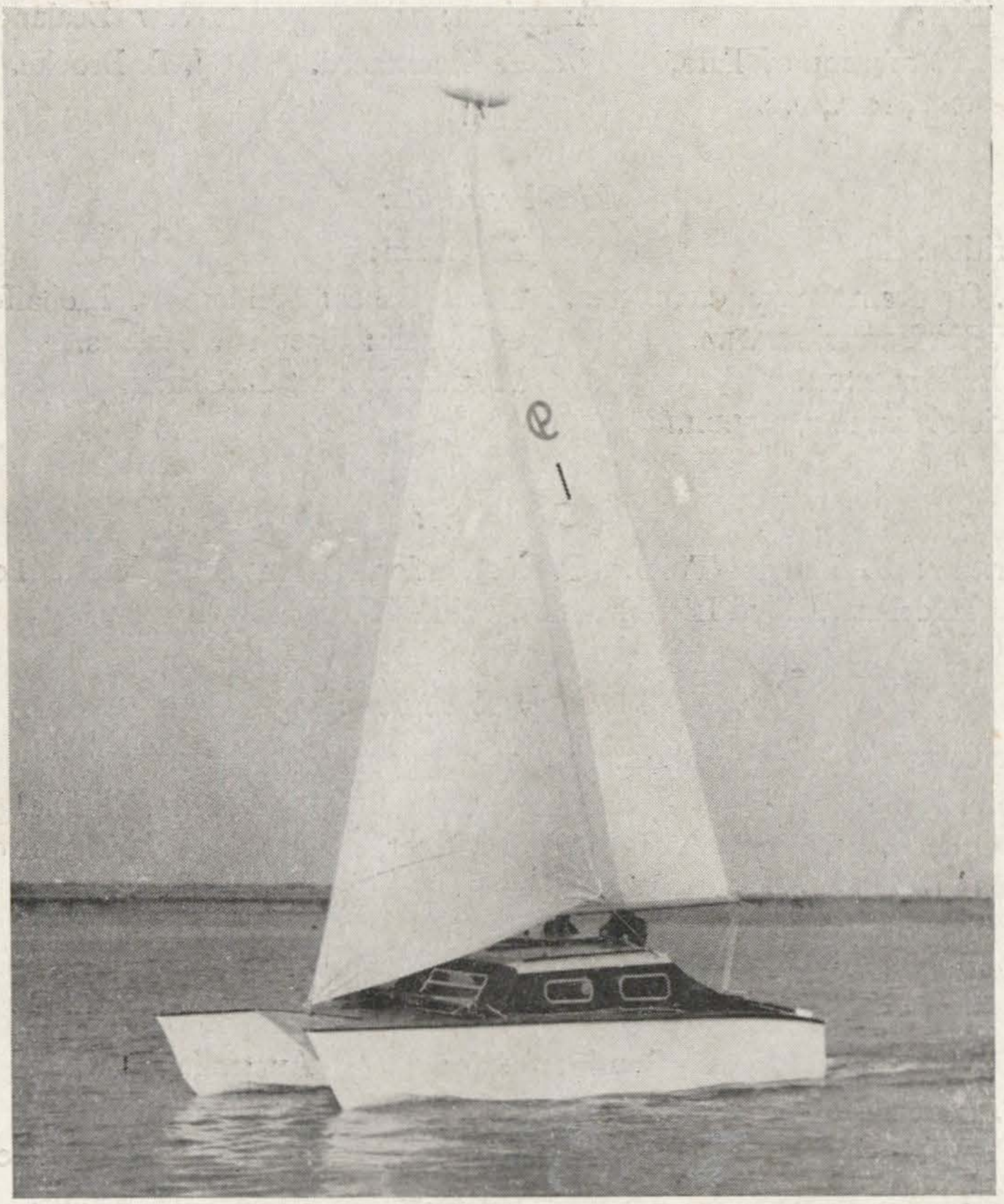
CATAMARANS 1963

A.Y.R.S. PUBLICATION No. 46



Prout 27 foot Catamaran

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EDITORIAL

January, 1964

With the information in this and the last two publications, I feel that the first major stage in the A.Y.R.S. development has been completed. We are now able to design and build the fastest possible sailing craft of the two main types in which people are interested, viz., the racer and the cruiser.

The Racer. This will consist of one C Class catamaran hull with hydrofoil stabilisers and an additional hydrofoil forward which will make it a flying hydrofoil craft. Construction will be of a polystyrene foam sandwiched with either Terylene (Dacren) or fibreglass. The rig will be a single semi-elliptical fully battened sail set either as a balanced lug or squaresail.

An alternative could be the Micronesian Hydrofoil craft of A.Y.R.S. No. 44. A recent book published in America called *The 40 Knot Sailboat* by Bernard Smith (price $10.00) suggests this type of craft amongst a lot of other information and ideas which we have studied in the A.Y.R.S. (apparently independently as he doesn't mention us in his bibliography).

The Cruiser. This will only differ from the racer in its beam to length ratio, displacement and gadgets. It is likely to have ballast on the bottom of a centreboard, and it will most certainly use a squaresail. George Dibb tells me that his squaresail will put itself from tack to tack without touching a sheet and without getting sternway. If the sail is held till the boat is just through the eye of the wind, it flicks itself round quickly. The A.Y.R.S. cruiser will most certainly have a self steering gear and automatic hydrofoils. I personally would like to have such a boat which I could tow to the water with a motor scooter (with side wheel), launch and then put the scooter inside to hitch it up to an "inboard-outboard" drive for auxiliary power. This boat would than have about everything one could wish for.

Apology. I am sorry that publication No. 45 was not out in time for the Weir Wood sailing meeting. Though some publications had been late, I was not told by the printers that they were now taking 6 weeks to do our publications instead of the month which they used to take. This means that we go to press sooner than we used to and therefore must have our articles sooner.

The London Boat Show. The main feature will be George Dibb's trimaran with semi-elliptical squaresail. George will be there most of the time and give people the information they want. Though the full list of exhibits is not yet in, we hope to have some very interesting models.

The A.Y.R.S. General Meeting. The British section will not have an A.G.M. this winter. There will be a meeting on January 4th to dissolve the present A.Y.R.S. and The Amateur Yacht Research Society Limited will immediately take its place. This will, as usual, take place at the Cedars, North End Road, near Earls Court, where the Boat Show is being held. Time 11.30 a.m.

RYSA. Though hard pressed for time, I started to make *RYSA*. The first difficulty was to join the sheets of plywood together accurately. This was more difficult than I had thought and gaps of up to 3/16th of an inch appeared between them. The second trouble is in bending up the huge sheets of plywood around the bulkhead. The weight of the wood is great and its stability poor. It is being made to come up but, if I ever made another, I would make up an internal framework in the normal way and put the individual sheets of plywood on afterwards.

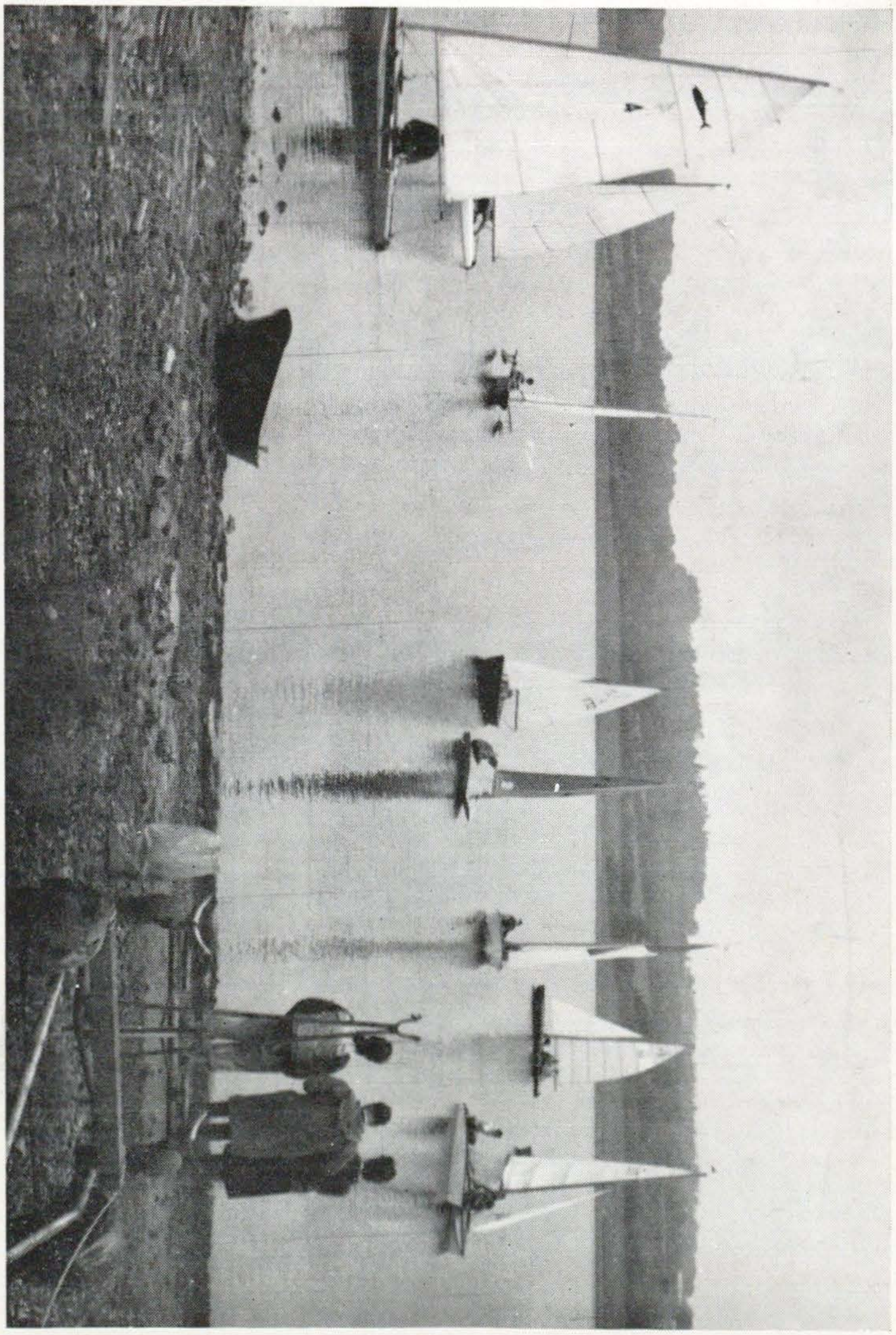
THE WEIR WOOD MEETING

BY FRED BENYON-TINKER

The second Annual Sailing Meeting of the A.Y.R.S. was held at the Weir Wood Reservoir in Sussex on 5th and 6th October. The boats which were brought along covered a wide range, being two of the Shark Trimarans from Shoreham, along with designer Anderson, a Fireball loaned by Norris Bros. a lazy E from the Jack Holt stable, a Swift catamaran belonging to Alan Smith, John Long's new Torpedo Moth, a Heron by Dudley Soulsby, a Flying Kitten catamaran, made locally by amateur Eric Scott and a delight to the eye for it fine craftsmanship, the Benyon-Tinker expanded polystyrene catamaran—described elsewhere in this issue—and last, but by no means least, Banham's 12′ dinghy, largely by courtesy of discarded billiard tables and described, not all that long back, in Lightcraft. It was a source of great reget to all that although George Dibbs managed to come up from Plymouth with his wife, he came minus boat, for this is in the throes of being refurbished for the Show—it will be on our stand—and he just did not have time to finish it.

The weather, alas, was a reversal of the two glorious days we had last year. Saturday was rainy and with a rugged wind, gusting very hard at times. Nevertheless, although not many people turned up on the first day, we had some very brisk sailing indeed, with Banham's boat giving its usual display of good manners and stability. The Sharks looked very impressive and the Tinkerkat, for once, did not shed any centreboards and travelled along in its usual cloud of very wet spray. In spite of the weather, it was nice to find that members had turned up from as far afield as Plymouth, Cheshire and Fareham.

Sunday was an improvement in that the rain held off, but then, so did the wind, which was not quite so good. Editor John Morwood was an early arrival, with his wife and we all set to work sailing each other's boats with a will. This was all very interesting and at one stage the proceedings were enlivened when the noble editor, precariously planted on the Tinkerkat, nearly vanished down the plug hole of the reservoir. However, the local Weir Gods relented in time, possibly because he was clad in natty gents suiting, which looked bizarre on what is normally a mobile spray cloud, and aided by a paddle and anything else he could think of, he eventually emerged into the open unscathed. On the previous day we had been treated to a superb example of sangfroid when designer Anderson mounted on, or in, one of his Sharks, was approached meanly from the rear by an unruly piece of wind which tipped him over. Not in the least put out, he calmly sat on his elevated perch, until the boat, realising that



The Weir Wood Meeting.

it had a hard man to deal with, gave up the struggle and returned to its feet, unaided by anything but will power. A striking tribute to both boat and man.

Comparisons are normally odious, but they do form one of our yardsticks, so watching how the various boats were performing was very interesting. The Flying Kitten coyly spent most of the time far off doing mysterious things with lots of crew having quiet little naps, draped all over it. The Sharks went along very quickly and handled very well, whilst the Tinkerkat displayed what seemed a very comparable performance, but on the whole, perhaps, not pointing quite as high. In the light winds prevailing the Torpedo Moth proved a delightful boat to sail. Should be fun in a blow.

The aim of the meeting was to let members get together and compare boats with one another and with accepted standard boats and was a great success. The intention is to hold such meetings every year.

MULTIHULL DESIGN

BY JOHN MORWOOD

Multihull designers are an "off-beat" lot, myself included. If anyone wants to know what shape to make a catamaran or the main hull of a trimaran, he need only study the Polynesian hull design, or, if he wants to be refined and "modern" he can study destroyer hulls. The *Shearwater* was designed from a destroyer hull and the recent *One of a Kind Catamaran* races have shown that *Shearwater* is as fast as any other catamaran by beating the *Thais* and all the other fast cats.

In practice, however, multihull designers have tried the following features with often very poor results:

1. Split boat type.
2. Asymmetry.
3. Deep hulls.
4. Chined hulls.
5. Planing hulls.
6. Canoe sterns.
7. Forward and after overhangs.
8. "Developed plywood" hulls.
9. Sharpie type hull.

The designers who produce these features, myself included, have all some very pretty reasons which roll off their tongues glibly enough for their hulls but let us not be deceived. All of these nine features slow the boat, for the following reasons.

1. Split boat. Too much wetted surfaces and wave making. The performance is far worse than a single hulled boat, though it sails like an omnibus.

2. Asymmetry. Too much wetted surface (though as "form resistance") and excessive wave making on the convex side. It is merely a refined version of the split boat. It took origin from the Micronesian canoe and hence is often deep which increases the wetted surface more. Some types like Rudy Coy's *Aikane* and *Waikiki Surf* are very fast in the larger sizes but the smaller ones are very slow.

3. Deep hulls. These are used to avoid the use of centreboards. The wetted surface usually makes them very slow.

4. Chined hulls. If the chine is above the waterline and the deepest section has a right angled V at the keel, like the hulls of Arthur Piver and myself, the boats are fast but still have more wetted surface than the rounded type. For peak performance, centreboards are still necessary.

5. Planing hulls. In publication No. 15 *Catamaran Design* we stated that these hulls do not plane. Despite this, the didactic statements of many people have misled catamaran sailors who feel the "breakaway" as their craft overrun the bow wave which is not, of course, planing. The Bruce article in A.Y.R.S. No. 45 *Basic Research* shows this clearly. A planing hull shape with a flat floor aft is therefore merely increasing wetted surface beyond optimum for a chined type of hull. However, Bill O'Brien's *Jumpahead* is still a fast boat so the losses are slight in practice.

6. Canoe sterns. The result of having canoe sterns on a catamaran is that the craft behaves as if it were much shorter in length than it is. In effect, one is losing the benefit of length, though gaining by reducing wetted surface.

7. Forward and after overhangs. These reduce the sailing length and hence the speed. If a vertical stem and the transom both just kiss that water (with the load on) at rest, the immersion when almost flying, the weather hull will be about right in my opinion, but I have no exact information on this.

8. Developed plywood hulls. If astutely designed like those of F. M. Montgomery (*Flying Cat*, *Flying Kitten*, *etc.*) one gets a fast craft but the wetted surface is a little greater. I suspect, however, that there is a little eddying along the keel line. I have been told also that the wave thrown up amidships holds this type of craft back. It is hard to tell if these three objections are absolutely valid because, though the racing results seem to show the Flying series to be a little slower than the rounded hulls, the difference is within that of helmsmanship. Tank tests here would be of immense interest, especially as the boat construction method is so suitable for amateurs. Rounding the slight keel angle might improve these boats in a startling way.

The "tortured plywood" system of hull construction used by J. R. Anderson in the *Shark* trimaran produces a normally shaped hull, resembling a *Shearwater*. A long sheet of plywood has a V cut out fore and aft and is forced up when wet into the shape.

9. The Sharpie shaped hull. For best results, each underwater section is half a square with the beam twice the depth which has the same wetted surface as a right angled V. However, with slight leeway, the water eddies over the underwater chines, producing resistance.

THE "C" CLASS CATAMARANS

BY JOHN MORWOOD

This year (1963) in England, we have seen six "C" Class catamarans, four British and two Australian. Others have been built in the U.S.A. and Australia but apart from Sealion and Beverley being the best in America, we know little of them. Somehow, the speeds claimed for them have not come to hand but 20 knots must be frequent and 25 knots easily possible. They are the fastest sailing boats in the world.

HELLCAT III

Hellcat III still reigns supreme for speed. Built of moulded ply, the weight is light and the structure strong. The present *Hellcat* has more of a bow overhang than *Hellcat I* and a fine V of an entrance sweeps aft to a curved greatest section which is nearly a semicircle. The stern sections only flatten slightly but rise up to almost straight buttock lines and the transom is similar in section. The overall picture is that of a slightly beamier *Shearwater* drawn out to 25 feet in length with a bow overhang.

Possible Improvements. For the last 100 years, it has been shown that, where overall length is used for measurement, the stem becomes vertical. One foot in overhang will cost *Hellcat* 2 per cent. in speed. Rounding the underwater bow sections would save a few square inches of wetted surface. The argument on the other side is that sea behaviour is improved by these two things. The answer here is that destroyers have vertical stems, functionally.

QUEST

Designed by Charles and Lindsay Cunningham, she is an enlarged *Yvonne* by the same designers. Construction is extremely light of Terylene, resin bonded to honeycomb paper to make a sandwich. The stem is vertical and the forebody excellent; developing in appro-

ximate semi-circles to the greatest section which is about the mid length position. The stern comes gently in to a vertical sternpost and is almost identical with the bow. In the International Catamaran Trophy, *Quest* was far faster than *Hellcat* in light going due to her small wetted surface but in the stronger winds of the completed races, she was functioning as a catamaran of only some 20 feet in length owing to her canoe stern. She was therefore much slower. In all other respects, however, she was a superb boat. All-up weight 485 lbs.

BOADICEA

Designed by John Fisk, this boat was excellent in design, and construction and was sailed by John himself in the catamaran *One of a Kind* trials so we know that she went as fast as possible, but she was slower than *Hellcat.* In all respects she had as sweet a hull as one could wish but with a 2 foot overhang forward. This alone put her at a 2 per cent. disadvantage in respect of *Hellcat* in strong winds but it resulted in slightly fuller bow sections so that she had to throw up a bigger bow wave at speed. However, she was still able to win the Marlow Rope Trophy for the fastest cat and come second to *Shearwater IV* for the fastest cat on corrected time so she is no sluggard in the hands of John Fisk.

