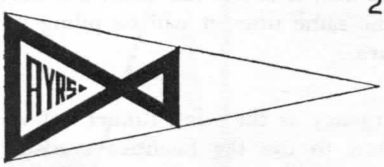

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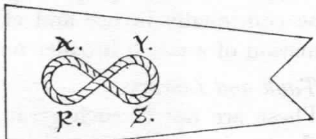
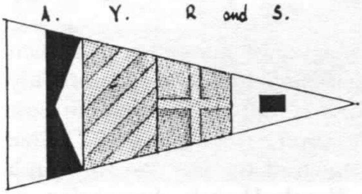
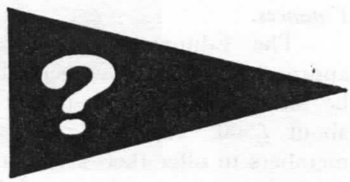
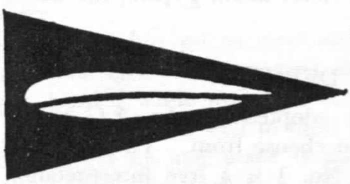
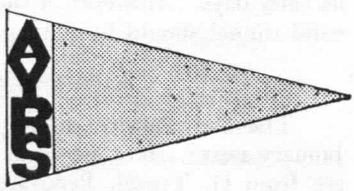


international code flags
A. Y. R and S.





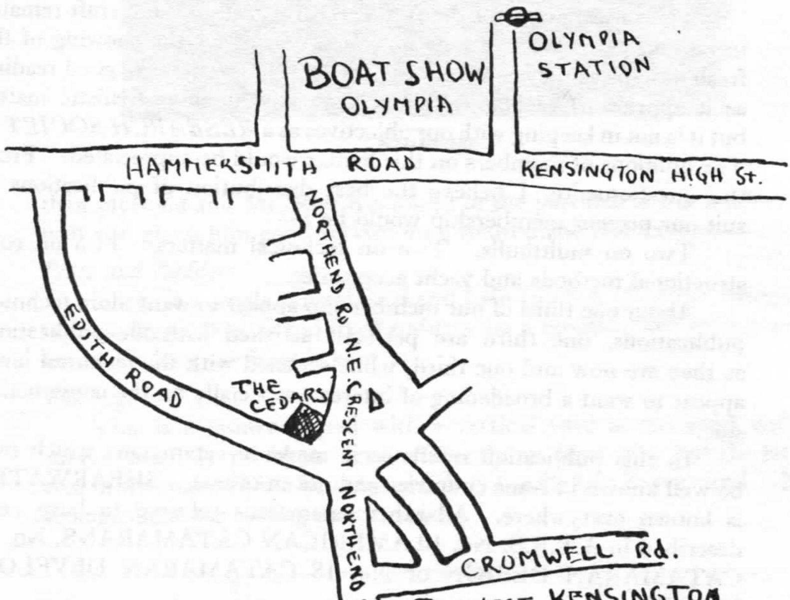




stayed with the boat, survived. The top left is a burgee with the International code flags A.Y.R.S. The top right symbolises general enquiry. The bottom left shows a " Hydro cum aerofoil " and the bottom right, initials and yellow burgee.

THE A.G.M.

The A.G.M. of the British A.Y.R.S. will be held on the first Saturday of the Boat Show, 3rd January, 1959 at 11 a.m., finishing at 1.30 p.m. at the " Cedars, " North End Road, near Olympia (see sketch map). Light refreshment will be available. Will all members wishing to come please let the Hon. Sec. Tom Herbert know so that the proprietor can have some idea of the number of sandwiches required. Matters for the Agenda can be sent at the same time.



THE BOAT SHOW

Our Stand at the London Boat Show is No. 216 on the top floor near where we were in 1957. We expect to be busier than ever this show but fortunately, I have managed to get the whole time off for it.

THE A.Y.R.S. AND MULTIHULLED CRAFT

From the answers to the questionnaire sent out with No. 21, it is obvious that the vast majority of our members are interested in multihulls, though some are definitely not. I believe also that many people would join us, if we could give more attention to other craft.

In this current year, we will have three multihull publications, namely, CATAMARANS 1958, OUTRIGGERS 1958 and, CRUISING CATAMARANS. From these three and what we have previously examined, all the essentials of the design of these craft will have been worked out so that any designer should be able to design one of these craft of any type and know that it will perform well. This was our original objective is taking up these craft for study and it has now been more or less completed.

The future policy of the A.Y.R.S. in regard to these craft remains to be decided. We can now only be a forum for the showing of the fresh designs as they come out each year. This will make good reading as it appeals to yachtsmen better than any other journalistic matter but it is not in keeping with our objectives as a *RESEARCH SOCIETY*. The opinions of members on this matter would be appreciated. From the questionnaire, I believe the best distribution of publications to suit our present membership would be :—

Two on multihulls. Two on technical matters. Two on constructional methods and yacht accessories.

About one third of our membership appear to want more technical publications, one third are perfectly satisfied with the publications as they are now and one third, while satisfied with the technical level, appear to want a broadening of interest, especially on the construction side.

In this publication reference is made to catamarans which may be well known in some countries and not in others. SHEARWATER is known everywhere. All other catamarans referred to have been described in A.Y.R.S. No. 10 AMERICAN CATAMARANS, No. 15 CATAMARAN DESIGN or No. 18 CATAMARAN DEVELOPMENTS.

INTRODUCTION

This is a collection of some of the catamaran designs which have so kindly been sent in by members and others. In fact, so many designs have been collected that there has not been room for them all in this publication but they will all appear either with OUTRIGGERS 1958 or CRUISING CATAMARANS. All the designs are interesting and most are excellent but we cannot have all the most interesting in one publication. Will all those people whose craft are not described here please forgive me.

The race results in 1958 seem to show that the most important speed factor in catamarans is weight, as long as the wetted surface is not excessive. As could be expected, the SHEARWATER III has consistently shown that it is as fast as any other catamaran and faster than most but in one hard wind race which I saw, the best SHEARWATERS were beaten by one well handled JUMPAHEAD. Now, though *Jumpahead* has some 20 or more square feet of sail area more than *Shearwater III*, the hull resistance could have been little greater. The *Mercury* catamaran, too, was equal first with a *Shearwater* in the Pevensey Bay Catamaran Cup Race, beating three other *Shearwaters* and two other cats in a hard wind. All these catamarans weigh about 250 pounds. Without exception, the heavier catamarans have been slower.

These race results show that while the *Shearwater* is still the fastest catamaran in all round conditions, she can be beaten by the chine catamarans in strong winds, though not often. The helmsman seems to be a far greater speed factor than the type of catamaran.

Larger catamarans are faster than the small ones and *Endeavour* is still the fastest of them all, as shown by the Cross Channel Race but Don Robertson's *Freedom* may prove equally fast. The *Yvonne* 20 (20 foot) appears to be faster than the local Australian *Shearwaters* but it seems to need a whole season's racing with a catamaran to get the best out of it and we will await next season's racing in Australia with interest. Reports of other catamarans which have beaten *Shearwaters* come in such as Ralph Flood's *Goer* (described later) which is 18 foot but the tests have not been quite conclusive.

MULTIHULL DESIGN

Shearwater III is still the best all round hull design for light and strong winds so what is written here can only be an indication of what *could* be better and what it might be worth while trying.

1. It might be an improvement to design a hull with semicircular sections, like those of *Shearwater* but with finer ends and fuller " midships " section. My *Tuahine* design (No. 18) has only one square foot more wetted surface than *Shearwater* and this and more could be saved with semicircular sections, instead of the right angled V. The drawback here lies in the fine bow which may dive too readily even though the crew move aft in strong winds. However, *Jumpahead* has even a finer bow so this cannot be of great moment.

2. The *Tuahine* hull shape may be faster than *Shearwater* as it is, if built to a weight of 250 lbs. When slightly heeled or flying a hull, it will have less wetted surface. However, no craft to this design has as yet been completed.

3. Both *Jumpahead* and *Mercury* are chined catamarans with a strong wind performance very similar to *Shearwater*. It would be well worth trying a compromise between their shapes and that of *Shearwater*.

4. *Freedom* by Donald Robertson is just such a compromise but she is 18 feet long. She finished only a few minutes behind Ken Pearce in *Endeavour* in the Cross Channel Race, thus proving that she was a very fast catamaran indeed. The main differences between *Freedom* and *Endeavour* are :

1. Greater rocker on the " keel " profile and thus finer ends and lower " prismatic coefficient ".
2. Greater midships section.
3. Much flatter sections aft.

The result appears to be a craft which is at least as fast, if not faster and one which puts about much more quickly. In spite of her finer bow, *Freedom* shows no sign of bow burying.

5. Finally, there is the compromise between the rounded right angled V sections of *Tuahine* and the planing type hull such as that of *Mercury*. The *Tuahine* shape would be carried back as far as the mid point of the L.W.L. and the after sections would be a little flatter than the right angle, possibly getting as flat as 10° from the horizontal, approximately the slope of *Mercury's* or *Gemini's* transoms. This might be the shape which would suit the home builder best, if we cannot make these hulls out of " over-developed plywood ". The plywood version of *Germini* has been partially modified towards this design but the greatest depth is a little farther forward than ideal to this system.

Overloading.

The *Shearwater* is very sensitive to overloading ; so much so, in fact that, in the Cross Channel Race, my *Gemini* design which was built by Norman Naish of fibreglass and hence weighed 400 lbs. was among the *Shearwaters* with three persons aboard, even though she had home made sails. The hull section which will be least affected by overloading is the " Sewer section " or the right angled V such as in the *Tuahine*. *Gemini* was less affected by overloading than *Shearwater* because her greater area of waterline plane did not allow her to sink so far into the water. Designing for overloading should be considered with cruising catamarans.

Summary.

Only a small percentage increase in speed is likely to be achieved by any modification of existing catamaran hulls ; possibly 1% at most. A slight improvement might be possible by flattening the after sections of the *Shearwater* hull, increasing the sectional area of the middle sections and reducing that of the ends. Hulls with a right angled V section forwards and flattening aft might also be fast. These suggestions are, however, only tentative and need not be correct in practice.

CATAMARAN WETNESS

It seems axiomatic that any fast craft will be wet and catamarans are no exception as will be agreed by anyone who has sailed them in a strong wind. However, the fine bow of the *Jumpahead* does not seem to throw as much spray over her crew as does the fuller bow of *Shearwater*. *Shearwater I* which had a finer bow than *Shearwater III* also seemed to cut through the waves rather than break them and was a drier craft. This is another reason why catamarans should have fine bows.

PLANING

So many people have disagreed with Walter Bloemhard and me in the question of planing with catamaran hulls, varying from those with *Mercury* cats (the best shaped for planing) to those with deep slicing hulls, that I have been rather shaken. In the meantime and till we have more definite evidence such as from a test tank when some of us will have to change our opinions, we must agree to differ. However, to many people " planing " means simply a sudden decrease in resistance and high speed and, if this is one's definition, then catamarans can plane. But this is not the technical definition which is that " planing " consists of dynamic lift from the water particles hitting the bottom of the craft at an angle of attack, whether or not there is a sudden decrease in resistance or even high speed.

MANOEUVERABILITY

The flatter floor aft, and indeed the slight tendency to have shallower hulls in general all make for greater speed in putting about. Not enough Ackerman angles have usually been used up to now and the following article shows how rudder efficiency can be improved by giving greater angles to the tillers.

DIFFERENTIAL STEERING FOR CATAMARANS

by

V. E. Needham

The account of Peter Coley's use of the Ackerman linkage for steering his catamaran in A.Y.R.S. No. 18 is very valuable but some of the alternatives of this linkage and the principles of its design may enlarge the picture.

When a vehicle designer starts to lay out his steering linkage, he commences by angling the steering arms to the centre of the rear axle (Fig. 1), which is exactly the same in principle as intersecting the angles of the tillers of a catamaran at the centreboard. This gives a very good compromise of angles when the arms or tillers are short and the link comparatively long. On a motor vehicle, the ratio between the length of the arms and the connecting link (track rod) is of the order of 1 : 7 or 1 : 8 but in the case of the catamaran the ratio between the length of the tillers and the cross link would be more like 1 : 2. The effect of this is to angle the cross link rather rapidly in relation to a line taken through the rudder pintles, which exaggerates the Ackerman differential, (Fig. 2). This means that the inner rudder on a turn is given an excessive angle relative to the outer rudder and thus acts as a slight brake—a better fault than the reverse condition.

