Load/Wetted Surface
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Manta Formed ply Cat. 28.

CATAMARANS 1965

A.Y.R.S. PUBLICATION No. 54

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CONTENTS

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EDITORIAL

January 1966.

Postponement of A.G.M. The British A.G.M. has had to be postponed. Members will be notified of the future date which, by the Constitution, must be before April.

The American A.Y.R.S. A pleasant and instructive meeting of the New York members has taken place of which we have a detailed account by Henry Morss in this publication. A Pacific Group has now been formed under the secretaryship of John Novak, 23100 Vanowen St., Canoga Park, California. They also have held a meeting and West Coast members should contact. So far, neither group has asked us for the $2.00 per member which we are holding for them in accordance with our promise of January last. Owing to rising costs and the need for paid secretarial assistance at Woodacres, this offer may have to be withdrawn soon and we may even have to raise subscriptions. Many members have pointed out what very good value they get for their small subscriptions which is due to the tremendous amount of work which Hetty Tett does. The A.Y.R.S. is now expanding very fast and we will soon need extra help.

The East Grinstead Group. We also have an account of this very vital group which has been run by Fred Benyon-Tinker and allies for several years. It was an extension of this group which has produced the Weir Wood Sailing meetings which have given so much pleasure.

Other Groups. Several groups are now forming in the British Isles. The Edinburgh Hon. Sec. is A. T. Brooke, 75 Craiglockart Rd., Edinburgh 11. The Bristol Hon. Sec. is M. Garnett, 7 Reynolds Walk. Horfield, Bristol 7.

Overseas Groups. All these are running smoothly, some with regular meetings, others without.

Annual Reports. I think that members all over the world would like to know what each group is doing and whom to contact if they should be in that country. Judging from the number of people whom we meet and who call on me here from all over the world, people seem to travel all over the place nowadays (by air, if not by yacht). It has therefore been my hope that we should be sent short reports of each A.Y.R.S. Group each year to arrive at Woodacres by October 1st so that we can publish them in the January issue.

CONFERENCE REPORT

Place : Eastern Yacht Club, Marblehead, Mass.

Present :

Mr. & Mrs. H. T. Ballantine, III
Dr. H. T. Ballantine, Jr.
Mr. Wm. Barrow
Mr. P. Bergstrom
Mr. & Mrs. Wm. C. Brewer, Jr.
Mr. Edmond Bruce
Mr. F. A. Caldeira
Mr. George Carson
Mr. & Mrs. W. Giger
Mr. E. Selman Graves
Mr. Howard P. Hart
Mr. D. P. Kieley
Mr. Bruce Larrabee
Mr. Paul A. Lindh
Mr. George McDonnell
Mr. Henry Morss
Mr. Martin L. Nason
Mr. Charles L. Prescott
Mr. J. O. Stoddart
Mr. Robert W. Stanhope
Mr. W. Dorwin Teague
Mr. John H. Thomson

Subject : Second Meeting of the Amateur Yacht Research Society.

Date : August 8, 1965 (11.30 a.m.).

Harry Morss opened the meeting saying that there were no specific problems but that he felt it would be good to restate the aims of the Society and to talk about what the members of the American Section were doing. He then introduced Dorwin Teague, who gave a brief report of the activities of the Secretary, the state of the A.Y.R.S. library and mentioned the fact that some small A.Y.R.S. burgees were available for members.

Jack Stoddart was introduced and gave the members a brief history of the A.Y.R.S. and a re-statement of the purpose of the Society.

Harry Morss then spoke on his ideas of the major needs of the Society and of some of the things he felt the American Section could do to further the interests of the Society, strengthen the position of the American Section, and to help sailing in general. He then introduced Edmond Bruce.

Mr. Bruce started by stating that present-day sailing, including such features as the America's Cup, were run with a distressing lack of scientific method. In the strict definition of the term, scientific method is theory backed up by experimentation ; one without the other is of no value and with present sailboat design, the experimental feature at full size is usually missing. Compared to some of the latest design thinking, the America's Cup 12-meters may be characterized as " houseboats."

In Edmund Bruce's opinion, on a given course to the apparent wind there are two values which must be known and compared to get

a real ideal of performance ; these are apparent wind speed and boat speed. At the present time there is no instantaneous comparison of the two and hence the effect of other variables on performance is not truly known. Mr. Bruce's experiments have been concerned with developing instrumentation to provide such a comparison or ratio.

Edmond Bruce measures wind speed with an electrical anemometer (the Simerl anemometer has proven best) and a simple, small type of rotating impeller driving an identical generator for boat speed. In equating this combination, the main problem is that the wind speed needs considerable damping to achieve a time constant comparable to that of the change in boat speed. Mr. Bruce puts a calibrated mass on the anemometer to bring the time constant into line. The two measurements are then brought into balance in a bridge circuit and thus any change in any part of the boat such as sails, trim, etc., resulting in a movement off of null indicates whether or not the change is beneficial. To take care of various factors such as the fact that the indicated hull speed is not linear with boat speed, certain calibrations are provided. With regard to the latter effect, the instrument readings are referred to master curves for the absolute answers.

In testing on board a boat, the instruments are balanced out, and before the reading is taken the operator waits until a steady state is achieved. The ratio between the boat speed and the wind speed changes slowly enough so that practical results can be obtained with this instrumentation.

Proof of the practicality of this method is the fact that Edmond Bruce has been able to achieve positive results in practice. The owner of one cruising type boat who prefers to remain anonymous for the time being has improved his performance to the point where he is now a winner in most of the events he enters whereas before his boat was tested with Edmond Bruce's instrumentation, he was usually intermediate in most of the races he went into.

Harry Morss and other members who are acquainted with Edmond Bruce's equipment and the results he has achieved, are unanimous in their opinion that significant findings will result. Edmond Bruce showed photographs of the equipment, which appears to be very neatly made, and he estimated a cost of approximately $600.00 for a complete set of equipment.

Some of the other points which Edmond Bruce brought out in his talk were also extremely interesting. It is his opinion that all of the 12-meters so far have been over-designed as far as leeway angle is concerned, that the optimum leeway angle is 4 or 5 degrees and that today's 12-meters are closer to $1\frac{1}{2}$-2 degrees.

Another rather startling statement by Mr. Bruce is the fact that there is an optimum aspect ratio which in most cases is not accurately known. He stated that the aspect ratio of some centreboards and rudders, particularly in the more exotic boats, is too great and that more efficiency would result if this were lessened. Specifically, Mr. Bruce stated that the bilge boards on Class E scows were very much too small and that if the Class rules allowed these to be increased to approximately three times the present area, a much better boat would result.

In many cases the designers are misled by the fact that they consider the action as that of an incompressible fluid whereas if the rudder or centerboard is surface piercing or generates surface waves in any degree, the action is " pseudo-compressible."

Harry Morss concluded the meeting by stating that he felt that more work like Edmond Bruce's would give a tremendous lift to the American Section. There are three questions which must be answered before the American Section can take the most advantage of these experiments.

1. What is the best way to go about running the experiments ?
2. How can we best go about acquiring perhaps ten sets of instruments ?
3. How can we get the necessary manpower and time to run the experiments ?

Harry Morss feels that it would be very difficult for the Society to gather sufficient manpower and that we should not underestimate this requirement. He would like all members to give these problems intensive thought and to write letters offering services and making all possible suggestions.

A vote of thanks was given to Harry Morss for organizing the meeting, and most of these present attended luncheon at the Eastern Yacht Club.

THE EAST SUSSEX A.Y.R.S.

BY

FRED BENYON-TINKER

High Fleet, Nether Lane, Nutley, Sussex.

The East Sussex group of the A.Y.R.S. stemmed from an experiment started some five years ago whilst the writer was at Redhill, Surrey. At that time it seemed to be a good idea to try to get together the members living within a reasonable travelling radius, so that we

could talk about things of common interest to do with sailing. An examination of the register showed that there were, in fact, some fifty members within such a category and, initially, a circular letter was sent out asking whether they would be interested in such a scheme. The response was sufficiently encouraging to arrange a series of meetings, during which we discussed all manner of topics and had a few films, notably one with suitable talk by Chris Hook on his work on hydrofoils. As an extension of these evening affairs, we also arranged a few sailing meetings at Shoreham. The attendance to all these varied considerably, but averaged around a dozen. When the writer moved to East Sussex, the centre was also shifted and it is not clear whether this was a good idea, for whilst there was a worthwhile increase in the new local membership, the attendance of the members who had originally come along fell off considerably. The present pattern of attendance at meetings does tend to follow the experience gained at Redhill, with quite a variation of members, but there is no doubt that within a quite restricted radius, groups of this nature serve a very useful purpose in bringing members together at regular intervals, and equally in attracting new members, especially where some local press coverage can be arranged. In general, the lessons we have learned so far have been that whilst most members comment on the pleasure they derive from sitting around and talking about boats, the actual attendance at meetings seems to be confined to a hard core of fairly local people, unless some special feature, such as a film or a lecture has been laid on, when people come from much further afield provided they know about it. Local membership figures do tend to rise where such a local centre exists and it has been our experience that such a nucleus does cooperate very well within a given area over any practical projects. For example a good deal of the organisation required for the last Weir Wood meeting was the the joint work of the local group. We have found that meetings during the summer months are not worth holding, but we are again trying out some sailing meetings at Shoreham. Starting next Autumn we are arranging a more ambitious programme of films and lectures, which we hope to have well established in good time for adequate publicity, both at local level and for general information of members, all of whom are most warmly invited to come along. We are also going to try the experiment of having one or more meetings in East Grinstead, with a suitable film as principal feature, to which the general public will be invited.

WEIR WOOD MEETING

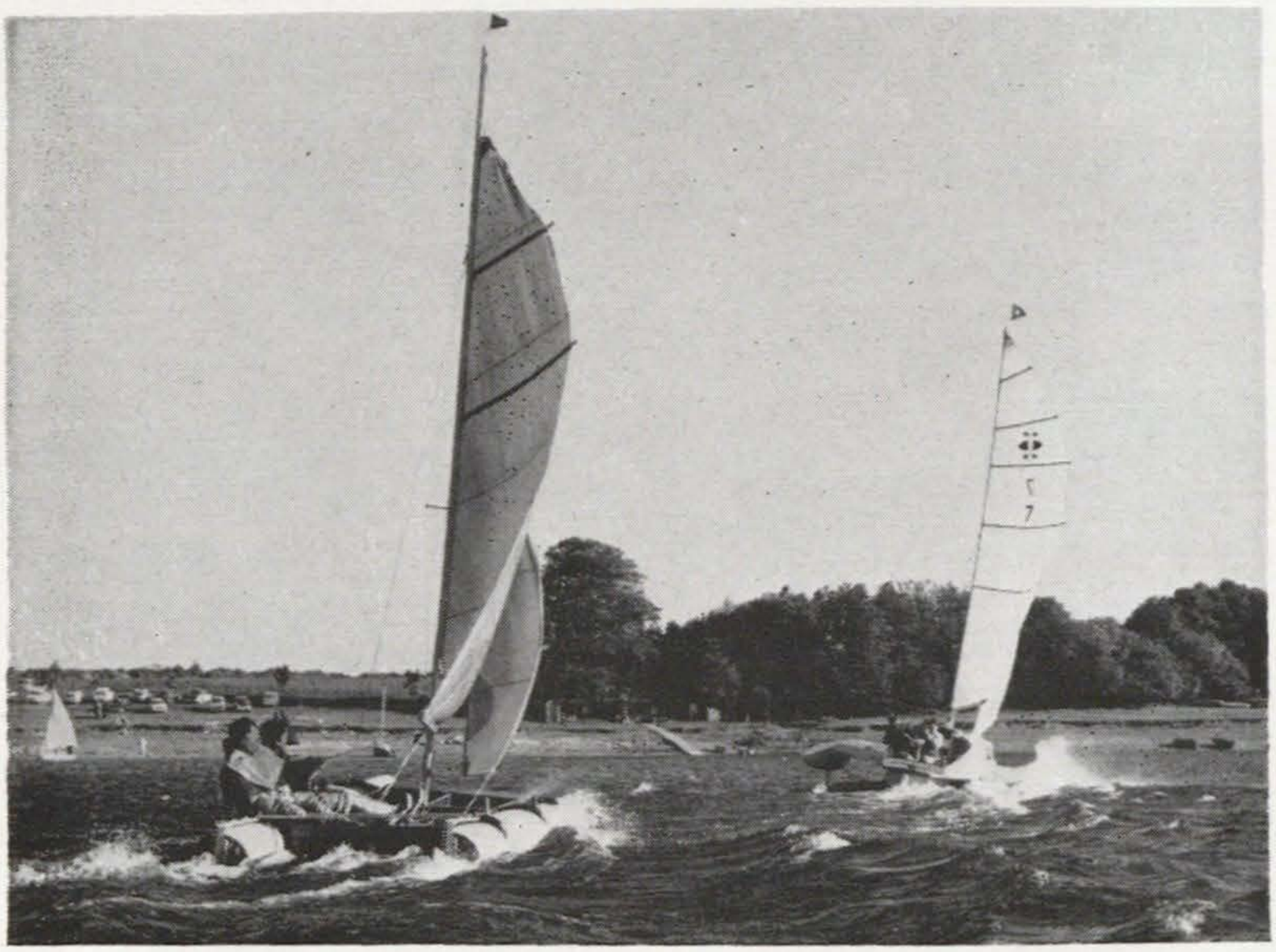
BY

FRED BENYON-TINKER

Well, the fourth meeting at Weir Wood has come and gone and this year we really hit the jackpot, for apart from a most interesting collection of boats, we had both sunshine and a decent sailing breeze on both days.