MATILDA

The Australian "trial horse," *Matilda* which came to England with *Quest* was designed by Peter Hooks, Jack Shaw and Peter Joubert. Peter Hooks will be remembered as the designer of the chine catamaran *Attunga. Matilda* is made from skins of Balsa wood sheathed in fibreglass and weighs 450 lbs. all-up. This also is a nicely designed catamaran but with a bow overhang, too much concentration of buoyancy amidships which was put there to give easy manuoevering for match racing and she ended aft with a hard chine section like the International Canoe. This stern may be worth while with the International Canoe as an excuse for a transom and, of course, the canoe may occasionally plane because of its extra beam though I doubt it. It must be valueless in a catamaran. *Matilda* was slower than *Quest* and was not chosen for the International Catamaran Trophy.

FLYING ROCKET

Designed by F. M. Montgomery this is a nice looking catamaran made from sheet plywood of a very good underwater shape, to my eyes. A straight and vertical stem, an easy entrance, a shallow mid-

ships section and a broad transom are the main features. In fact, she has been a little slower than the other British catamarans but no clear cut reasons for this can be given by me. I suspect quite a few factors which are:

1. Slightly more wetted surface. 2. The greater hull beam gives extra weight. 3. Slightly shorter overall length (23 feet). 4. Slight eddying over the keel angle when making leeway.

In all, however, the *Shark* is a very nice craft which could well find its place as a cruising type where the above features would not be of importance.

C Class Catamaran Design. It is my opinion that any critic should always be prepared to state his own views of anything he criticises so that those criticised can retaliate. I feel therefore that I must state my own feelings on the design of these wonderful craft so, in order to help me, I have got out the lines of Bob Harris' *Tigercat* (*Modern Sailing Catamarans*, Charles Scribner and Nicholas Kaye) and Don Robertson's *Freedom* (A.Y.R.S. No. 44). I also have the lines of *Shearwater III* and *Thai II* but have not got them out as they tend to be misleading, and are also not available to most of my readers.

Stem. It is uncivil, to say the least, to have a perfectly vertical stem because of the nature of the damage it causes in case of collision. I would therefore draw the stem with about 3 inches of overhang just touching the L.W.L. at the lower end.

Transom. This would be drawn raking forward to save deck weight. Its lower edge would just touch the L.W.L.

Greatest Section. Using an estimated all-up weight of 900 lbs. and a prismatic coefficient of 0.6, I would calculate the area of the greatest underwater section and, using a point 3 inches above the L.W.L. I would draw an arc of a circle to include that area below the L.W.L. This would give me the deepest point of the profile which I would place half way along the waterline length.

The Profile. The forward profile would be an arc of a circle parallel to the L.W.L. at the deepest section and touching the lower end of the stem. The after profile would be part of an ellipse drawn in the same way as the forward part, using the shape to flatten the buttock lines somewhat. The deck line would be normal.

Forward Underwater Sections. These would be arcs of circles as near semi-circles as I could get, the centres of which would gradually

drop from 3 inches above the L.W.L. at the greatest section to the L.W.L. at the stem.

After Underwater Sections. These would develop in a series of shallowing ellipses from the greatest section to the transom always keeping the hull beam the same. The horizontal axes of these ellipses might have to be raised to give a good shape.

The Above Water Sections. In the bows, it does not seem worth while to me to curve out the sections to the deck to give extra buoyancy when digging into a wave. A V of 30° near the forward end of the L.W.L. seems adequate. This V disappears at the fore end of the bridge deck where the topsides become vertical. Aft of this, I would have a great deal of tumblehome to reduce the weight and windage of the after deck.

Checking the Design. All good designers check their designs in several ways. The curve of sectional areas is usually drawn, if only to check the total displacement. This curve must also be fair with no humps on it, or one will produce hollows in the water flow. Because there is usually a hollow in this curve forward, Austin Farrar suggests plotting the curve of the *Squares* of the sectional areas which removes the hollow and makes checking easier. The second check is a measurement of wetted surface and this and the curve of sectional areas between them are an indication of the resistance of the hull. The third check should be that of the boat above the L.W.L. and for a catamaran this should be the sectional area curve when the total displacement is being carried on one hull.

Dear John,

I feel that Hellcat's slight superiority stems mainly from her extra waterline length, but we should not forget that Boadicea is a match for Hellcat 3, which was really Rod's 1963 boat, whereas 3 (S) might well be considered to be the 1964 boat built a little early. We found in practice, that in a good strong breeze we could do well, particularly to windward, and I feel that our rig was a little better than Rod's. Also our mast stood well with our triangular crosstree and our windage was less than Hellcat's, which may have helped us on the windward legs.

My present ideas for a new boat would be to lengthen out the waterline (this would make the boat less seaworthy and harder to tack) to gain in straight line sailing speed; reduce the rocker, which I now feel was excessive; fine the waterlines forward and introduce a little more Vee to the sections; lastly, reduce the mid and other sections

to produce finer lines right through. I feel the rig is O.K. for the time being, although I would very much like to play with one or two ideas and to set off on the trail of experiment. However we have plenty of problems for the time being and I feel we must for the present stick with the things we know.

Yours,

JOHN FISK.

The Parkway,
Canvey Island, Essex.

47 FOOT CRUISING CATAMARAN

L.O.A. 46 ft. 6 in.
L.W.L. 40 ft.
Beam, O.A. 20 ft. 5 in.
Draft, C.B. up 2 ft. 3 in.

Designers: MacLear and Harris, 366, Madison Avenue, New York, New York. YUkon 6-6940.

Owner and Builder: Mr. E. H. Mullen, Connecticut.

This 47 foot catamaran is the second largest of a series designed by MacLear and Harris. Eight 37 footers have been built and two 41 footers are under construction. This 47 footer is commencing construction in Connecticut at the present time. She is ketch rigged to make her easy to handle and safe.

While a catamaran of this size can easily sleep ten, the present owner only wishes accommodations for six. It is interesting to note that these six people are sleeping in five distinct and private compartments.

Other unusual features of this craft that are seldom found on single hulled sailboats of 47 feet are: two bathrooms, twin screw power, and a large comfortable chart table. One of the most interesting advantages of catamarans over ordinary boats is the tremendous outdoor lounging space in the cockpit and on the foredeck, and the generous space in the doghouse.

The large expanse of foredeck that consists of netting made of nylon webbing, greatly facilitates changing headsails. When one goes forward instead of finding the ever narrowing deck of a single hull boat, one is confronted by a large and spacious platform with elastic spring which is completely self draining. At speeds below twelve knots, this net provides an excellent hammock for siestas, but over this speed, a supine crew member would receive an invigorating spray bath.

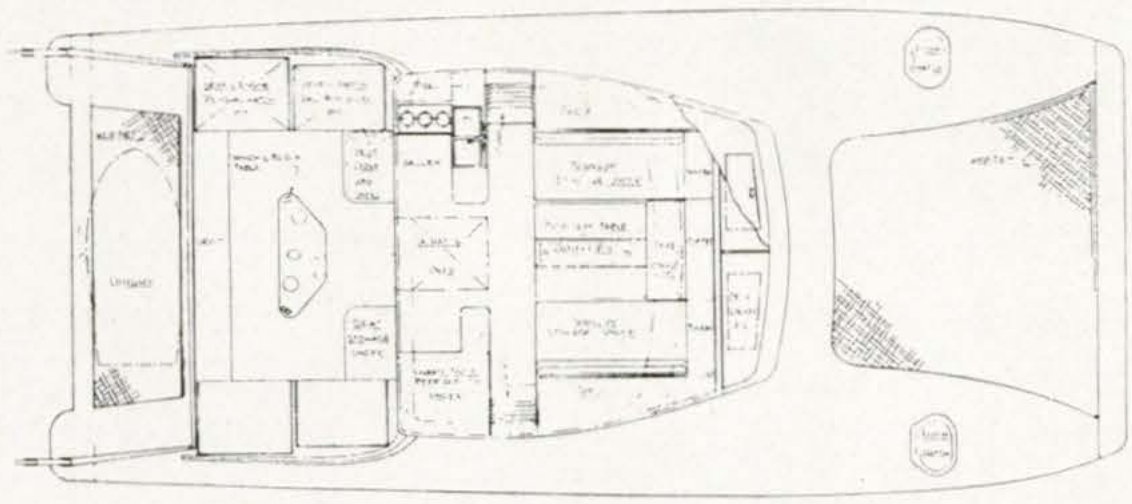
The twin MerCruiser drives can be swung up completely out of water, thus not leaving any underwater appendages to impair the boat's high speed under sail.

MacLear and Harris 47 foot Catamaran.

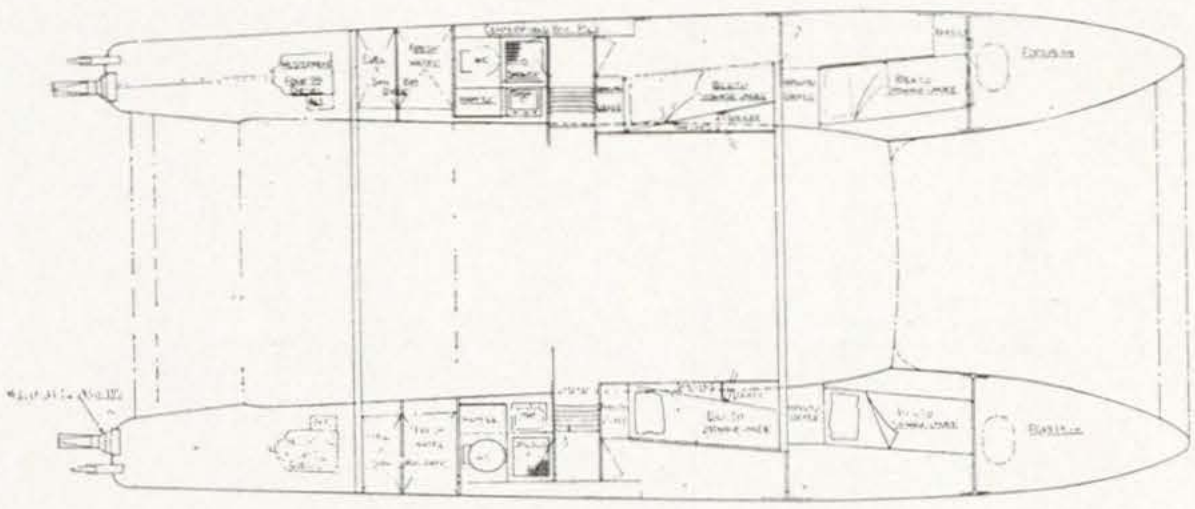
The twin Westerbeke diesel engines specified, are expected to power the craft at between 10 and 14 knots. Each diesel delivers 30 continuous horse-power, or 40 horse-power intermittently. The twin screw arrangement will permit the craft to be turned in her own length, and to be very manoeuverable at all times. Since the Z-drives, the rudders and the centerboards are all retractable, the craft can be beached readily. She can sail or power in water of only three feet of depth, and can anchor in still shallower water.

The owner of this boat, Mr. Mullen, has owned several catamarans before, most of them built by himself. This boat will be built under his supervision with the help of some professional boat-builders, near his Connecticut home.

One of the unusual features of this boat's rig, is that she does not have any upper shrouds as such. The twin permanent backstays



DECK ARRANGEMENT



HULL ARRANGEMENTS

DESIGN Nº 205
ARRANGEMENT PLAN
OF A
46'-6" OCEAN RACING CATAMARAN
FOR
MR EDWIN H. MULLEN
SCALE: 1/4"=1'-0"
MACLEAR & HARRIS

MacLear and Harris 47 foot Catamaran.

however, have enough spread to not only act as backstays, but also as upper shrouds. Thus the craft has no spreaders, and large genoas can be trimmed as flat as the skipper desires. The absence of upper shrouds and spreaders will also facilitate tacking since the overlapping headsails will have far less drag in coming from one side of the mast to the other.

One advantage to the catamaran configuration is that the cockpit sole and the main cabin sole are on the same level, and one can walk from the cockpit to the galley to the chart table to the main dining table without going up or down any steps. It is like single level living with two basements.

The ketch rig is favoured by the designers because of its versatility and many sail combinations. Since catamarans tend to draw their own wind more than single hulled vessels, it becomes particularly advantageous to shorten down when going to windward. Conversely, as one runs off the wind, the catamaran is so fast that in running away from the wind, it reduces the relative wind velocity and the boat requires as much canvas as one can physically hang up. With this in mind the design called for a large mizzen staysail as well as a huge overlapping reaching jib, that hoists on the fore stay and trims to the

end of the mizzen boom. The foot of this sail is longer than the catamaran itself, and constitutes a tremendous light weather sail. All sheets lead to winches and then to jam cleats so that any sail can be quickly released in the advent of a sudden squall.

One great advantage of catamarans is that they heel very little and sail on an almost even keel, thus facilitating the daily chores and making it easy to move around even when the wind is quite fresh and the boat is sailing at speeds in excess of 18 knots.

It is believed that this cruising ketch catamaran with her generous diesel power can make faster passages under sail and power than any single hulled auxiliary or motorsailer up to 100 feet in length.

HIGH SPEED CRUISING KETCH CATAMARAN—DESIGN NO. 182

L.O.A. 36 ft. 11 in. Draft, cbd up 1 ft. 6 in.
Datum W.L. 32 ft. 11 in. Draft, cbd down 5 ft. 7 in.

Designers: MacLear and Harris, 366, Madison Avenue, New York 17, N.Y. YUkon 6-6940.

This high speed cruising Catamaran was designed by MacLear and Harris for persons who want to increase their cruising range on weekends by going faster.

In all but adverse conditions, the craft is expected to average well over ten knots under either sail or power.

In light and ghosting weather, they are faster than the fastest monohulled cruising boats of her size, although not as spectacularly so as when it breezes over 12 m.p.h. The sailplan calls for a gigantic nylon reacher which tacks down at the bows and trims to the end of the mizzen boom. With this sail no other sail need be carried, and the craft can go from very close reaching to very broad reaching.

The first of these boats was built in Santa Barbara, California and others are under construction in Sweden, South Africa, and Lebanon. There is also the possbility of some others being built on the East Coast of the United States as well as Bermuda.

Some of the craft are powered by Volvo Z-drives and others by Porsche engines through an extended shaft Eaton Z-drive. Still others have extended shaft outboard motors.

MacLear and Harris 37 foot Catamaran.

Plans exist for either wooden or plastic sandwich panel construction. This latter specifies polyurethane foam board to build the boat. The foam boat is then covered inside and out by glass cloth and resin. The wood model has plywood sides and strip planked wooden turn of bilge.

The craft's rig was designed for ease of handling. To come about, the helmsman simple puts the helm down and she is about. No running back stays, no genoas—everything is self trimming. The high aspect ratio makes the three lowers easy to furl. The boat balances well under jib and mizzen alone or under main alone. The main roller reefing and the mizzen and club-footed jib each have deep sets of reef points, so that shortening down is a very easy matter. The main sheet is double ended with one end going to a conventional drum winch while the other end goes to a specially re-worked halyard reel winch with a high speed break lever. This friction break can be set to release manually or automatically at any specified tension. The rig is somewhat unique in that it has no spreaders because the boat's beam is so large.

Accommodations

The spacious accommodations on this 37 foot Catamaran are greater than on the average 45 foot single hulled vessel. She can sleep 7 to 9 persons and she could sleep three more in the cockpit under a mizzen awning if necessary. The cockpit will seat 11 persons while the boat is at anchor or at a slip (under way this could be excessive because of stern trim).

The bow and stern netting are excellent for sun bathing. Built-in spray steps of generous size will reduce spray greatly and provide substantial lift to the lee bow at speeds over 12 m.p.h.

The boat is believed to be capable of speeds in excess of 20 m.p.h. in ideal conditions. She can be beached readily having swing up rudders and centerboards (two of each). With these partly raised she can sail in 2 feet of water, and can even go to windward.

In summary we think that it is safe to say that this boat opens up several truly new dimensions in sailing. She has a high speed potential. She is tremendously roomy. She is exceedingly shallow of draft with boards and rudders up, and can negotiate very shallow bars and anchor close to shore, or be beached like a landing craft.

We think that she is a significant step in a new era of sailing and may point the way to the true potential of cruising Catamarans.

PROUT 27 FOOT CRUISING CATAMARAN

L.O.A. 27 ft. 3 in.

Beam 12 ft. 6 in

Draught with c.b. 4ft. 0 in.

Draught ex c.b. 11 in.

Sail areas: Main 207 sq. ft.
Jib No. 1 64 sq. ft.
Jib No. 2 130 sq. ft.
Genoa 212 sq. ft.

Designers and builders: G. Prout and Sons, 1, The Point, Canvey Island, Essex.

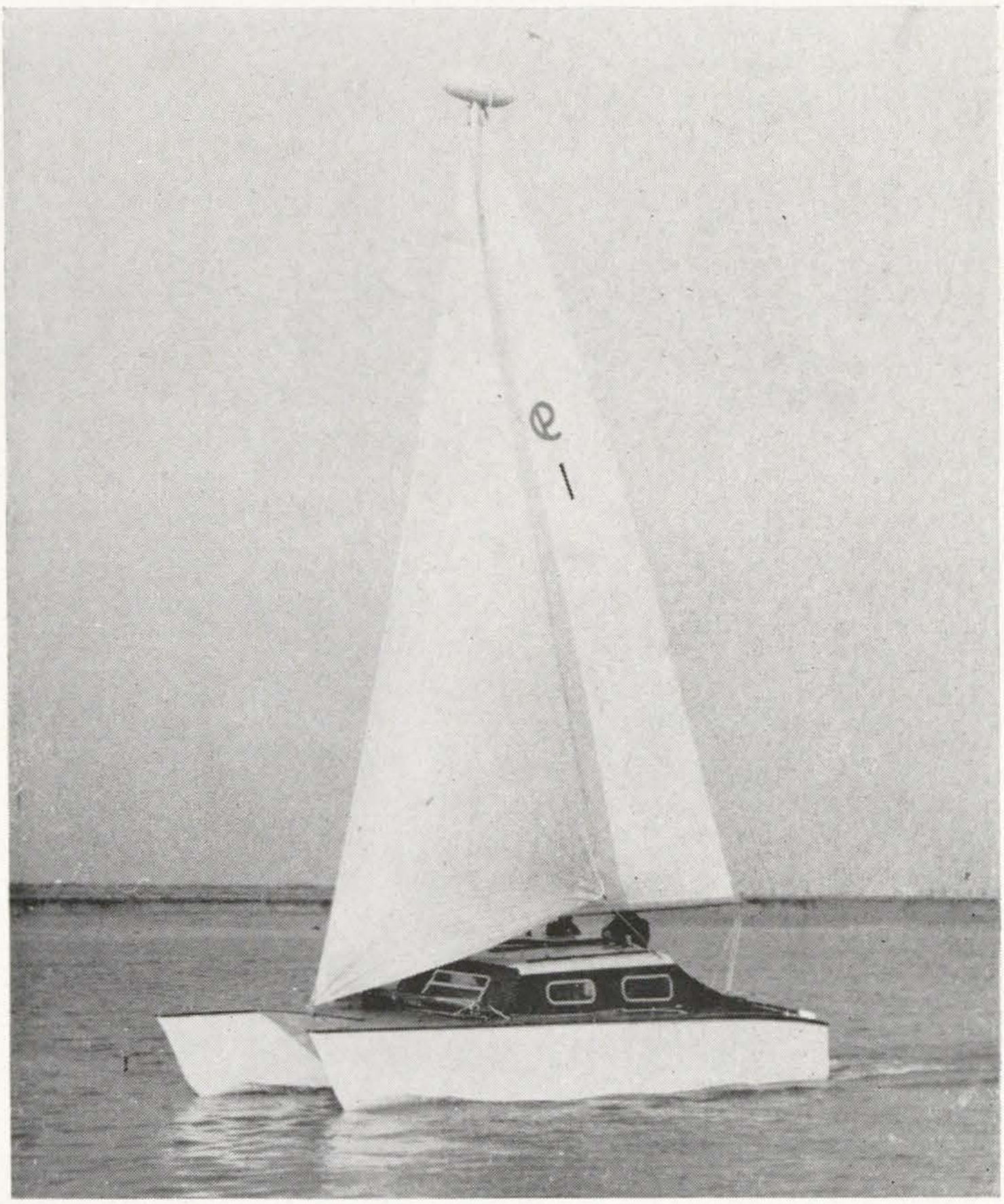
Price: Complete with sails: £2,648.0.0.

