CATAMARAN CONSTRUCTION

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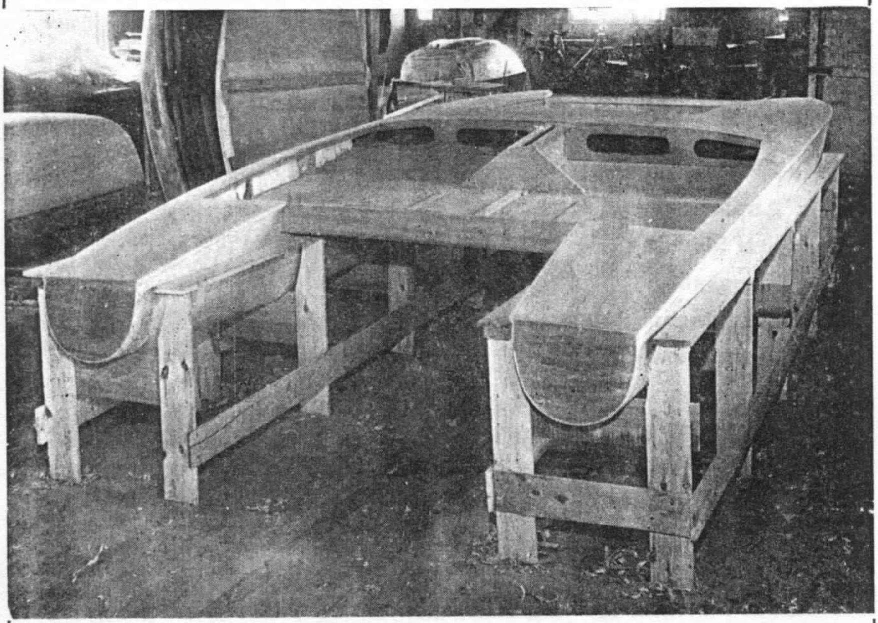
A.Y.R.S. PUBLICATION No. 7



SHEARWATER III IN JIGS

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JUNE, 1956

EDITORIAL

I hope, that the article in the last issue, on "Writing for the A.Y.R.S." has stimulated members to send in articles on their ideas. There was one point which I did not make as clear as I should. Drawings can be printed from ordinary tracing paper, if Indian Ink is used. If, therefore, sketches and drawings for the articles are done in this way, they will not have to suffer any indignities at the hand of the Editor.

At present, I have accumulated all the A.Y.R.S. property at my house and I have many drawers full of miscellaneous information on many aspects of yachting. If anyone is in Hythe, he is welcome to come and see our treasures.

This publication ends our study of Outrigger craft for the present, though Bob Harris will be giving us one on AMERICAN CATAMARANS later. I think that these craft have been studied from every possible theoretical angle and all that remains is to find the best possible practical applications and to discover the practical knacks of handling them, as small boats. It is not reasonable at present to conjecture the application of the Outrigger principle to cruising yachts or commercial sailing vessels. I feel that there ought to be more experience with small craft before we do that. These larger vessels represent an outlay of what is for most of us a small fortune and it would not be reasonable if we encouraged someone to have one built without being sure that he would have a satisfactory craft.

A.Y.R.S. CORRESPONDENTS

One of the poor things about any organisation is the fact that one or two people run the whole thing and the ordinary member feels that he has no say in any of its work. Such centralisation would be bad for the A.Y.R.S. We are amateurs and the virtue of the amateur is that he gets more ideas than the professional. Many of these ideas have already been tried before and some do not take enough consideration of the facts about materials or what is humanly acceptable but we want to know about them, nevertheless, because we believe that these ideas can advance yachting. We know, too, that many of the greatest advances of science have been made by amateurs and we want to bring out the inventive talent in our members.

To bring many more members into active contact with the various fields of yachting, it has been decided to divide up the general field into departments and let each of these have one A.Y.R.S. member responsible for it. Some departments might need to have a central member with specialist knowledge such as Hull Design, Conventional Sail Rigs, Engineering and Electrics but most would only need a central member with a strong interest in his subject. Indeed, it might be a positive hindrance in some fields if the responsible member had too much knowledge because he would not be so receptive of new ideas.

The specialities which suggest themselves for a start are :— 1. Hull Design. 2. Yacht Construction. 3. Fibreglass. 4. Hull and Sail Tests. 5. Sail Rigs. 6. New Rigs. 7. Sailing Aerodynamics, 8. Engineering. 9. Galleys. 10. Food. 11. Electrics. 12. Navigation. 13. Racing Tactics. 14. Outriggers. 15. World Cruising. 16. Trade Wind Hulls. 17. Single Handed Hulls. 18. World Cruise Routes. 19. World Health. 20. Self Steering. 21. Storms. 22. Racing Yacht Tuning. 23. Wind and Waves. 24. Yachting Gadgets. 25. Commercial Sail. 26. Hydrofoils. 27. Yachting Magazines.

There would be a central member for each of these subjects and the name of "Correspondent" has been suggested for him. Possibly three "Correspondents" would be necessary for each, one for America, one for Australasia and one for Britain.

The Correspondent would be available for any member to write to if he wants to get any information about a subject. Nearly all the letters which I get from the A.Y.R.S. members contain information and, if anyone asks me for information, I can always refer him to someone who knows more about the particular subject than I do. In a similar way, a Correspondent should very soon build up a pool of people who really know the subject for which he is responsible.

Ideally, the Correspondent would hunt out every piece of information he can get on his subject. He would experiment himself and help others with their experiments or he would put people in touch with others doing the same work. But these are not essentials. It is enough if the Correspondent will answer any letters he gets which he must keep for the day when he passes on the work to someone else.

Finally, the Correspondent would have to make up the information he gathers into a form in which it could be put before the general members as a publication. He could either write this himself or pass it on to the Editor to do it for him.

It would be impossible for me to write to many individual members to ask them to take on Correspondent work. I know very few of you individually and I might ask people to accept certain lines when their interests were in other fields. I feel that a member who is studying one of the subjects mentioned should send me his name for Correspondent. His studies will be greatly accelerated by his correspondence and, should he get a question he cannot answer, I will always put him in touch with someone who can help him. The names and addresses of the Correspondents will be in each publication so that readers may contact them. It is unlikely that the work will be more than answering about two letters a week.

I feel that it would be in the best interests both of the A.Y.R.S. and the Correspondents themselves, if Correspondents did not hold their positions permanently but were prepared to exchange their files of letters each year, though provision should be made for a longer tenure if some intricate research should be taking place.