Thanks again to Roy Pipe, we had an imposing tent to house the members who took a turn at reception duties, and I am more than grateful to them for easing the burden for me. As a result, this year I was able to get in some sailing for myself—a welcome change. Whilst on this subject, I do think that the most valuable feature of these meetings is the ready way in which everybody goes out and sails with everyone else.

To introduce dull statistics after such a week-end seems to be something of an anti-climax, but they are, to my mind, interesting rather than dull and serve to show the progress that these meetings have made in the last four years. For instance, some 52 members came along and brought with them such a retinue of friends and



Benyon-Tinker's VANESSA and Sides T 18

family to see our activities that the total number ran close to 250. It is true that the bulk came from the home counties and this was, of course, to be expected, but not all, as in previous years a number of stalwarts made prodigious journeys to be with us. The array of boats added up to 20, of which no less than 11 were multi-hulls of one type or another and, also, eleven of the boats were either wholly designed and built by members or modified in a major degree from a standard design. Of the remainder, only four were professionally built. These facts alone are a complete justification, if one were needed, of these meetings and, equally, for the very existence of the A.Y.R.S. as a society. I give a complete list at the end for those who wish to see the precise line-up.

Year by year, as I make out a report on these meetings, I find much difficulty in deciding which to pick out for comment because of the number of interesting boats which I would like to write about in detail and which have to be balanced against the space available. A similar difficulty presents itself in knowing what to say about each boat. It is inevitable that one is tempted to make comparisons between boats of similar sizes performancewise, and this is fair enough when they have been designed to meet similar objectives, but it can be grossly inaccurate or unfair to pursue this path in all cases. I am, therefore, confining myself to commenting on boats which have not previously been at Weir Wood or which have been modified in some significant manner in the past year.

I was more than grateful for the presence this year of the two cabin trimarans of Dennis Banham and Ken Sides, for these two formed between them a remarkable passenger service around the reservoir and there was seldom a time when there was not a queue waiting. I am very indebted to them both, along with their crews, for their efforts. The T18 of Ken Sides was a new boat to Weir Wood and aroused a good deal of interest and favourable comment.

For the past two years we have been able to see the Shark trimarans from Shoreham, but this year the pattern changed in that one boat was fitted with hydrofoils below the floats and their effect in terms of lift was very apparent. In discussing this with the designer I gathered that the advantages have not yet been clearly established, for whilst at times the hydrofoils show a definite superiority, this is not always the case. It will be very interesting next year to see what developments have taken place and what pattern emerges of either floats, foils, or a combination of the two.

I was especially pleased that Martin Ryle managed to get down with his hydrofoil boat, for last year there was no wind so we could not see it in action. This week-end, however, the wind was more

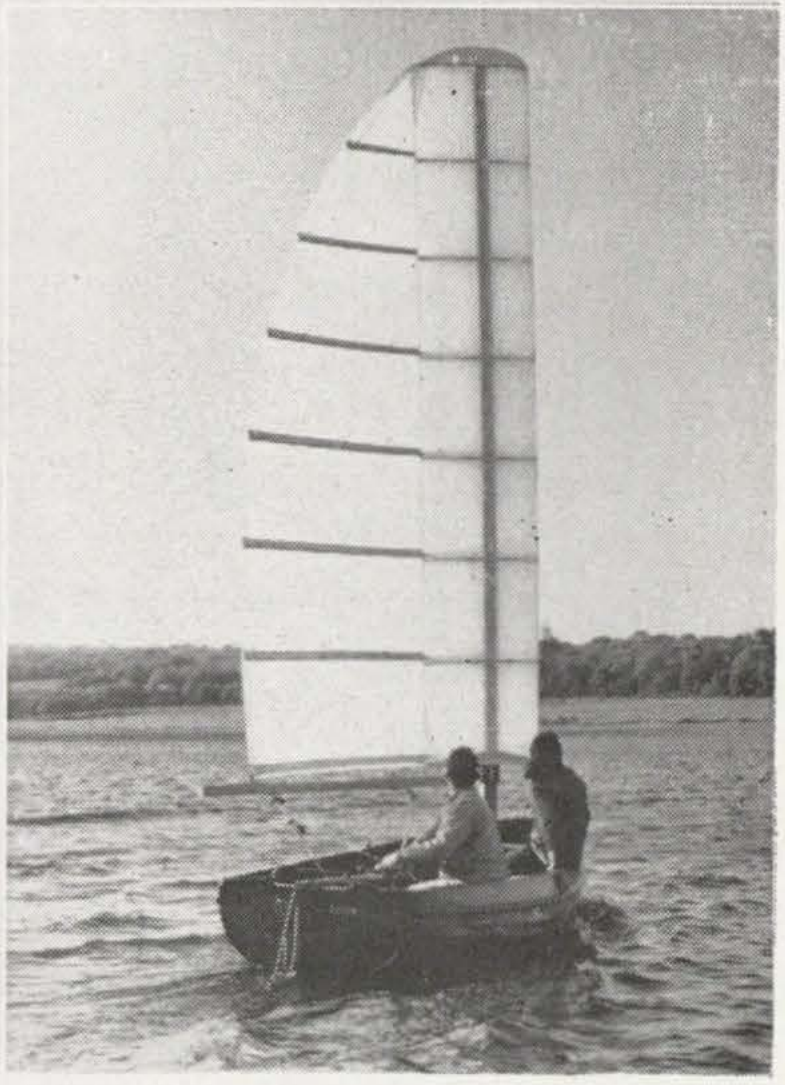
Rigg's single outrigger, Banham's SEA WRAITH, Chapman's R.N.S.A., sail furled

than adequate, so we all had a good look at it rising up on the foils with the marked change of attitude as the bows rose and the stern did not.

A boat which particularly impressed me was Maclachlan's trimaran which was fast, immensely stable, remarkably easy to control and behaved in an exemplary manner. To my mind this is one of the best boats of its type and size I have seen so far. It was a matter of regret to me that I just did not have the time to sail it myself. A considerable number of people did so and they were all loud in its praises. I hope that I shall be able to persuade him to bring it over to Weir Wood again shortly, for there are a number of people who would like to have another look at it. If the plans, which a few of us, in this area are now concentrating on, to produce some simple, effective and accurate instrumentation are successful, it would be very informative to do a precise evaluation on the performance.

I was delighted that Chapman arrived with his Chinese version of a RNSA 14, complete with a full array of instruments, over which my mouth watered, and his own version of a wingsail. I have been playing on paper along very similar lines for some time—and here it

was in the flesh. I did manage to get out in this boat for a brief sail and to my shame I so plied him with questions that I did not devote anything like enough attention to the sail and its behaviour. What I did see, however, did suggest that it has a good deal in its favour, though I fancy that it might well take some time to learn how to



SEA WRAITH, McLachlan's trimaran, Ryle on foils, Chapman's wingsail

handle it to best effect. It struck me that it was much more critical to angle of attack when close hauled than a conventional rig, and might present some of the problems we encountered with the Dibb sail in this respect. Here again, I would very much like to have the chance of further experience with it at Weir Wood this winter.

Then there was the Foil dinghy which John Morwood produced from his pocket, complete with a battened square sail. He was unable to sail it himself for he simply overflowed around the edges, but eventually he found a suitable size of test pilot and, aided by sundry tyre levers and outsized shoe horns got him in and away. This experiment did not last very long, due to a capsize and that was that and we were deprived of the opportunity of seeing whether the sail had any merits or not.

From Don Rigg we had a single outrigger type, based on a P.B.K. canoe, which, in spite of its sail area of only some 65 sq. ft. went very well indeed. This is generally similar to John Partington's boat, so these two had plenty to discuss and swap notes about.

I was especially regretful that I just did not have time to have a detailed look at the boat by Reg Cobb, which we had at last year's show, nor yet was I able to observe its performance on the water for the same reason. I had been looking forward to seeing this with great interest, but as it happened I was elsewhere during its all too brief appearance.

Finally I come to my own offering, the inflatable catamaran. A description of this is in this journal, so there is no need to comment upon it here, except to say that I think it surprised quite a number of people that a blown-up thing could actually sail quickly, handled just like a conventional boat, and was very comfortable—if rather damp—with splendid built in air cushions to sit upon. It is true that there were certain incidents connected with a self-reefing mast, the first being by courtesy of sheered shroud plate bolts and the second by virtue of a tired shackle. Surprising how much water comes rushing out of a tubular alloy mast after it has been floating alongside, tethered by an imposing array of rigging and sails !

A special word of thanks to all who helped in the running of this meeting for it is now becoming quite a task to organise. As a final comment, and one which gives me great pleasure, after all the tumult had died down on the Sunday evening, I had a walk around to see what had been left behind, and I was delighted that there was not so much as a single piece of paper left on the ground—thank you everyone.

It looks as if we are going to be fairly busy this winter at the reservoir and I would ask all those who intend to come down for testing to contact either Dennis Banham or myself in advance. The

reason for this is twofold, the first being that we are officially only allowed three boats on the water at a time and the second is that the authorities do require that either one of the above should be responsible for the activities of the Society at the reservoir, and we cannot do this unless we know who is going to be there.

The local meetings are still being held on the last Friday in each month, though it is not yet certain whether the venue will be the same as last year. If you would care to come along please contact the writer to check on this—'phone East Grinstead 4090 during business hours or Nutley 2333 evenings.

TRIMARANS

Sea Wraith	D. S. Banham
Humming Bird	K. Sides
Trim	A. Kanssen
Shark (hydrofoil)	R. G. Garrett
Shark (floats only)	J. R. Anderson
18 ft. trimaran	D. Maclachlan

CATAMARANS

Vanessa Inflatable	F. Benyon-Tinker
Flying Kitten	E. Scott
Swift	A. Smith

SINGLE OUTRIGGERS

Tabuariki	J. Partington
Goonraker	D. Rigg

MONO HULLS

Alloette (hydrofoil)	M. Ryle
Ski Sail	A. Ryle
RNSA (wingsail)	G. C. Chapman
Snipe	R. Pipe
Foil (squaresail)	J. Morwood
Graduate	D. Beedle
14 ft. Clinker	D. Rush
Gull	— — —
Experimental—circular	R. Cobb
Mirror	K. Hands

Anchor Films Ltd. 2 Fairwarp Forest Drive, Kingswood, Surrey have taken a colour film of the Weirwood Meeting which will be shown in the "Film Lounge" at the London Boat Show.

POLYSTYRENE FOAM " WOOD "

BY

JOHN MORWOOD

Members may remember the " Polystyrene Foam Wood ", described in the October publication of last year when a laminate of sheet polystyrene foam and glass cloth was suggested. During this year, I have been experimenting with this principle and, after a number of failures with various substances, a laminate has been produced with some remarkable properties.

The present samples are made from craft paper and sheet polystyrene foam at 12 of each to the inch glued together with urea-formaldehyde glue (Cascamite " One-shot " or Aerolite 311). The density is $11\frac{1}{4}$ lbs. per cubic foot. I have made up my samples as boards with the " grain " of paper running along them lengthwise and straight through the thickness. It is handsome looking stuff, therefore.

The boards are quite strong along their length but will break " across the grain " quite easily as their strength that way is only that of the foam. Their greatest strength however is in compression and one can stand on the material with a heel and not mark it.

Boatbuilding uses. The material is easily worked and bends well. It should be quite easy to build boats from it whose surface will take a smooth satin finish. The density, being one quarter that of plywood, should allow the planks to be fairly thick, thus giving the strength required. On completion, an outside skin of craft paper, nylon or even calico can be glued on with urea-formaldehyde and for extra strength, fibreglass can be glued on the inside with the same glue. Polyester resin dissolves polystyrene foam and epoxy is, in my opinion, unnecessarily expensive. Racing yachts made from this material should be lighter than those of plywood, while cruising yachts will be silent inside and heatproof.

It is just possible that we have hit on an ideal boat building material which should be cheap to buy. I reckon its possible cost at 15/- or $2.50 per cubic foot, retail. I am at present trying to get some manufacturer to take it up.

QUEST II AND *EMMA HAMILTON*

BY

JOHN MORWOOD

The Australian C Class catamaran *Quest II* lost to the British *Emma Hamilton* in the LITTLE AMERICA'S CUP races this year. It is the opinion of us all that *Quest* was the faster boat on all courses when everything was just right but that race tactics lost her the series. I do not feel that the A.Y.R.S. is the proper place to describe the tactics or the story of the races, which has been well covered in the yachting magazines. Our value lies in a discussion of the two boats, relative to each other to see where the merits of design and rigging lie.

Quest II. The hull is basically the same shape as the first *Quest* which was beaten in a previous series at Thorpe Bay for the Little America's Cup. Her hull bottoms were made of fibreglass in the same mould, instead of honeycomb and resinized cloth as before. Special plywood was made for the topsides, however, 5/32 in. thick with a transverse grain in the middle as used in Cunningham's *Quick-cat.* This was butted onto the bottom and were raised higher to give more freeboard than in the earlier craft. The result has been that the new hulls are even lighter than the original *Quest.* The foredecks are 1/8th in. plywood and there is slightly more buoyancy in the bows, due to the extra freeboard. The stem and canoe stern-posts are vertical and the total length is just under the 25 ft. allowed.