27 FT. CRUISER TEST REPORT

This Cruiser designed by the Prout Brothers was launched in December 1962 and trials were carried out in the Thames Estuary.

We were delighted with her performance in the conditions prevailing at the time. It was fortunate that during this period the winds varied from strong to light so we were able to find out her characteristics under varied conditions. We were extremely pleased by the way she handled. She seems to be perfectly balanced and was light on the helm whether the Genoa, working foresail, or storm jib was used.

On one of the days when it was blowing very hard we reefed the mainsail down to the bottom batten and put the storm jib up. Snugged

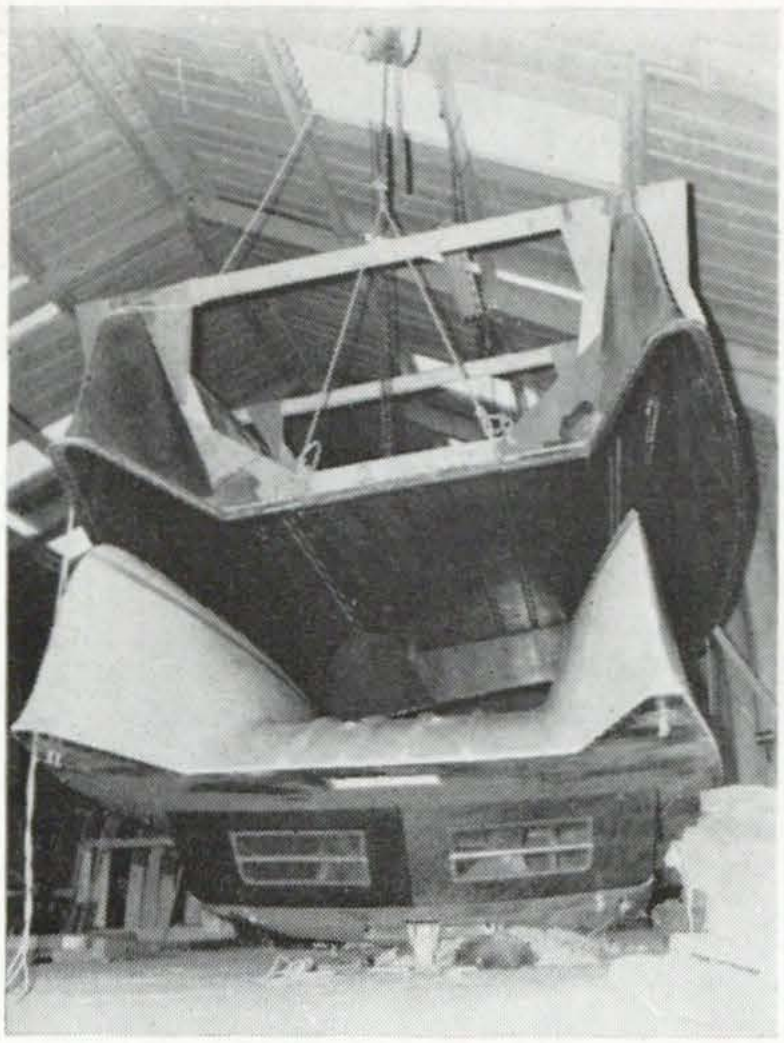


Prout 27 foot Catamaran.

down like this she was comfortable and easy to sail. We beat up river for a while and her windward capabilities in this strong wind were very pleasing indeed. Running was as we had anticipated very good.

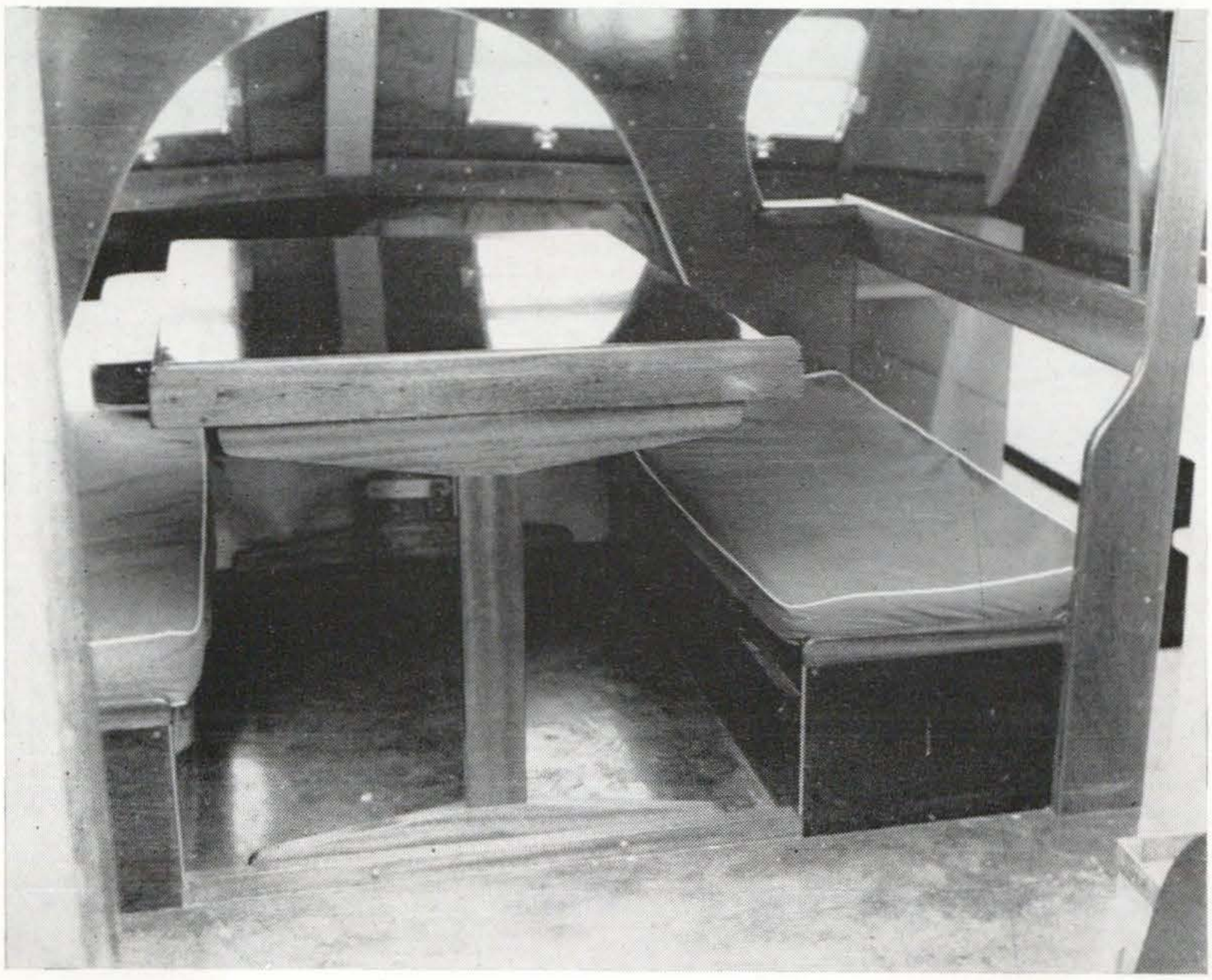
In the lighter winds on one day in particular we had a most exhilarating sail and were able to try out our Spinnaker. This proved very easy to handle on the broad fore deck. There is a separate halyard for the Spinnaker so one can set it before removing the Genoa.

Reaching in this light air was great fun and the way the boat smoothly and quietly planed at what seemed to us around 9 knots was truly a delight.



Lifting off the mould.

The Galley.

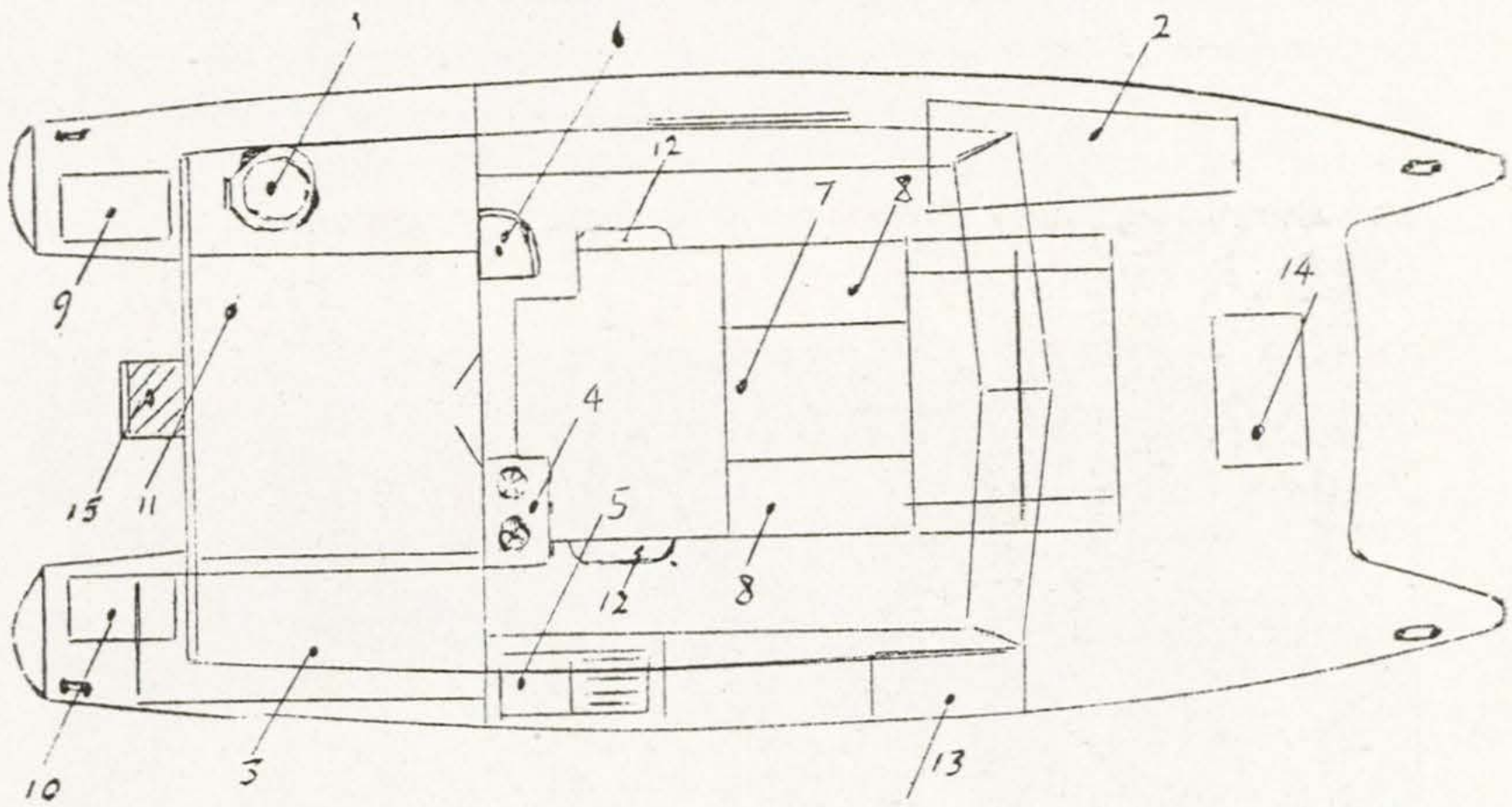


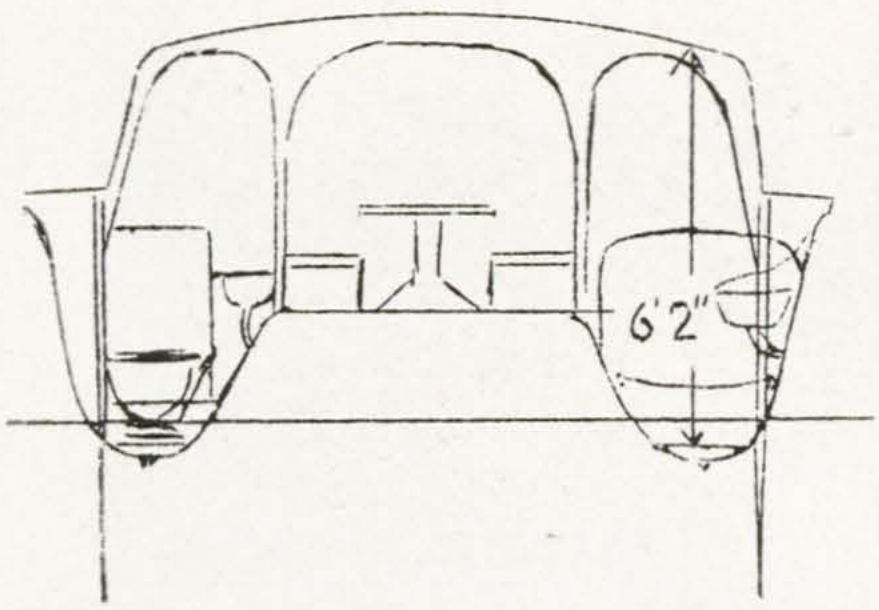
Inside the bridge deck.

Coming about was as we knew it would be, very quick and positive, even in the very strong winds.

For auxiliary power we took along our Crescent 8 h.p. outboard motor and we could not wish to have anything better. This little motor pushed the Cat up our creek against a force 6 wind and against a Spring Tide ebbing at its strongest. The motor is mounted on an attachment which is retractable. It enables one to use a standard short shaft motor which is very useful if one wants it for the dinghy too. When retracted and tilted the motor is well clear of the water.

We feel that owners will find the accommodation very good. There is standing head room in the hulls, so when washing, dressing, cooking, etc., it is easy and comfortable. The separate compartment for toilet has standing headroom and there is plenty of space. The berths, two aft and the double forward are very comfortable, giving a width of 2 ft. 3 in. in each of the single berths. The double berth





1. Toilet
2. Forward Pipecot 6′ 3″ x 2′ 3″ wide
3. Aft Pipecot 6′ 3″ x 2′ 3″
4. Calor Gas Two-Burner and Grill
5. Sink with compartment for water under
6. Wash Bowl
7. Table (Down for Double Berth)
8. Seats with Cupboards and Locker under
9. Hatch and Locker
10. Hatch and Locker for Gas Bottle
11. Self draining cockpit
12. Steps.
13. Cupboard
14. Locker for anchor and warp
15. Retractable Outboard Bracket

Prout 27 footer—Accommodation layout.

which is formed by lowering the table is wide and long and should be comfortable even for the largest of persons.

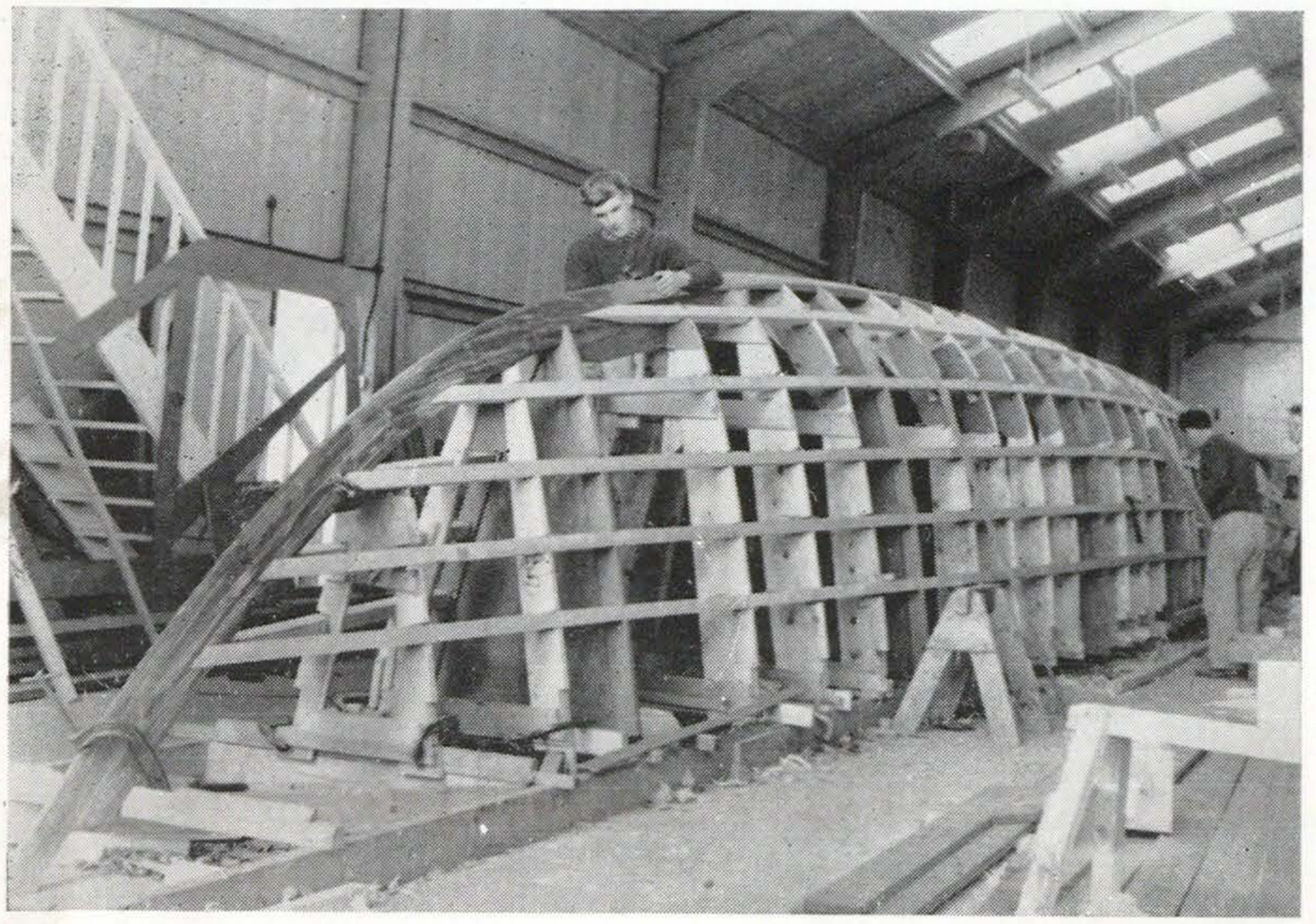
The table is large and four can sit comfortably with plenty of elbow room.

As will have been noted earlier this cruiser will be produced in all fibreglass construction top and bottom with wood trim and wood furniture, lockers, galley units etc.