" SHEARWATER III "

Length :	16 ft. 6 ins.
Beam (total) :	7 ft. 6 ins.
Hull beam :	Max. 1 ft. 6 ins., on W.L. 13 ins.
Weight :	255 lbs.
Sail area :	160 sq. ft. Mainsail, 115 sq. ft. Foresail, 45 sq. ft.

This is a catamaran designed by Roland Prout. It is now being produced for sale at approximately £320 with terylene sails. It can be had as a kit with the hulls moulded and all other parts sawn to shape for £226 14s. 0d. with terylene sails.

SHEARWATER III was designed to produce a reasonably priced craft of popular appeal, and it is now the world's best known catamaran

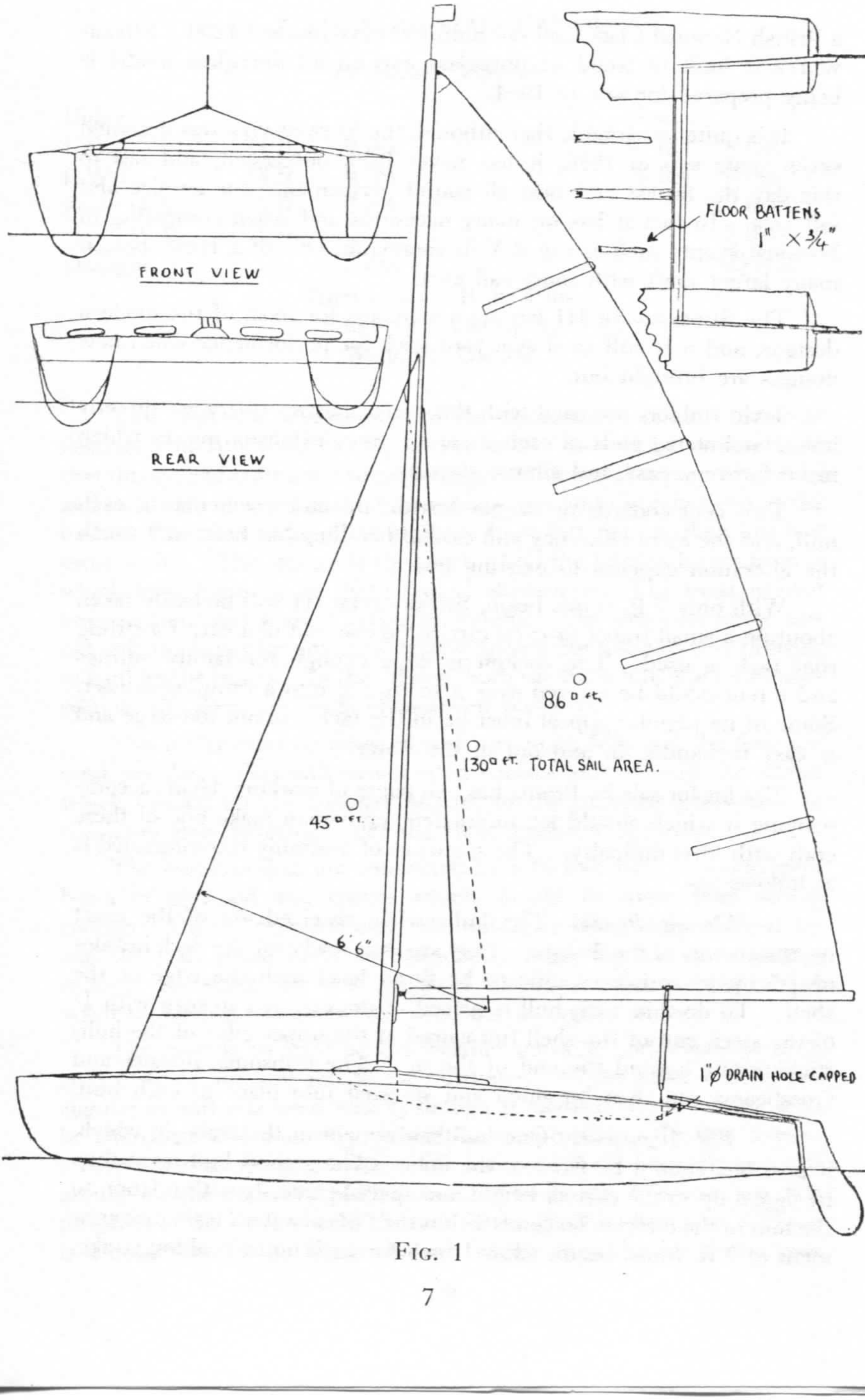

FRONT VIEW
REAR VIEW
FLOOR BATTENS
1" × 3/4"
86 □ ft.
130 □ ft. TOTAL SAIL AREA.
45 □ ft.
6' 6"
1" ø DRAIN HOLE CAPPED

FIG. 1

a British National Class, and sail numbers have reached 1200. SHEARWATER is built in wood or fibreglass and an all fibreglass model is being prepared for sale in 1964.

It is quite remarkable that although the SHEARWATER was designed seven years ago in 1956, it has never been outclassed, and has to this day the fastest and best all round performance for its size and sail area. In fact it has on many occasions and when competing in National events such as the R.Y.A. catamaran One of a Kind, beaten many larger craft with more sail area.

The SHEARWATER III has set a standard for most of the modern designs, and it is still used as a yard stick for performance when new designs are brought out.

Twin rudders are used with this craft, the two tillers are directly linked and at the ends of each there are short extension pieces which make for very easy and simple steering.

Two centreboards or dagger boards are now used, one in each hull, and the extra efficiency and ease of handling has been well worth the alteration expense to existing boats.

With only 7 ft. 6 ins. beam, SHEARWATER III will be easily taken about on a small trailer or even carried on the roof of a car, if a strong roof rack is used. The cockpit is large enough for family outings and a tent could be erected over it to turn it into a camping cruiser. Some of its popular appeal must lie in the fact it is not too large and is easy to handle, in and out of the water.

The kit for sale by Prouts has two pages of working details accompanying it which should let an amateur craftsman make one of these craft with little difficulty. The sequence of assembly recommended is as follows :—

1. *Making Ready.* The hulls when received are of the exact measurements of the design. They are thus ready for the deck inwales of $\frac{7}{16}''$ by $\frac{7}{8}''$ spruce or pine to be fitted level with the edge of the shell. To do this, each hull is placed in the crate-jig in turn with $\frac{1}{2}''$ of the stern end of the shell (measured at the upper edge of the hull) sticking out beyond the end of the jig. The transoms, inwales and crossbeams can then be glued and screwed into place in each hull.