The hulls are joined by three 6 in. diameter alloy beams. The mast beam is, however, angled up, being cut and joined in the middle, to raise the underneath jumper strut farther off the water. This strut is stayed by 1 in. by $\frac{1}{4}$ in. solid stainless steel rod which should have very little stretch under the compression loading of the mast.

The trampoline cockpit floor is terylene fishing net with $1\frac{1}{2}$ in. mesh. There are three advantages : 1. Windage is less when heeled. 2. Water is not carried about on it, and 3. Some weight is saved.

The Rigging. An aerofoil mast is used whose angle to the boom is set by a Hi-field lever and a simple system of blocks and wires. The maximum angle between mast and boom is 45° which, with an easily adjustable clew outhaul gives a sail of all useful amounts of flow from a nearly flat sail to a very full sail. The mast is 16 ins. fore and aft and a smallish jib is used.

Quest II's superiority. This, in my opinion, was due to three factors. 1. Being at least 100 lbs. lighter in weight. 2. Having less wetted surface, and 3. Having better sails. The lightness in weight and the better sails are the result of attention to details, which

is probably where the British designers are falling behind due to complacency. This only leaves us to discuss the matter of the lesser wetted surface in the design.

The Stem and Bow. The almost vertical stem increases the sailing length here to a maximum and this, in turn allows the section of greatest underwater area to be slightly reduced in size. The result is a smaller hull beam which, with the lesser deck area reduces weight and hence wetted surface. The vertical topsides here are also of value in reducing deck area which is relatively heavy.

The Stern. A.Y.R.S. members will know my opinion about canoe sterns in catamarans and other craft and I still hold to them but, like many another thing, there are several sides to this matter. I feel that it is possible that 25 feet may be too long for a C Class catamaran and that a boat of only 20 ft. with the maximum beam of 14 ft. could carry the 300 sq. ft. of sail, if she used a transom. On the other hand, if this were to be done, the rudders would be nearer the centre of the boat with a resultant difficulty in steering. The rudders might stall or need to be excessively large. My conclusion is that the canoe stern of *Quest II* merely acts as an outrigged support for the rudder and could well be replaced by steel or alloy tubing, the boat being chopped off at the aft end of the cockpit. However, the rudders would then make greater surface waves so for reasons of elegance, the only very slight increase in weight and wetted surface of the canoe stern is probably of little importance. In its favour, it may be said as well that the fuss it creates when flying a hull is less than with the transom sterned catamarans.

Summary. *Quest II* was a faster catamaran than *Emma Hamilton* as a result of a superior attention to details of 1. Building weight. 2. Lesser wetted surface in the design. 3. The terylene net trampoline. 4. The greater elegance of her sails.

THE BRITISH C CLASS ELIMINATION TRIALS

BY

JOHN MORWOOD

Eight C Class catamarans took part in the British National Championships at the Catamaran Yacht Club, Sheppey, from the 11th to the 15th August, 1965. The best three of these were :

Emma Hamilton, sailed by Reg White with John Osborn as crew.
Thunder II, sailed by Peter Shaw, crewed by Rodney Marsh.
Miss Senior Service, sailed by Roland and Francis Prout.

The performance of these three can be summed up by saying that *Thunder II* was the fastest in light winds while *Emma* and *Miss Senior Service* were better in strong winds, with *Emma* being slightly better than the Prout boat.

The final trials of the elimination series took place over the course to be used for the International Catamaran Challenge Trophy at Thorpe Bay. For these, the above three boats were joined by *Nell Gwynne*, sailed by Ian Tremlett and crewed by his brother Bill.

These final trials were sailed by the boats in pairs so that on each day three races were needed to find the overall winner. The final result was that :

Emma had seven wins.

Thunder II had five wins.

Miss Senior Service had five wins.

Nell Gwynne did not win any races.

Miss Senior Service was now eliminated because her light weather performance was not as good as *Emma's* or *Thunder's* and so was *Nell Gwynne*.

On the last day of the trials *Emma* and *Thunder* sailed two races both won by *Emma* so she was chosen for the cup defender.

Comment. It is noteworthy that the relative merits of *Emma* and *Miss Senior Service* in both light and strong winds were the same. This, of itself vindicates our contention that the dynamics of catamarans are the same in both sets of conditions. What is surprising, therefore, is the fact that *Thunder II* showed such superiority in the light going but, though she was able to sail fast and well in strong winds, was not as fast as the other two. An explanation for this can be given in the sensitivity of an aerofoil sail to the angle of attack.

We all know that the wind jumps about in direction quite a lot at all times, and it does this far more than most practical sailors realise. Now Peter Shaw has been sailing without jibs for several years in *Shark* trimarans and, possibly because of this has a much more delicate feel for these wind shifts. In light winds, therefore, when these wind shifts occur relatively slowly and infrequently, he can follow them by playing his sheet and altering course. This then lets him use the efficiency of his sail to its utmost. In strong winds, however, the wind is gusty and very turbulent so its changes of direction cannot be followed so well. The result is frequent stalling and too fine an angle of attack with loss of drive.

The sloop rig with its jib makes a boat much more insensitive to the angle of attack of the wind and therefore faster in strong winds. The solution to the problems set by the aerofoil sail may lie in the suggestions in the later article on *Thunder II*.

THE AUSTRALIAN C CLASS ELIMINATION TRIALS

From the report by MAX PRESS in C.A.T.I.N.

Eleven C Class boats attended the trials which took place on Port Phillip Bay, whereas only eight boats competed in the English Trials and nine boats were present at the American trials at Stamford this year.

Of the eleven Australian boats, the ones which showed the most potential were *Quest II*, *Joy-C*, *Rainbow* and *Cheetah*.

Quest II was a convincing winner.

THUNDER II

L.O.A., 25 ft.
L.W.L., 23 ft.
Beam, 16 ft.
Sail area, 300 sq. ft.
Weight, 500 lb.
Designer : R. March.
Builders and Owners : R. March and P. Shaw, 36, Southdown Rd., Shoreham, Sussex.

Thunder II has what may well be the most advanced sail-rig in the world today, married to an excellent hull shape and in " Wind tunnel sailing " might well be the fastest catamaran in the world.

Hull Shape. *Thunder II* has narrow waterlines and a very fine but very deep bow. The hulls are in fact made of sheets of plywood and by the method developed by John Mazzotti for his " B " Class *Manta* (and of course used in his *Manta C*), producing a very handsome hull shape. Being Una-rigged, the mast is set further forward than for a sloop rig and the resulting increased separation of main and rear beams gives sufficient strength and rigidity without the use of the fore beam. The boat itself has the incredibly low weight of only 280 lbs. and weighs under 500 lbs. fully rigged.

The Aerofoil Sail. The " hard " part of the sail (or mast, if you prefer it) is 2 ft. fore and aft but tapers near the top above the attachment of the three stays. It is supported below this point by a single cross tree and a jumper stay on each side. The sail runs in a groove at the trailing edge of the " mast ". It is fully battened and

has a sliding outhaul at the clew to vary the amount of flow. As with *Quest II*, the mast can be rotated and fixed in relation to the boom by wires, blocks and tackle.

THUNDER II. Photo: Joyce and Ron Doughty

Summary. There is no doubt that *Thunder II* is an extremely fine boat with a performance second to none. It is interesting to note that she won the regatta put on after the International Catamaran Challenge, beating *Emma Hamilton*, the second boat home, by some 6 minutes.

The Wingsail Fault. The sensitivity of a wingsail to its angle of attack is a great handicap and two methods come to mind for dealing

THUNDER II. Photo: Joyce and Ron Doughty

with it. The first of these is to have a very sensitive wind direction indicator at a convenient height to be easily watched. This could be a dial but these have not always been found useful. I think small streamers on short pins sticking out from the mast to define the " stagnation point " of the windflow would be best. The second method is to delay the stalling point of the sail by the use of slats or slots.

A Slotted Mast Suggestion. A wingsail could be fitted with a " slat " ahead of the leading edge to delay the stalling point and some ingenious methods can be devised to make such a slat work on either tack. However, this is not the only way of delaying the stall and making a wingsail less sensitive to the angle of attack. A vertical " slot " could be set into the mast to take the wind from the weather side at the " Stagnation point " to the leeside of the mast where it would increase the total sail force, as well as delay the stall. Two slots more or less at right angles to each other could also be set into the mast with rubber valves to direct the airflow from the weather to the lee side on each tack.

MISS SENIOR SERVICE AND PROUT B CLASS CATAMARAN

Dimensions : Full limits of the Class Rules in each case.

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

These catamarans are the nearest thing so far to my own ideas about turtle decks for the saving of weight and windage. I feel quite sure that they are the ultimate in catamaran hull design and cannot be improved upon. The drawings we have been sent don't show the system fully but each hull is the result of joining two mouldings, mouth to mouth so that the transoms are quite circular. The mid-ships section, however looks a bit oval and some sheet plywood may have been used between the mouldings, or the moulding may have been brought a bit higher than would have been used for a usual type of hull.

The centreboards, it will be noted are dagger boards which can knock up a bit if they hit anything or it is needed for balance. They obviously set on pins in the boxes.

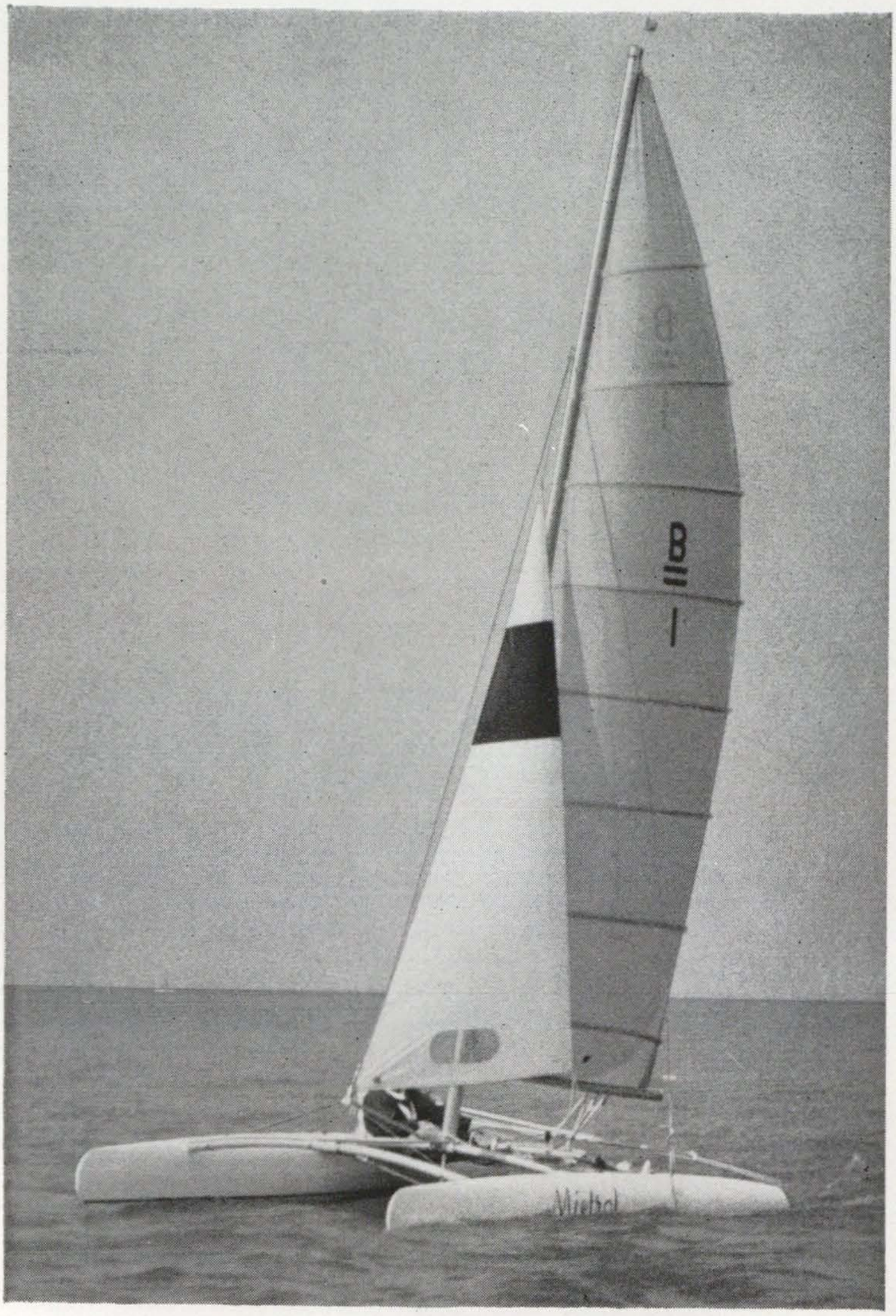
For the C Class, a normal sloop has been drawn with an aerofoil sail (in which case there is no fore beam) as an alternative.