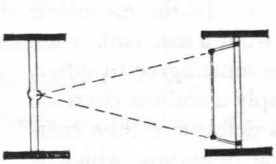


Fig 1

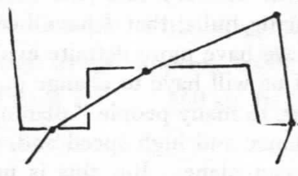


Fig 2

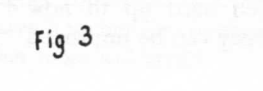


Fig 3

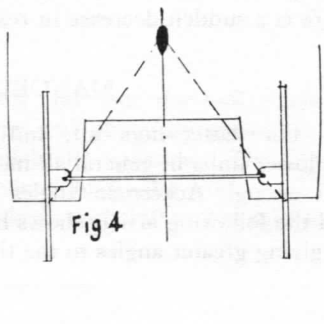


Fig 4

Put in terms of practical application, all this means that, if we point the tillers at the centreboard on a normally proportioned catamaran, we obtain pretty accurate angles on the rudders up to approximately 30° of angle on the weather rudder, after which the error is progressively exaggerated. On the other hand, if we reduce the angle of inset of the tillers by some 5° or 6°, we can maintain the correct differential angles within 2° from 0° to 50° movement of the weather rudder. As an instance of this, if I point the tillers on my catamaran *Genette* to intersect on the centre of lateral resistance, the angles of inset are 22/3/4° on each tiller and the lee rudder angles remain within 1° of the ideal up to about 35° movement of the weather rudder. At 50°, there is approximately 6° of error and because we have now passed the dead centre position between the link and the tiller, there is an error of 14° at 60° helm. After some study, I found that the best compromise for *Genette* occurred when the tillers were inset 17°. At this, the maximum error is only 2° through the arc of the weather rudder of 0° to 50° and, even after the dead centre is passed, the error is barely 7° at 60° of helm.

In the case of the motor vehicle, the cross link (track rod) remains more nearly parallel to a line taken through the king pins (Fig. 3) and therefore does not have the same foreshortening effect as with the tiller linkage of a catamaran and so the errors are much less. It would be possible to improve the catamaran linkage by moving it aft, locating the pivots within 6″ or so of the rudder pintles and on the centreboard to rudder pintles line, (Fig. 4). However, I find the cross link so useful and to hand at the inboard end of the tillers that I would prefer it there in spite of the accompanying errors.

WIND RESISTANCE

It is most important to reduce the wind resistance of catamarans and outriggers. I have heard of a catamaran with a strong, light lattice work bridge deck whose performance was poor but became good when the bridge deck was covered in at an increase of weight. Fairing and streamlining of struts, aft beams of cockpits etc., can be easily and cheaply done with expanded polystyrene, weighing 1lb. per cubic foot.

The only part of sailing boats which few people have made any attempt to streamline is the crew. I reckon that one person sitting on the side deck of a craft has a windage equivalent to about 16 square feet of sail area when close hauled, taking a side force to thrust ratio of 3.5 : 1.

CENTREBOARDS

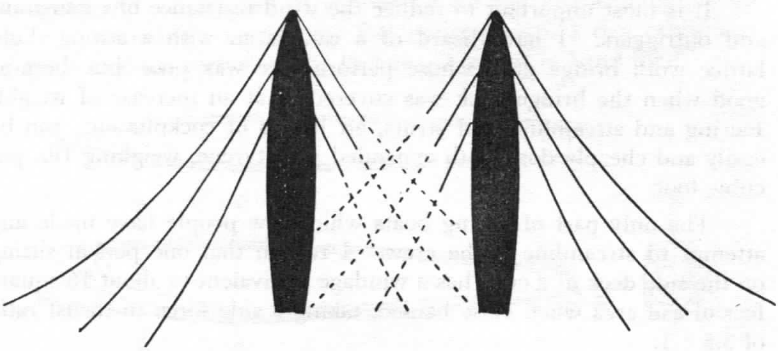
Roland Prout and others have proved that twin centreboards in each hull are better than a single central centreboard but hardly worth the cost of installing them in a one design racing class.

The long narrow hulls of these craft have a lot of lateral resistance in themselves, possibly two-thirds of the necessary amount needed to go to windward at greatest efficiency. Many people, who have tried angling their boards to abolish leeway, even in dinghies, have told me that they have not been successful and this is obviously due to overloading the board which has only been of normal size. It merely suffers from air entrainment or " stalling ". Centreboards in my opinion, should always be placed fore and aft, even in dinghies.

CATAMARAN HULL SPACING

The result of spacing the hulls of catamarans too widely apart is that a stern over bows capsize will occur before the normal sideways capsize. This is simply a matter of the relative stability in the two directions. If the lateral stability is greater than the fore and aft stability, the lee bow will bury and the craft will sail under before it will capsize. One cure for bow burying, therefore, lies in reducing the overall beam.

When the two hulls are too close together, on the other hand, there may be a strong " venturi " effect between them with a hollow, instead of a wave system. The water flow is speeded up in this hollow and the whole condition is one of greater resistance. It is aggravated by having asymmetrical hulls with the more curved sides *inwards* and minimised by asymmetrical hulls with the more curved sides *outwards*. If it is the intention, therefore, to have a very narrow overall beam for a catamaran, asymmetrical hulls with the greater



curvature *outwards* could be considered, which is the opposite of that usually used.

The Optimum Spacing.

The best possible spacing is, in my opinion, where the bow waves of each hull lie on the quarters of the opposite hull to lift it up and push it along. To achieve this, catamarans with bluff bows which throw off broader bow waves should be more beamy than those with finer entrances. Of course, considerations of stability take precedence over wave formation in considering beam, within reason.

HULL SHAPE AND SPEED

Up to 4 *knots.*

The best shape for a 16 foot boat is that with the lowest possible wetted surface. This means concentrating the buoyancy in the middle which will result in fine ends (low prismatic coefficient) or long overhangs as in the *Veloce* catamaran, described later. Exactly at 4 knots, the stern wave is giving the stern an even and nice push forward.

From 4 *to* 6 *knots.*

Again with a 16 foot boat, the stern wave has moved a little further aft and does not get such a good surface on which to push. It is therefore best to move the buoyancy more into the ends of the boat and reduce the overhangs. The extra fullness of the bow pushes off the bow wave a little farther forward bringing the stern wave also farther forward and the extra fullness aft gives a slightly better shape for the stern wave to push against. This is the " Destroyer " shaped hull which is used by the *Shearwater*. About 6 knots, the stern wave has moved aft to such an extent that its push has become negligible and heavy boats find that this is their top speed. Catamarans, however, possibly use their stern waves up to about 8 knots before it is lost.

Above 8 *knots.*

Again with a 16 foot boat, the stern wave is now virtually lost and gives practically no push at all. It is therefore useless to design the buttock lines with any " spring " and these should be almost straight. There is no point either, at this speed, to having a bow which will throw off a more forwardly placed bow wave. It should just be the most suitable shape to cleave the water and push it aside (and underneath) with the greatest ease.

At 16 *knots.*

According to the tank test of Professor Nutku, the resistance due to the surface friction at 16 knots is still 40% of the total so the fine bow which will push the water away gently is called for to reduce the wetted surface also. The stern should be fine also in terms of sectional area but it can be flattish on the floor to prevent " squatting " and give an easier flow to the water.

The Long Bow.

It has been shown by Professor Nutku that a model catamaran has less resistance with the largest section placed just aft of the centre of waterline length. The explanation of this is surely that the longer bow deals more gently with the water and has less resistance.

Bow Burying.

It would appear that we should have fine bows to the multi-hulled craft and this will reduce their fore and aft stability still further in relation to their lateral stability. The solution to this may lie in a medium forward overhang like that of the *Yvonne* 20 or my *Gemini* (both in No. 15). Incidentally, *Gemini* has far greater fore and aft stability than *Shearwater* but the extra weight and larger waterline plane might account for this as well as the forward overhang. However, Norman Naish likes the forward overhang in a seaway when he says that it takes the bow over the steep seas we have in Folkestone.

THE PATINES A VELA

by

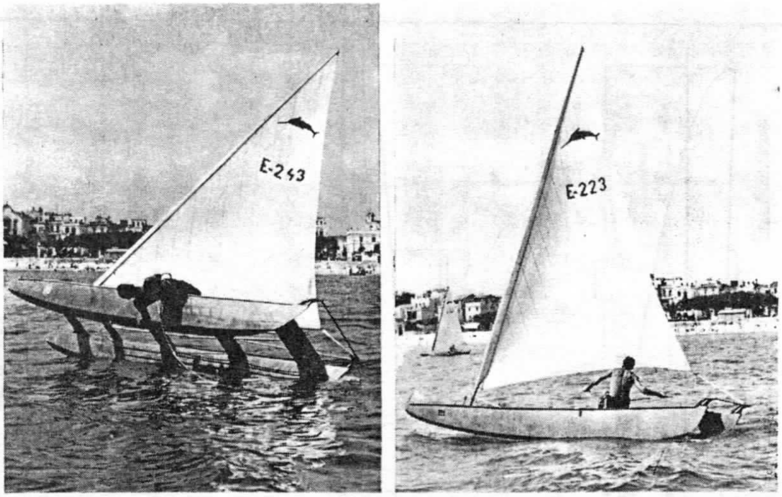
G. TRUZZI, PADOVA, ITALY.

L.W.L.	16′ 6″	Sail Area	120 sq. ft.
L.O.A. ;	18 feet	Hull Beam :	1′ 1″
Hulls Spaced :	4′ 3″	Hull Depth	1′ 7″
Draught :	1′ 1″		

Designer—Senor Carlos Pena.

This boat was designed ten or more years ago by Senor Carlos Pena for the Club Natacion de Barcelona (Barcelona Swimming Club) to rather unusual requirements. It was meant, in fact, to serve as a tender to the Club members who wanted to swim off those beaches where restrictions on swimming costumes were too drastic. It had therefore to be handy, light, cheap both in cost and upkeep and, above all, fast and stable, for the boat was to take the swimmer to the chosen spot quickly where it was left unattended for a while.

The result looks peculiar, though I think the hull design is clever and she would be very wet and hard to come about. When racing,

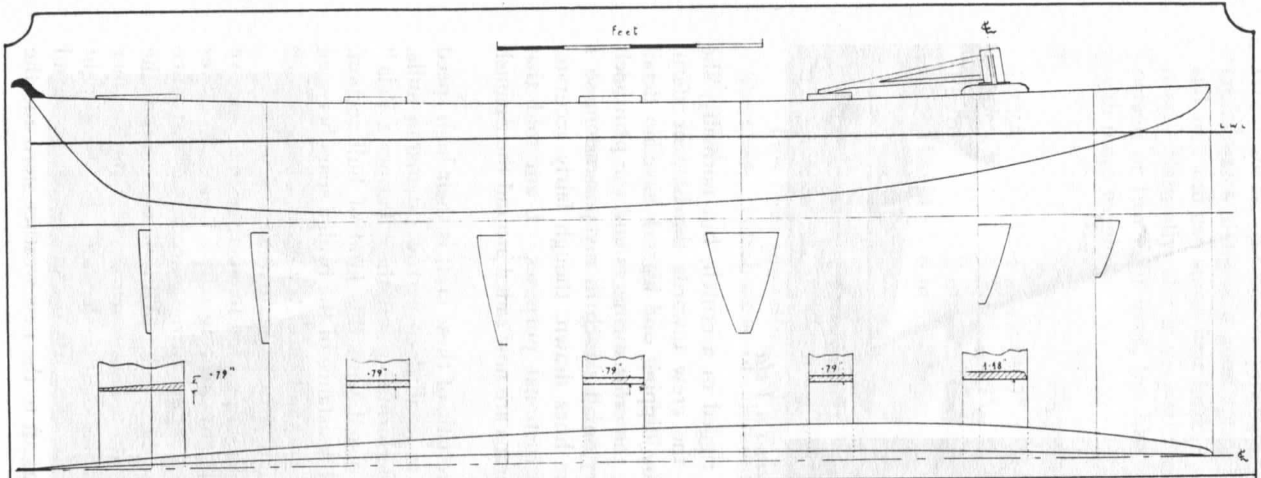


Patines a Vela

she steers with a steering oar rigged in a crutch, but normally, she steers by alternative shifts of the crew towards the bow or stern, often helping the manoeuvre by dipping one leg. I have no detail of her scantlings, excepting for the cross members and the plan itself had to be enlarged from a very small sketch in my possession, so I wish to stress the fact that the lines drawn, though fairly accurate, should not be used for constructional purposes. I am told that quite a number of these catamarans are now sailed around the Spanish coast.