2. *The Alignment.* One hull can remain in the crate-jig which, if possible, should be fixed to the floor. The second hull must then be jigged up to the correct height and spaced correctly with relation to the hull in the crate. To come within the "Shearwater" class measurement of 7 ft. 6 ins. beam, allow 1 inch for each outer rubbing strake.

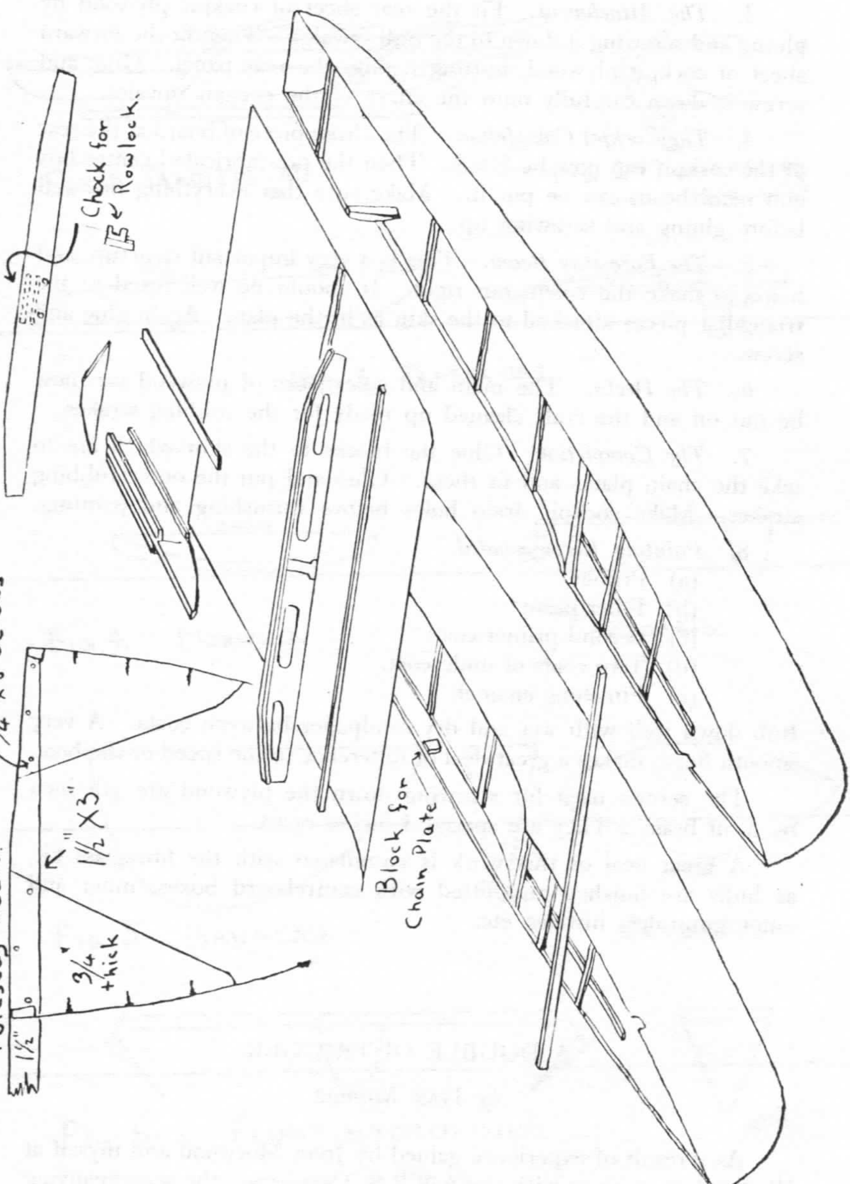

Forestay Beam
1½"
3/4" thick
1½" X 3
¼" x 8 Screws
Block for Chain Plate
Chock for Rowlock

Fig. 2

3. *The Attachment.* Fit the rear sheet of cockpit plywood by gluing and screwing it down to the hull inwales. Then fit the forward sheet of cockpit plywood, butting it onto the rear panel. Glue and screw it down carefully onto the curve of the cockpit inwales.

4. *The Cockpit Completion.* The Cross piece of board at the rear of the cockpit can now be fitted. Then the pre-fabricated centre box and main beam can be put in. Make sure that everything fits well before gluing and screwing up.

5. *The Fore-stay Beam.* This is a very important structure and helps to make the catamaran rigid. It should be well fitted to the triangular pieces attached to the skin as in the plan. Again glue and screw.

6. *The Decks.* The main and side decks of plywood can now be put on and the craft cleaned up ready for the rubbing strakes.

7. *The Completion.* Glue the blocks to the skin which are to take the chain plates and fit these. Glue and pin the outer rubbing strakes. Make cockpit drain holes before varnishing and painting.

8. *Painting Recommended.*

   (a) Primer.
   (b) Filler paste.
   (c) Second primer coat.
   (d) Two coats of undercoat.
   (e) Finishing enamel.

Rub down well with wet and dry sandpaper between coats. A very smooth finish makes a great deal of difference to the speed of the boat.

The screws used for screwing down the plywood are $\frac{5}{8}$th inch by 5, of brass. They are spaced 3 inches apart.

A great deal of this work is eliminated with the fibreglass kit, as hulls are finished and fitted with centreboard boxes, inner and outer gunwales, inwales etc.

A DOUBLE OUTRIGGER

by Ivan Morris

As a result of experience gained by John Morwood and myself at Weston last summer with the A.Y.R.S. Catamaran, the accompanying designs for a fast Indonesian type craft have been worked out. On the whole, scantlings have been kept on the light side to give the utmost speed and there is only one float beam put just abaft the mast which is 8′ 6″ from the stem. For more general use and to give added security, two float beams of smaller section might be used. The dural ladder we used last year seemed adequate, however, and the single beam should be quite as strong. In this account, the design of this member is simple for easy building but one of good streamline section would have less wind resistance and be slightly better.