MISS SENIOR SERVICE. Photo: Joyce and Ron Doughty

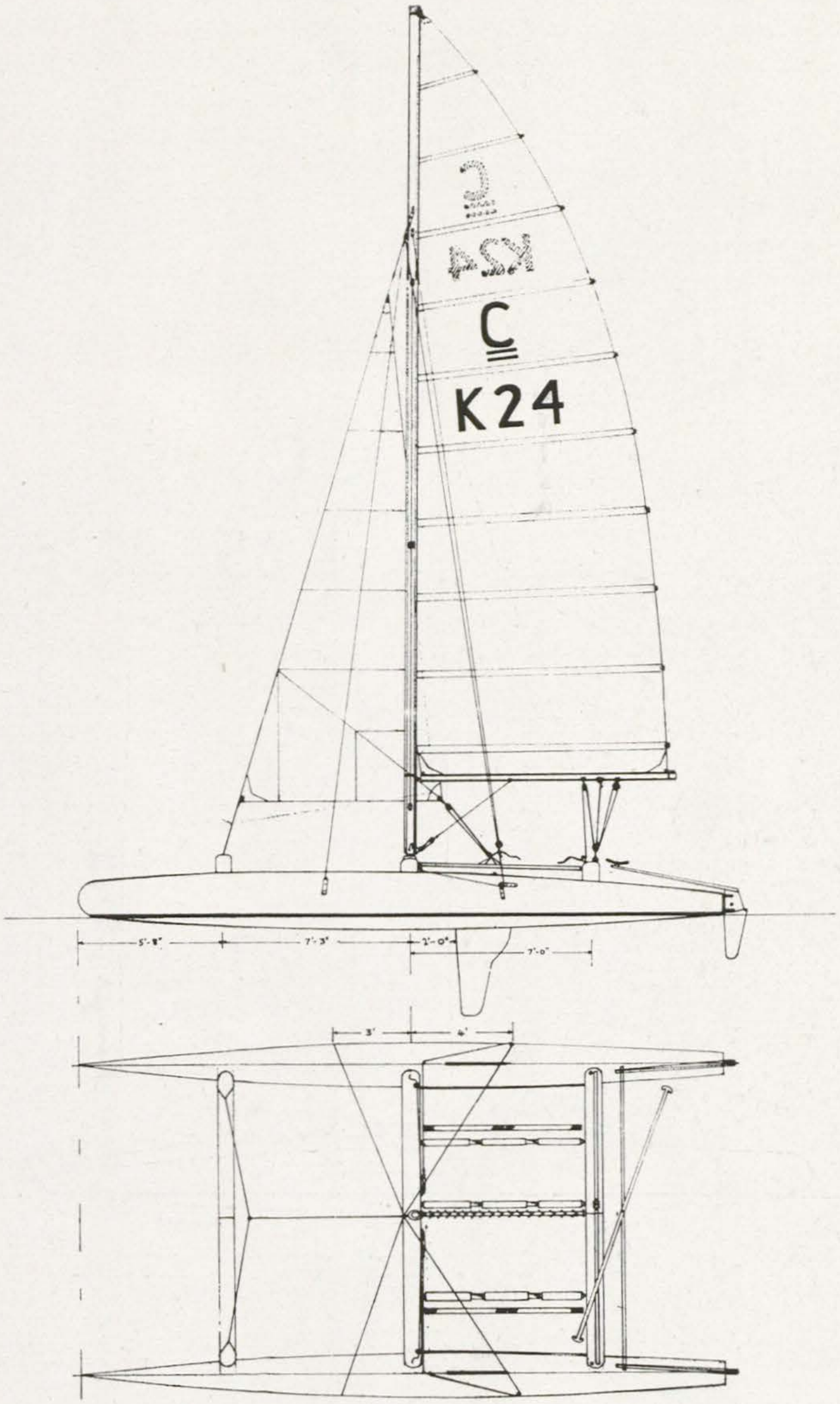
MISS SENIOR SERVICE. Photo: Joyce and Ron Doughty

Roland Prout writes :

" Our C Class Cat shows great potential and I believe we have an exceptionally smooth and fast hull, which only needs a good and well tuned rig on her to make her the fastest.

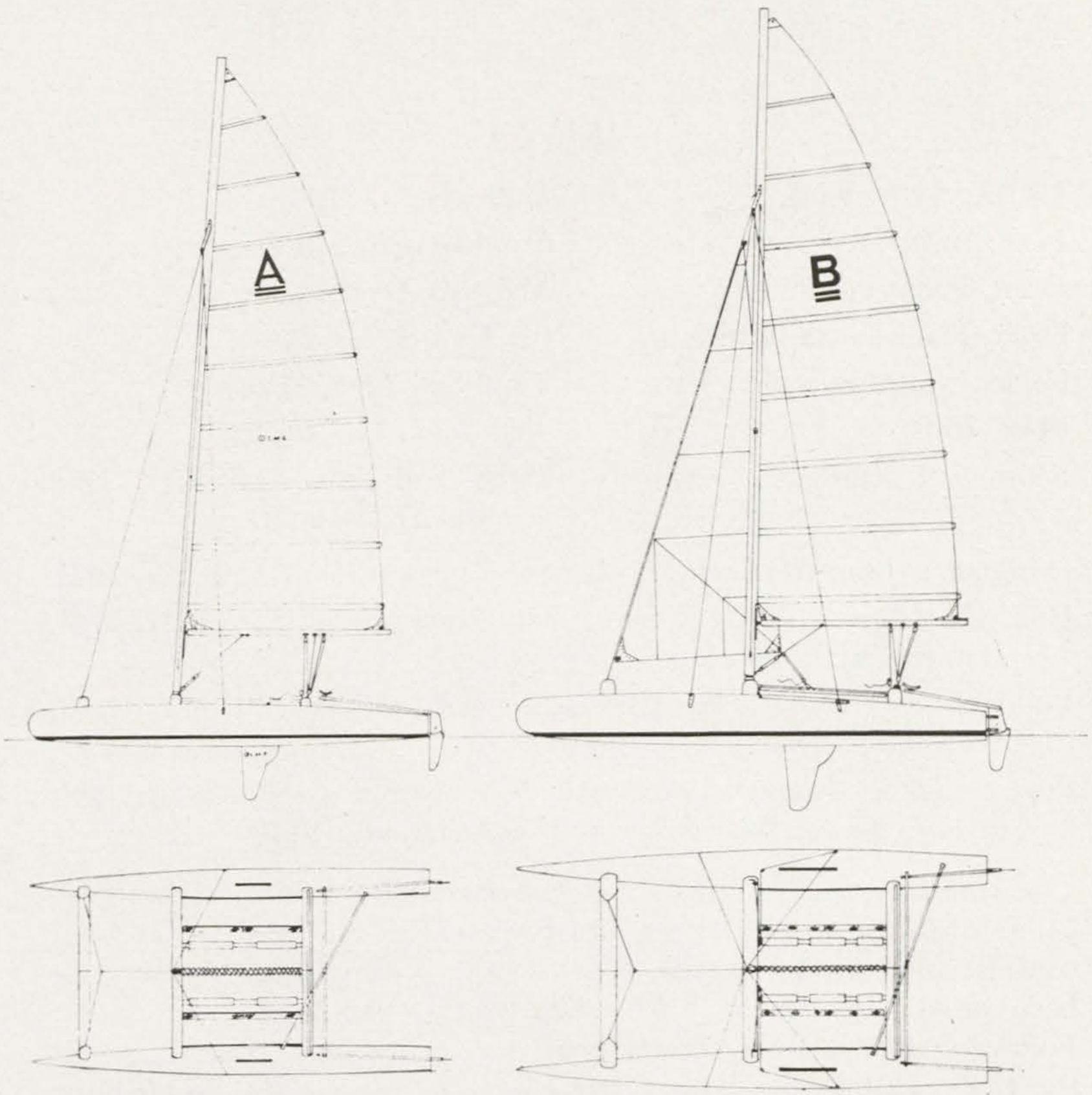


Prout B Class. Photo: Joyce and Ron Doughty



MISS SENIOR SERVICE—Sail and deck plans

UNA rig—alternative sail plan



Sail plans of A and B Class Prout cats

" We suffered time loss as a result of experimenting with a new narrow section metal mast which broke three times in vital race meetings before we finally strengthened it enough to start the serious business of testing. However, I believe we should have had a taller narrower rig, and it would be interesting to try out the boat with a Una rig. The boat is to be rerigged for next year's sailing."

MANTA

L.O.A., 19 ft. 8 ins.
Bean, 10 ft.
Draft, Plates up, 9 ins.
Draft, Plates down, 3 ft. 3 ins.
Folded width on trailer, 5 ft.
Mast, 26 ft.
Boom, 9 ft. 3 ins.

Hull weight, 210 lbs.
Total weight, 310 lbs.
Mainsail Area, 162 sq. ft.
Jib Area, 57 sq. ft.
Total Sail Area, 219 sq. ft.
Spar Area, 13.5 sq. ft.
Rated Sail Area (I.Y.R.U. Div. B), 232.5 sq. ft.

Designer : John Mazzotti, 35 Alinora Crescent, Worthing, England.

Hon. Class Sec. : A. G. J. Smith, Old House, High Street, Hamble, Hampshire, England.

Builders : Personal Transport Ltd., 129 Olivers Battery Road, Winchester, Hampshire, England.

Price : £385, complete with sails ; kits from £150. Plans with royalty, £8 8s. 0d. Price in U.S.A., around $1400.

Manta is a new " B " class Catamaran designed and built by John Mazzotti; the prototype has been sailed by the designer with considerable success in the 1964 season in England. *Manta* has been proved the fastest " B " class boat in the United Kingdom. Following this success several boats are being built from plans in the U.K., U.S.A. and West Germany. The boat is also being built professionally.

John Mazzotti is a twenty-seven year old Mechanical Designer who has built and sailed several types of Catamarans from Catamanners and Jumpaheads to Thai Mk. 4's. The *Manta* is a new design, to the limit of the " B " class rule ; the prototype has used the Thai rig.

The main feature of the *Manta* is its light weight. The hull weight complete with decking is 210 lbs. and the complete boat with

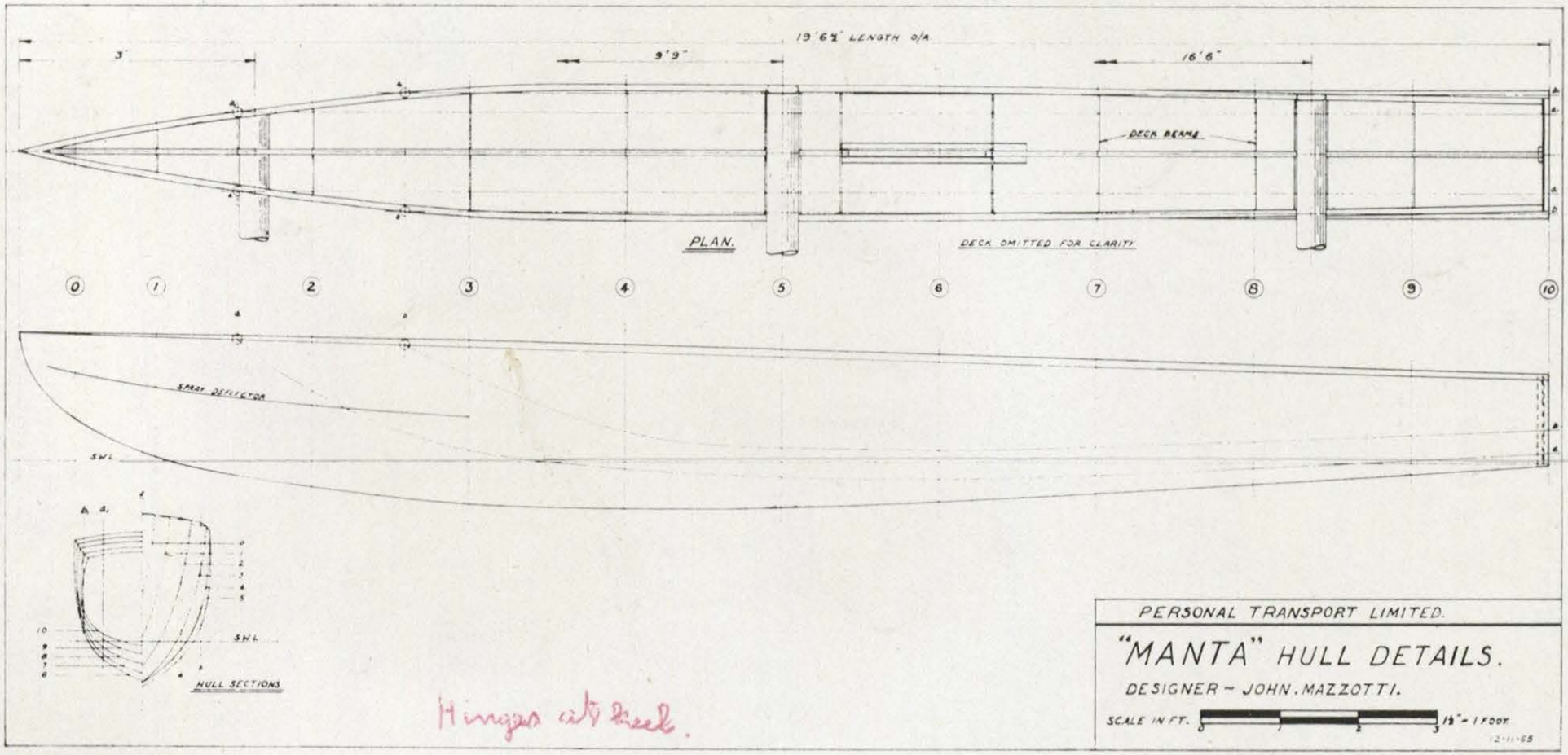
sails set can be lifted into the water by her two crew, which is quite an achievement for a 20 ft. x 10 ft. boat.