Editor : The main characteristic of these craft is their high speed without any appreciable wash, as in all deep narrow catamaran hulls. This usually kills light wind performance but the "Patines a Vela" have less wetted surface than usual with this kind of hull section. Another feature is the low wind resistance of the bridge spars between the two hulls. This is much less than that of the conventional bridge as used in modern American and British catamarans.

Putting about seems to be a complicated manoeuvre but I believe it can be accomplished without any steering oar. The crew moves forward onto the weather bow. This brings the lateral resistance forward and the craft luffs into the wind. While head to wind, the momentum of the craft still continues the turn because the weather hull is pressed further into the water than the lee hull when the weight is out of the sail. As soon as the craft has passed the head to wind position, however, the crew runs aft to the new weather stern and the

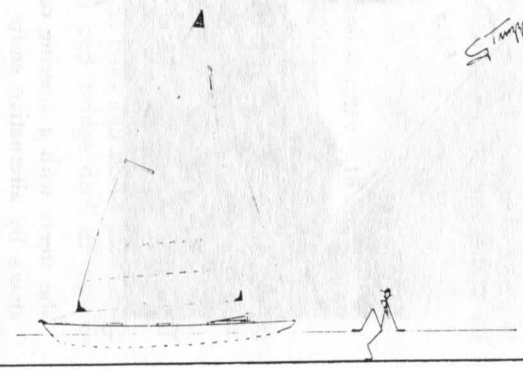


Sketch of Spanish

"PATIN A VELA"

L.O.A. 18 feet.

(hulls spaced 4 ft. 3 in.)



windage of the sail draws the head of the boat off onto the new tack.

Summary.

The Patines a Vela must be a most amusing craft to sail. They have several good design features and are the second largest catamaran class in the world today with over 200 craft, only being outnumbered by the *Shearwater III*.

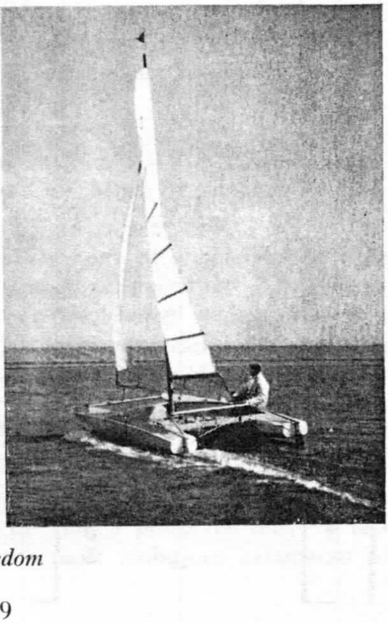
" FREEDOM "

L.O.A. :	18′ 6″	Draught :	7″
L.W.L. :	16′ 10″	Freeboard :	1′ 6″
Beam O.A. :	9′ 5″	Displacement :	585 lbs. + crew, say 350 lbs.
Beam (hull) :	1′ 10½″	Sail Area :	= 253 sq. ft.
Beam (hull L.W.L.) :	1′ 7″	main :	176 sq. ft.

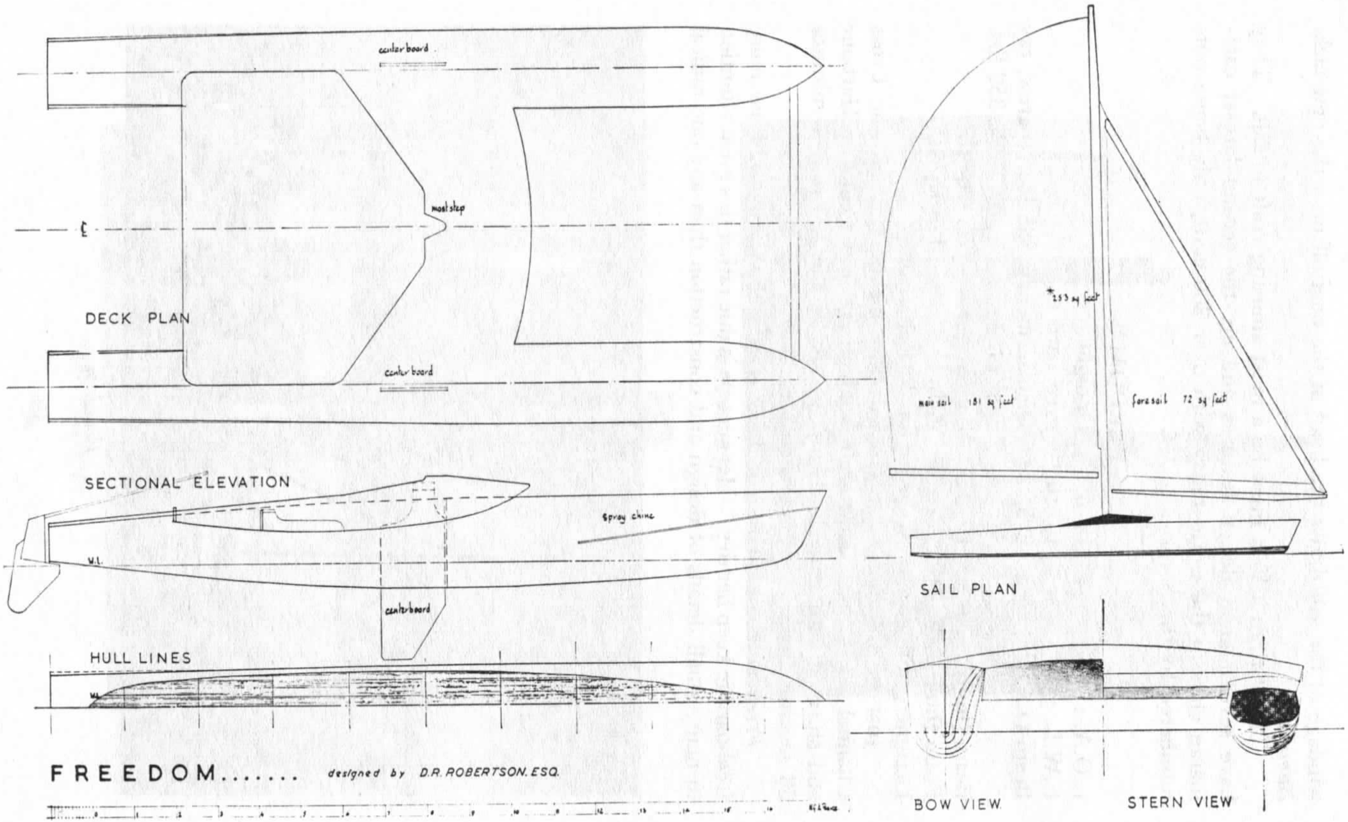
Designer, builder and owner : Donald Robertson.

Just before *Endeavour* crossed the finishing line in the Cross Channel Race, the second craft was coming into Boulogne Harbour and stormed across the line quite as fast as she and only 7 minutes 38 seconds behind. It was *Freedom.*

Freedom is not such a cut down craft as *Endeavour* and has more freeboard to keep her dry. Her success is due rather to a great attention to many small details of design and construction than any one radical



Freedom


center board
mast step
DECK PLAN
center board
SECTIONAL ELEVATION
Spray chine
W.L.
centerboard
HULL LINES
253 sq feet
main sail 181 sq feet
fore sail 72 sq feet
SAIL PLAN
BOW VIEW
STERN VIEW
FREEDOM.......
designed by D.R. ROBERTSON. ESQ.

alteration. Donald Robertson used to be a test pilot of aircraft and this training was clearly of the utmost value in *Freedom's* make-up as it allowed him to evaluate each feature as a separate entity while not losing sight of its overall purpose.

The Hull Design.

The hull differs from that of *Endeavour* in having a gentler sweep-up to the buttock lines aft with a slightly wider floor. Forward, the entrance is just slightly finer, leading back to a semi-circular midships section about the centre of the length. There are twin centreboards, one in each hull, which we know gives extra speed to windward but, of course, they were not used in this year's race as the wind was free throughout.

The Rig.

Freedom is kept in the River Alde and so it was felt that some kind of working jib would be a great convenience for short tacking. This took the form of a balanced jib with luff spar and boom, with a single sheet to the boom. However, this jib sits well without twist and is a far better sail, in my opinion, than the normal jib. I do not know whether it is better aerodynamically to have the luff of the jib to *Windward* of the centreline of the craft where it gets more of the properties of the " slat " of an aeroplane wing or to *Leeward* of the centreline where it tends more to have the properties of the upper wing of a bi-plane.

Handling.

Freedom puts about very quickly indeed. Donald feels that this is due to the flatter floor and shallower sections aft, an opinion of this feature shared by Arthur Piver.

Summary.

Freedom is a very fast craft which should be easy to manoeuvre in narrow waters. *Freedom* was only launched 10 weeks before the Cross Channel Race and had never been in salt water till the actual race itself. With more sailing and racing experience, we can hope that her performance will be still further improved.

" FREEDOM ", AN 18′ 6″ CATAMARAN

by

DONALD ROBERTSON

I designed and built *Freedom* after sailing my first catamaran *Snap* for two seasons. *Snap* was home built from two 18′3″ Shearwater moulded hulls and has proved a success. However, after studying both the water flow and general handling characteristics, I thought it would be possible to improve on her. My new boat *Freedom* has nearly the same overall dimensions, namely 18′ 6″ length 9′ 5″ beam, as I wished to be able to compare the performance of the two and incidentally use the existing trailer. The trailer is designed for loading the boat horizontally and by raising one side, the boat rides at an angle of about 60°. This reduces the width for trailing to 6′ 6″.

Freedom's hulls have more buoyancy than *Snap*, the radius of the semi-circle being 10″ instead of about 7½″. The reason for this is that when flying a hull the whole weight is on the leeward hull and the drag is greatly increased if it sinks beyond the semi-circular section. Each hull was therefore designed for a displacement of 765lbs. Unfortunately, the total weight with a crew of two was heavier than anticipated ($585 + (2 \times 170) = 925$ lbs.,) ; but additional weight, say a third crew member, improves *Freedom's* performance in a strong wind whereas in *Snap* a third member of the crew takes the edge off and she goes slower.

A further consideration for increasing the beam of each hull was to reduce the length to beam ratio from about 18 to 12. This is, I think, about the ideal ratio as it reduces the wetted surface and certainly *Freedom* appears to be fast in a light wind.

Snap was very sensitive to fore and aft trim when running ; unless the crew moved forward the transom dragged a lot of water. Also when close hauled the hull lifted forward and pushed the stern about 6″ below the surface. To minimise these two factors, the new boat was given a broad stern with a 10° deadrise rather like a speedboat, and the transom was lifted 1″ above the loaded waterline. *Freedom* runs more cleanly both slowly and fast and, in addition, the increased rocker on her keel has made her quicker in stays.

Whereas *Snap's* bows have a convex section, I gave the new boat a pronounced flare and also a finer entry. The angle either side of the fore and aft line is 10° instead of 13°. Both boats have spray deflectors which, in my opinion, not only keep the boats drier but give lift to the bow when reaching. The new boat does not bury her nose when reaching but when running in a steep sea, care must be taken not to go too fast.

Freedom has a dagger board in each hull slightly offset outboard from the centre line. This was done to avoid cutting and weakening the keels. The area of the dagger boards was increased by 50% over the lifting centreboards in *Snap* and this has made a very big difference going to windward. The original boards were of wood and fitted the slots exactly, but these broke and were replaced with aluminium alloy plates. These have proved satisfactory so far as strength is concerned, but when the plates are not loaded i.e. running, free, they are very noisy. The noise is a useful warning to the crew to pull them up but the problem of dagger boards has not been satisfactorily solved yet. One of the difficulties is that to raise or lower the leeward plate in a strong wind, the crew must go down to leeward and there is a danger of capsizing.