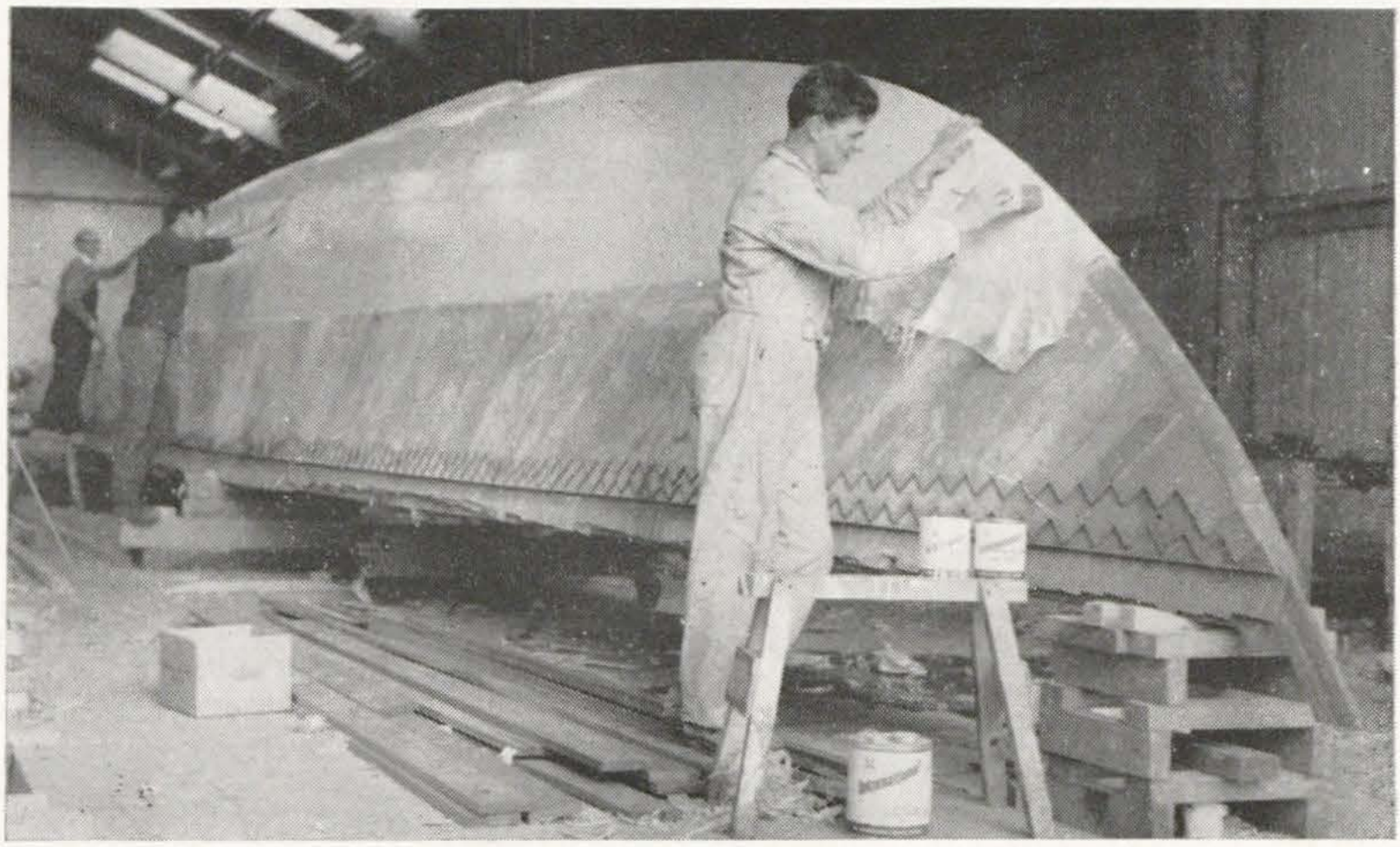
The price of £2,500 ex sails we hope will not have to be increased, in fact we feel confident we can, with carefully planned production methods, keep to this figure.

THE PROUT 70 FOOT CATAMARAN

A.Y.R.S. members may have wondered what had happened to the 70 Prout catamaran which was shown in A.Y.R.S. No. 38 CATAMARANS 1961, as a design. The answer is that it is not particularly easy to find space to build such a large boat nor the men to put to work on it. However, it is now firmly in course of construction as the photographs show. It must be a tremendous undertaking and shows the ability and capacity of the Prout works.



Prout 70 footer—Skeleton.



Prout 70 foot Catamaran—Applying the glass cloth.

SOME CALIFORNIA CATAMARANS

BY L. G. DAWSON

71, High Street, Castle Donington, Derby.

I first saw the results of Myers and Ewing's work in the Amateur Yacht Research Society Publication No. 35 which dealt with Catamarans, in 1960. There was an excellent article by Bruce Ewing on *Dreamer* the big Catamaran built by a syndicate. This was Myers and Ewing's first effort at designing a large Catamaran. There was also a description of *Aikane* the big Rudy Choy ocean racer and of *Symmetry*, a very elegant 33 ft. Catamaran.

Fortunately, not too long after these articles appeared, I visited California and, taking the address from the A.Y.R.S., I looked up Hugo Myers and asked him if he would be good enough to tell me something about their work.

Dreamer—as those who read the article will know—was a most impressive boat. Her displacement was approximately 11,500 lbs. and she had 800 sq. ft. of main and jib. The genoa was 800 sq. ft. The organisation and the effort that went into producing this boat was remarkable. It was built by a syndicate of seven people who shared the work between them. A very ambitious effort since none

of them, as far as I know, had built a Catamaran before, and it was the designer's first shot, most of his previous sailing experience having been on small boats on the Great Lakes.

Unfortunately, we were not able to look at *Dreamer*, but Hugo Myers very kindly took me to a marina down the coast from Santa Monica to see *Symmetry*.

Symmetry is an attractive boat as the photograph in the A.Y.R.S. Publication shows. I was not a bit disappointed at seeing her "in the flesh." We went to a small shipyard, unfortunately I have forgotten the name of the owners, and had a look at a Rudy Choy design being built. These designs are rather different to anything built in England as they have very narrow vee hulls. They used to have no centre plates in the hulls, but I understand that they are now having dagger boards or skegs. Those who have studied the theory of the subject, myself among them, have all come to the conclusion that it is essential to have centre plates for good windward performance. One interesting feature of these narrow vee hulls is they give a very good ride in rough water. There is no doubt that the hulls being designed in this country, the semi-circular section with a broader stern, probably pitch more in rough water. In any discussion with Hugo Myers he often comes back to this question of getting a reasonable ride and clearly in the mind of the people in California, and they have a certain amount of experience, the ride and comfort in a seaway is certainly of equal importance to out and out performance.

On my second visit to California, which was in February this year, they were kind enough to invite me to go for a sail on a pleasant Sunday afternoon in their third and probably most successful design. This is a 36 ft. Catamaran called *Wind Song*.

She was built in Japan to designs and specifications produced by Hugo Myers and Bruce Ewing in California. This was a courageous effort since the whole of the specification work was carried out by themselves. They wrote to several shipyards in Japan, ultimately chose one and commissioned them to build the boat. They agreed with me when I suggested that they must have been relieved when they first saw her delivered by sea in California and found all the pieces in the right places.

As you will see from the photograph, *Wind Song* is an extremely attractive Catamaran—fairly large 36 ft. overall length, 31 ft. on the water line. The mast is 47 ft. above the deck. The beam of each hull is 28 in., length/beam ratio being 13.3. The weight empty 7,200 lbs. and the total beam of the whole ship is 16 ft. The hulls are laminated and covered with a layer of fibreglass afterwards. All

Windsong—Myers and Ewing.

the Catamarans in California are sheathed in fibreglass and it gives a very durable finish, the wood laminating construction allowing considerable flexibility in the design. The sails on *Wind Song* are impressive. The genoa is 500 sq. ft., the mainsail 400 sq. ft. and she sets a 1,400 sq. ft. spinnaker.

On arriving at the marina I was very pleased to see the first thing Hugo Myers did was to leave a very large American outboard behind. Every now and again his old Great Lakes dinghy sailing instincts come to the fore and he thinks going sailing with an engine is not a gentleman's occupation.

While the sails were being hoisted I had a chance to look at the accommodation; there was a head and large double bunk on the port side, galley on the starboard side and a single bunk forward on the port side. Pipe cots will be fitted into the forward end of the two hulls. As one can sleep in the Saloon as well there is plenty of accommodation.

The Saloon is extremely pleasant, light and airy, The headroom is 5 ft. 6 in. at the centre, low enough to make a tall man bend and know that he cannot stand upright, and high enough for a small woman or girl to stand upright.

We got away from the dock without any difficulty and set off from the Playa del Rey Marina, not far from San Pedro. An interesting feature of this new marina is that it generates a sizeable swell in the entry. Although it was a calm day, as we were sailing out this swell was very noticeable. We tacked several times, the handling was easy and the boat very controllable.

The steering arrangements are ingenious, the rudders are submerged beneath the stern and are worked by cables and pulleys. In the centre of the cockpit is a post on the aft face of which is a small steering wheel. This post can be rocked to port or starboard or can be locked central. By this means one can stand in the centre of the aft cockpit and steer with the wheel or if you want to sit you can release a catch and rock the post with the wheel to port or starboard and steer from that position. The mechanism needed a little development, but there isn't any doubt, that it can be a very satisfactory method of steering the boat.

I spent some time at the helm. One of the most interesting features of this boat is that when going to windward she is almost self-steering. You can take your hands off the wheel and she will sail straight, while close-hauled, for long periods of time, something up to three or four minutes and then only needs very slight correction. The sails are impressive. Personally, I have not seen a 1,400 sq. ft.

spinnaker set before. It was an ideal day for it. One noticeable thing is that it was possible to take out slxteen people on this trip without inconvenience. She is so big and the considerable deck area means that you can take out a large party of inexperienced people for an afternoon sail without them getting under the crew's feet.

Wind Song to some extent shows her Californian ancestry. I think a similar boat built for the English Channel would have to be "beefed up" in places. Her designers know this, they have designed for the lowest possible weight and obviously were making the boat for their local conditions. I believe later makes of this boat will be strengthened in places. Anyone who wishes to write to Hugo Myers for more information will find him most helpful. I have enclosed his address; he moved from the address which he gave when he wrote his original article for the A.Y.R.S.

One of the most impressive things was the way he docked the boat with no assistance whatever in relatively confined waters. The last thing which should be said is that both Hugo Myers and Bruce Ewing carried out the whole of the design work in their spare time. Let's hope their efforts may be rewarded by sister ships of *Wind Song* being ordered. The favourable price at which these boats can be built in Japan, and cheap sea freight, makes this very likely.

MR. HUGO MYERS ADDRESS

8011 York Town Ave., Los Angeles, California.

PETANQUE

L.O.A. 23 ft. 6 in. Draft 1 ft (Boards up)
L.W.L. 20 ft. 6 in. 4 ft. (Boards down)
Beam O.A. 11 ft. 6 in. Displacement 3150/3650 lbs.

Designer: Michael Henderson, 2, Sun Hill, Cowes, I.O.W.

Builder: W. A. Souter, Cowes, I.O.W. Owner: The Hon. J. F. Lewis.

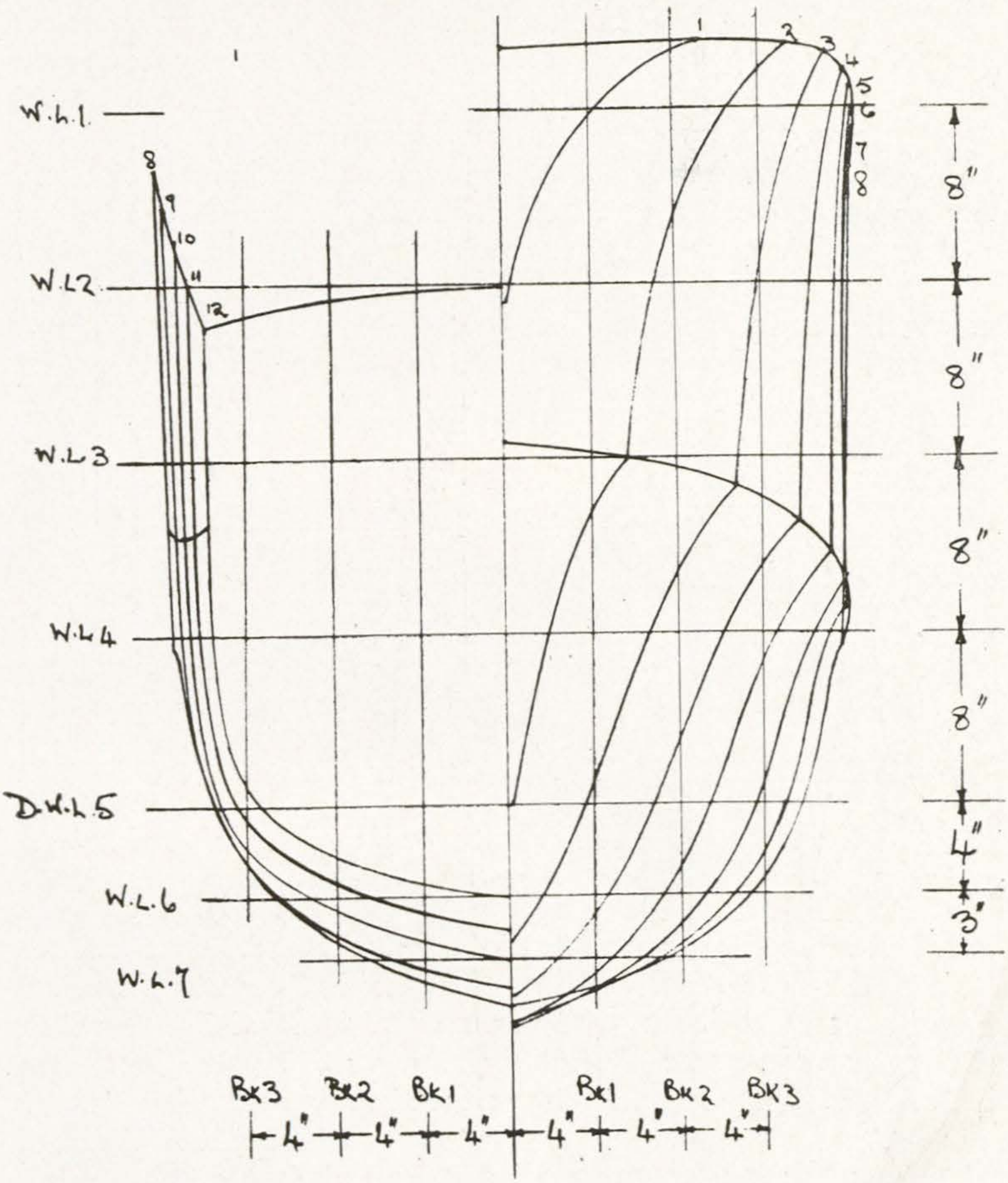
This is Michael Henderson's latest catamaran, in which he has not used the ballasted fin keels of *Misty Miller* and *Golden Miller*, as the ability to sail in shallow water was important. Instead, as a compromise, he uses 300 lbs. of righting ballast on a spar slung under the bridge—a method reminiscent of that suggested by V. E. Needham in A.Y.R.S. No. 38. In the case of a knockdown, the boat rests in a stable attitude with her masthead supported by the masthead float first suggested by Michael himself. The spar is then extended and

rights her, being hauled up into it's stowed position afterwards. V. E. Needham's suggestion in A.Y.R.S. No. 35 might be even easier, although Michael Henderson says that a study of the position of the C.G. of such a boat suggests that it would have little chance of working —an objection he has to Needham's method in A.Y.R.S. 38 as well.

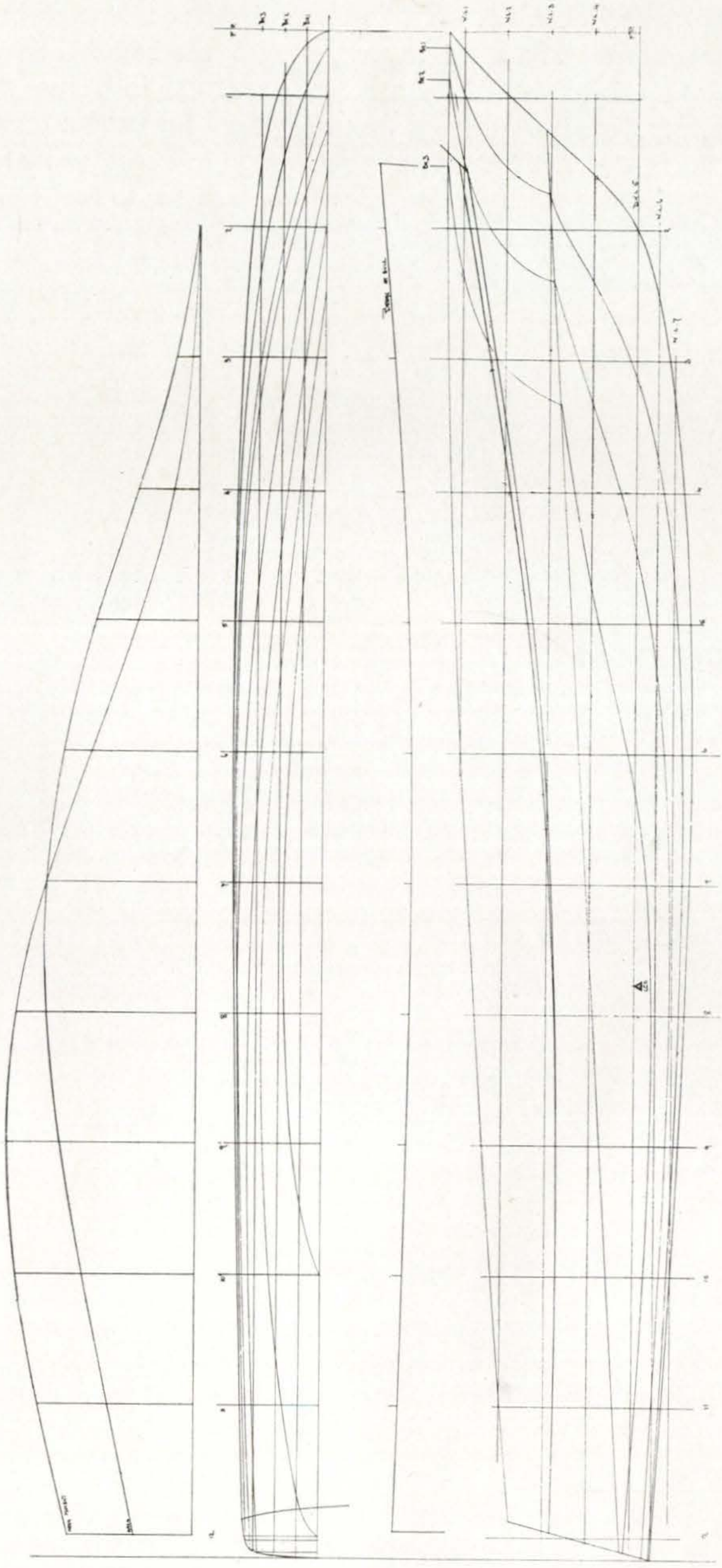
Petanque.

The Lines and Sections. These show a sweet shape of hull with very easy lines fore and aft. Forward, there is the knuckle bow which was found so useful on *Misty Miller*. This is, in some respects, a built-in spray deflector and was first suggested for use on catamarans by Derek Norfolk in A.Y.R.S. No. 16, although in *Petanque* its function is to provide adequate reserve buoyancy above water to resist excessive pitching while at the same time retaining the fine sections below so necessary for good resistance characteristics.

The transom is immersed by 4 inches on a level keel, which is more than on any other catamaran. This gives easier underwater



Petanque's Sections.



Lines of Petanque.

lines and tank tests indicate that on this type of fairly heavily loaded hull it improves resistance, especially in the difficult "hump" speed regime.