The construction is quick and simple being designed by an amateur for amateur construction.

Hulls : These are constructed from flat sheets of 4 mm. marine plywood, with three sheets of 8 ft. x 4 ft. ply being required for each hull sides. The developed shape of each half hull is drawn out on a flat sheet of ply, sawn out and scarphed together. The two halves are then stitched together along the keel line and reinforced by glass-fibre strip, the stitching being cut off when the resin has set.

Mazzotti's MANTA

A stringer is then glued in at approximately half gunwhale height, and the hull pulled out to shape by drawstrings against spacers inserted between the stringers. When completed the hull is a closed tube



Hinges at keel.

PERSONAL TRANSPORT LIMITED.

"MANTA" HULL DETAILS.

DESIGNER – JOHN. MAZZOTTI.

SCALE IN FT. 0 1 2 3 — 1½" = 1 FOOT.

12-11-65

with curvature at all parts giving a stressed skin construction of good strength/weight ratio. The prototype has stood up well to a hard and successful season's racing.

The hull lines are a fine "V" section forward changing to a fuller section aft, and there is hardly any rocker. Owing to the light-weight, wetted area is small and the fine forward sections give a good windward performance and a good ride in a seaway. Many remarks have been made about the attractive shape.

There are no frames in the hull, bouyancy being provided by light bulkheads or expanded polystyrene.

Cross-beams : These are dural spar sections, rigidly fixed to each hull by epoxy resin and fibre-glass, this being done before the 6-mm. thick hull top decking is finished. The fore and aft beams are hinged at the centre for trailing the boat and the hinge pins can be removed to split the boat for storage or shipping. The down thrust on the main beam is taken by a strop and a dolphin striker and there is a locking plate on the rear beam to take the upthrust of the main-sheet.

Unfolding the boat and locking it requires only one bolt and a forestay lanyard and as the boat folds with the hulls down and the hinges up, sailing loads lock the boat

Centre-box : This is fitted with fibre-glass reinforcement, dagger plates being used to reduce torsional loads on the hull.

Rudders : Drop rudders are fitted with aluminium cheeks, tiller bars, connector bar and extensions.

Deck : A trampoline deck of P.V.C./terylene, which is non-tear and cheaper than terylene, is reinforced by foot tubes with toe straps for the helmsman and crew.

Mast and Boom : Anodised aluminium alloy with revolving step for the mast. The prototype had a boom height above deck of 18 ins. which is efficient but this has been increased by 6 ins. for crew comfort.

Sails : Fully battened mainsail 24 ft. luff and 8 ft. 9 ins. foot, total area 162 sq. ft. High aspect ratio. Non-overlapping jib 17 ft. luff, 8 ft. foot.

Halyards : Pre-stretched terylene with external jib halyard which is simple and saves the weak point on the mast hound. No winch on the halyards as these are both expensive and unnecessary, particularly with anodised masts. The halyards are tucked away into pockets in the decks when sailing.

Sheets and Blocks : Full width mainsheet track with double purchase on slide. Novex jambing blocks for jib fairleads and mainsheet. For heavy weather a double purchase whip may be used on the jib.

Hatches : These could be fitted in the hulls but would increase the weight and weaken the structure and they invariably leak. For cruising and day sailing a " dry holdall " can be clipped to the deck without getting in the way as the deck is quite large (10 ft. x 6 ft.) and no kicking strap is fitted.

Trapeze : This is normally used for racing with foot loops on the gunwhale for security.

Rigging and Fittings : Stainless steel or nylon.

Sailing performance is impressive. With only one boat last season the Portsmouth Harbour Yardstick has not been evaluated yet on the available evidence it is in the region 62 to 65 which is faster than any other boat of its size. *Manta* also performs well against " A ", " B " and " C " class catamarans under the R.Y.A. formula.

Windward performance is particularly good, the boat being very close-winded and the speed made good to windward, is better than many " C " class boats. In optimum conditions the boat will reach over 24 knots. In the Royal Sovereign race *Manta* covered eight miles in twenty minutes. The beam of 10 ft. gives good stability and the boat performs well in the stronger winds. In a calm sea she tacks very quickly despite the length and beam.

Many commentators have remarked that the *Manta* could carry more sail area, even 300 sq. ft. as smaller boats carry the same sail area as *Manta.* At the moment the *Manta* has a sail area to unladen weight ratio of 0.75 which gives remarkable acceleration in the puffs. With 300 sq. ft. the ratio approaches 1.

The greater sail area, of course, will increase the crew's physical effort and reduce the boat's manners for cruising. However the sail area is probably the answer for an International Catamaran as the " C " class is a very expensive boat and awkward to handle when beaching. A cheaper and more manageable boat would find acceptance in more countries quicker.

A *Manta* with 300 sq. ft. will be tried out in 1965.

A Class Association has been formed of owners and strict class rules within the I.Y.R.U. " B " class have been drawn up. The class in the immediate future hopes to get class racing for *Manta's* at The Catamaran Yacht Club at Sheppey and Petters' Sailing Club, Hamble.

The *Manta* combines size and performance with cheapness,

simple construction, easy towing (can be towed behind a mini-car) and storage. The light weight enables it to be easily handled by the crew both on the shore and in the water, and the time taken to erect and launch the boat from the trailer is half-an-hour.

The following are some of the racing successes of *Manta* in 1964, sailed by John Mazzotti :

Royal Sovereign Race, Eastbourne Sailing Club : Winner of Cats Bowl and fastest time ever.

International Catamaran Week, Sheppey : Best of eight races corrected time " A ", " B " and " C " classes. Winner " B " class elapsed time.

One of a kind series, Torquay : Winner of all eight races for " B " class on elapsed time. *Manta* was faster than several of the " C" class on some days.

Autumn Regatta, Thorpe Bay Yacht Club : Fastest boat corrected time, " B " and " C " classes.

Using the same principles John Mazzotti is Building a " C " class boat, *Manta C* for the 1965 season. Specification : L.O.A., 25 ft.; Beam, 14 ft.; Sail area including spars, 300 sq. ft. The total weight is expected to be around 400 lbs.

THE AQUA CAT 12

L.O.A., 12 ft. 2 in.
Beam, 6 ft. 0 ins.
Draught, 5 ins.
Draught with c.b., 24 ins.
Sail area, 78 or 90 sq. ft.
Weight, 150 lbs.
Mast height, 22 ft.
Construction : Fibreglass in red, white or blue.
Builders : American Fibreglass Corp., P.O. Box 2297, Norwalk, Conn., U.S.A.

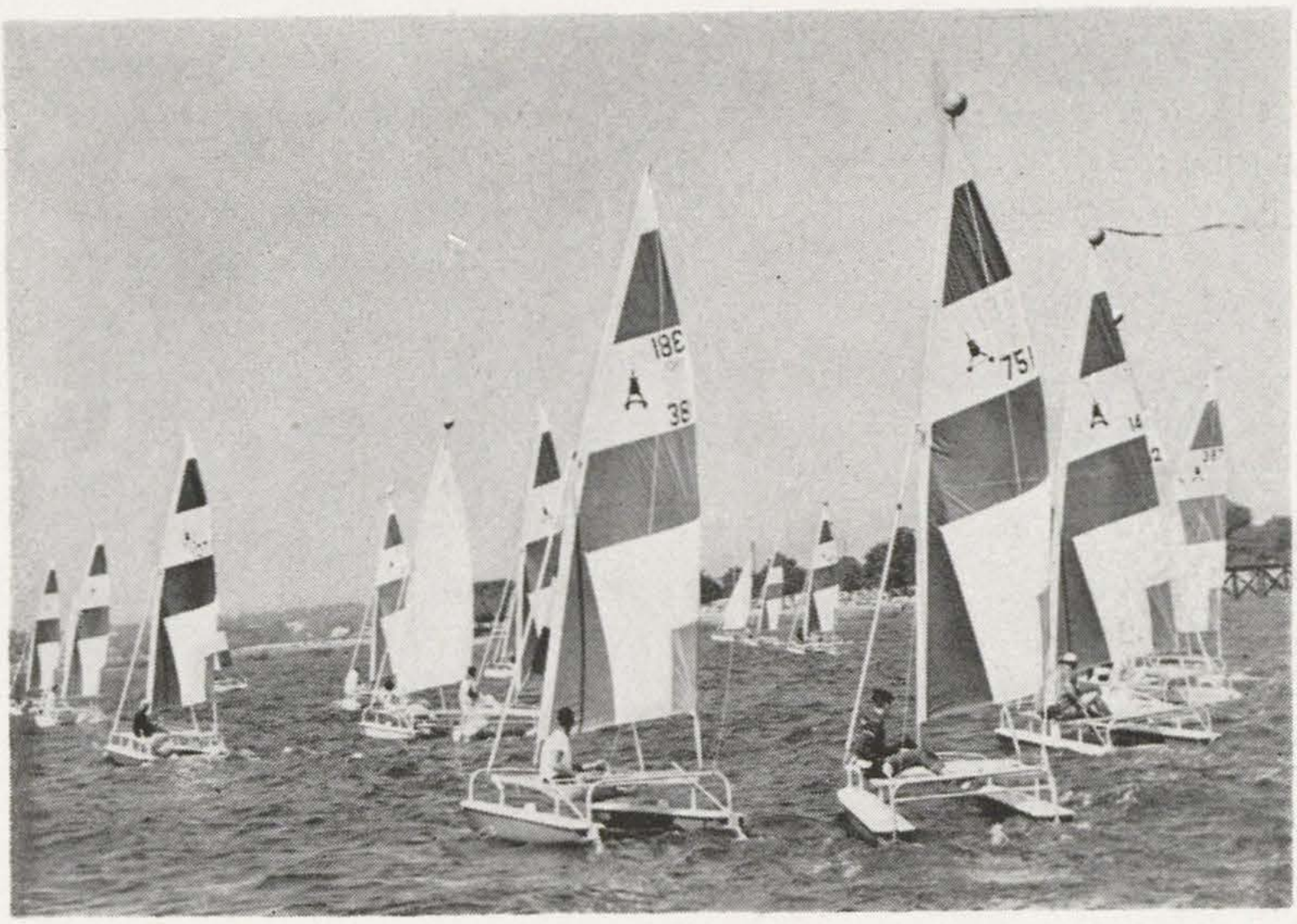
Claimed to be America's most popular sailing catamaran with the largest catamaran racing association in the U.S., the *Aqua Cat* has foam filled fibreglass hulls with a dagger board in each. The rudders are alloy.

The hulls are joined by four inverted U aluminium tubing, the two centre loops having right angles at the turn. The four right angles are then connected by two tubes to give a rectangular framework for the canvas or Dacron trampoline " deck " which has 28 sq. ft. of area.

The sail is a lateen of a kind first used to my knowledge by Francis Herreshoff. It uses a bipod mast with the " feet " of the two masts

AQUA CAT 12

at the fore ends of the bridge deck. The yard is streamlined and is slung by its centre from the apex of the bipod. Its lower end is attached to the centre of the fore beam. This system is, engineering-wise, the strongest possible rig for its weight and doubly suitable for



An AQUA CAT fleet

a catamaran where the loads come in appropriate places. In general, the sailing loads come as compressive strains on the yard, the bipod being usually in tension so it can be relatively light and thus produce little drag.

Members often write asking about bipod rigs and we have always had to reply that, in practice, they have proved slower than the sloop but the *Aqua Cat's* rig must be very similar to the sloop in performance. It is stated that the *Aqua Cat* has been clocked at 18 knots

Price : £695.00, complete with sail.

THE AQUA CAT "18"

L.O.A., 17 ft. 10 ins.
Beam, 7 ft. 11 ins.
Draught (boards up), 6 ins.
Draught (boards down), 24 ins.
Spar length, 28 ft. 8 ins.
Weight rigged, 365 lbs.
Boards and Rudders, Cast Aluminium.
Deck, Dacron.
Sail area, 180 sq. ft.
Hulls, Fibreglass.
Structural members, Aluminium.
Fitting and fastenings Stainless steel or nylon
Cockpit dimensions, 8 ft. x 7 ft. 10 in.

Price : £1795.00, complete with sail.

Builders : American Fibreglass Corp., P.O. Box 2466, Norwalk, Conn., U.S.A.

The *Aqua Cat* " 18 " is the big sister of the previously described *Aqua Cat* " 12 " and is similar in most ways. She is primarily a one-design sailing boat which can sail well with four adults aboard and the dacron deck provides lounging area for six. Eight foot by fourteen inch seats can be provided for each side to provide additional comfort, if required.

A number of rigs were tested during the development of the " 18 ". Although extensive trials were run with a high aspect ratio, full battened conventional rig with shrouds and boom, the " A " frame type rig proved to the the most effective, the most pleasant to sail and of course the easiest to raise and lower.