As the boat is normally used off a concrete hard, the rudders are made to lift. Originally wooden rudders were used but it was found that the slightest warping, which occured when the rudders were left in the sun, was enough to upset the balance of the boat i.e. weather helm on one tack, lee helm on the other. The metal rudder plates are water balanced to give improved directional stability and also to lighten the helm. These rudders have taken a lot of developing. *Snap* had four sets and *Freedom* is now on her second set ! Due to the speed of a catamaran the rudders are very sensitive for instance 20 strokes of a file on one side of the trailing edge is enough to upset the blance of the boat.

The tillers are angled inwards to give an Ackerman effect and the length and height above the bridge deck is such that the helmsman can steady the rudders with his knee. This is important as when sailing fast the helm cannot be left, and two hands are sometimes necessary to pull in the main sheet. The main sheet is run round a snubbing winch mounted high enough to give a horizontal pull. The runner on the wire horse can be controlled from two jam cleats mounted on the aft end of the bridge deck.

Freedom carries a lot of sail, 253 square ft. against 202 on *Snap*. However, before her new sails arrived *Freedom* used *Snap's* sails and it was found that with the same weight of crew she lifted a hull more easily. It is difficult to give any satisfactory explanation for this but it may be due to more plate area increasing the lateral resistance, although the feeling is that the increased buoyancy has something to do with it. A third crew member in a strong wind gives a feeling of confidence and of course provides extra power on the wind.

The rig used on *Freedom* was developed on *Snap* with the exception of the revolving mast which is a copy of Prout's Shearwater mast. I have tried a sloop rig, twin side by side masts, and a lateen rig with wishbone boom but came to the conclusion that a conventional rig with a large lifting foresail was the best compromise. Having, with a catamaran, overcome the loss of power caused through heeling, the next problem was to drive the boat forward without burying the bow. In an attempt to do this, the mast of *Freedom* was moved one foot further aft than on *Snap* and the foresail area increased from 54 to 77 square feet and the wooden foresail luff was raked more. The foresail is mounted on a boom which pivots 25% aft of the leading edge, this is a copy of canoe practice and is a great advantage in a river where short tacks have to be made as it can be cleated and works automatically. In addition it holds the sail very flat when the sheet is eased and can also be goosewinged out for running. Although the sail is very powerful, the sheet can be handled under all conditions by a girl.

The fully battened mainsail was designed and made by Austin Farrar and carries an enormous roach. The area is about 170 square feet on a 21′ 6″ hoist 9′ 9″ foot. The battens are doubled in the main part of the roach and in a strong wind the trailing edge bends slightly to leeward, but the large area is very effective in light winds and when running, although when going to windward in a very strong wind it pays to use a smaller mainsail.

The balance of the boat is very sensitive to sail trimming. When close hauled the foresail is trimmed very flat, about 8° from amidships, and the mainsail is hauled in tight with the horse runner central, this gives an angle of about 75° from one tack to the other on heading, allowing 3° for drift this works out at an angle of 40° 30′ from the true wind. When close hauled in a strong wind it is important not to cleat the foresail as if the main is freed in a gust the foresail on its own is powerful enough to lift a hull. In addition, the boat will bear away and can only just be held on the rudder.

"GOER"

L.O.A. :	18′ 0″	Freeboard :	16″
L.W.L. :	17′ 0″	Hull weight (fibreglass) :	78 lbs.
Beam O.A. :	8′ 0″	Sail Area :	220 sq. ft.
Beam (hull)	2′ 0″	Weight :	399 lbs.

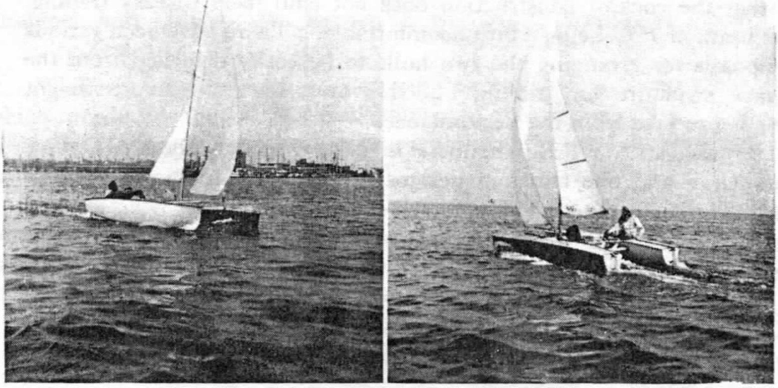
Designer and builder : Ralph Flood, 3883, Sunbeam Drive, L.A. 65, California, U.S.A.

Hull Design.

The hull is similar to the *Shearwater* but with slightly more buoyancy amidships and hence slightly less wetted surface. There is a distinct concavity forwards at the entrance which is an attempt to throw some spray clear and to give a little more grip on the water forward, to help putting about, add to lateral resistance and allow the sail rig to be slightly farther forward.

The Sail Rig.

Ralph Flood sails where there is not much wind and a lot of sail area is needed. He has accomplished this by a masthead jib which has an enormous overlap but it can be reefed and furled by the rotating forestay. In practice, the area can be varied from 95 sq. ft. to 220 sq. ft. within a few seconds. The usual plan is to use all the area when the wind is behind the beam and when reaching in light winds but never more than 2/3 the area when close hauled because the full jib would upset the sail balance. One of the objections to



Goer

the use of this jib furling system is that the shape of the reefed sail is bad but this can partially be overcome by having a luff pole, and by another method developed by Ralph Flood.

Bridge Deck, etc.

These are conventional.

Performance.

In a light wind race with two *Shearwaters* and Arthur Piver's 16′ *Frolic*, Ralph Flood tells me that he was definitely faster than the trimaran and the *Shearwater* with the standard rig and at least equal to the *Shearwater* with 180 sq. ft. of sail. He was using 180 sq. ft. also in this race.

Summary.

Goer is a nicely shaped catamaran which should be capable of some very high speeds and also go well in light winds. It is being produced as a racing class by Fleetcraft Marine Sales Co., of Los Angeles, U.S.A.

CATAMARANS IN NEW ZEALAND

by

CHARLES SATTERTHWAITE

General interest in catamarans has always been high in New Zealand probably because the Maoris originally came to the country in large double hulled canoes about 60 feet long. The advent of the Prout *Shearwater* has initiated a spate of building at most centres of sailing activity. The design of the *Shearwater* has come in for a good deal of criticism, mostly favourable, but one common complaint is that the cockpit construction does not lend itself to easy trailing, the beam of 7′ 6″ being a bit uncomfortable. There have been various proposals for arranging the two hulls to be easily detached from the centre structure for trailing but this must always increase weight and hence take from the performance.

Amongst A.Y.R.S. members in New Zealand, there are three catamaran and one trimaran designs extant and there are reports of several other catamaran designs, at least one of which bears a close resemblance to the Prout *Shearwater* but has, I am told, an inferior performance.

A. N. Sames of Auckland is working on the design and construction of a trimaran which he says is 18 feet long. Further details are lacking but we hope to hear of his successful maiden voyage in the near future.

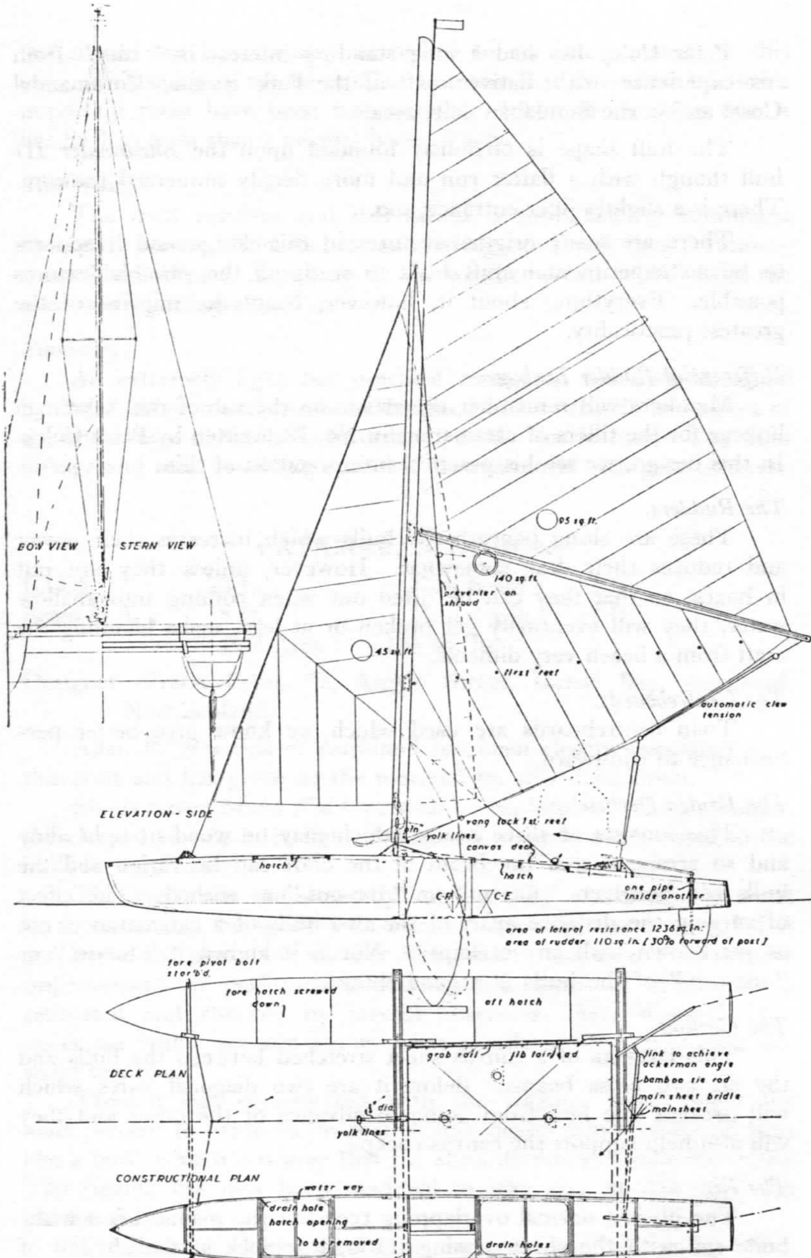
Catamarans are also flourishing in Australia and it is hoped to gather enough information to make up an article about them for a future A.Y.R.S. publication. I am told that there is a cruising catamaran under construction at Hobart, Tasmania, L.O.A. 50 ft., Beam O.A. 15ft., Draft 3 ft. and that a class of catamaran races in Melbourne harbour.

A Mr. Pritchard tells me that when working in the Tokelau Islands, he made up a catamaran out of empty oil drums and scrap of one sort or another, all welded together. He reports that the vessel worked badly in a seaway but that the more flexible she bacame, the faster she went. There is food for thought here and I wonder if a flexible " cat " is necessarily faster than a rigid one, or is this phenomenon peculiar to oil drums !

A 16′ 6″ CATAMARAN DESIGN

L.O.A. :	16′ 6″	Hull beam :	1′ 9″
L.W.L. :	16′ 0″	Hull depth :	1′ 8″
Beam O.A. :	7′ 6″	Sail Area :	140 sq. ft.

Designer—Peter Coley, Auckland, New Zealand.


BOW VIEW
STERN VIEW
95 sq. ft.
140 sq. ft.
preventer on shroud
45 sq. ft.
first reef
automatic clew tension
ELEVATION - SIDE
vang lock 1st. reef
yolk lines
canvas deck
hatch
hatch
C.E.
one pipe inside another
area of lateral resistance 1236 sq. in.
area of rudder 110 sq. in. (30% forward of post)
fore pivot bolt stor'b'd.
fore hatch screwed down
aft hatch
grab rail
jib fairlead
link to achieve ackerman angle
bamboo tie rod
mainsheet bridle
mainsheet
DECK PLAN
yolk lines
CONSTRUCTIONAL PLAN
water way
drain hole
hatch opening
to be removed
drain holes
water way
fore pivot bolt port
overhang to take care of toe in and toe out

Peter Coley has had a long standing interest in " cats " from his experience with native craft of the Palk Straits, Coromandel Coast and in the Sundaban delta area.