The craft is based on the standard " SHEARWATER II " hull, and with the exception of the hydrofoil craft, could be the fastest sailing craft

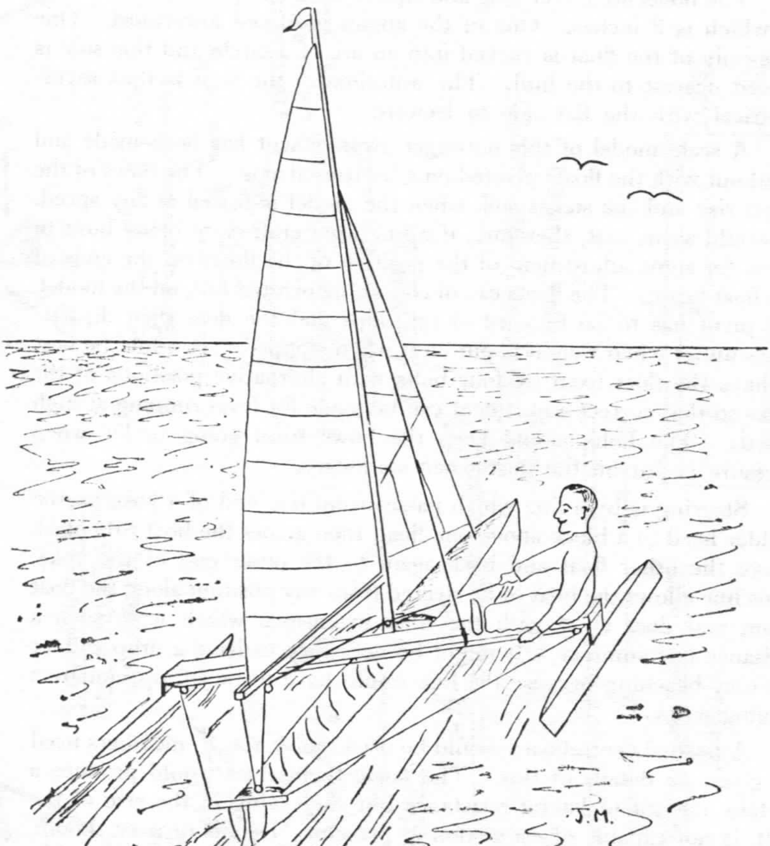


FIG. 3

possible. It is designed to be taken apart rapidly for stowage and transport. The float beam is built up from three pieces of spruce and ply to form a very strong box girder, $11\frac{1}{2}''$ wide, $2\frac{1}{2}''$ deep and $12'$ long. This member is bolted through adequate pieces of hardwood which are, in turn, fastened to reinforcing doublers attached to the inside of the hull skin. To each end of the float beam are bolted the strong vertical plywood webs which run down into the floats and these webs could pass right through the floats, if one wished, to gain extra lateral resistance. When the bolts are undone, the float beam can be taken from the hull and the floats from its ends.

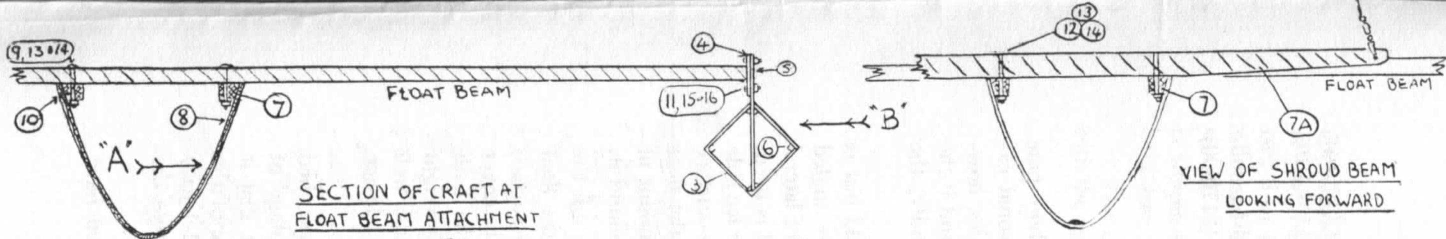
The floats are 8 feet long and square in midship section, each side of which is 8 inches. One of the angles is placed lowermost. One side only of the float is curved into an arc of a circle and this side is placed nearest to the hull. The waterline of the float is thus asymmetrical with the flat side to leeward.

A scale model of this outrigger arrangement has been made and tried out with the floats pivoted on a horizontal axis. The bows of the floats rise and the sterns sink when the model is towed at any speed. It would seem best, therefore, if a full sized craft were being built to allow for some adjustment of the position of the floats on the ends of the float beam. The floats can of course, be pivoted but, on the model, the pivot has to be forward of midships and the float then dips its bows under when weight is put on it when stopped. It would be best to have the float fixed by four bolts with alternative positions of the holes so that correct adjustment can be made for level running at high speeds. The bolts would keep the bows from going under when pressure is put on the float when stationary.

Steering is by a line which passes from one end of a yoke on the rudder head to a block above one float, then across the boat to a block above the other float and back again to the other end of the yoke. This line allows the boat to be steered from any position along the float beam and does away with the tiller extensions which were such a nuisance last summer. It might be necessary to have a drop rudder for easy beaching because the line would have to be set up taut by a rigging screw.

A normal centreboard would be used but A.Y.R.S. members need be given no details of this. The floats themselves would produce a certain amount of lateral resistance but the saving in the size of the C.B. is not capable of estimation at present. Details of mast, boom, rigging and rudder have been omitted. These can be made to individual requirements but a sail area of 120-140 square feet is suggested.

The total weight of the craft should be about 150 lbs. or 300 lbs.