The *Aqua Cat* " 18 " is a racer as well as day sailer. It is claimed that she has similar speeds to the *Sea Lion II* in light winds but will beat her in stronger conditions. Such comparisons are often weak because of inadequate tuning in the " trial horse " but the improvement in aerodynamic characteristics due to the lessened relative drag in strong winds of the bare struts is to be expected. High pointing to windward is claimed and this could be improved by lowering the sail to the bottom of the yard.

The *Aqua Cat* " 18 " is delivered fully equipped and ready to go. This includes a sail furling device, a yard lowering device and a mainsheet snubbing winch. Extra items are a sleeping tent, foam rubber cushions, motor mount, Aquapouch with two storage compartments, whisker pole, spinnaker and custom trailer.

The *Aqua Cat* " 18 " can be completely disassembled and sent anywhere at cheap freight rates.

THE ALCORT *CATFISH*

L.O.A., 13 ft. 2 in.
Beam, 6 ft. 0 in.
Sail area, 105 sq. ft.
Mast height, 22 ft. 0 in.
Weight, 160 lbs.
Crew capacity, 600 lbs.
Shrouds and stays, 3/32 Stainless steel.

Designer : George Patterson.

Builders : Alcort, Inc., Box 1345, Waterbury, Conn., U.S.A. Price £896.00.

American members will know of Alcort's *Sail Fish* and *Sunfish* which are both sailing surfboards and very popular in America. Alcort have now brought out this little fibreglass catamaran which looks very pleasing.

CATFISH

Hulls : These are fibreglass with foam floatation. What are called " Under hull righting straps " are provided presumably to right the boat after a capsize, and polyurethane foam floatation is built onto the leading edge of the mast at the top to prevent complete capsize. The mast itself twists, though it is round in section and this will help efficiency somewhat.

Boards and rudders : The boards are made of fibreglass and the rudders of aluminium alloy.

The Sail : This is a single mainsail without jib. The mast is set on an upwards arched cross beam with three stays, the forestay being attached to a span between the bows.

Summary. The *Catfish* is a pretty little catamaran whose deck can be red, white or blue. It may well become popular.

TIME OUT II

Length, 14 ft. 2 in.
Beam, 6 ft. 10 in.
Draft
  Hulls, 7 in.
Dagger Boards, 34 in.
Sail Area, 123 sq. ft.

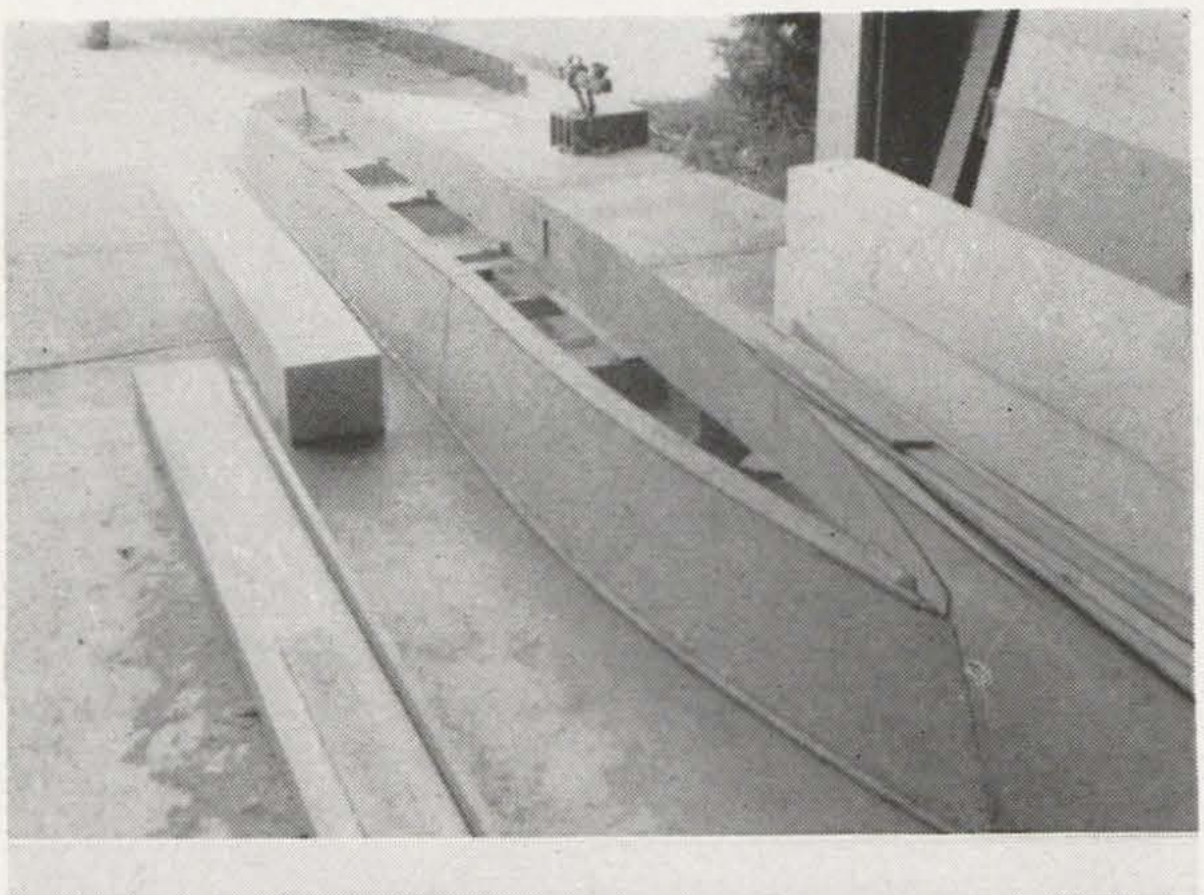
Hulls (each), 85 lbs.
Bridge Assem., 120
Rudders, Boards,
Spars, Sail, 60

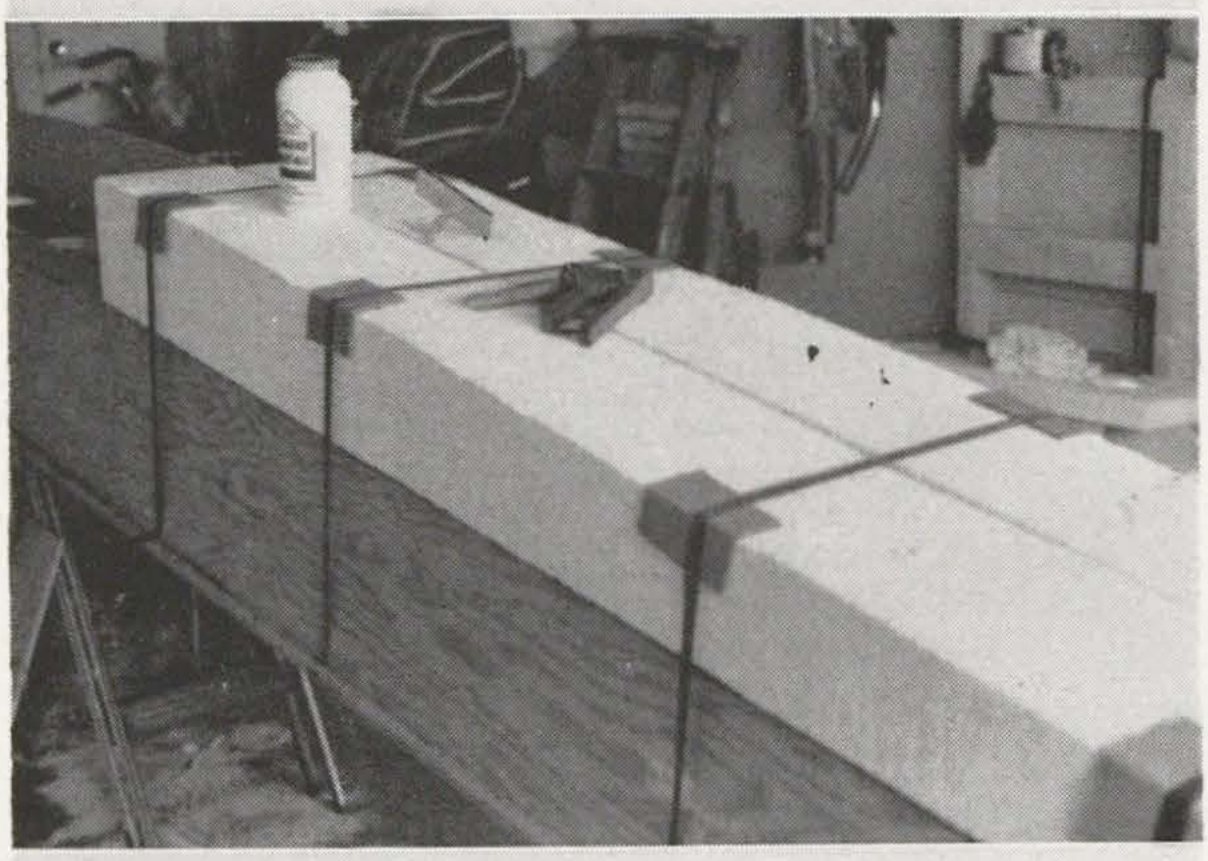
Total Weight, 350 lbs.

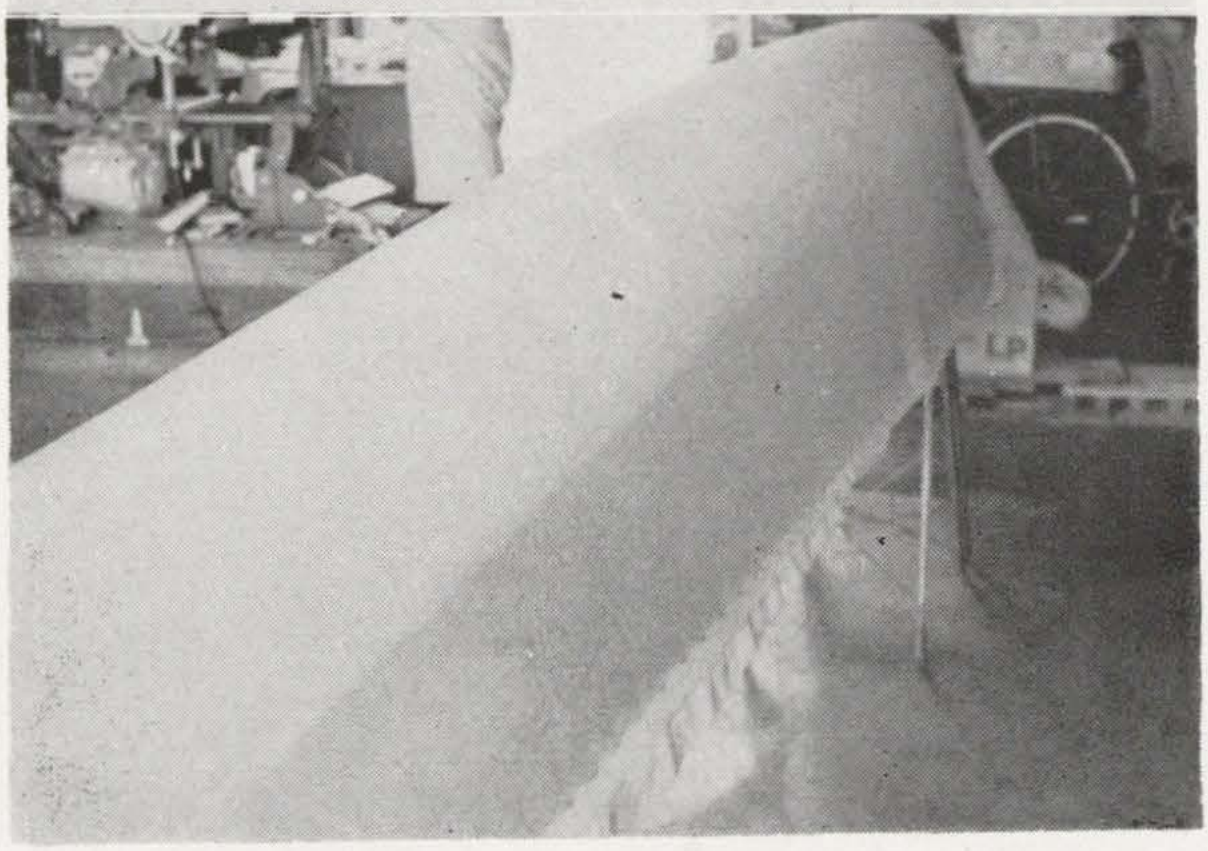
Designer, Builder and Owner : K. A. Heath, 5665 South Zunis, Tulsa, Oklahoma.

Primary consideration in developing this boat was given to ease of transportation, launching, loading on the family auto, and storage between trips to the water. Construction is of plywood, essentially, with rounded hull bottoms of rigid Styrofoam plastic sheathed with epoxy plastic on Dynel fabric. A lateen sail is supported by an unstayed mast. A small outboard engine is normally mounted ready to go. Hulls are secured to the bridge or deck assembly by two bolts each, and the boat is separated into its three main sections when unloading or loading (inverted) on the automobile. A rack or adapter tailored to fit the car-top and boat plus four tie-down cables provide a secure mounting. At home, a simple winch installation hoists the entire assembly to the ceiling of the garage for storage.

Under sail, *Time Out II* comes about readily and is not unreasonably wet. Performance is limited by a poorly cut sail of limited area, and some apparent errors in hull lines. Hull underbody is a bit too full forward and the profile of the after bottom is too straight (it *is* straight).