The hull shape is obviously founded upon the *Shearwater III* hull though with a flatter run and more deeply immersed transom. There is a slightly finer entrance, too.

There are many original features in this design and it appears to be an experimental craft built to study all the variable features possible. Everything about it, however, bears the imprint of the greatest practicality.

Differential Rudder Linkage.

Members will remember the article on the use of the Ackerman linkage for the tillers of catamarans in No. 18, written by Peter Coley. In this design, we see his practical interpretation of this.

The Rudders.

These are slung beneath the hulls which increases their power and reduces their drag somewhat. However, unless they are put in boxes, so that they can be lifted out when coming into shallow water, they will eventually get broken or at least make handling the craft from a beach very difficult.

The Centreboards.

Twin centreboards are used which we know give better performance to windward.

The Bridge Deck.

This consists of three beams which may be wood or light alloy and so arranged that the beam of the craft can be varied and the hulls can be given " toe-in " or " toe-out " as wished. The effect of varying the distance apart of the two hulls of a catamaran is not as yet known with any certainty. Nor is it known if " toe-in " or " toe-out " of the hulls is a good thing.

The Cockpit.

This consists of a canvas sheet stretched between the hulls and the aft two cross beams. Below it are two diagonal wires which will prevent one hull from going in advance of the other and they will also help support the canvas cockpit.

The Rig.

The jib is a normal overlapping type but the mainsail is a wishbone sail with the sheet passing through a block at the aft end of the wishbone spar to put tension into the sail in strong winds. This last should not be necessary, according to my interpretation of this sail. This sail may not be familiar to many British readers but some important races have been won with it. Its main virtue is that it has far less twist than a normal boomed sail.

The Mast.

The mast revolves and this action is simplified by running a short sprit forward from its base and having two " yolk lines " running across the cockpit. A pull up on the weather yolk line will twist the mast when putting about.

Summary.

An extremely light but practical catamaran has been designed by Peter Coley which has been designed to be variable in respect of the attachment of the hulls in order to study this feature. The tiller linkage and mast revolving sprit will be examined with great interest.

CATAMARAN DESIGN

L.O.A. :	20 ft.	Hull beam :	2 ft.
Beam O.A. :	8 ft.	Hull depth :	2 ft.
	Sail Area :	165 sq. ft.	

Designer—Frank Pelin, 79, Argyle Street, Herne Bay, Auckland, New Zealand.

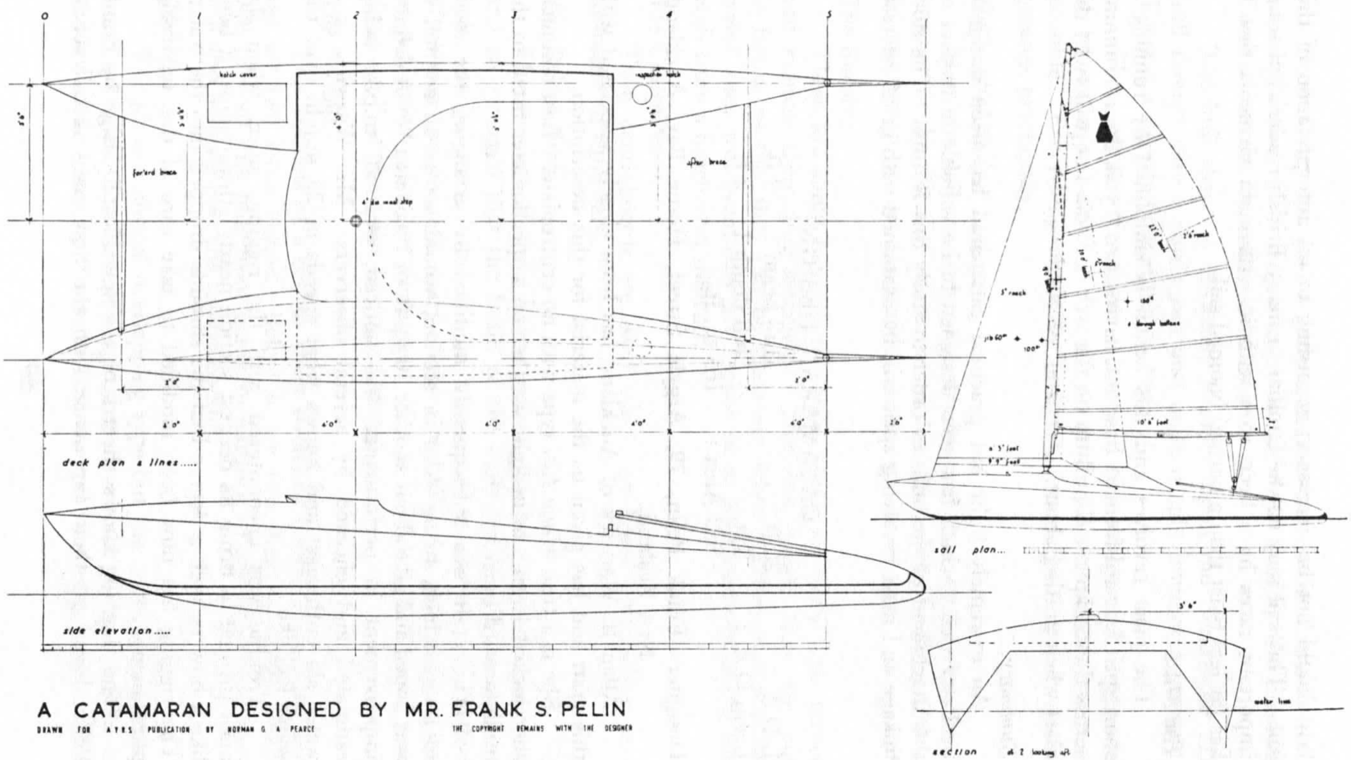
Allan B. Warwick of Auckland has been closely associated with this craft and has given us the material for this description.

She is a true *Manu Kai* type with no centreplate. Last summer, she clocked 16 m.p.h. in light weather on a speedometer fitted to the hulls forward brace.

The craft was subsequently modified by arranging the mast to rotate which, being deep in section, would act as an aerofoil it was hoped and give about another 30 sq. ft. of " sail area ". A definite improvement in performance was noticed, over 20 m.p.h. being estimated and checked by several observers. Mr. Warwick is a water ski enthusiast and knows what speeds of 25 m.p.h. over the water feel like.

Trouble was encountered with the rigging, since, when the mast pivoted to bring its deepest section nearly athwartships, it bent like a bow to such a degree that the shrouds dropped into the water. The rigging has now been modified to take care of this terrifying phenomenon.

The drawing shows sheet 1 of the new " cat " design by Frank Pelin, based on their experience with the first one. A full set of



A CATAMARAN DESIGNED BY MR. FRANK S. PELIN

DRAWN FOR A.Y.R.S. PUBLICATION BY NORMAN G. A. PEARCE drawings for this craft is obtainable from the designer at the above address. The main dimensions of the new craft are :—

L.O.A. :	22′ 6″	Hull Beam :	2′ 4″
L.W.L. :	19′ 6″	Hull depth :	3′ 0″
Beam O.A. :	8′ 3″	Sail Area :	210 sq. ft.

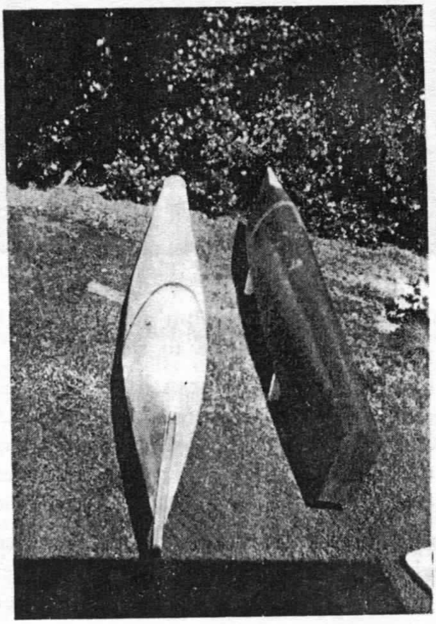
A ROUND BILGE PLYWOOD CATAMARAN

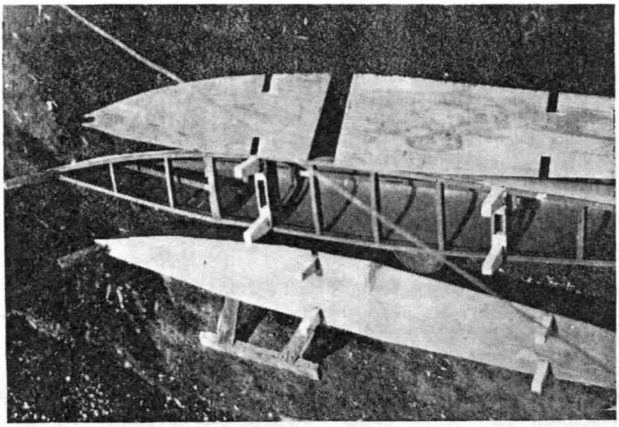
L.O.A. :	12 ft.		
Beam O.A. :	6 ft. 4 ins.	Sail Area :	65 sq. ft.

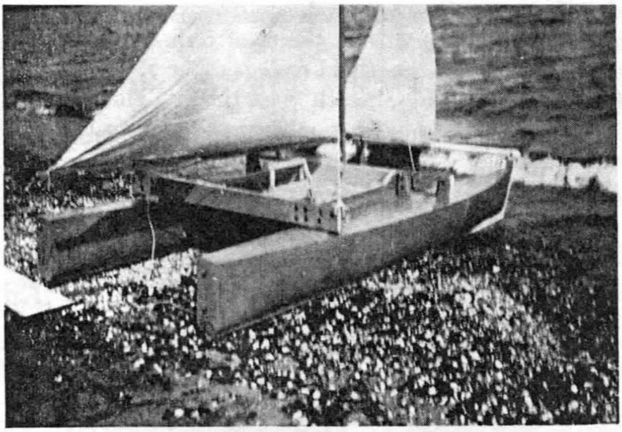
Designer and builder—W. Barnet, Lower Hutt, Wellington, New Zealand.

W. Barnet was inspired by a strong desire to own a cheap yacht, which produced the little vessel shown in the photographs. The design was by eye in joint consultation with his father and no drawings were used as far as can be discovered.

Each hull is made up of two sheets of resin-bonded white pine plywood bent round the frames and nailed. The aft sheet is 8′ by 3′ and the forward sheet 4′ by 3′, each $\frac{3}{16}$in. thick. The bottom radius of the round part of the hull section decreases forward to 3″ which







the plywood took without cracking but forward of this, the sheet was slit on the centreline and nailed to the stem.

At first, as is usual with catamaran experimenters, the rig was too far forward for reasons explained in A.Y.R.S. No. 7 CATAMARAN CONSTRUCTION. She was found to be unbalanced and it was found necessary to wear from tack to tack since she refused to stay. This has since been remedied by moving the centreboard forward.

This craft has proved to be too short for the steep seas commonly found in Port Nicholson, New Zealand, and Mr. Barnet is now considering building a larger version, incorporating the experience gained.

Summary.

This design shows what can be done to produce a cheap and enioyable craft, using what can truly be described as traditional methods of design and construction by eye alone. However, the amount of distortion which plywood can take will be noted as being of interest in the process of " overdevelopment " as described in MODERN BOAT BUILDING, A.Y.R.S. No. 20.

" LOTUS ", A CATAMARAN DAYSAILER

by

WALTER BLOEMHARD

L.O.A. :	16 ft.	Beam :	8 ft.
L.W.L. :	15 ft.	Displacement :	250 lbs.

Sail Area : 140 sq. ft.

Designer—Walter Bloemhard.