Accommodation. The boat is described as a "Daysailing Cat" and the internal arrangements are spartan in the extreme. Nevertheless, they give four dry bunks, a galley, a chart table, a W.C. and sitting space, with reasonable stowage lockers as well. Three people have carried out some quite lengthy cruises in the boat this year, and of course a considerably larger cabin top could be fitted if the additional windage was acceptable, giving better accommodation if it were wanted.

Summary. Michael Henderson has designed a very pleasant and fast catamaran. One suspects it of being a scale model for a much larger boat. It is interesting to see how one man's ideas can be modified to produce a boat to fit a given set of requirements, and how the free flow of information throughout the field of design coupled with close cooperation between the designer and an owner who knows what he wants can improve the breed.

TINKER'S CUSS

L.O.A. 12 ft.
L.W.L. 11 ft. 3 in.
Hull Beam 1 ft. 5 in.
Overall Beam 6 ft.
Draft 6 in. (plate up)
Draft 2 ft. 6 in. (plate down)

Designer, Builder and Owner: Fred Benyon-Tinker, "High Fleet," Nether Lane, Nutley, Uckfield, Sussex.

The design of this boat arose from a theoretical mental exercise in mechanics, in that I started by considering just how one could build a strong, light structure which would be adequate to carry the loads imposed, both by the wind and also by varying conditions of sea. Having arrived at this stage, to the accompaniment of masses of calculations, the whole thing was put on one side until it occurred to me that the logical development would be to clothe this structure with some form of rigid buoyancy to give it the right shape and to enable it to float. There were, of course, a few other factors involved, such as the desire to try out an assortment of ideas on hull forms, the need to explore in a practical way the possibilities of expanded polystyrene as a constructional material and the desire to have a floating test bed on which I could experiment with certain ideas I had about sails, especially with regard to the particular needs of multi hulls in this respect.

Tinker's Cuss—a polystyrene boat.

The basic design of the hulls lies in making these as girders of considerable vertical depth and this was done by cutting out the shape of the hull, at the centre line, in plywood. This shape was then bounded by glueing on strips of wood of 2 in. x $\frac{1}{2}$ in. section, suitably rabbetted out to suit the thickness of the plywood, which was $\frac{1}{4}$ in. in this case.

At the point where the crossbeams connected to the hulls, extra vertical members were glued and screwed to the plywood webs, on each side, and the crossbeams, which were of hollow box section, were fastened to these with suitable additional bracing knees. The forward crossbeam was further built up by the incorporation of an extra box section, extending forward, the bottom edge forming the continuation of the cockpit floor. A spruce beam was added at the bows, to which the forestay was attached and in the first instance, an X bracing was incorporated in the cockpit. Apart from having a quite astonishingly high nuisance value from a sailing viewpoint, to say nothing of being a superb remover of skin from knees and legs, this bracing, although installed for reasons which appeared to be quite valid at the time, was nevertheless found to be unnecessary and was subsequently removed, to the enormous relief of all who sailed the boat.

The next stage was to shape, roughly, the expanded polystyrene blocks and this was done by making hardboard templates at one foot stations along the desired hull shape and clamping these in a primitive but effective jig on either side of a foot wide section of the plastic material and cutting around the templates with a hot wire cutter, which I had made up from odds and ends. This method proved very effective but can only cut straight lines, whereas the whole of the hull surfaces are slightly curved. The blocks so formed were then glued together, using a urea-formaldehyde glue, using a suitable flat plank to ensure that the inside flat surfaces were true and in line, and finally each half hull complete was glued, again using the same glue, to the plywood webs. So far, all this was quite simple and quick to do but then the fun began, starting with the final blending of the straight lines into the required curves with a Surform tool. I had thought that it would be necessary to check this work with a series of female templates but, in the event, this proved not to be necessary for it could be done as accurately as I needed, by eye, but the building shed rapidly became snowed under with expanded polystyrene in powdered form as it came away under the Surform tool. This waste seems to acquire a healthy static charge when worked in this way and is the very devil to get rid of, particularly if wearing a hairy sweater. It was at this stage that I acquired some measure of domestic odium when I arrived home, having spent hours getting rid of the stuff, as I thought, still looking remarkably like a snowman.

This material has little mechanical strength and obviously has to be skinned. I had previously done quite a bit of experimental work on this aspect and as a result was satisfied that for my purpose a light skin of .012 in. thickness fibre glass, reinforced with a urea-formaldehyde glue would be adequate. The reason for not doing the obvious and using a considerably thicker skin was simply that I wished to retain the ability to alter the hull shape quickly, should this be necessary. The first hull was covered one day in 4 in. wide strips of fibe glass with the glue suitably brushed in and looked very well in the wet state. My garage, where this operation was taking place, was a wooden structure and the weather at that time was very hot so that the whole effect was that of a quite efficient oven. When, on a Saturday afternoon some three days later, I went down to do the other hull, I opened up the garage doors for it felt like a furnace inside and the temperature fell rapidly. The effect was startling, for within a matter of minutes the whole of the skinned hull started to give a remarkable imitation of a machine gun, the skin splitting all over with rapid and loud reports. On the whole, rather disappointing. This little episode happened two weeks or so of the deadline I had

fixed for taking the boat away on holiday, so some rapid action was called for. It was fairly obvious that this unhappy result was due to one of two things, the one being the effect of thermal expansion of the plastic material, which is mostly air bubbles anyway, under the action of the high temperature in the garage and the other possibility was that it was due to a contraction of the glue. Having thought about it for a while, I came to the conclusion that it was the latter, rightly as it subsequently turned out, so, being faced with the necessity for getting a result quickly I glued on extra skins of fibre glass with a p.v.a. glue, which has quite a high measure of flexibility. I was aware that this type of glue is neither very strong nor wholly waterproof, but I decided to risk it and after it had been suitably painted it did, in fact, serve its purpose for the rest of the season.

Subsequently the whole of these skins were stripped off and the hulls recoated with an epoxide glue, using some sheets which my wife had forgotten about and therefore did not miss, as the reinforcing base. I had consulted one of the glue makers, in detail over this problem and it was unfortunate, perhaps, that in the first instance they suggested and supplied through their distributors a glue of a type containing a solvent and this has the unhappy effect of blowing great holes in the expanded polystyrene. This fact was made apparent to me when, having mixed some of this glue with micro balloons as a filler to make good some of the surface irregularities left when stripping off the original skin, I found to my horror on inspecting the results after a few minutes, that I had something looking suspiciously like an enlarged photograph of the moon's surface. However, I eventually obtained some solvent free epoxide and the result was quite satisfactory.

This type of construction does have certain advantages for building one off boats, especially where the shape is such as to make it difficult or impossible to produce from plywood sheets, but my own experience has suggested that it is essential to make the skin of such thickness that it is strong enough of itself, that is, using the polystyrene shape largely as a mould cum base. I also think that it is probably preferable to use the material of a density of 4 lb. per cu. ft. as against the density of around $1\frac{1}{2}$ lbs. per cu. ft. which I used, though this may present weight problems. It must be remembered that the surface of this material is very friable, so that the adhesion of the skin is not very good. With the thinner skins which I used this leads to blistering in places, which becomes apparent after the boat has stood in the hot sun for a day or so. I fancy that this is probably due to expansion of air pockets under the skin and unless this skin is reasonably thick and rigid, it is likely to distort locally under these conditions.

Sailing Qualities

This catamaran was equipped, when finished, with a Scorpion mast, a G.P. 14 boom and an elderly set of cotton sails from a National 12. With this mixture it went remarkably well, being quite close winded, tacking very fast indeed, faster in fact than one can move across the boat and possessed surprising ghosting qualities. In harder winds it was a very exciting boat to sail, showing very little tendency to lift a hull, but moving very quickly. When travelling at near its maximum speed, the lee hull vanishes from sight in a cloud of spray, but does not seem to sink much in the water. It is always tempting to claim exaggerated performances for your own brain child, but I cannot give any precise figures as to what it will do in the way of speed, for I have no means for accurate measurement. By way of comparison with other catamarans against which I have been able to try it, one can say that it is clearly faster than a Swift in light winds, keeping moving when it is difficult to detect any air movement at all and in harder winds seems to have about the same performance, except that in harder puffs, because of its very high transverse stability it seems to make better use of the wind and tends to move ahead a bit. The rudders are extremely light and sensitive and when moving at any speed you need a very light touch on the tiller. One thing which has surprised me is that when correctly trimmed one can frequently let go of the tiller altogether for minutes at a time and the boat will pursue a steady course by itself, with the tillers gently weaving to and fro. I did, originally, have an Ackermann linkage but substituted this for a parallel motion and could not detect any difference. Quite a few of our members have sailed this boat and all, so far, have found, as indeed I have, that it is a very attractive boat to sail, though the boom height, combined with the X bracing in the cockpit did make for rather cramped sitting.

I have now lifted the mast by a further six inches and replaced the sails by a set of terylenes from a Scorpion, so the area has gone up from 90 sq. ft. to 106 sq. ft. This produced problems in that the boat no longer balanced, but some new centre plates with the area further aft appears to have cured this problem. I have had quite a measure of trouble with breakage of centre plates and rudder blades, on which the loads must be considerably higher than I had thought likely, so they are now being replaced by metal boards, which I hope will settle the trouble once and for all. I have done very little sailing with the new rig, so cannot say how the performance will compare, but my first impressions are that it is no longer quite such a nice boat to sail, in terms of its manners. This may just be a question of getting the balance back precisely where it was before.

HOLGER TORNØE

The Frivilligt Drenge-Forbund catamaran. A Danish catamaran for a boys' organisation.

BY T. ENGSIG-KARUP

For youngsters, it is of great importance to take part in different kinds of sports. In recent years, the understanding of this need has led to a large number of youth organisations of which "The Boys Brigade" (the "B.B.") is well known in the United Kingdom as a Christian boys organisation.

In Denmark, a similar organisation is known under the abbreviated name "FDF." FDF works according to the same principles as the B.B. and to some extent as the Boy Scouts. However, going out on bikes along the roads with a growing motor traffic is not the same adventure as it was some years ago.

Consequently, we thought—in our company—that it might be an idea to go out sailing. So, during $2\frac{1}{2}$ years 6-12 boys have been building a catamaran of which everything except the mast, boom and the sails is "home made."

Holger Tornøe

Holger Tornøe is 30 feet long and 10 feet wide. The mast top is 35 feet above sea level. The maximum speed obtained so far is about 12-13 knots which is not very exciting but we find that, with a capacity of 12 men, we have a safe boat rather than a quick one.

The demands for this boat were set to be (1) safety, (2) big enough to house 12 men, (3) independent of harbours, i.e., capable of landing on beaches.

The catamaran did not go into the sea until late in the summer of 1962. We have not got very much experience as yet. But already we have made some nice trips. On week-end trips we do not spend our time in the harbours or on the beaches. We sail!

We are still training our boys. We find it a very good way of keeping them busy. It is remarkable to see their friendship without any quarrelling even if they are tired and without sufficient sleep. They do their job; they are eager to learn and they are becoming men.

A BIPLANE CATAMARAN

BY WALTER CASTLES JNR.
1350 Riverview Road, N.W., Atlanta, 5, Georgia.

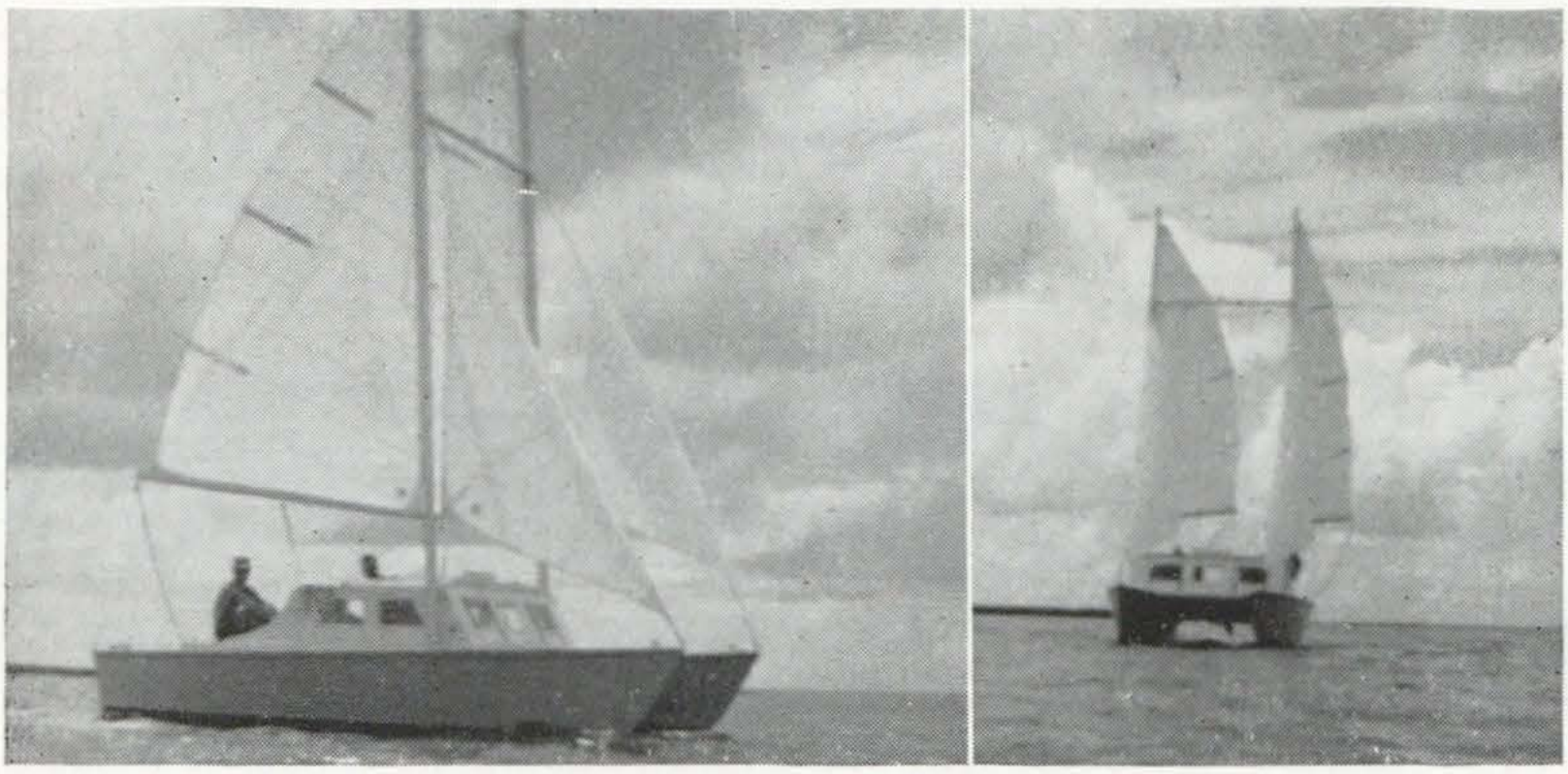
L.O.A. = 20 ft., L.W.L. = 17 ft., Beam = 11 ft., Draft = 18 in., Design Displacement = 1800 lb., Distance between keels = 7 ft. 4 in., Distance between centres at deck = 7 ft., Clearance over water = 15 in., Weight empty = 1200 lb., Total Sail Area = 220 ft., Mainsail = 70, Jib = 40, Geometric Aspect Ratio of each set of sails = 2.33, Effective aspect ratio of combination about 2, Lateral area of each hull about 24 sq. ft., wetted area of each hull about 52 sq. ft., hull water-line sections are N.A.C.A. 16000 series symmetrical airfoils with the thickness tapering from 9 per cent. at the waterline to about 3 per cent. just above the keel line, berth in each hull, head in port hull, 3 ft. 6 in. headroom in deckhouse, aluminium masts with tops 27 ft. above water, parachute spinnaker = 160 sq. ft.

The design, which was done seven years ago, was in the nature of a quadruple experiment. I was interested in trying out the following.

1. A really good two dimensional hull shape (that is one in which practically all the water goes around the sides and almost none around the bottom).

2. The effectiveness of rudders which are an integral part of the hull shape and have covered slots.

3. Rudders which can be differentially deflected for brakes and differentially set to make the boat self steering (the tops of the



Walter Castle's Biplane Catamaran.

rudders extend well above the waterline so that as the boat heels one rudder becomes more effective and the other less effective. Thus with the rudders cocked in a few degrees, the boat will theoretically steer itself on the wind and vice versa off the wind).

4. A biplane rig with its possible advantages of low centre of effort, ability to wing and wing with sails (main) ahead of the masts to make the boat self steering on down-wind courses and the structural advantages of having the masts stepped on the hulls and eliminating the big download on the bridge connecting the hulls. This made it easier to make the centre three foot section of the bridge removable for trailering.

I have sailed the cat now for five years, first on a large lake near Atlanta and for the last two years down in the Florida Keys at Big Pine. In retrospect I would evaluate the experiments as follows:

1. The hull shape is lacking in pitch damping and is too sensitive to changes in trim for small cats. Also, with its relatively large wetted area it is very sensitive to surface condition (fouling). Pitch dampers were added in the form of streamline horizontal plates located about 8 in. above the waterline at the inboard bow of each hull. This cured the pitching troubles when underway but not at anchor. When the hulls are clean the cat will sail about as close to the wind as a Thistle in spite of the excessive cabin air resistance. In light and moderate winds the cat was about 20 per cent. slower than a Thistle when hard on the wind, about the same speed on crosswind courses and faster running before the wind when we sailed on the lake. In the often steep chop off the Florida Keys the cat is dry and comfortable.

2. The rudder design was an unqualified success. There is a large difference in the ease with which the cat will come about with the rudder slot covers on versus with the slot covers off.

3. The automatic steering works fine on the wind and cross-wind. The rudders are built with about five degrees twist—out at the bottom trailing edge. On downwind courses the cat will not steer itself unless the mainsails are wing and wing out ahead of the masts.

4. The biplane rig works fine but requires a little different technique. For example, the points of attachment of the main sheets to the bridge are somewhat inboard of the line of the masts so that in tacking the "lee" main will be trimmed in closer than the "windward" main on coming about with the sheets cleated. On courses where the relative wind is aft it is necessary to wing and wing the mains to keep both jibs full. On downwind courses I usually tie the clews of the jibs together. In shortening sail it is well to take in the jib on one side and the main on the other. With this combination the cat will come about in either direction with no trouble and the sails appear to be more effective. One unexpected advantage of the biplane rig was the ease of leading all the sheets to the helm without running them across the decks or cockpit. In jibing, one main will always go first which relieves the shock and gives a more gradual change in in trim. The only real disadvantage to the biplane rig is that it is expensive.

If anyone knows of a good way to mount an outboard on a cat so that its propeller will stay submerged without having five extensions in the lower housing I would like to find out how it is done.

MIGA

BY JOÃO MENDONÇA
Nacala-Porto, Portugese East Africa.

L.O.A. 4.75 meters.
Beam 2.40 meters.
Sail Area 18 sq. meters.

Displacement (a) designed 0.542 ton.
(b) actual 0.600 ton.

Designer, builder and owner: João Mendonça.

I finally finished, launched and sailed my catamaran *Miga* on 20th November, 1962 and in the first month have sailed it 19 times with winds from force 0 to force 6.