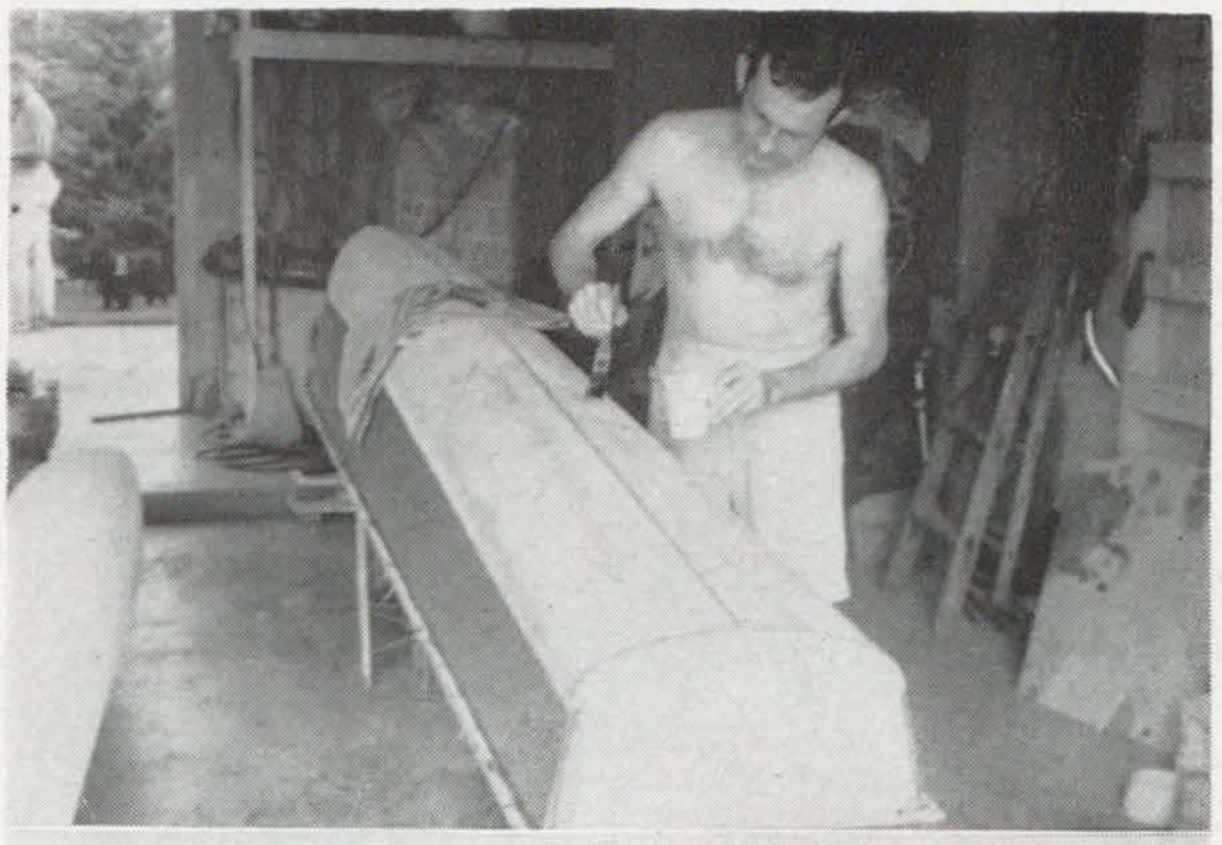






Constructional stays

Finishing and down to the water



Structural strength is more than adequate with the exception of the hull bottoms. An added layer of sheathing is in order.

A lighter bridge structure is now being built (weight 65 lbs.) and beam will then increase to 8 feet. A bipod mast is to be fitted and the full-length boom replaced by a short club. If results show promise, a larger sail will be next. If the greater distance between hulls does not provide adequate relief from inter-hull interference, a major revision of the underbody lines may be undertaken.

An enjoyable boat with acceptable but modest performance was expected. We were not disappointed.

VENTAS VANESSA—AN INFLATABLE CATAMARAN

BY

FRED BENYON-TINKER,

" High Fleet," Nether Lane, Nutley, Uckfield, Sussex.

I suppose that it was inevitable that the interest I have had in multi-hulls over quite a number of years should have turned my thoughts in this direction when I entered the field of inflatable craft. One of the problems associated with catamarans has always been their considerable size, especially with regard to beam, from a transportation angle. The matter of winter storage can also present acute difficulties. It seemed to me that, provided the design was adequately done, the advantages of an inflatable catamaran would be considerable because it would solve most of the basic problems, at all events, in these particular directions.

The first thing I had to decide was the basis on which the design had to be worked out ; that is, what were the design parameters to be. When considering catamarans as a type, I imagine the normal reaction is to lay the major emphasis on speed, for it is especially in this direction that they score most prominently. This, however, is not their only significant virtue, for they do possess other marked advantages, chiefly in terms of the size of the accommodation and stability. For some years now it has been one of the bees in my bonnet that amongst the ever increasing number of small boats being produced far too much emphasis has been placed on speed and far too little on stability and seaworthiness. It was, therefore, from this aspect that I started design work, and the list of desirable characteristics went something like this :—

1) Without regard to the method of construction to be employed (in this case inflatable) it had to be a good boat.

VENTAS VANESSA—Benyon-Tinker

2) It had to be portable and storable to a very high degree and light in weight.

3) It must dispense with the problems and cost of trailing.

4) It must be stable to the extent that the average individual would feel that it was just about as safe to take his family out in as is possible for a sailing boat.
5) It must be easy to erect and dismantle, to launch and recover.
6) It must not pose any handling problems nor require highly developed skill.
7) Nobody really likes a slow boat, so it required to have a reasonable performance.
8) Some measure of " do it yourself " potential was desirable.

As in all boat design, many of these factors do conflict with one another, sometimes making demands in diametrically opposite directions, so, as usual, some measure of compromise had to be found.

I eventually decided that anything much less than 14 ft. 0 in. overall by about 7 ft. 0 in. beam would not meet the requirements of reasonable performance and a roomy bridge deck, and something much larger than this would raise problems in relation to weight, cost and transportation, so I settled on this size. The next factor was the sail area to be used and for this I had to assess the speed requirement, the desired stability characteristics, and the cost against all-up weight, to achieve a satisfactory balance. I finally decided that 100 sq. ft. would probably produce the best compromise.

One of the problems associated with the design of any inflatable is that they will go in circular sections when blown up and this can sometimes be a considerable embarrassment. Fortunately, however, this is not the case with catamaran hulls—in this connection see the analysis of design by John Morwood in publication No. 50. The sections of the hulls are wholly circular throughout, with the largest diameters and therefore the greatest depth just aft of midships, with a straight slight taper to a circular transom, vertically set. The forward sections simply reduce in diameter in such a way as to give the shape I wanted, and terminate in semi-spherical mouldings. Whilst it can be argued that it would have been better to continue the section as a constant diameter to the transom, this can present problems in coming about, so the present shape was adopted. The centreboards are housed in the hollow box members which form the sides of the bridge deck structure. This is of timber construction and is so arranged as to form a convenient car roof-rack once the tubes are detached. These, in deflated form, can then be stowed along with rudders etc. in either the deck or the car boot and the deck itself forms a suitable support for the mast.

I do not know of any inflatable which can be offered in kit form, nor yet is this desirable, for the problems involved in the production

of this type of craft are too complex at the moment for the average amateur interested in boat building. However, I have been able to go a little way along this road by using a composite structure in which the inflatable portions, complete with attachment brackets etc. will be supplied in finished form, but as the bridge deck structure is mainly in ply and conforms closely to normal boat building, it can be made by the amateur. The boat will be marketed in this way in its simplest and cheapest form.

The development of this catamaran has followed much the same pattern as is usual in this type of work, with the occasional failures followed by modifications and improvements suggested by practical experience. It has now reached the stage where, apart from minor changes, it is ready to go into production. Quite a number of members sailed the prototype at the Weir Wood meeting and all seemed very pleased with it.

In general, it is fair to say that the performance is well in excess of that I actually required and subject to some further tuning and detail changes will be well up to the standard normally associated with a conventional catamaran of this size. The light weather performance, due in part to the hull shape and in part to the low all-up weight of around 160 lbs., rigged, has given it an excellent behaviour in light winds, whilst the stability of a 7 ft. 0 in. beam with only 100 sq. ft. of sail area enables it to stand up to its canvas. It tacks extremely well provided it is correctly sailed and the helm is finger light under all conditions. It is interesting that I originally had in mind a Una rig for simplicity, but found that a two sail rig is essential because the boat is so light that it tends to stop head to wind when tacking unless there is a jib. A point on which many people have commented is the comparative absence of noise when sailing fast and the comfort of sitting on the inflatable hulls instead of on a piece of timber.

The development of this boat from the drawing board to its present state has been extremely interesting and I was gratified to find that, apart from having to re-design the attachment brackets after the first sail, the modifications have only been ones of detail and the original concept has needed no real change.

I am reasonably sure that I shall be assailed from all directions with indignant questions as to why the sail area has been kept so low. The fact is that I have been more concerned with safety than with all out performance, within the framework of the market for which the boat was designed. It is apparent that the speed is suprisingly high with this small rig and, provided it is not at a disadvantage with its

peers in size in this respect, then the merits of small area in terms of cost, weight, simplicity, mast height and size, and stability are considerable.

I am confident that for those who require the highest possible speed, the boat could easily carry 140 sq. ft. in competent hands, and, judging by present performance, it should be decidedly hairy ! This is a matter with which I shall do some experimenting in the near future.

THE CATACRUISER

L.O.A., 34 ft. 0 ins. Weight, 6,800 lbs.
Beam, 12 ft. 10 ins.
Sail area, 510 sq. ft. Price : £3,300
Builder : Border Marine, Greenwich Road, Berwick on Tweed.

The basic idea with this catamaran is different from all other cruising catamarans in that the hulls are not used for accommodation. Indeed, they are of a deepish rounded V section and completely filled with polyurethane foam. Dagger boards at the outsides of the hull provide lateral resistance while the weight of the hulls and the shape of the cabin top are such that self-righting from an upside down capsize is probably possible, though this is not stated in the literature.

The Accommodation. This is all placed in the bridge deck, thus avoiding the " upstairs and downstairs " procedure of other catamarans, but, at the same time needing the greatly arched cabin top for headroom, which is mostly 6ft. but rises to 6ft. 4ins. in the centreline. Four to six berths are provided with the usual offices, as well as a large cockpit of normal size.

Summary. The *Catacruiser* is a pleasant and fast cruiser with comfortable accommodation in the bridge deck. This accommodation plan will suit many people.

CATA CRUISER DESIGN

If you set out to design a drinking vessel such as a fine brandy glass, you can be fairly sure that not too many people will buy it to use instead of an enamel tea mug.

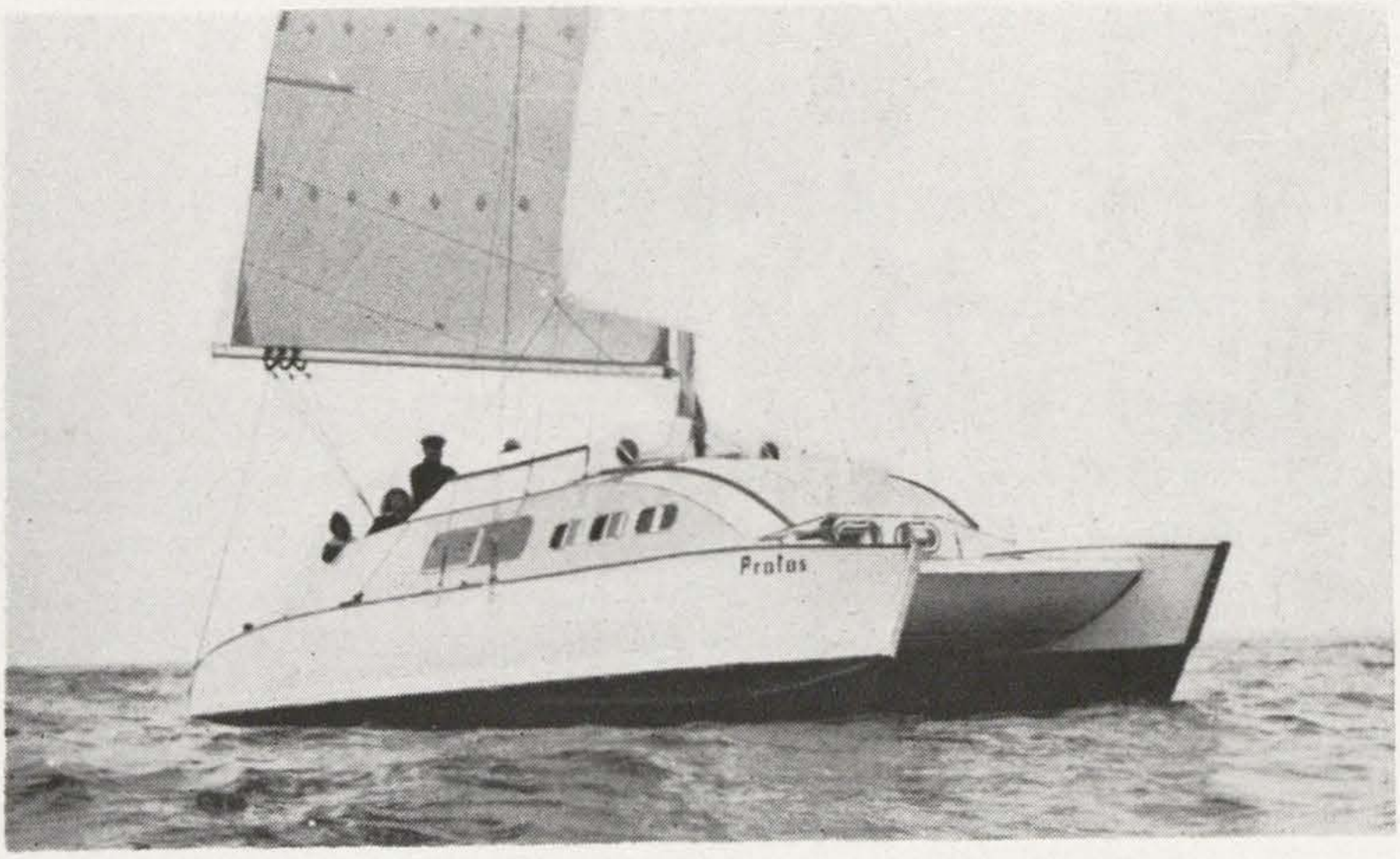
Not so with a sailing vessel—you can design a feather-light craft to skim at high speed on an almost waveless lagoon and be sure that some buyer will want to weather a typhoon at the Cape of Good Hope, with four times the load you intended !