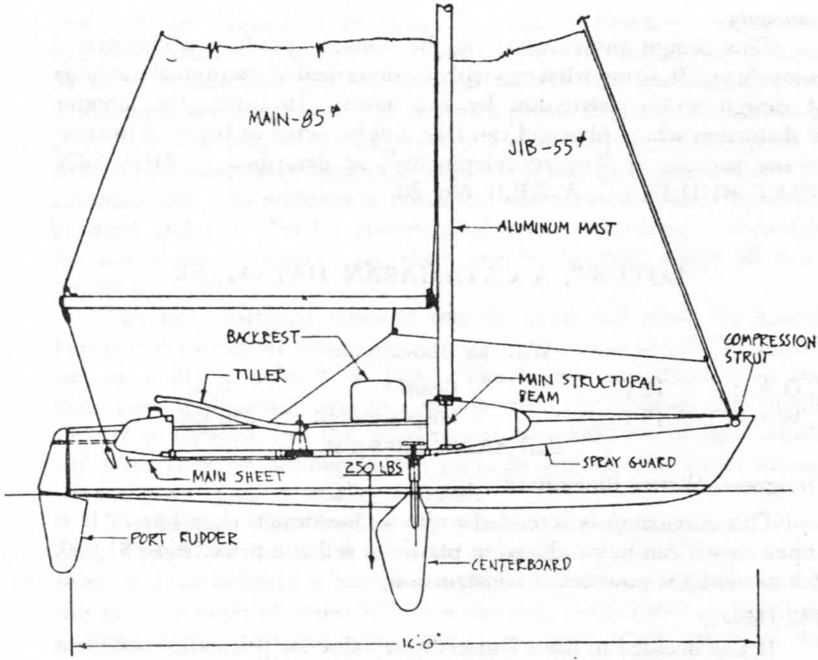
This catamatan is intended to be a One-design class boat. It is hoped that it can be produced in plastic to sell at a price below $1,000. A first model is now under construction.

The Design.

It was decided to use a conservative value for prismatic coefficient to ensure good ghosting speeds, rather than the high P.C. which makes for top speeds. Otherwise, the shape is suited for high speeds with V-bow, long straight entrance and body tapering from oval in the middle to a wide U aft. Although this form makes for a wet ship at speed and also does not help to cure the nose diving tendency of powerful catamarans, there will be no problems, what with the spray guard and the 250 lbs. weight as compared with 320 lbs. for a two man crew. It is believed that this design will result in a fast and practical sailer, which is easy to build by the amateur.

Present Construction

The hulls are constructed of $\frac{1}{8}$ inch mahogany plywood and consist of 4 sheets, 2 of which are simply bent to shape in a female mould. Although there is curvature in different directions, the plywood takes the shape rather easily. The result is actually a stressed skin boat. Frame spacing is critical and it is also wise to join the parts together, while they are still in the mould. Lack of space forced me to build the hulls in pieces, which gave some trouble and was very time consuming. The joints are simply made by glueing on a lapstrake. Resorcinol glue is used throughout the boat, screws applying the pressure where clamps cannot be used. The stem



is a laminate. The finished hulls are covered with fibreglass, using a very light cloth.

The Centreplate.

This is "balanced" and in the centreline. Its angle of attack can be adjusted to abolish leeway. The flow around the hulls in proper trim will therefore be symmetrical and a high speed made good to windward is expected. All the area is under the water surface and there will consequently be no penalty in excessive wave drag. The profile is NACA 06, but other shapes can be used, if one wants to experiment. The plate stows flat under the bridge by a system involving two hinges at 90° to each other, a guide and a clamp. The head is arranged with a wheel and friction clutch.

A refinement would be to allow the whole plate assembly to slide fore and aft, but this is not contemplated at present. The rudder would be slightly loaded for best results and therefore there would not be "balance" but this is not serious in a daysailer.

Tiller and Rudders.

The tiller post, it will be noted, is in the middle of the cockpit.

It will have a jaw clutch and a locking arrangement which will keep the rudders central while making changes. It will thus be possible to steer the boat from any desired position in the cockpit. The parts are simple, to be machined from stock.

The rudders have short tiller arms to which are connected control lines running over sheaves to a yoke on a cross bar, for a non-slip connection between the port and starboard sides. A second set of lines runs from the bar to the quadrant on the tiller post. The rudders are pivoted to facilitate beaching.

Mast and Rigging.

The mast is a standard aluminium extrusion as is the boom which will be equipped for roller reefing. It will have small halliard winches. The rigging is as usual ; the shrouds coming down to chain plates which are on the main structural beam and not on the hull as is sometimes done. The forestay ends in a bridle, the parts of which attach to the ends of a compression strut. The backstays are the usual arrangement with a Highfield lever. These levers are installed in an athwartships position along the aft cockpit sides.

The Sheets.

The mainsheet is led under the bridge and comes up through the centre of the tiller post, passing through a clamp of the familiar cam type. The part then disappears through a hole in the deck into the port hull. This is one of my little obsessions. I hate a mess of rope on the deck. In case the sheet jams underdecks, it pulls open a little spring loaded lid and frees itself.

The jib sheets go to leadblocks on tracks atop the rails. There will be one snubbing winch for the main and a ratchet winch for the Genoa.

The Sprayguard.

The canvas spray guard between the hulls forward has bolt ropes at the sides and these pass through slots on the inside of the bows for a tight connection. It is amazing what amounts of spray a catamaran will throw up when at speed.

The Cockpit.

The cockpit will have simple back rests which fit over the gunwale, in addition to cushions and toerails. This is to offset the discomforts of a flat cockpit area, while retaining simplicity. There is a bilge pump in each hull, permanently mounted with detachable handles going through the deck.

Walter Bloemhard would be prepared to make the plans, specifications and instructions available (to A.Y.R.S. members only) at a low price, if there is some interest. If, therefore, A.Y.R.S. members are interested, will they write to him so that he can get an idea of whether such work on his part would be worth while.

CHERINDA TWO

(A modified *Shearwater III*)

Walter J. Hall, Westminster, California has put a *Thistle* rig on his *Shearwater* catamaran with 175 square feet of sail area. A No. 2 Zephyr (Wareham, Mass.) aluminium extruded 25 foot mast was used which was untapered and had a fixed step. Twin $\frac{1}{4}$ inch aluminium dagger boards 51 inches by 24 inches were also used and the mast was tanged for a trapeze wire.

Mr. Hall writes as follows :—

" I think that our multihull members might be interested to know that the myth that a catamaran is not able to point with the single hulls is losing its hold in the minds of West Coast Yachtsmen. I find no evidence to support this old belief. When I sheet *Cherinda*

Cherinda Two

Two's main and jib flat, she works up in each puff with exactly the characteristics of a well rigged single hull one-design racer.

" Our next scheduled race is the Fall Pt. Firmin in which all classes compete in a free-for-all from Cabrillo Beach, San Pedro, out into the Ocean to Pt. Firmin and back (8 miles). Travis Bailey, who sails his standard *Shearwater III* without a crew has said he intends to travel from his home in Arnold, Calveras County, California to participate in this race.

" Rudy Choi, the designer of the famous 44 ft. cat *Aikane*, has started a whole fleet of *Foamys* (24ft. by 27ft. by 10ft.). Eight are expected to be sailing in 1959 and three are expected to compete in the Firmin race.

" A new lightweight fibreglass catamaran 18ft. by 8ft. with each hull weighing 50 lbs. is being produced at Costa Mesa by Danny Sanderson, 2232, Harbour Boulevard. The first of them is now sailing and is also expected to enter the Pt. Firmin race.

" The *Malibu* outriggers are the hottest fleet in the West. Their entry in the one-of-a-kind race won 3 out of the 5 races and soundly beat everything in the regatta. They also do well in strong winds and will also be represented at Firmin.

" Several of us are now planning to hold a cross-channel speed run annually, open to all boats under sail, from San Pedro in Avalon, Catalina returning the next day. This should be a real proving and testing race. Fred Miller, Jr., a *Snipe* Class International Racing Association Area Governor and organiser of this recent one-of-a-kind regatta, is working on this program, along with others ".

TIKI

L.O.A. :	12′ 0″	Beam :	6′ 1″
L.W.L.	10′ 11″	Displacement :	475 lbs.

Sail Area : 104 sq. ft.

Designer—Robert B. Harris.

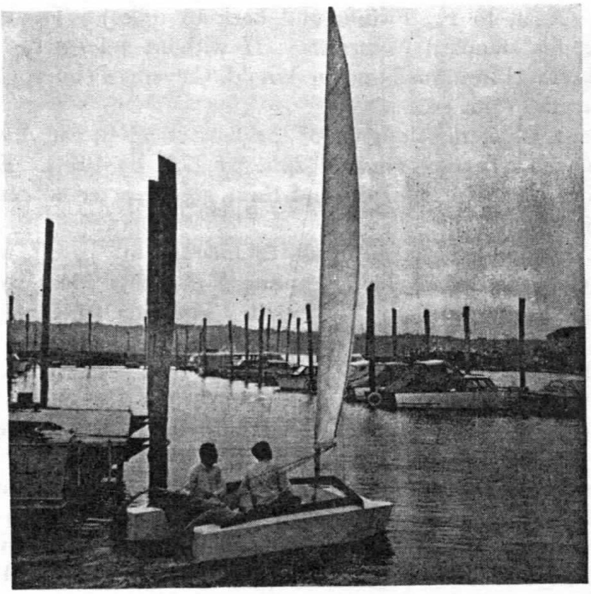
Builders—Catamaran Corporation of America, 516 R.A. Long Building, 928 Grand Avenue, Kansas City, Mo.

The Design.

The hull sections show the shallow rounded underwater sections which have been shown to be fast and manoeuverable. The cockpit is deeper than in current practice but this, though it may give more wind and water resistance, makes for a much more comfortable seating than the shallow saucers of the racing cats. The dagger board box is placed below the cockpit floor which again gives more cockpit space at a slight cost in drag. *Tiki* has yet to be built but it should perform well both for speed and comfort.

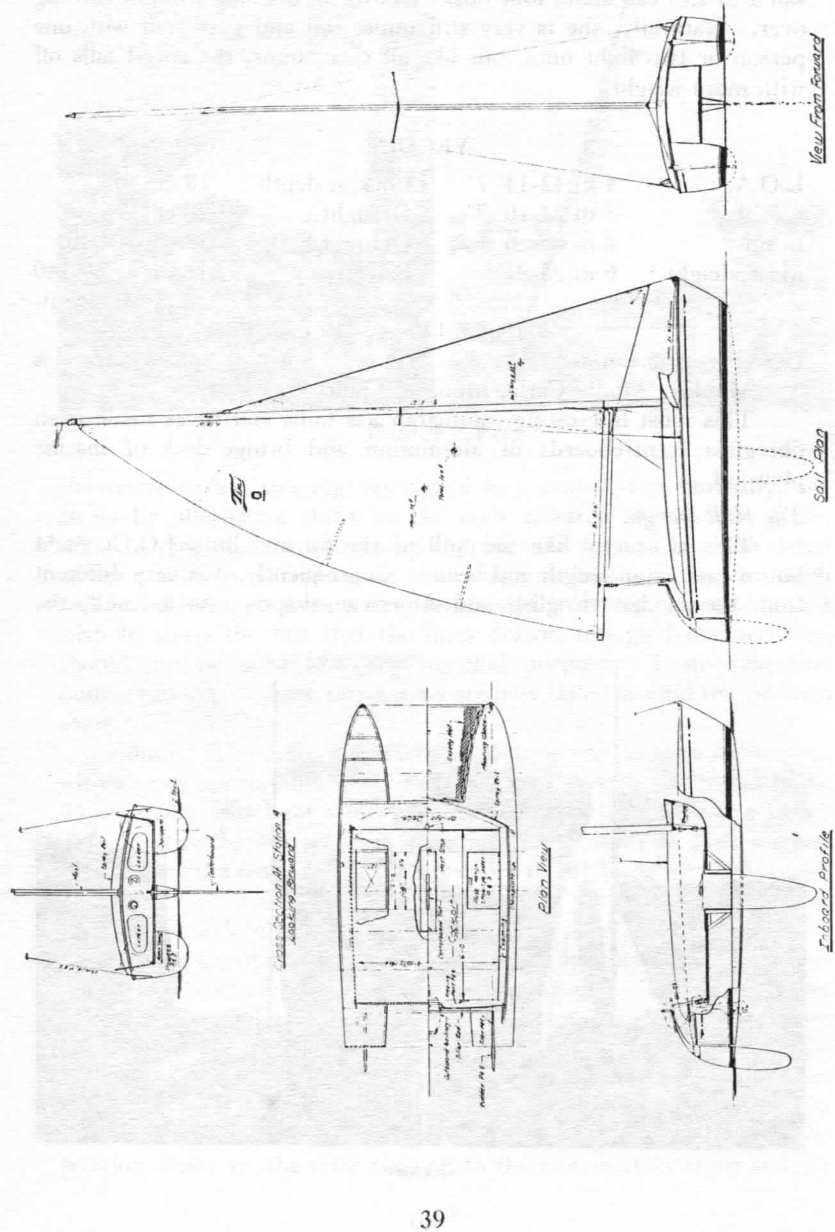
The Prototype.