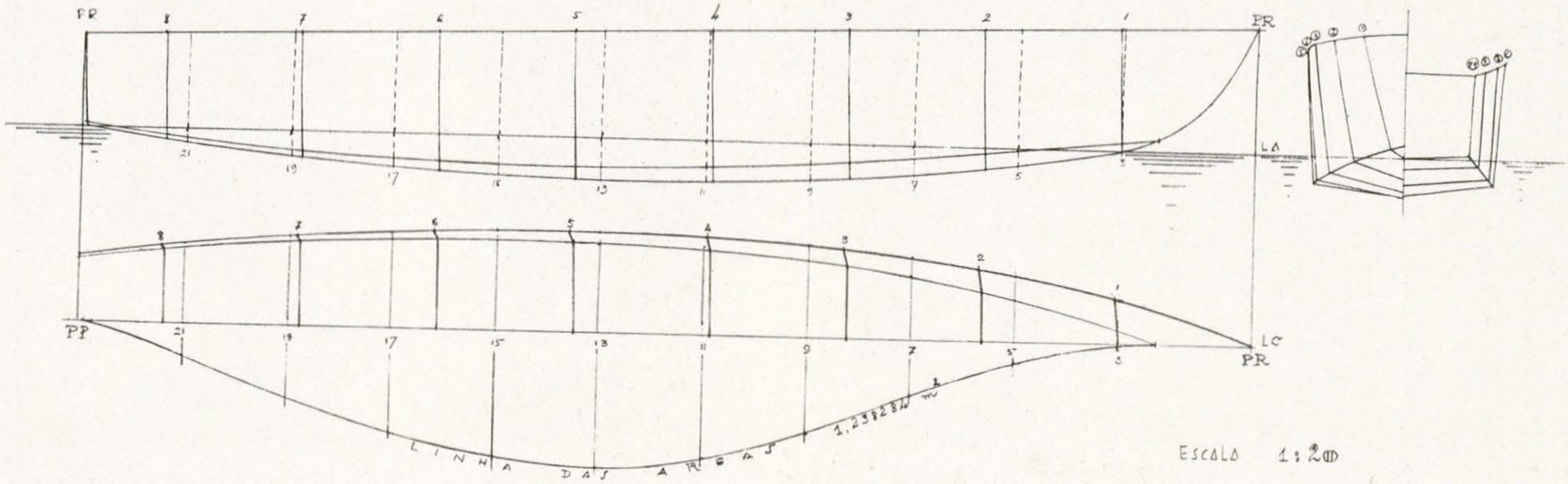
Miga is a small catamaran not intended for speed but for coastal cruising with comfort. Originally, I had designed her with a L.O.A. of 3,99 meters (13 feet and 1 inch) but my wife insisted that I redesign her to the full length of the 16 feet length of the plywood board.

The hull lines show a very flat bottom of V section and the beam was calculated to give the necessary space inside of 0.8 meter. I used $\frac{1}{4}$ inch marine plywood, glued and screwed, the final weight being about 1,000 pounds, without crew. The bridge deck extended right from the bows to the sterns because I wanted plenty of space and a dry cat.

Miga.

The proud moment of her contact with the wind and water was wonderful and I was happy with everything. Firstly, there was the pleasure of sailing a catamaran of my own design, the second I had seen and sailed (the first was to my design, too, and it was wrecked 3 years before in the night); Secondly, I was not disappointed with anything at all.

The speed was good for such a boat; she *Planes* with winds of force 4. The lateral stability is enormous, She tacks in 2 or 3 seconds because of (a) the weight, (b) the big beam of each hull and (c) because I put the centre of lateral resistance 10 per cent. back to obtain an



Miga — Lines and sections.

exaggerated Ackermann effect. The weather rudder brakes somewhat and helps the cat to go about quickly.

On the second day, I had a strong wind of force 6 and I was forced to reef the mainsail not because of the stability but because I was afraid the mast might break. The fore hatches were not well closed and some water got in but when sailing free, we met one wave into which the bows dived till the fore deck was covered with water about one foot deep. But the cat recovered very well and we have never done the same since.

I have never measured the speed but I suppose that when planing *Miga* reached the modest but good speed of 10 knots for short periods.

Miga is very dry. The spray deflectors work well. The bottom of the bridge only occasionally is touched by waves. When close hauled, with a foot high short waves, the motion is smooth, I suppose because of compressed air under the bridge. Her course, close hauled is very good, too, at 45° from the wind.

There is plenty of space for 5 adults, or 9 children but the ideal is 2 or 3 adults only.

The only bad thing I found in *Miga* is that it was a very expensive boat to build, £300. I suppose with the same money, I could have built a small coastal cruising boat (one hull) of 20 feet or a trimaran of 24 feet.

If my official life goes as I hope, in October next year I will sail with *Miga* to Lourenco Marques, 1,500 miles away.

SEQUEL TO THE BRIDGE FERRULE

BY HERMAN BERGER

85, Merrick Road, Copiague, Long Island, N.Y.

It looks like I'm becoming a catnut. Once I had devised the bridge ferrule, the compulsion to apply it to a boat became an obsession. Thinking about it is one thing. Putting it on paper became something like wrestling with a wild cat. Hollow-eyed from many sleepless nights I came up with figures, 1, 2 and 3. A 28 footer, 13 ft. wide, it had to be large enough to hold a family of up to six and be available to an average middle income man. It also has to be a top performer.

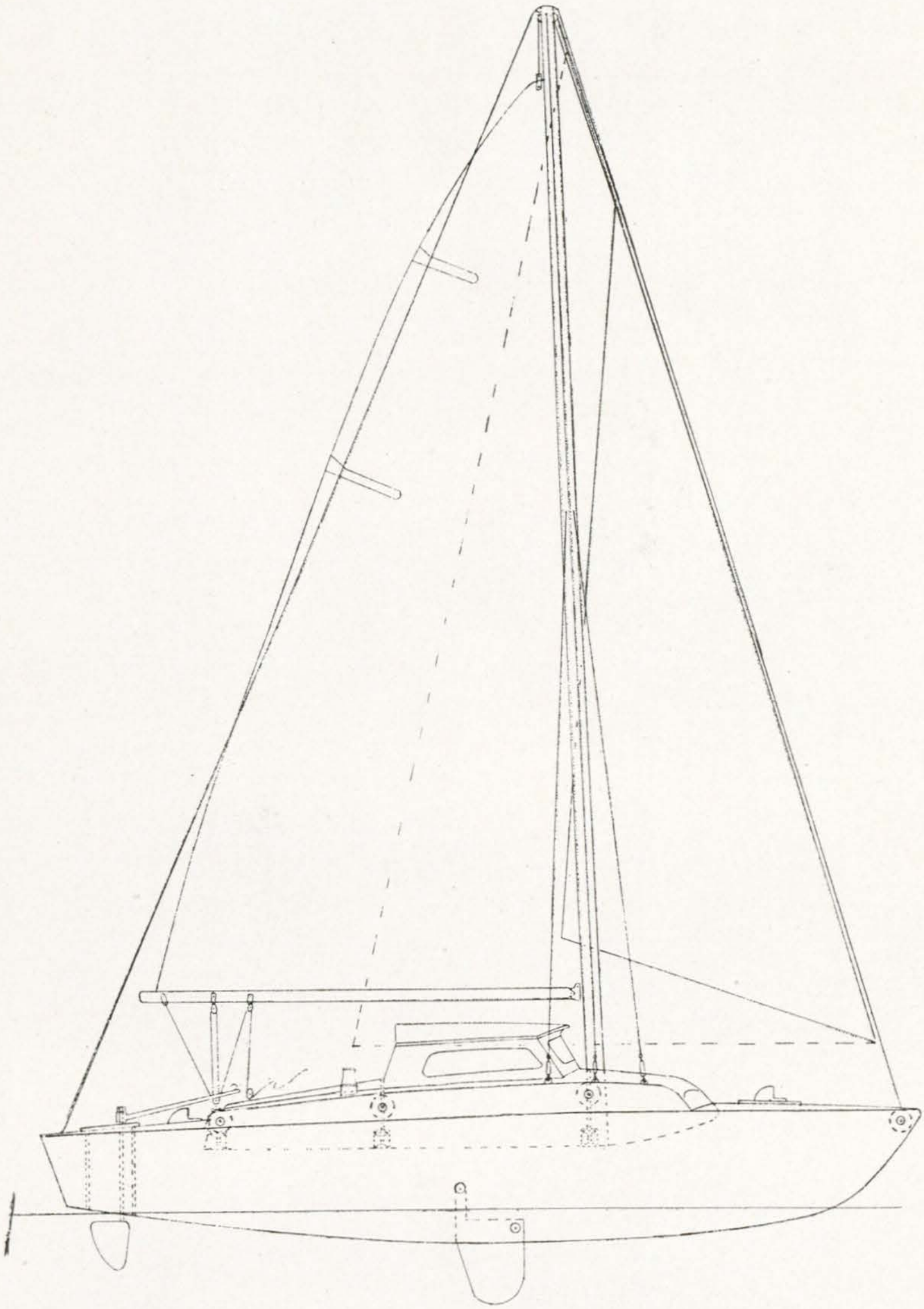


Fig. 1.

It comes apart in twelve large pieces. There are 5 bridges (4, 5, 6, 7, 8, Fig. 5) three deck sections, (9, 10, 11, Fig. 4 and 5) two rudders (12, Fig. 4) which are retractable and removable for the prevention of damage when beaching and trailering respectively and two hulls,

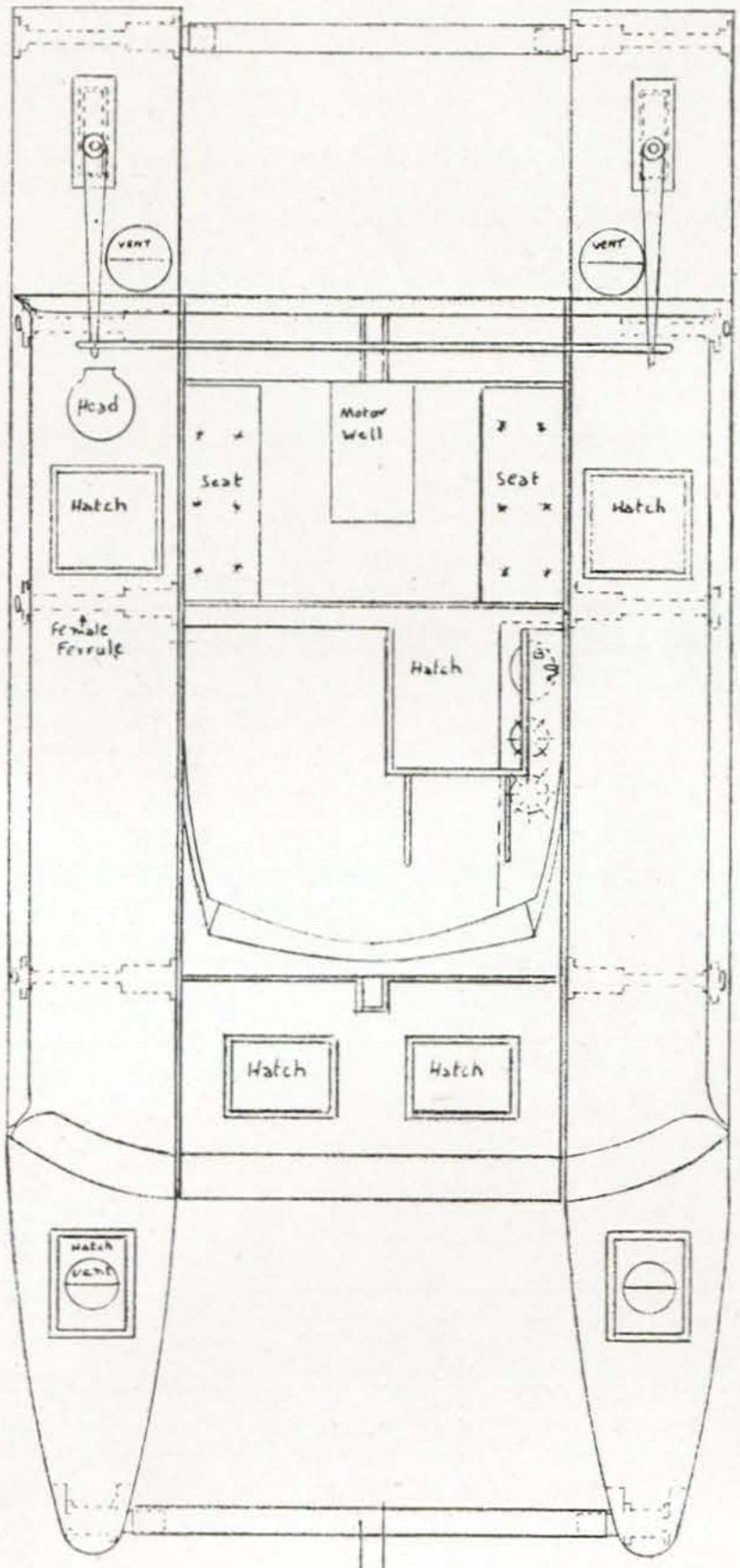


Fig 2

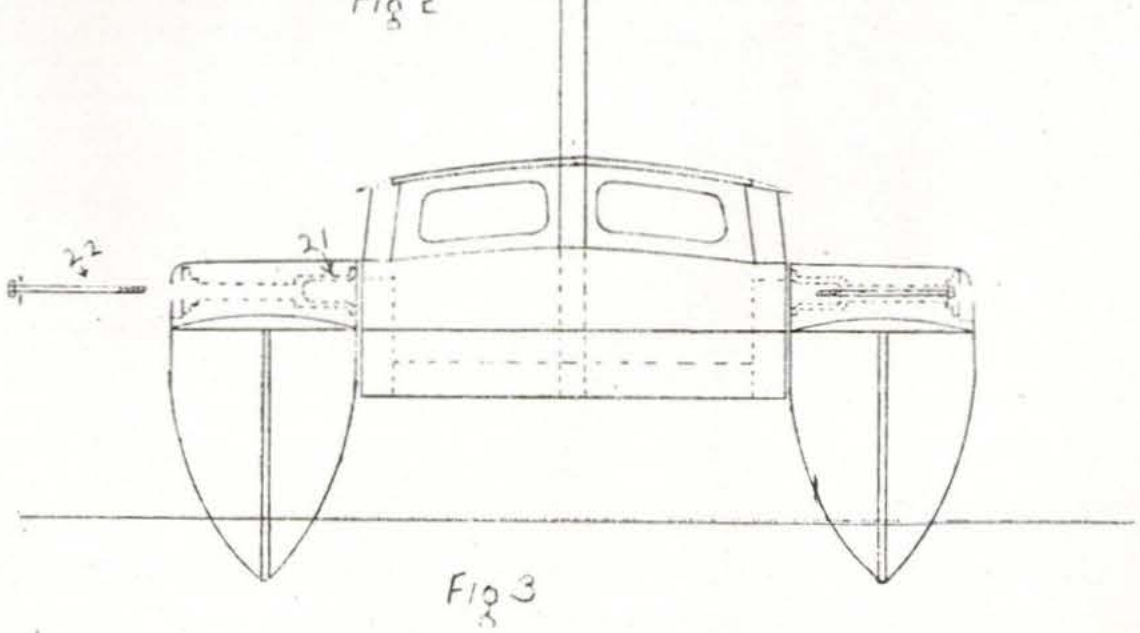


Fig 3

(13 and 14, Fig. 5). Top of cabin rises (as in 10, Fig. 4) allowing from 4 ft. to 6 ft. headroom.

Well, alright so I'm sitting on a pile of hulls and decks with a

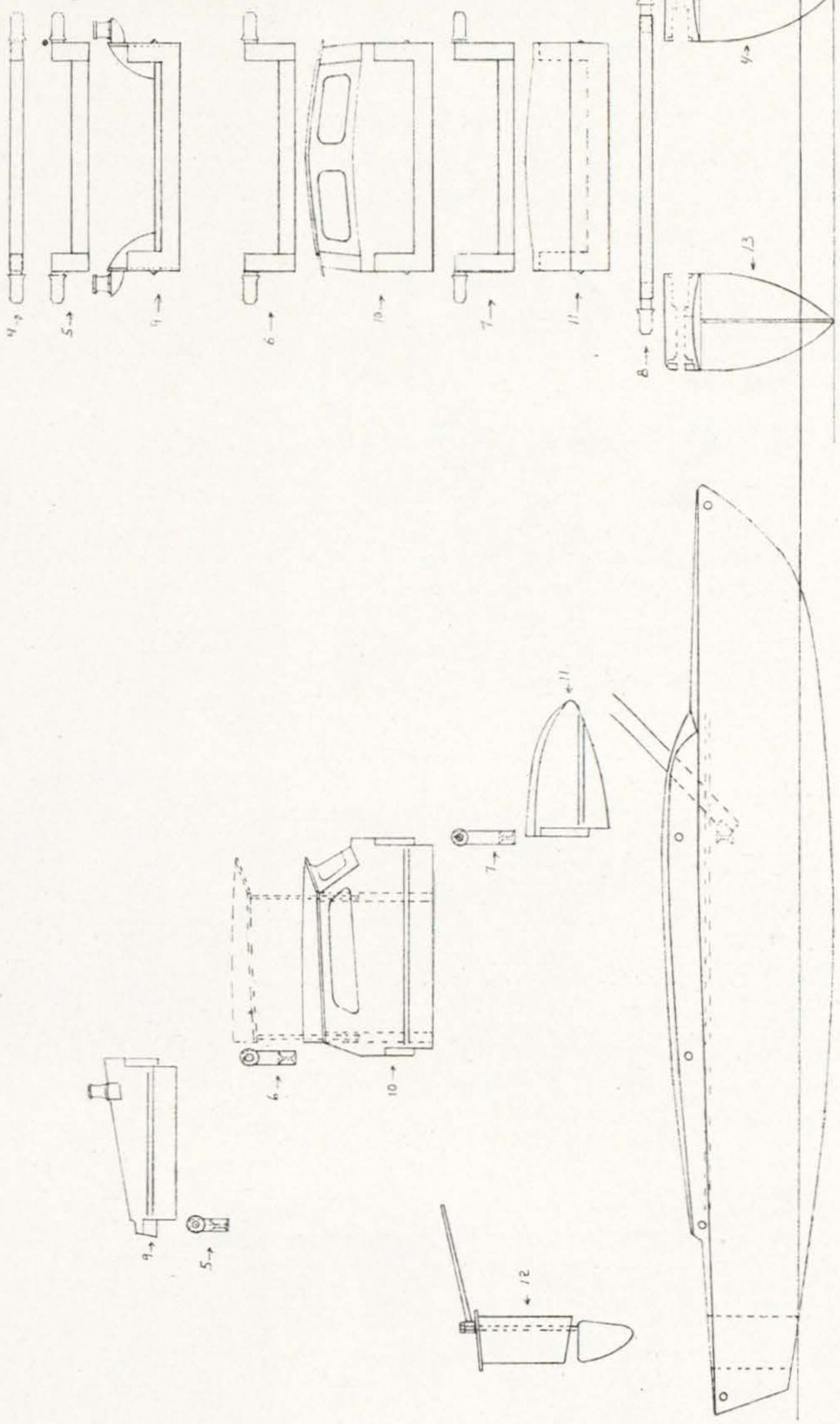


Fig. 5.