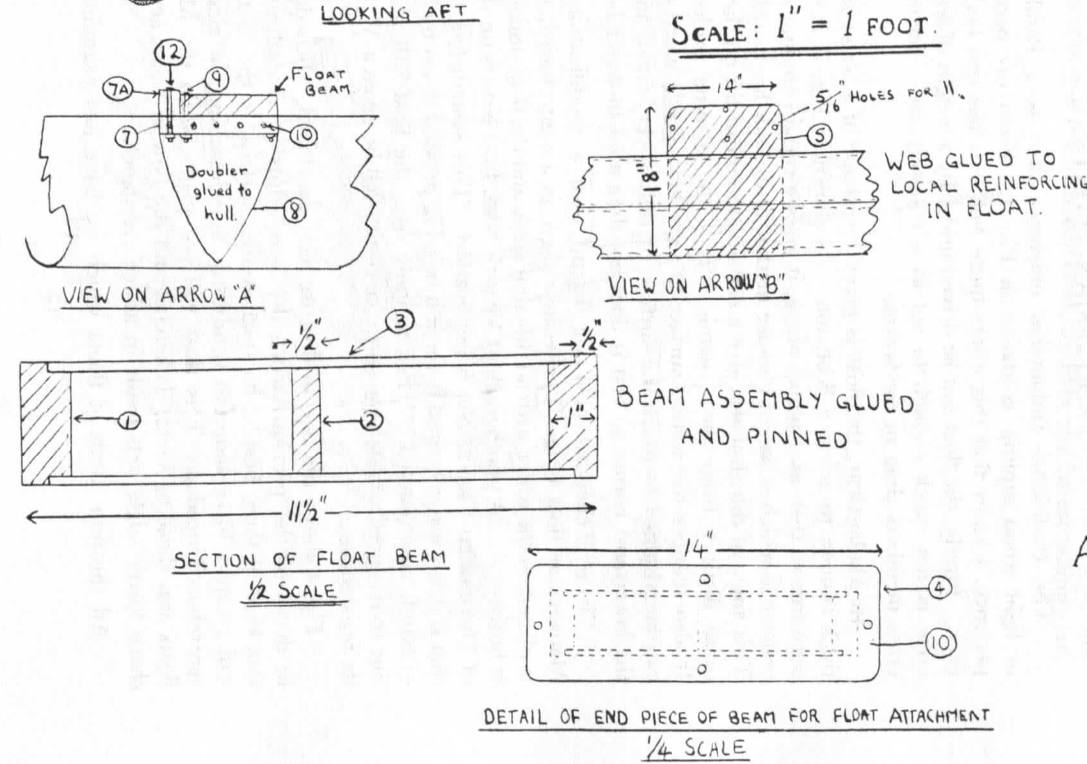


FIG. 4

ITEM	MATERIAL.	No. OFF
1	SPRUCE 12' × 2 1/2" × 1"	2
2	" 12' × 2 1/4 × 1/2"	1
3	PLY 8' × 4' × 4 m/m	2 Sheets
4	" 14" × 4 1/2" × 5/8"	2
5	" 18" × 14" × 5/8"	2
6	SPRUCE 8' × 1/2" × 1/2"	8
7	MAHOGANY 14" × 2" × 2"	2
7A	OAK 6' × 3" × 2"	1
8	PLY 21" × 21" × 5 m/m	WILL MAKE TWO
9	BOLTS (BRASS) 5" × 3/8"	4
10	SCREWS (BRASS) 1 1/4" × 10 g	22
11	BOLTS (BRASS) 1 3/4" 5/16"	8
12	" " 5 1/2" × 3/8"	2
13	NUTS (BRASS) 3/8" WING OR PLAIN	6
14	WASHERS (BRASS) 3/8"	6
15	NUTS (BRASS) 5/16" WING OR PLAIN	8
16	WASHERS (BRASS) 5/16"	8

A DOUBLE OUTRIGGER

by

IVAN MORRIS.

with a crew of one person. A crew of two is quite likely to improve the performances because greater sail area can be carried and the trim can be better.

The total cost of materials for home construction, including hull, masts, sails, glue, plywood, varnish, etc., would be about £56 ($170.00) at British prices.

INDONESIAN FLOATS

The traditional Indonesian outrigger float is a Bamboo pole or light wood sapling as shown in Fig. 1. From my personal experience, I know that this works quite well. It has two faults, however. Firstly, the float can be driven under by a weight of wind if the crew is not quick enough to act as a counterpoise. Secondly, the cross members drag in the waves.

In Madagascar, the float is given the shape of a water ski but is thick enough to act as a float, too. As shown in Fig. 2, it is angled outwards so that, as it planes along, it gives a certain amount of lateral resistance which is useful because neither centre nor lee-board is used. This angle of dihedral also give a certain amount of lift on the lee side quite distinct from the dynamic lift of the planing under-surface It also reduces the wetted surface at very low speeds when the float can be trimmed to touch the surface by only a very small amount of the lowermost corner so that it does not drag a lot of water behind it.

Victor Tchetchet of Long Island uses a modification of the Madagascar float (Fig. 3). Because there is a centreboard, the float is placed on the water with no dihedral angle and the float under surface is horizontal. A photograph of Victor's boat, EGG NOG is on the cover of OUTRIGGED CRAFT, No. 6 publication. This system has the fault that it drags water behind it when it is being pressed down by a weight of wind, close hauled. When running free, the float will plane well due to its speed, though the entrance could well be given a V to lessen its resistance.

Fig. 4 shows the type of float we have developed. It is described in detail in the previous article by Ivan Morris. An advantage of this kind of float, besides its small wetted surface, is the fact that it will create a force acting to windward, thus lessening the size of the centreboard needed. This float will not plane as do the Melagasy floats and those of Victor Tchetchet and the flow of water across the sharp lower angle will result in added resistance.