Before going into production of *Tiki*, a prototype only 9½ feet long was made which surely is the most ambitious catamaran of



Tiki Prototype

Tiki Prototype


View From Forward
Sail Plan
Inboard Profile
Plan View
Cross Section At Station 4 Looking Forward

recent times. From the photograph, it will be seen that this little craft buzzes along at a good speed. She has relatively an enormous sail area and can stand four husky fellows on her side without turning over. Naturally, she is very stiff under sail and goes well with one person or two light ones, but like all catamarans, the speed falls off with more weight.

VELOCE

L.O.A. :	4 m 42-14′ 7″	Cockpit depth :	18 cm.-6″
L.W.L. :	3 m 21-10′ 7″	Draught :	20 cm.-7″
Beam :	2 m 06- 6′ 10″	Draught C.B. :	55 c.m.-1′ 10″
Mast Height :	6 m 35-21′	Sail Area :	14 m² 60-140 sq. ft.

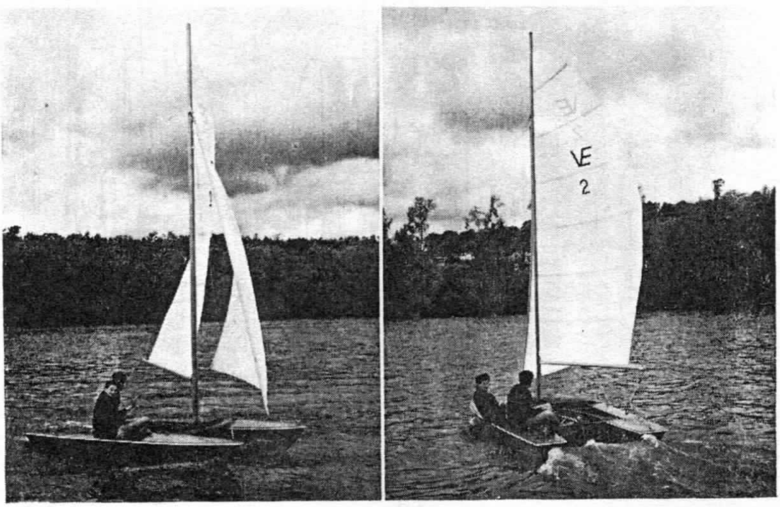
Weight : 145 kg.-319 lbs.

Designer and builder : L. Le Marrec, Le Continental, Place des Moulins, Monte Carlo, Monaco, France.

This most interesting catamaran has hulls and decks made from fibreglass, centreboards of aluminium and bridge deck of marine plywood.

The Hull Design.

This is exactly like the hull of the fin and bulb J.O.G. yacht but of catamaran length and beam. Consequently, it is very different from the modern English and American shapes. As a result, the

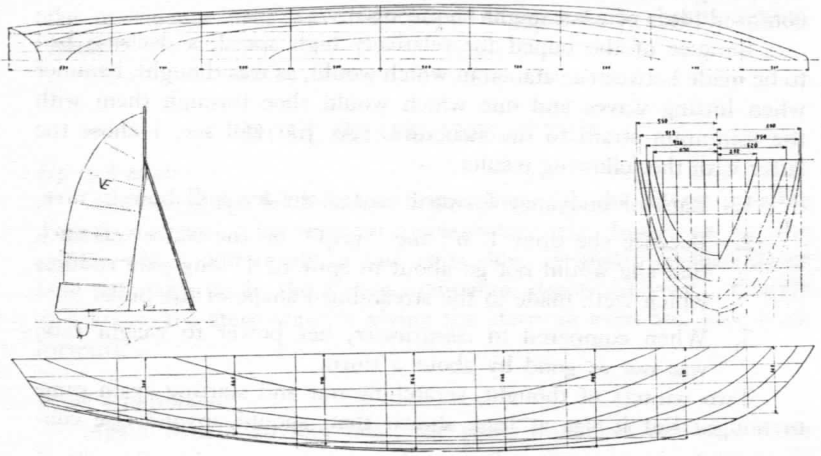


Veloce

wetted surface will be far less than with any of the usual catamarans and speeds will be much greater in light winds.

The photographs show *Veloce* travelling about 6 knots where I expect there is a distinct hump in her resistance curve. Her wave formation looks very similar to that of a conventional deep keeled yacht.

I have no information on her performance at speeds above 6 knots but feel that they will not compare with the modern catamarans



in any way. The weight seems excessive for high speeds. Twin centreboards in each hull will give good windward performance, when conditions suit her.

Bridge Deck, etc.

All other details are in accordance with modern catamaran practice. The single rudder, however, is a slightly backwards step.

Summary.

The makers claim that *Veloce* is faster than any centreboard boat at all times and this is to be expected. In my opinion, this hull design should be the fastest shape in light winds for a catamaran and hence the best for the light wind areas of the world. Its performance will not compare with *Shearwater* or *Jumpahead* in strong winds. *Veloce* will be far faster coming about than any other cat and be more suitable for rivers.

The price is 370,000 francs for the " Standard " version. 418,000 for the " Luxe ".

A CAT IN 1950

by

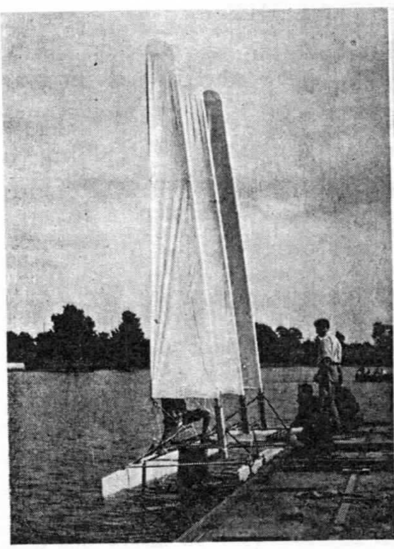
F. W. M. Lee

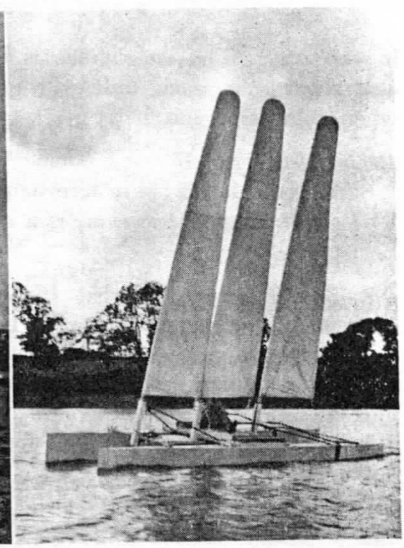
Eight to ten years ago, those interested in the design of "Cats" did not know what they were up against and very little practical information was available. When designing a catamaran at that time, all you had was a nice white piece of paper to draw on and many confused ideas of what might be put on it.

Because of the hoped for relatively high speed, a decision had to be made between a catamaran which would, as was thought, hammer when hitting waves and one which would slice through them with the minimum strain to the structure. As you will see, I chose the latter with the following results :—

1. Lack of buoyancy forward caused the lee hull bow to dive.
2. Because she drew 1′ 6″, the "grip" on the water was such that she would not go about in spite of 4′ long gate rudders which were made to the streamlined shape of the hulls.
3. When compared to *Shearwater*, her power to weight ratio was not as good by about a third.

Two winters of thought, scratching out and starting again came to nought but it has at least shown that, should anyone else con-





template this type of design and construction, they will now know that it is unsuitable and will not work.

Editor.

The best speed obtained was 12 knots which was achieved without either bow or stern waves. This absence of waves is some justification for making catamaran sections just a little deeper than a semicircle but the present tendency is to go for sections a little *Shallower* than a semicircle.

The Aerofoil Sails.

These are most delightful and have interesting possibilities. They are made like pillow slips and are slid over the top of the mast. The clew is thrust outwards and downwards by means of an over-centre strut like that found in a baby's pram. The aspect ratio of each sail is high but the three sails together could give a very high thrust compared to an equal area of a single sail, acting as slat and flap.

Summary.

This is a very instructive catamaran hull with a sail rig of which we may see more sometime.

THE TEMPEST CATAMARAN

Specification

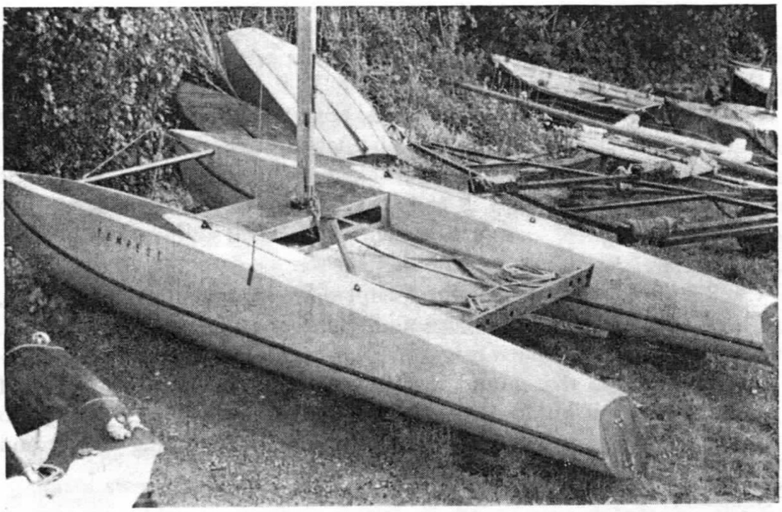
Length :	17′ 6″	Beam (hulls)	1′ 9″
Beam :	8′ 0″	Draft (plate)	2′ 6″
Draft :	5½″	Sail Area :	206 sq. ft.

Weight (less rig) : 340 lbs.

Designer : J. Fenwick, Reed House, Chapman Road, Canvey Island, Essex.

The Tempest Catamaran is the result of building and extensive sailing of three prototypes. The main objectives in mind were to produce a trailable class racing catamaran with a good performance in all sea and weather conditions, providing a reasonable degree of comfort to crew and to be equally suitable for hauling out or leaving on a mooring.

The hulls are of highly finished fibreglass joined by a dural front crossmember and two mahogany girders, marine plywood being used for the cockpit. The hull shape has reverse sheer along its entire length thus keeping the maximum buoyancy low down and the deck area small. This serves to prevent submarining when running and also to improve the performance when flying a hull by preventing the lee hull from burying itself. Due to the low degree of heel encountered, even when flying a hull, the underwater section

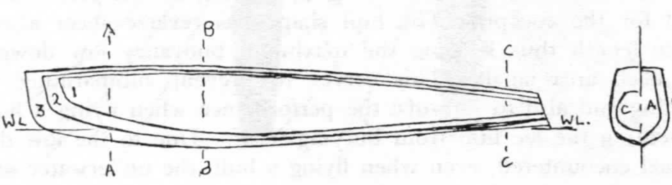


Tempest

was kept almost constant along with a flat run aft to provide a good planing section. The draft was kept to a minimum to help fast " going about ".

Twin knock up plates of asymmetrical section are used and set with a two degree angle. This type of plate scores heavily over the single dagger board. The absence of surface eddies, increased efficiency of angled asymmetrical plates and retention of total plate in the water whilst heeling enables a much smaller plate to be used with success. This type of plate is easy to operate, safe in shallow waters and imposes less strain on the craft.

The performance of the Tempest Catamaran is extremely encouraging and we are full of confidence for the forthcoming racing season. A modified version for fast cruising with a day cabin and using a scaled-up version of the hull shape is well in hand for 1959.



THE " CAR - CAT "

L.O.A. :	11′ 3″	Beam on deck of each hull	2′
L.W.L. :	10′ 9″	Sail Area :	75 sq. ft.
Beam :	5′ 3″	Draught :	8″
Weight :	1 cwt.	Draught :	1′ 9″ with board down.