Fig. 4.

bunch of bridges under each arm. Who's going to bother putting together and taking apart a mess like this. I began to get visions of something like an assembly line, where something comes down

from the ceiling, up from the floor and from the left, and the right simultaneously, an operator tickles the grape-like bunch of parts with a magic gun and the mass continues down the assembly line as one symetrical unit. Back to the drawing board I go. Several weeks later the bags under my eyes resting on my chin, I came up with the plumbers delite. (Figs. 6 and 7) Fig. 6 shows a frontal view. The two hulls rest on a cradle (15) attached to a rail (16) which telescopes

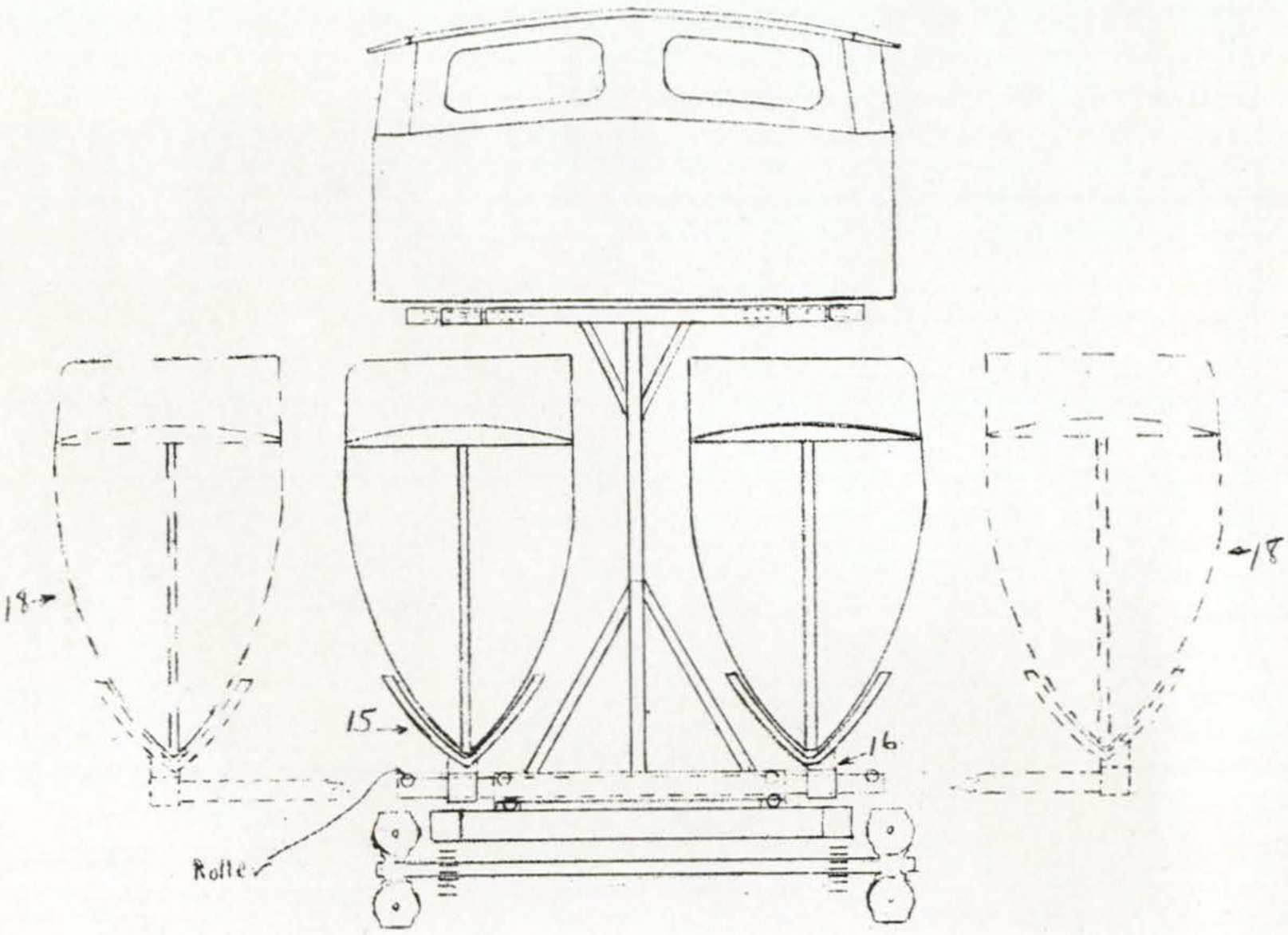
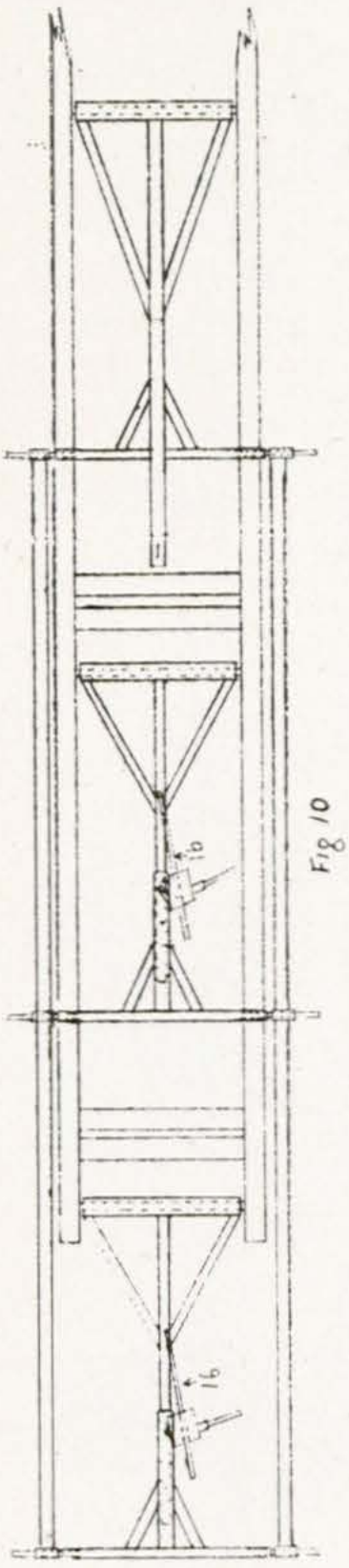
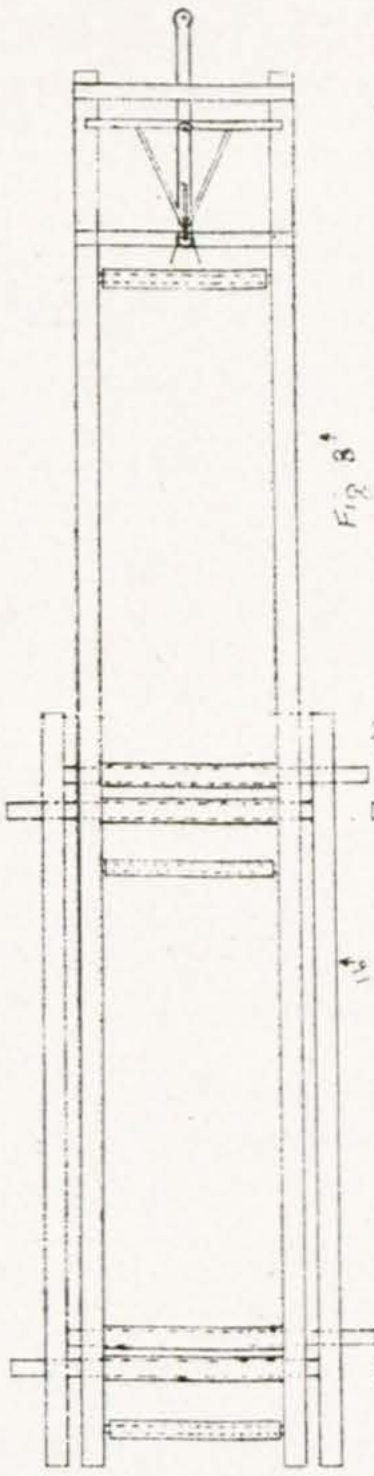


Fig. 6.

into the trailer chassis (better illustrated in Fig. 8, 16). To avoid a lot of confusing detail, I withdrew the rail (Fig. 9) and placed the two cradles on it (15). Fig. 10 was added to show the trailer chassis with only the deck raising and lowering mechanism. The jacks (16) were added to help align the bridges with the hulls, if this became necessary. Pegs can be put in the supports as shown (in 17, Fig. 7). The jacks can then be removed to avoid damage in salt water.

The boat arrives at the lunching ramp as shown (in Figs. 6 and 7). The mast and deck section (11) is placed on the ground. The hulls are drawn apart (18, Fig. 6). The bridges (5, 6, 60 are placed between the deck sections in their respective places on the lowering frame (19, Fig. 7). The frame (19) is lowered by means of the winch (20) till the bridges line up with the female ferrules in the starboard hull (Fig. 3, 21). All the 5 bolts similar to 22, Fig. 3 are fastened firmly





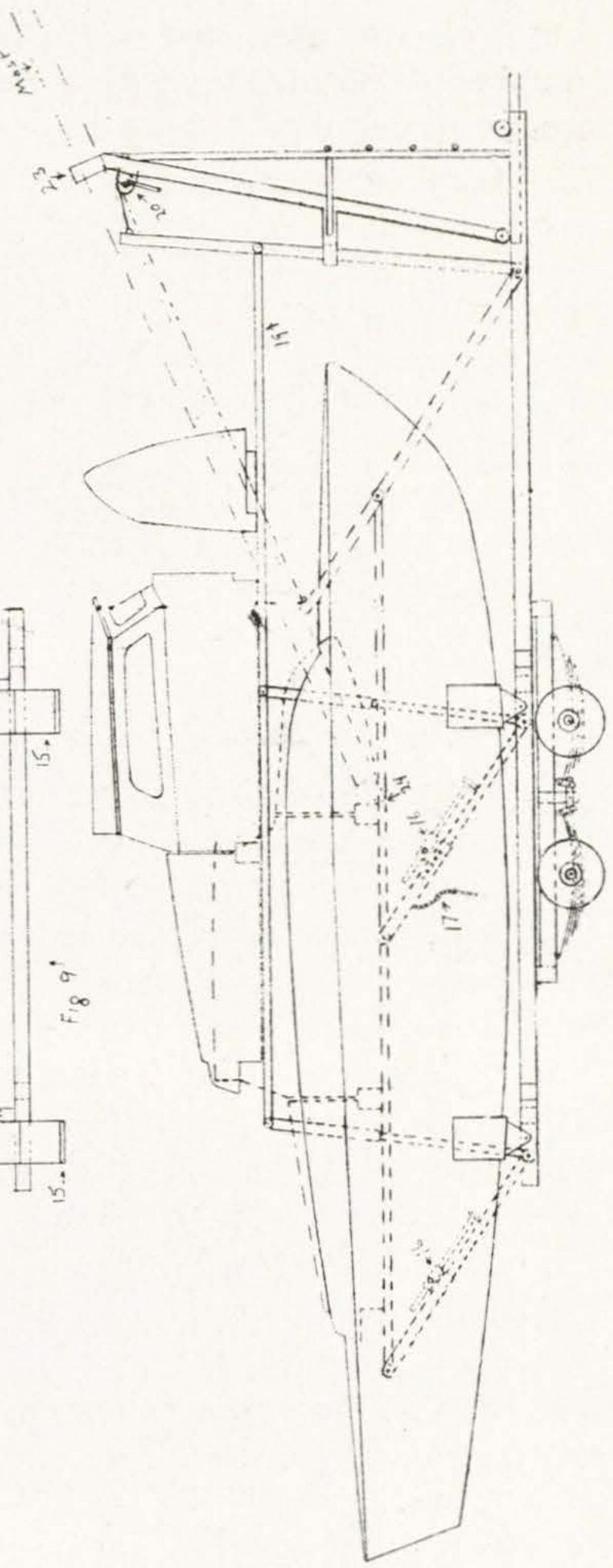


Fig. 7.

to the male ferrules in the starboard hull. The port hull is slid in and the bolts are left 1 in. loose. The mast is now rested in the mast crotch (23, Fig. 7) and hinged at point 24, Fig. 7 and raised into place by means of the back stay and shrouds. Deck section 11 is now put in place and the port hull is fastened. Resting on the cradles the boat can be launched in about $3\frac{1}{2}$ ft. of water. However if the frame 19 is raised again, the cradles can be pushed in or removed and with the boat resting on the frame 19, Fig. 7 it can be launched in its own draft about 15 in. of water.

This whole concept might seem wild to the reader but it has a number of advantages. An American ordering a boat of this size from Europe, would make the following savings:

1.	Cradling or crating	$300.00
2.	Transportation from shipyard to ship	75.00
3.	,, ,, dock to within 40 mile radius of dock to owners home	75.00
4.	Assembly and launching	75.00
	TOTAL	$525.00

The builder puts the boat on the trailer and delivers it to the dock with his own car. The boat arrives in America and its new owner with a trailer ball attached to his car picks it up at the dock and drives it home.

The trailer eliminates the cost of dry docking and the boat can be stored in the owners back yard saving storage costs. Trying strange waters would be no problem. A New Yorker could trailer it to Florida in 3 days, get 8 days of sailing in the Bahamas, be back in New York covering a 14 day vacation and save 8 days of hotel costs. The boat should lend itself easily to changes for experimental purposes. The trailer can be used as a launching device for most large catamarans. The boat is conventional looking, offering the thrills of catamaran performance and an opportunity for the family to come along and enjoy the ride while the catnut experiments.

As I write I'm beginning to think of more innovations to add to the boat. I think I'll go back to drinking, it's pleasanter.

FLYVEFISKEN II

L.O.A. 18 ft.	Draught 8 in.
L.W.L. 16 ft. 3 in.	D. with C.B.'s 2 ft. 9 in.
Beam ext. 8 ft. 3 in.	Sail Area 230 sq. ft.
Hull Beam 16 in.	Weight 550 lbs.

Designer, Builder and Owner: Leif Wagner Smitt, Slotsalleen 20, Klampenborg, Denmark.

Dear Sir,

In Denmark catamarans and trimarans have not yet really been accepted, but I think that this summer (1962) was a break, and that in a year or two full acception will be attained.

Besides Mr. Bierberg's and other well known Micronesian single-outriggers, four Shearwaters, one Cheeta-cat and a couple of homemade designs have sailed, and their speed and sea-keeping performance have been good propaganda. This winter 1962-63 several multihulls are under construction.

Flyvefisken II.

Hulls. Plating is 9/32 in. plywood, longitudinals are spruce and frames (bulkheads) are plywood and spruce. To get little wetted surface the underwater sections have four chines approximating amidship to a semicircular section. The hulls have sharp little-flaring sections forward and not so flat transoms as racing catamarans normally have. The purpose was to get a smooth and comfortable ride, and this seems to be attained. But is has also had the effect, that the lee bow in stronger winds is forced down more than usual.

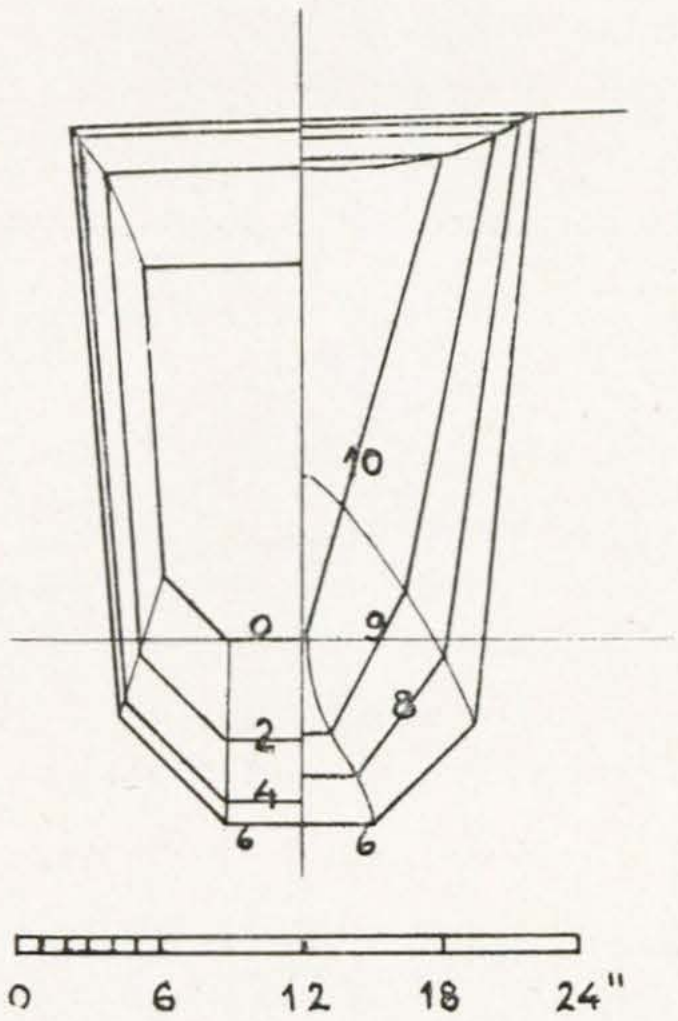
Flyvefisken II.

There are two symmetric *Centreboards* made of fibreglass—reinforced polyester resin.

The *Rudders* are $\frac{3}{4}$ in. mahogany plywood.

The *Mainbeam* is a box section construction computed for a load (mast-thrust) of 4,000 lbs.

The *Rig* was designed and made before I had the opportunity to read the A.Y.R.S. Publications, so it has a too low aspect-ratio and an overlapping jib. The main is fully battened; the halyard is internal, the mast rotating and made of laminated spruce.



Performance

The best meanspeed measured is 11.0 knots over a 13 miles distance. This was in varying winds and I believe we sometimes went between 18 and 20 knots.

In windspeeds over 10 m.p.h. the windward performance is good and we outsail everybody, but in less wind the centreboards do not seem sufficient. (Each has an area of 1.7 sq. ft. and an aspect ratio of 2.6).

At windspeeds under 15 m.p.h. *Flyvefisken II* is faster than *Shearwater III*. In stronger winds it has not yet been tried.

Next year I intend to add detachable hydrofoils at the fore ends to keep them up. Also the tillers are to be raised to enable the helmsman to sit abaft the after-beam.

Yours respectfully,

LEIF WAGNER SMITT.

Slotsalleen 20, Klampenborg, Denmark.

SIR,

The principle upon which a sail works is that it bends the airflow. Air being heavy stuff resists being bent out of its natural course and "leans" heavily against the fabric of the sail as it goes round the curve of the sail. The result is to give a continuous pressure at right angles to the sail's surface. The amount by which the airflow is curved is a measure of the thrust being developed at any given wind speed.

In an ideal sail, in which the air stayed attached to the lee of the sail right to the leach the angle through which the airflow is deflected would be A (Fig. 1).

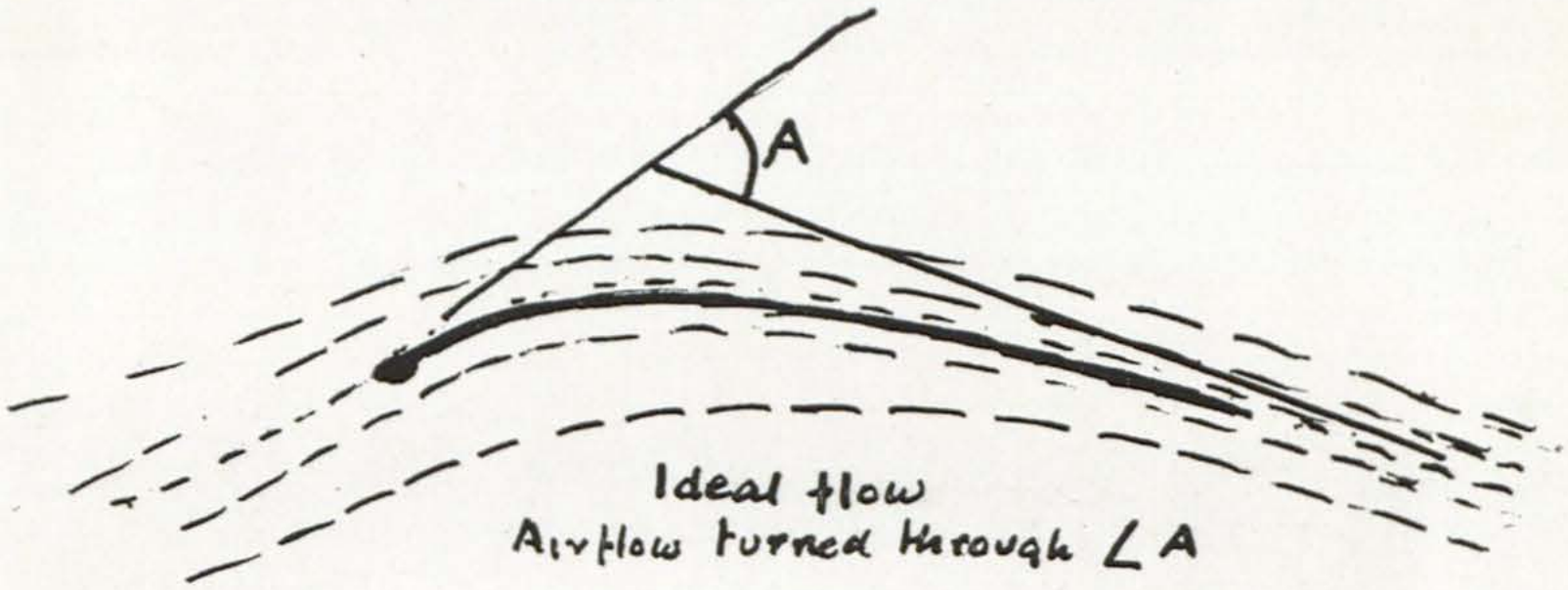


Fig. 1.