All the four kinds of floats which we have just examined have

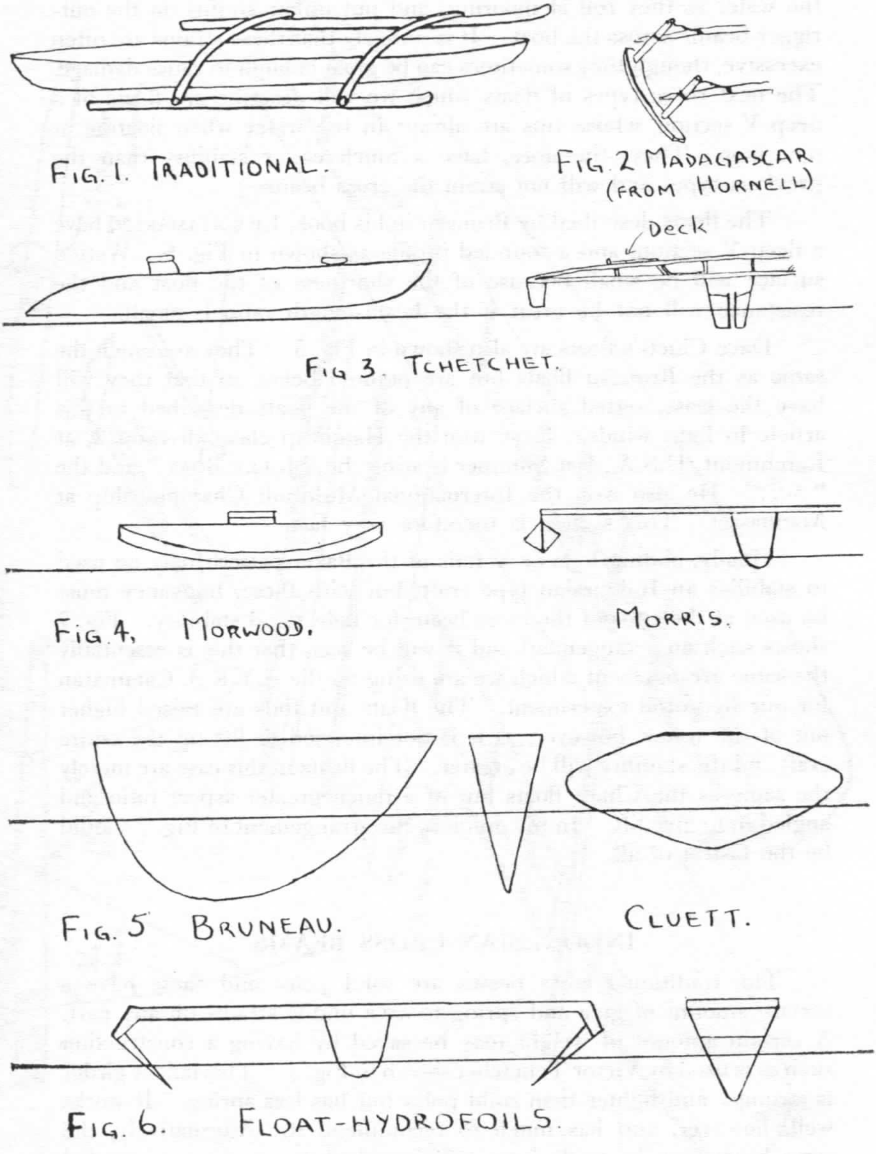


FIG. 1. TRADITIONAL.
FIG. 2 MADAGASCAR (FROM HORNELL)
DECK
FIG 3. TCHETCHET.
FIG. 4. MORWOOD.
MORRIS.
FIG. 5 BRUNEAU.
CLUETT.
FIG. 6. FLOAT-HYDROFOILS.

FIG. 5

been designed to sit on the surface of the water and thus can slap the water as they roll at moorings and put unfair strains on the outrigger beams across the boat. It is unlikely that these strains are often excessive, though they sometimes can be great enough to cause damage. The next three types of floats which we will describe are floats of a deep V section, whose tips are always in the water when floating at moorings. They, therefore, have a much easier stability than the previous types and will not strain the cross beams.

The floats described by Bruneau in his book, LE CATAMARAN, have a deep V section, and a rounded profile as shown in Fig. 5. Wetted surface will be small because of the shortness of the float and the resistance will not be great if the beam-length ratio is small.

Dave Cluett's floats are also shown in Fig. 5. They are much the same as the Bruneau floats but are pointed below so that they will have the least wetted surface of any of the floats described in this article in light winds. Dave won the Handicap class, division 2, at Larchmont, U.S.A., last Summer beating the " JOLLY BOAT " and the " 505." He also won the International Multihull Championship at Manhasset. This system is therefore very fast.

Finally, sliding foils or V foils of the Baker pattern may be used to stabilise an Indonesian type craft, but with these, buoyancy must be used at the ends of the cross beam for light wind stability. Fig. 7 shows such an arrangement and it will be seen that this is essentially the same arrangement which we are using on the A.Y.R.S. Catamaran for our hydrofoil experiment. The floats and foils are raised higher out of the water, however, as it is not intended to lift up the entire craft and the stability will be greater. The floats in this case are merely the same as the Cluett floats but of a much greater aspect ratio and angled in to give lift. In my opinion, the arrangement of Fig. 7 should be the fastest of all.

INDONESIAN CROSS BEAMS

The traditional cross beams are solid poles and these have a certain amount of give and spring to save undue strains on any part. A certain amount of weight may be saved by having a construction such as is used by Victor Tchetchet shown in Fig. 3. This ladder girder is stronger and lighter than solid poles but has less spring. It works well, however, and has much to recommend it. Alternatively, the cross beams can be made from spruce and plywood as recommended by Ivan Morris in the previous article to form strong box girders which can be easily streamlined to lessen wind resistance.

A MICRONESIAN CANOE

by SANDY WATSON

	Hull:		Float:	
L.O.A.	21 ft.	0 ins.	10 ft.	6 ins.
L.W.L.	18 ft.	0 ins.	9 ft.	0 ins.
Beam O.A.	1 ft.	8 ins.		10 ins.
,, W.L.	1 ft.	2 ins.		7 ins.
Draught:		7 ins.		$3\frac{1}{2}$ ins.

Total beam : 10 ft. 4 ins.
Sail area : 130 sq. ft.
Weight : 120 lbs.

This craft is a development of the Micronesian canoe which was described in A.Y.R.S. No. 4, OUTRIGGERS. It will be remembered that this type of craft has a single outrigger which is always to windward and sails with one end as the bow on one tack and the other end as the bow on the other tack. The craft we built last year worked but had some faults. This design is the result of all the lessons learnt from it which have led to some quite radical alterations. The most needed improvement was a great saving in weight. The previous canoe was not only too heavy for any considerable speeds but was also very difficult to haul up the beach. In this design, both the main hull and its smaller edition, the float, are made of moulded plywood.

The underwater sections of both the main hull and the float are semi-circular. This will save wetted surface and prevent the eddies which formed on the weather quarter of the previous canoe due to the water flow swirling under the right angled V sections.

The hull and float are connected by a 10 foot by 3 foot outrigger beam of plywood and spruce which should be more than strong enough. On the previous craft, the outrigger had plenty of elasticity and the float could move independently from the hull to a certain extent. We think that this is a good feature as much weight can be saved by having a beam which need not be rigidly braced.

The mast is stepped on the weather gunwale and stayed to both ends of the main hull and to the outrigger. In the other boat, a triangular lugsail was used which, though it enabled the sail balance to be altered at will, was very difficult to set properly. In this design, a Bermudian sloop rig is used. The main sail is set normally in a luff groove on the centrally placed mast. The boom, however, extends forwards of the mast to take the tack of the jib at its fore end. There is a cross bar on the boom through whose ends the jib sheets pass