Designer—Erick J. Manners.

This catamaran was primarily designed to be easily lifted on top of the average car for ready transport to any water way and to facilitate home storage. The design has been satisfactory tried out under all manner of sailing conditions. Side seating of 6″ height is provided and optional wells for full leg room are available.

The photograph shows the Car-Cat in action. It may be noted that the single crew is sitting well inboard compared to the similar size single hull boat in the background which is heeling more although two people are set well out.

The hulls are mahogany round chine moulded with ply decks. Prior to the production of this design last year the under water sections throughout the longitudinal axis of other catamarans were either a half circle or hard chine variations of Vee'd section. Manners' design in the Car-Cat and larger catamarans provides curved Vee'd sections in the deep chest forward of amidships generating into the stem head and terminating on a flat keel like a water ski. The keel is cambered and aft of amidships the pyramidal underwater lines diminish into a flattened half circle planing area.

The standard compact rig has a vertical gaff and gives a total area of 75 sq. ft. A larger light weather racing rig can be used for the class. Complete boat at £140 or Build-it-Yourself Kits with shell hulls at £70 can be obtained from Twin Hulls, Ltd., 2, Capadocia Street, Thorpe Bay, Essex.

AY-AY

L.O.A. :	40′	Hull draught :	2′
L.W.L. :	36′	Hull Draught with skegs	2′ 6″
Beam :	19½′	Empty weight approx.	6.000 lbs.
Beam W.L. :	13½′	Sail Area :	560 sq. ft.

Designer, builder and skipper—Dick Newick.

This large catamaran is a commercial vessel designed to carry 20 passengers on trips from Christiansted, St. Criox, Virgin Islands in the West Indies.

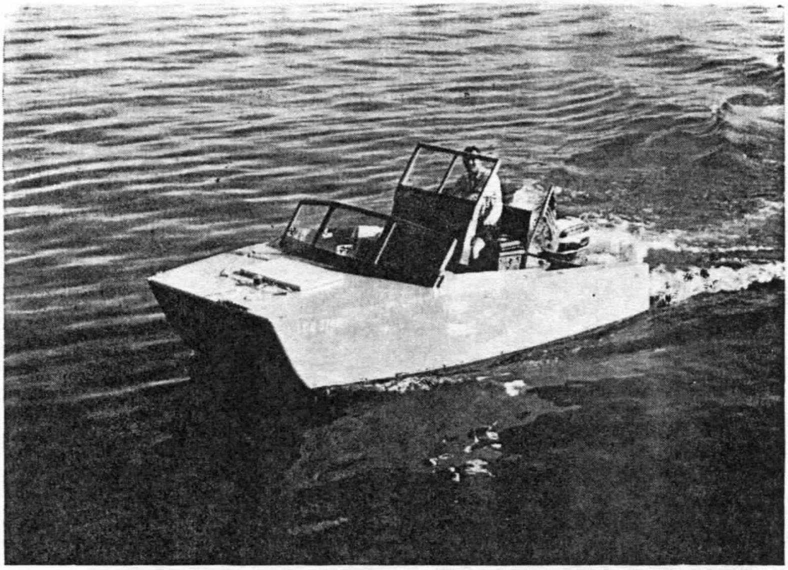
The Design.

We have little information about this craft but the hull shape appears to be the wide-keel, deep V type and obviously goes well, especially in the Trade Wind area in which she operates. The designer comments that the next boat he designs for similar work would have 6 inches less freeboard and narrower keels with 150 to 200 square feet more sail area.

Ay-Ay

AN OUTBOARD POWER CATAMARAN

The photograph shows a nice little powered catamaran designed by William M. Harris, 2732 23rd. Avenue, Oakland 6, California. It is an excellent rough water fishing boat with comfortable seating for 6 adults. It is an interesting experimentation and diversion for Mr. Harris but his true love is for sailing catamarans.



William M. Harris' Power Catamaran

KITTIWAKE

L.O.A. :	16′ 6″	Draught :	8″
L.W.L. :	16′ 0″	Draught with C.B. :	3′ 0″
Beam :	7′ 6″	Weight, stripped :	320 lbs.

Sail Area : 170 sq. ft.

Designer, owner and builder—Frank Rice, Corner House, Lansdown Crescent, Bournemouth.

This is an asymmetrical hulled catamaran with the flatter sides outwards. These are not quite flat but have a slight curve for strength, appearance and to ease the curve of the axis of each hull.

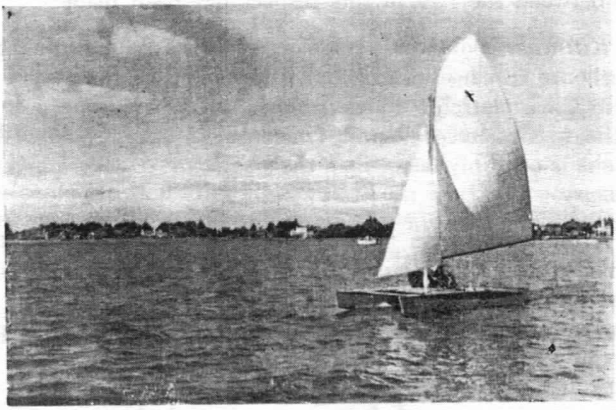
Frank Rice first made a one fifth scale model and sailed it. The trials were satisfactory and he then build the full sized craft.

Design.

The hull sections show a flat outer side and an inner side which has been made of four segments so as to form what is really a quarter circle below the waterline. This is done by having three angles on the inside so that the skin will fit on snugly without any forcing. The ends are fine with a prismatic coefficient of 0.58 as compared with *Shearwater* 0.68 and *Ocelot* 0.57

Construction.

The framework was made of spruce and it was covered with "Masonite" $\frac{1}{8}$ inch tempered hardboard. This is much cheaper



Kittiwake

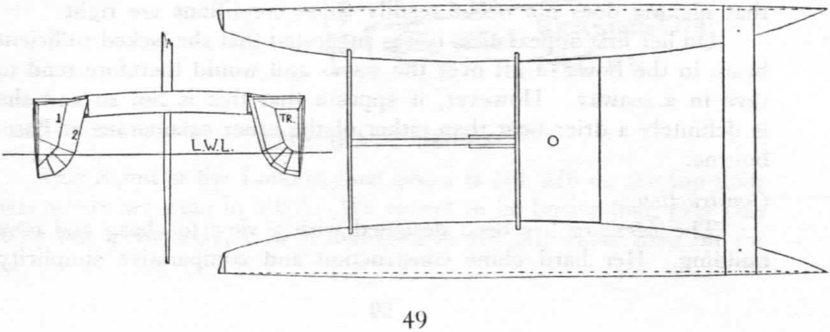
than plywood and Mr. Rice has found in the past that it has weathered well and given him good service on a hydroplane and canoes.

Plate and Rudders.

There is a single centreboard and twin rudders all of the swinging type as dagger boards and fixed rudders are a nuisance in Christchurch harbour where the boat is kept.

The Rig.

This is a gunter lugsail with a vertical yard at the mast and a curved top. It performs very efficiently in light airs but the large area of the mainsail is a little too much to handle in a heavy wind. No arrangements for reefing are provided.



Performance.

The *Kittiwake* sails quite close to the wind without the plate but it assists quite a lot when going about. Like most cats, she is a little slow in stays and perhaps slower than a *Shearwater* but no trial between the two in this respect has been made.

Kittiwake is obviously not slow as she has sailed from the Needles Lighthouse to Christchurch Bar 8 miles in 50 minutes and also Poole Bar to Christchurch 9 miles in 65 minutes, wind speed as estimated by the local Meteorological Office as 15 m.p.h. Mr. Rice states that she is certainly faster than the *Jollyboat*.

Summary.

Kittiwake appears to be a very fast catamaran and the fastest asymmetrical hulled one of which I have heard. The curved top to the gunter sail looks very good and efficient but neither Mr. Rice nor anyone else who has tried it has seemed to find it an improvement over the normal straight mast.

THE MERCURY CATAMARAN

L.O.A. :	15′ 6″	Weight :	250 lbs.
Beam O.A. :	7′ 6″	Sail Area :	150 sq. ft. (total).
Beam hull :	2′ 0″		

Designer : Bill Prangnell, The Fishing Station, Beach Road, Eastbourne.

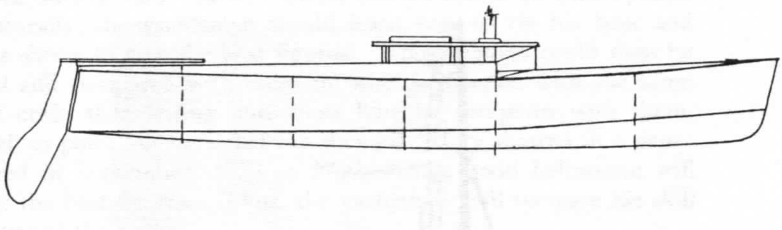
Hull Design.

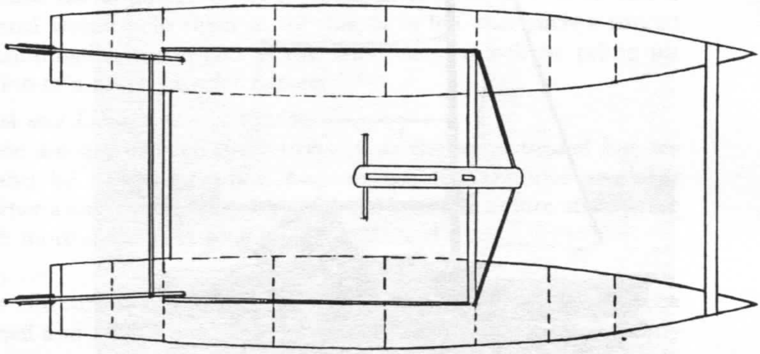
The hulls are hard chined and have a narrow entry, though not as fine as the *Jumpahead*, and widen out to a long flat run. This enables the *Mercury* to cut through the waves without any tendency to dive or pound and also to lift onto a plane earlier than other catamarans and to plane faster, according to the reports from Eastbourne. From the performance reports given later, there is no reason to suppose that planing does not occur readily when conditions are right.

On her first appearance, it was suggested that she lacked sufficient beam in the bows to lift over the waves and would therefore tend to dive in a seaway. However, it appears that this is not so and she is definitely a drier boat than either of the other catamarans at Eastbourne.

Construction.

The *Mercury* has been designed with a view to cheap and easy building. Her hard chine construction and comparative simplicity mean that she can be built easily by the amateur, with the amateur's equipment. Her length of 15′ 6″ was chosen partly because this is the most economic length in view of the fact that normal sheets of plywood come in 8′ lengths. Strength and rigidity are obtained by three spruce cross girders, which fit along frames inside the hulls and extend right to their outer edges. Each hull contains four frames





and these and the large cockpit make a rigid whole which should have a long life.

Handling.

The *Mercury* can be easily handled on the stony shore at Eastbourne. Three people can carry her without difficulty and this can be reduced to two with rollers. Trailing is simple, too, and she has been trailed for long distances behind a normal saloon car on a trailer of the heavier type extended with a pair of planks or ladders.

The Rudders.

At first, these were causing too much disturbance in the water but this was cured by altering their rake until they stood perpendicular in the water. Experiments were carried out with a tiller linkage to give some Ackerman but they proved too cumbersome in practice and have been discarded without any adverse effect on the manoeuverability which is good due to the flattish floor aft.

Mercury

Performance.

The *Mercury* has yet to meet any first class opposition, but in the local races against *Shearwaters* and other catamarans, she has done well, beating some in most races and being well up with the leaders in all. She goes well in light winds and strong winds, when her ability to get up and plane is useful. In moderate conditions, she does not shine so much but still holds her own.

Summary.

These notes have been compiled from information supplied from Eastbourne. In my opinion, she is as fast a catamaran as there is in strong winds and is likely to be little slower than others in light ones. She, apparently, is a delight to sail as a cruising boat, docile in an average breeze and as easy to sail as a cruising dinghy. She has also the advantage of a selling price which, to the best of our knowledge, is lower than that of any other cat over 12′ in length.

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