But the sail is imperfect and somewhere along the lee side the airflow leaves the sail and a wake is formed. This has the effect of considerably reducing the angle through which the airflow is deflected (see Fig. 2).

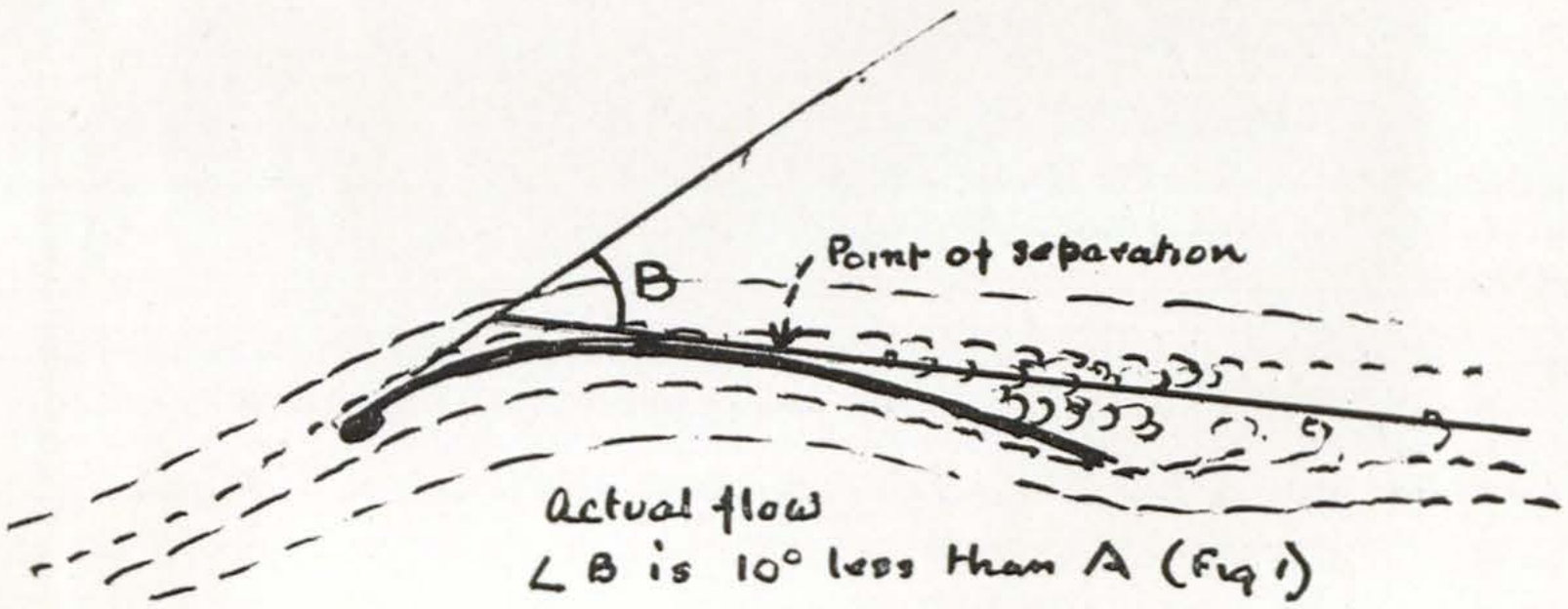


Fig. 2.

The angle B is considerably less than the angle A. Obviously the further aft the air can be made to stick to the lee side the better.

With all this in mind I carried out some experiments on my "bent mast" wingsail, using wool tufts (of knitting wool) spaced 12 in. apart from luff to leach on a 7 ft. 6 in. chord section of the sail 3 ft. from the foot noting the behaviour of the tufts on the lee side. These wool tufts were just threaded through the canvas (not mounted on stalks as is sometimes done) and so, being very close indeed to the surface of the sail would, by streaming aft or not streaming aft, indicate pretty accurately whether the airflow was still attached to

the surface or had broken away from it. I must point out that there is virtually no mast interference to leeward on this rig, which has a "soft" sail with short battens and no jib.

Very careful observations made in smooth water and a 10 m.p.h. (about) wind gave consistent results which seemed conclusively to show that with this particular sail the point of breakaway was pretty far aft about $4\frac{1}{2}$ ft. from the leading edge on a $7\frac{1}{2}$ ft. chord, i.e. at 60 per cent. chord. This result was attainable over a range of angles of attack from that at which the sail's curve started to collapse up to a few degrees below the stall (as indicated by the sudden drop of all the lee side wool tufts from near horizontal to vertical). The approach to this stall showed first at the tufts nearest the 60 per cent. chord point and those ahead began progressively to drop from the rear towards the mast till all had stalled, showing that the "breakaway," advanced towards the L.E. as the angle of attack increased, which is I think in accordance with theory. It is very hard to measure the depth of camber on a sail but I would guess it at about 1 in 9 on mine. If one draws a scale drawing of the test section with this camber it would seem that whereas the "ideal" sail would deflect the air through about 43° the actual one (even with the point of breakaway as far aft 60 per cent. must only be deflecting it about 30°. All this is of course a *rough* estimate but interesting none the less. What is interesting, too, is that on such a comparatively crude thing as a sail the point of separation was as far aft as 60 per cent. of the chord. Two further experiments were made. The first was to mount a

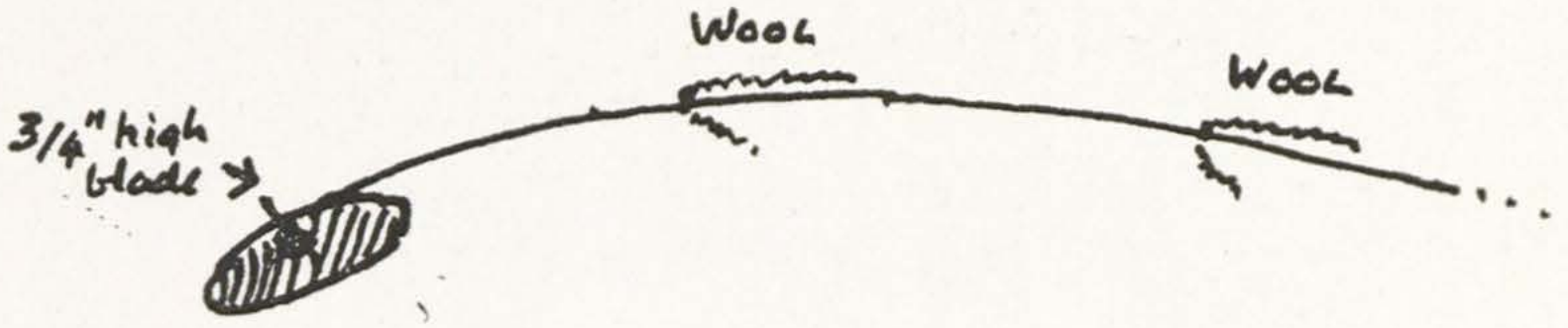


Fig. 3.

thin vertical blade in the mast track (see Fig. 3) projecting $\frac{3}{4}$ in. (i.e. 1/20th of the chord) into the fastest part of the airstream. Its effect was not very pronounced but the tufts downstream of it were rather less steady. There was no apparent shift of the separation point.

Finally a much larger obstruction, corresponding in shape and position to the normal "streamlined" mast was tried out. The effect of this was pronounced as the wool tuft 12 in. down stream of it showed

violent turbulence and at coarser angles of attack (but below the stalling angle) it also showed a reverse i.e. forward flow. The main flow seemed to re-attach itself to the sail some 18 in. aft of the luff but clearly the important, forward facing part of the sail ahead of its hump had lost all or most of its forward "suck."

I hope these notes may interest someone.

Yours sincerely,

Hintlesham, Ipswich. H. F. PANHAM.

Dear Sir,

On the subject of lateen rigs, I've seen no mention of lateens as handled in the Mediterranean. During World War II I was

Lateen Sails.

stationed for a time near Alghero, Sardinia, and had the opportunity of going out with local fishermen. Their 20 ft. odd craft had whale-boat hulls, outboard rudders and a sort of sloop lateen as sketched here. These could be taken to windward quite smartly by one man, and were good sailers. The main sheet is easily held by the same hand grasping, the tiller and the running rigging that comes into most play is the pair of tackles handling the lower forward end of the spar (called "antenna" in Sardinia). The windward tackle is used to trim the antenna base about in tacking, and the leeward one let fly. This also permits the antenna to take any other desired position in sailing, and in running it is paid out until that spar is almost horizontal, giving the sail a very good set for downwind running. It seems to me that this arrangement is quite practical and the light spar could easily be brought to lee of the mast for any extended time on a given course. On short tacks into a harbour, the inefficiency of the sail to windward of the mast is not significant. The sail is reefed to the antenna by lacing through holes in the canvas. It is obviously an efficient rig and perhaps the most beautiful of any.

RICHARD L. ANDREWS.
25, Audubon Drive, Ossining, N.Y., U.S.A.

Dear Dr. Morwood,

Congratulations on your original design for Pelorus Jack. I have copied your hull shape in thin cardboard and it makes up successfully. Personally I would prefer to have more rounded sections midships and aft as this helps planing, enables a greater load to be carried and gives less wetted surface and hence greater speed. I am dubious of the hydro-foils particularly in rough water going to windward. For example, what happens in stays under gusty conditions when the very light boat will probably have lost all forward speed and thus any lift from the hydrofoils? The foils themselves built hollow of fibreglass would have insufficient buoyancy for stability under those conditions.

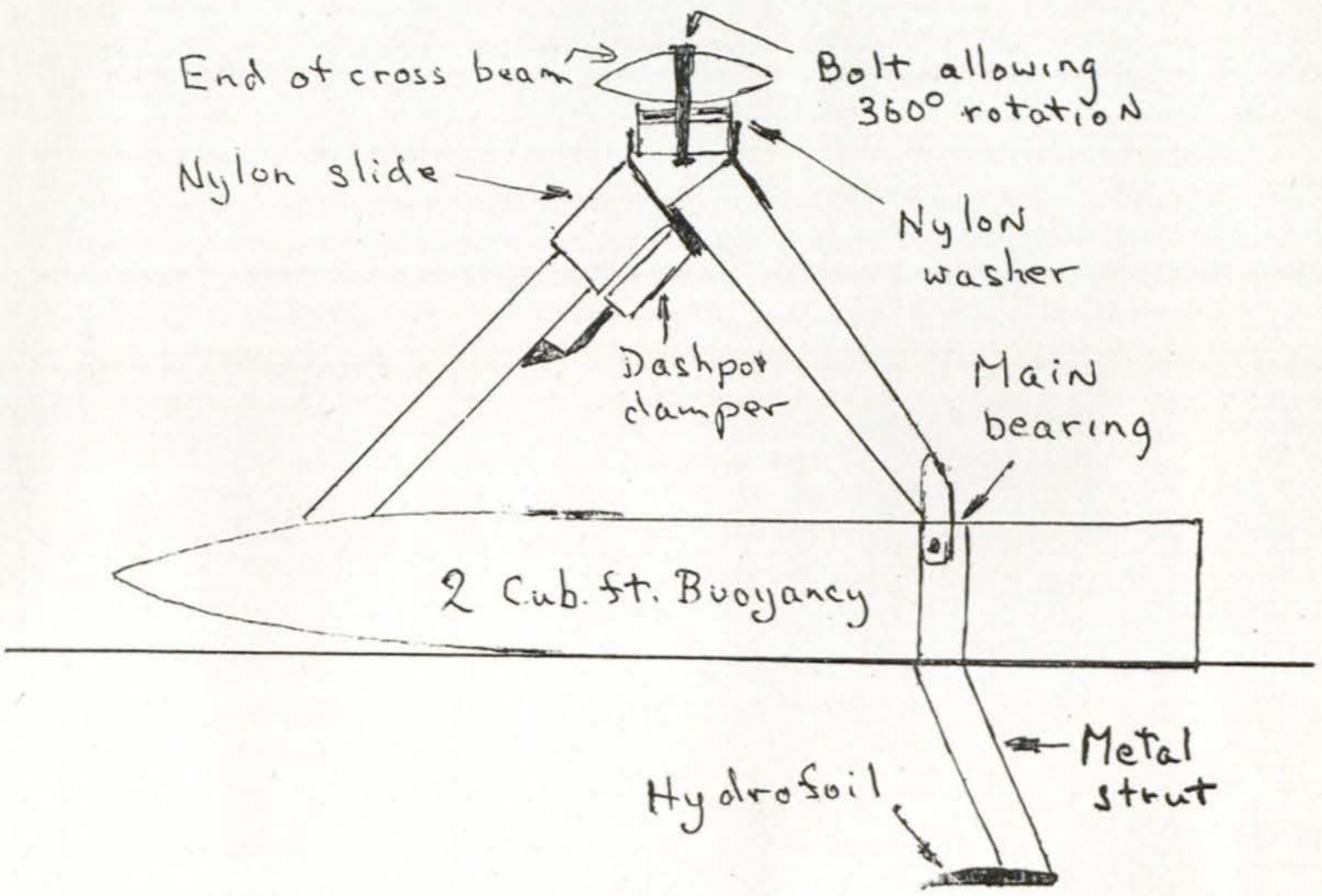
I am developing your hull shape further and not having any further information than is given in your publication No. 20, Modern Boatbuilding. I am having to use the laborious empirical methods at $\frac{1}{8}$ scale which may not work out at full scale. I should be most grateful therefore if you could enlarge a little on the development of plywood. This seems to be a good method for building in composite plywood and fibreglass by moulding a former of developed plywood into fibreglass sheathing which can be built up with expanded polystyrene to give the strength and stiffness where required.

I look forward to having your comments and to the information on further development of plywood. Perhaps I could be put in touch with Dr. C. N. Davies and F. M. Montgomery.

WING COMMANDER R. J. BURROUGH, D.F.C., R.A.F. (RTD.)
The Smithy,
Farnborough, Wantage, Berks.

EDITOR: Several people have questioned this point of Wing Commander Burrough's about what happens to hydrofoils when the weight comes into the sails after putting about. In the case of *Pelorus Jack*, this is taken care of by the ballast but in our experiments, both model and full sized, this was no problem at all. For strong winds, the weight might have to be taken slowly with certain types of hull.

One idea which might be of value is that shown in the sketch. In this, there is 128 lbs. (2 cub. ft.) of buoyancy which actuates the foil incidence, being suitably damped to prevent violent foil movements.



The bullet shaped float may be expected to skip from small wave top to wave top and plunge into steep wave slopes, to come out the other side. The whole foil system can rotate through 360° so that a square-sail (which may be taken aback) can be used and the cross beams can be retracted along the sides of the hull with the foil systems behind the transom.

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The
Amateur Yacht Research Society

(Founded June, 1955)

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OBJECTIVES

1. To encourage the design and construction of all kinds of experimental craft, whether propelled by wind, power or human agency.

2. To improve and promote the invention of any kind of yachting equipment or accessory.

3. To build up a pool of technical information on Marine subjects available to members on request.

The A.Y.R.S. has been going for over 8 years at the time of writing and so far we have collected what can be regarded as an enormous amount of information on many subjects to do with yachting.

On the technical side, we have been fortunate enough to discover that it is possible to do tank tests with good accuracy in a tank only 10 feet long. Edmond Bruce, who originated this tank, is at present giving us fundamental research into yacht hulls which incidentally shows the value and best shape of the catamaran hull. In England, we have made one of these tanks but have yet to use it constructively. At least one privately owned tank has also been made.

We have constructed an 8 foot yacht wind tunnel at Woodacres and are in the process of instrumenting it. Eventually, we hope to have a yacht wind tunnel large enough for any dinghy sailor to test his sails and make sure he is getting the best possible drive from them.

As regards yacht inventions, we have published very many different varieties of sails invented by our members and devices of many kinds which could make yachts easier to sail and more efficient. In publications No. 44 and 45, we show ways of erecting semi-elliptical sails which, both theoretically and practically, seem likely to produce greater sail forces and windward superiority than the conventional sloop.

Perhaps, however, our greatest accomplishment to date is that we have sorted out all the principles of catamaran and outrigger design both as day racers and cruisers. In this field, we have been quoted as the "World Authority" by the New York Public Library, and indeed, there is no other published information on these interesting craft at present half so informative as ours.

Now that we have sorted out the design of both catamarans and outriggers, we are rapidly finalizing the details of hydrofoils as applied to sailing and power boats (see publication No. 44). When

this has been done, we will then be able to design a sailing boat which will give us the ultimate in efficiency. This exciting development will occur during the next five years but could take place in 1964.

THE METHOD OF WORK

At present, the A.Y.R.S. only encourages development through our publications which will come out quarterly on January 1st, April 1st, July 1st, and October 1st. We have members all over the world from Rarotonga to Peru, and if anyone, anywhere, knows of a fully or partially successful experiment, we hear about it. An account is then published with suggested lines for still further improvement and the general principles of design are worked out.

QUALIFICATIONS FOR MEMBERSHIP

There are no qualifications for membership other than an interest in our objectives. Though we are an *amateur* Society, we do not bar people professionally engaged in some branch of yachting. This is because we know that our researches will not directly benefit anyone financially and will be made available to anyone who wants to see them.

SUBSCRIPTION

The A.Y.R.S. year ends with the October publication. Most of the back numbers are available at 5/- or $1.00 each, though some may be out of print. All these may be got from the Hon. Editor or the Hon. Secretaries in the different countries.

The publications for each year will include one on catamarans and outriggers. One will deal with sails and sail rigs. One will be rather technical dealing with the results of practical tests on yachts which we hope to express in a simple enough manner to be understood by anyone who knows some slight mathematics. The fourth one will be on any other subject on which articles and information has been accumulated by the Hon. Editor.

The subscription to the A.Y.R.S. is £1 of $5.00 per annum for which one receives:

1. Four publications beginning with that of January 1st.

2. An invitation to the A.G.M.

3. The use of any A.Y.R.S. equipment, Yacht Wind Tunnel or test tank which is functioning.

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Please send publications for previous years numbered for which an additional is enclosed.

Yours faithfully,

Address.....

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.....

QUESTIONNAIRE

If you will be good enough to answer the following questions, the Committee will be in a better position to adapt the Society to the general wishes of its members.

1. What are your interests? Theory of Sailing; Design; Racing; Cruising; Conventional Yachts; Multihulls; Hydrofoils.
2. Should future publications be more, less or the same technicals levels as at present.
3. Would you like to meet fellow members in your area?
4. Would you like to join in an organised experiment?
5. Have you any suggestions for improving the A.Y.R.S.?

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