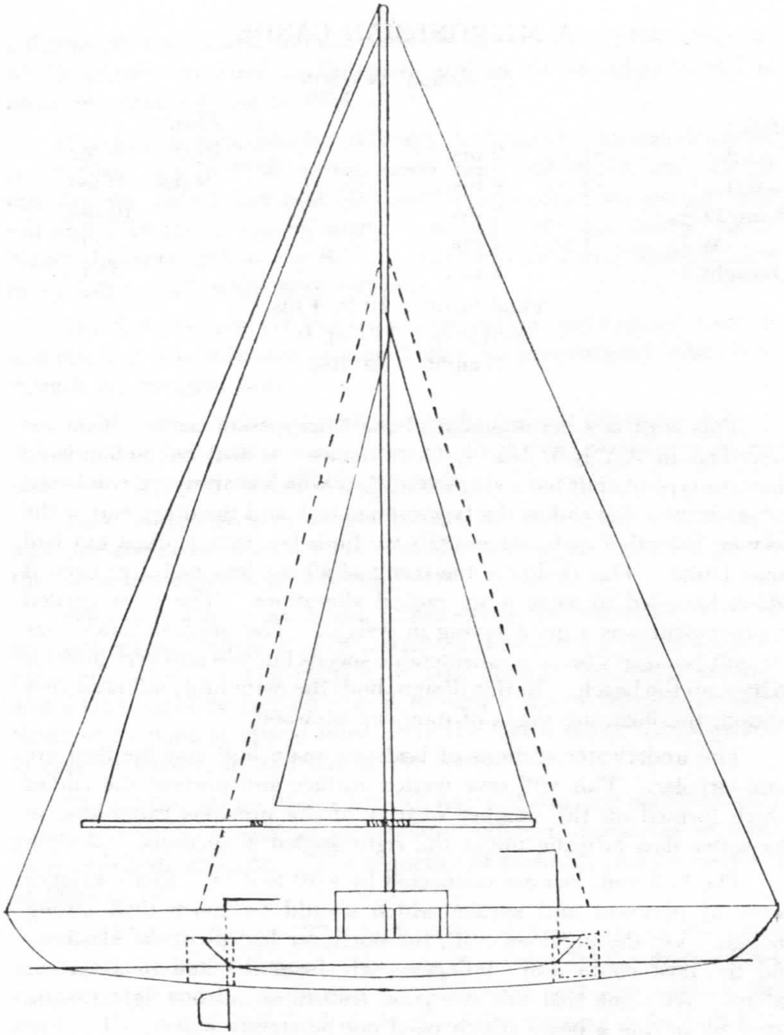


FIG. 6

before they go to the outrigger. It has been found on the model that this arrangement automatically sheets the jib correctly on each tack and it seems likely that we have here the perfect self acting jib.

The whole sail plan is reversed when changing tack so that the end of the boom is swung from one end of the craft to the other. The native boats take about a minute to change from full speed ahead to going astern. With this system, the change takes about 5 seconds. I found that when manoeuvring the old canoe in confined or crowded waters, I could stop her in her own length by "backwinding."

The sail area is 130 sq. ft. and the weight with a one man crew should be less than 300 lbs. With a crew of two, it should be about 450 lbs. Speeds of well over 20 kts. should be attained and the speeds in light winds should be exceptional. The float has ample buoyancy

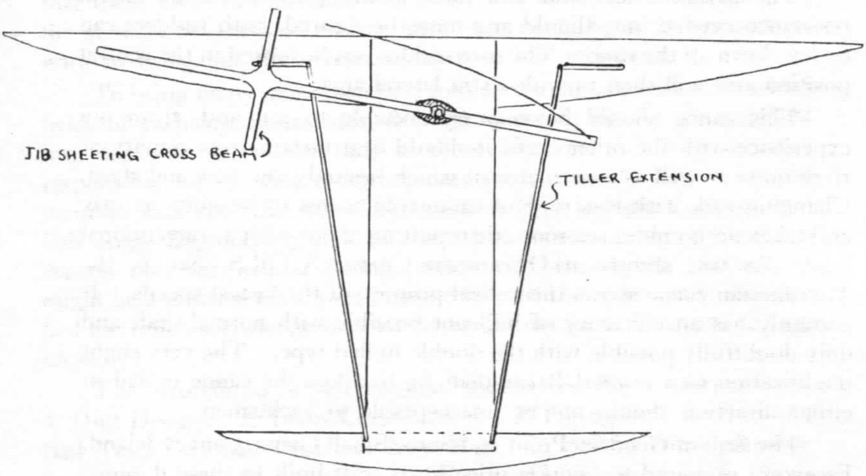


FIG. 7

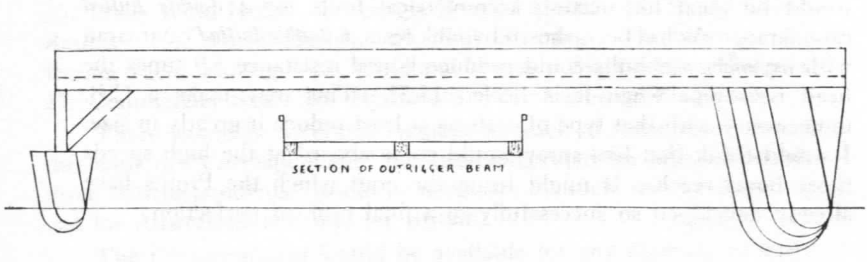


FIG. 8

to support a crew of two, who, with their tremendous righting power 10 feet from the main hull, should carry the sails easily in very strong winds.

The sizes of the fore and mainsail, as shown in these plans, are thought to be about right. The asymmetrical hull of the Micronesian craft, however, has a tendency to turn to leeward, the extent of which is not known with certainty, as yet. This means that the final proportions of the two sails can finally be established only by trial and error.

There are two rudders, each 6 feet from their respective bows. They are housed in centreboard boxes and are raised vertically when not in use. Two long tiller extensions, which reach to above the float, allow the boat to be steered from any position on the outrigger beam.

The asymmetrical hull and float should provide all the lateral resistance needed but, should any more be desired, both rudders can be left down all the time. The fore rudder can be locked in the central position and will then provide extra lateral area.

This canoe should be very comfortable to sail and, from my experience with the other craft, it should beat up a narrow estuary or river quite as well as a normal boat which has only one bow and stern. Changing tack with this type of catamaran seems to be quite as easy and takes up no more sea room than putting about with a conventional boat. As was shown in OUTRIGGED CRAFT, A.Y.R.S. No. 6, the Micronesian canoe shows theoretical promise of the fastest speeds. It certainly has an efficiency of hull not possible with normal craft and only doubtfully possible with the double hulled type. The very slight modification to a normal Bermudian rig to allow the canoe to sail in either direction should not be unacceptable to yachtsmen.

The firm of Geoffrey Prout and Sons, Small Gains, Canvey Island, Essex are prepared to quote a price for a craft built to these designs, It is noted that, if a mould were to be made for this hull shape, it would be ideal for making asymmetrical hulls for a *double hulled* catamaran. As has been shown by tank tests, a *double hulled* catamaran with *asymmetrical* hulls could produce lateral resistance 5.9 times the head resistance when it is heeled 13.5°. This may make a C.B. unnecessary with that type of craft or at least reduce it greatly in size. I would think that less spray would come aboard at the high speeds those boats reach. It might bring the craft which the Prouts have already developed so successfully to a final peak of perfection.

CATAMARAN SAIL BALANCE

The sail rig of a Catamaran has to be farther back than that of other boats. This is a fact which is not well enough known. I think this is because the people who have built these craft may have been just a bit uneasy in case they had made a mistake in their calculations.

If this should be so, I would like to console them. Their calculations have been correct.

The explanation of this difference in sail balance is quite simple. It depends on the fact that the centres of area of the heeled, underwater sections of dinghys and often of deep keeled yachts lie on a curve with its concave face to windward. Let us now imagine a log in the water of the same length as the boat and curved to the shape of the centres of area of the heeled, underwater sections. If we give it a push forward, it will not run straight but will go in a circle, turning always towards the concave side. For this reason, a boat of this shape will have a luffing tendency which is quite distinct from the relationship between the centre of effort and the centre of lateral resistance. This turning force is the principal cause of the increased weather helm which some yachts have when they heel. It is also used to a surprisingly great amount to steer the boat from one tack to the other when putting about.

In the directly opposite way to that which has just been described, a Micronesian type of craft, whose centres of underwater area lie on a curve which has a hollow to *leeward*, will have a paying off tendency. This tendency was very marked in the craft which Sandy Watson and I made in 1955 (described in OUTRIGGERS). We found that the centre of effort had to be very far back. Indeed, this craft sailed in good balance with a Bermudian mainsail only on its mast which is, of course, in the exact centre of its length.

Indonesian and double hulled craft lie between these two extremes. The centres of the heeled underwater sections of the Prout hulls lie almost in a straight line. The same centres in Victor Tchetchet's EGG NOG with its deep chines and box-like sections actually have a very slight hollow to leeward like the Micronesian canoe. These craft, therefore, will run almost straight forward if heeled and given a push in still water. Because the sails do not need to counteract a luffing tendency of a heeled hull such as is found in a sailing dinghy, they have to be nearer the stern. Because of the *paying off* tendency of the Micronesian hull, the sails with that craft have to be further aft still.

The straight axis of the Indonesian and double hulled craft also keep these boats from being as quick in stays as a sailing dinghy. This is because the curved axis of the heeled dinghy helps to turn it through the wind. The straight axis is not so helpful.

LETTERS

Dear Sir,

For the past four years we have been sailing a 20 foot Catamaran which we built from certain American plans. It has, however, one very bad fault, namely excessive pounding in a head sea caused by the completely flat bottom. This fault we hope to minimise in a 12 foot craft we are now going to build by having a V hull for, say, the first four feet. In the 20 foot cat with home made sails, considerable difficulty was experienced in coming about but this was cured when our English suit of sails arrived and it would appear that sail position, etc., is of paramount importance in a double hulled craft.

D. Row.

Ferham Estate, Talawakelle, Ceylon.

Dear Sir,

I intend to do some research in the relative (" quantitative " seems to be too precise for an amateur researcher) merits of highly polished, unpolished, brome bottom, simonized, " siliconised," boot polished, black leaded, etc. surface. So much time is spent on polishing that it seems worthwhile to test the need for it. Do you know if this has ever been done before, with these surfaces?

C. H. Jeltes, A.I.N.A.

Sweelinckstraat 29, 'S-Gravenhage, Holland.

Dear Sir,

I have constructed an 11 foot twin hull Catamaran with hulls at 3′ 6″ centres, total weight 200 lbs. and sail area 65 sq. ft. with jib and mainsail. The craft is very stable although the hulls are too close together. They would be better at about 5′ centres. I have no means of measuring speed although it is not far behind a 14′ Y.W. General Purpose dinghy. I can sail as close to the wind as a single hull vessel and turning about is no bother at all. I have a single rudder fitted centrally on the rear cross bar which is about 18″ from the sterns of the hulls. The hulls are 1 foot wide with curved, flat bottoms. They are not of very good design and should have been wider as the draught is 7 inches, although one advantage of this excessive depth is that a centreboard is not really necessary. I can take the boat to pieces and carry it on the top of my car. It will take three adults even in a fairly choppy sea.

A. J. BROOM.

P.W.D., H.Q., Maxwell Road, Kuala Lumpur, Malaya.

Dear Sir,

I am contemplating building a small Catamaran approximately 12 feet long by 7 foot beam. The design I have in mind is a twin hulled craft not unlike the Prout's brothers SHEARWATER.

I am considering covering the hulls with $\frac{1}{8}$th inch good quality hardboard, then a skin of glass fibre, etc., which from information I have, seems to be adequate and fits in with the weights etc.

G. HUTCHINSON.

50, Belle Vue Road, Southampton, Hants.

Ed.—Owen Dumpleton has also suggested that boats could be made from hardboard, coated outside and inside with fibreglass. This would probably cheapen construction greatly. Has any reader any experience? Would the bonding glue of the hardboard " sicken " the fibreglass resin glue?

Dear Sir,

Endeavour is now laid up for the winter season and experiments have been shelved until the weather gets a little warmer. Towards the end of last summer, I had one partially successful run on my hydrofoils with the boat practically clear of the water. Unfortunately, at this stage, the operating gear showed several failures and first one and then finally both forward hydrofoils collapsed under the hulls. With the weight factor so much in mind, one is always inclined to under-estimate the strains and stresses imposed upon a boat when the wind blows fresh.

KEN PEARCE.

Northside, High Road, South Benfleet, Essex.

Dear Sir,

I sail a 16 foot Catamaran with 170 sq. ft. of sail and, in a fair breeze, can hold my own with the popular one designs in this country, including the International 14. I have done some test tank work on Catamaran models and have about come to the conclusion that most any hull form is satisfactory. My own hulls are made flat for convenience and rather broad for greater displacement.

Later this year, I plan to do some work on mast interference with respect to the main sail by rigging the mainsail from a vertical stay about 16 inches abaft the mast so that the turbulence passes to leeward without disturbing the negative pressure on the lee of the main.

ALLEN H. LLOYD.

306, Rugby Avenue, Terrace Park, Ohio, U.S.

Ed.—With the mainsail luff 16 inches behind the mast, the above system would still act as a " Spoiler." In practice, Bipod masts with the sail between the legs have not proved successful. The only way to deal with this problem is to get a *single* mast to *windward* of the luff. This is done with the Squaresail, lugsail, Ljungstrom and P.18, OUTRIGGERS.

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