PROTUS

When the design for 10 metre CataCruisers were in embryo, one of the listed requirements was that the design should be capable of reasonable expansion to other pruposes.

Other listed requirements were :—

1. Easy manufacture in limited space.
2. Easy transportation.
3. Easy building by amateur craftsmen.
4. Easy winter storage.
5. Easy repair and maintenance.
6. Really comfortable living accommodation.



Protus

However, no requirement was to take priority over safe, fast, comfortable performance which, above almost everything, demanded a very high strength/weight ratio.

The only design that seemed to meet all requirements to a reasonable degree was something entirely novel and thus opened to attack by all the conservative sceptics, who can only think of what Grandad did.

It was with some mental reservation, therefore, that the CataCraft design team went ahead and produced a yacht made from " bolted together " units, none of which exceeds 8 ft. x 13 ft., except for the hulls themselves, which are full length.

The forward unit includes a massive, tube shaped, hollow beam, some 30 inches in diameter, to withstand the torsional stresses of the bows in a lumpy sea and the battering of solid green water hurled at high speed at the wing and hull joints.

The " berths " unit contains two separate, double berth compartments, each with private basin, also a W.C. on the port side and a shower room on the starboard side.

The central unit houses the galley and dinette to seat six, a 48 in. x 32 in. chart table and room for an opintional extra berth, as well as the one or two berths that convert from the dinette settee. This central saloon unit, 13 ft. wide by nearly 8 ft. long, has an arched roof of enormous strength and gives headroom of over 6 ft. in the middle, a feature found on few Catamarans of under 40 ft.

The spacious 13 ft. x 6 ft. 6 ins. cockpit unit enables up to six people to sit in comfort and enjoy the sun, well protected from the flying spray.

The hulls are made of expanded " Clocel", manufactured by the Baxenden Chemical Company, sheathed with " Thames " serayah marine ply, which, in turn, is sheathed with " Cascover ". This results in a very light, very strong, unsinkable structure.

The hulls are decked and thus totally sealed below the superstructure and there is a space between the hull decks and the floors of the superstructure units, so that not only does any water that might enter between the hulls and superstructure drain away aft, but the entire superstructure is self draining.

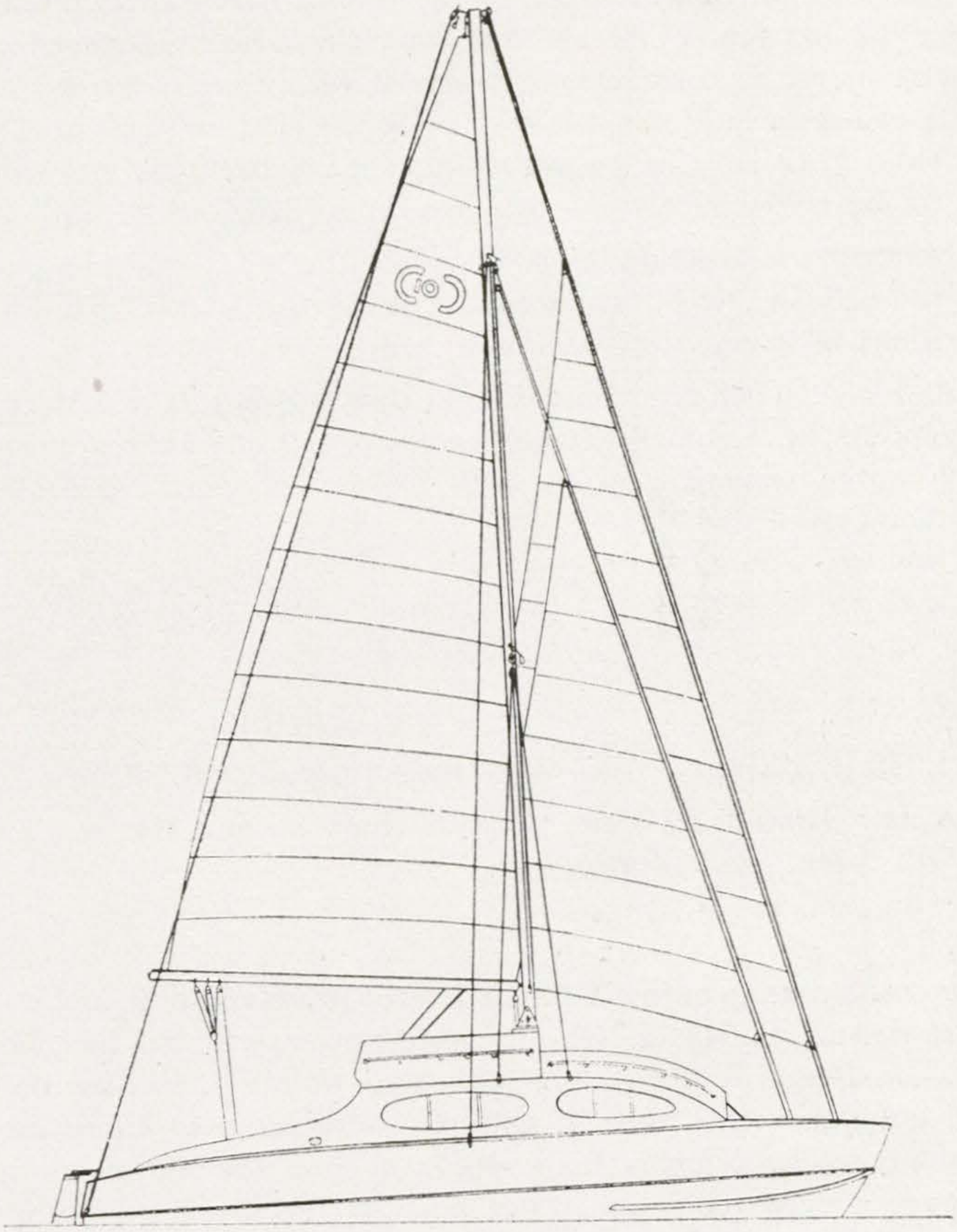
On one occasion, the hatch cover blew off the forward beam hatch and gallons of water started to enter as the craft tore along in a rough sea—it simply ran out at the back.

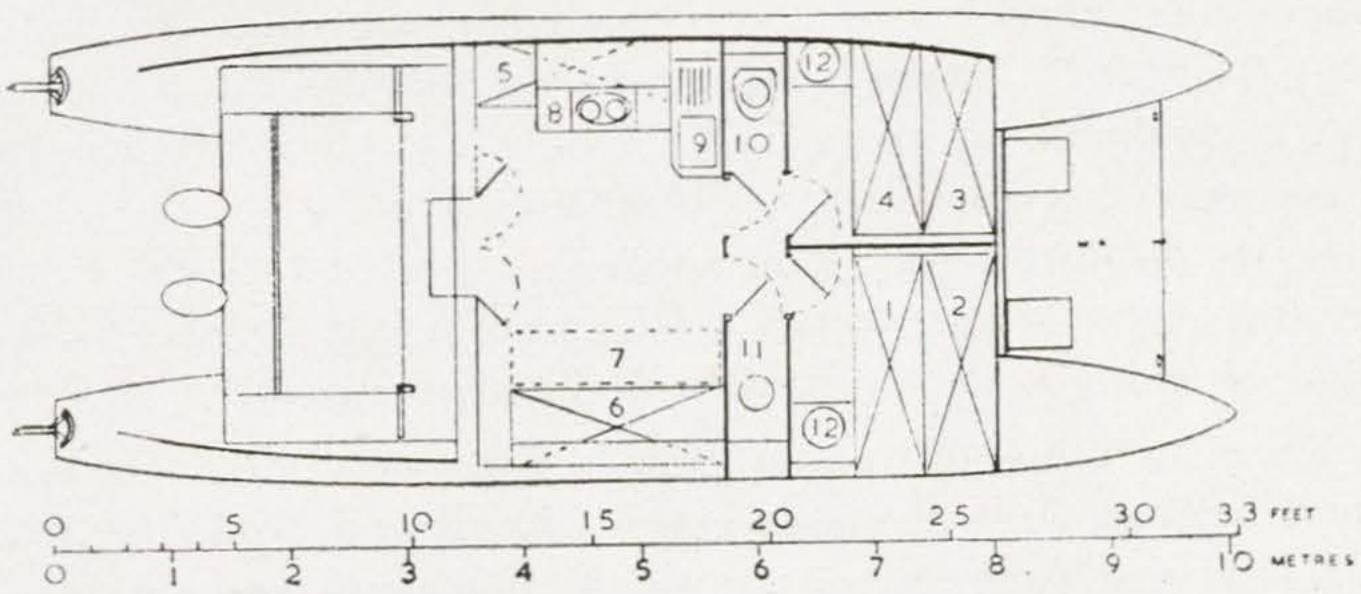
Most of the problems we anticipated, such as leaking rain and spray between the units, have still to appear after three years and you cannot solve a problem that does not appear.

Since the first design, however, the " expandability " has been put to the test.

R. Wayte, a keen A.Y.R.S. fan, has converted his 8 metre into a 10 metre, simply by taking off his 8 metre hulls, lengthening the fore and aft Units and bolting on a pair of 10 metre hulls (his 8 metre hulls are for sale, cheap, if anybody wants them).

Another increase required has been the extra load of some additional 4,000 lb. of fresh water and fuel for two independent amateur builder crews, each of whom are planning to encircle the earth and thus need enough supplies for 3/4,000 mile legs between the east coast of America and the Pacific Archipelagos.





10 *meter CATACRUISER*

One unexpected advantage of the design has been pointed out by hire fleet operators, namely that if a yacht is badly damaged in an accident, it can be back in service almost within hours by the interchange of a new hull or superstructure unit, held in stock to service the fleet. Price, too, is an attraction when a complete new hull—ready to be bolted in place—costs less than £200.

Amateur construction is made easy by the self jigging design and the extremely detailed drawings and cutting list, which includes the dimensions of every piece of wood used.

Professional constructors point out that they can be manufactured on upper storeys or small garage size workshops and are therefore not committed to waterside yards, with all the inherant expenses and disadvantages.

INCREDIBLE

L.O.A., 23 ft. 7 in. Beam, 12 ft. 4 in.

L.W.L. 20 ft. 10 in. Draught (Hull) 1 ft. 11 in.

Designers : Harold T. White, Jr., and MacLear and Harris, 11 East 44th Street, New York, N.W.

Description by H. T. White, Jr.

Incredible is the outgrowth of a 15 foot prototype designed by her owner, Harold T. White, Jr., and tested extensively on the choppy waters of Buzzards Bay. The principal objective of the design, which embodies twin hulls of extreme deadrise, is to eliminate the pounding which occurs at high speeds in even the softest riding of the modern deep-vee rough water boats.

Planned as a utility boat with no cruising accommodations, *Incredible* has an 8 by 10 ft. cockpit which provides adequate space for 8 passengers. There is a toilet in one forward cabin, and stowage space is available in the other. Under the deck aft are two 280 horsepower Chrysler Golden Commando's fitted to Chrysler Drive 90° Series 80 outdrives. Top speed is expected to be 40-45 m.p.h.; more important to the owner, a relaxed cruising speed of 30 m.p.h. should be easily and comfortably maintained in 3 to 4 ft. head seas.

Construction is of wood. Half inch plywood planking is covered with dynel cloth set in epoxy resin. Keels and stems are one-piece laminated mahogany, with frames of mahogany and, in the engine compartment, of oak. The builder is Fred Scopinich's Hampton Shipyard in Long Island.

Prototype INCREDIBLE McLear and Harris

Three approaches to the problem of eliminating pounding were considered in the design of the prototype :

1. The use of normal hydrofoils. This was eliminated because of the deep draught or propeller depth required for use in rough water, because of sensitivity to damage from striking submerged objects, and because of technical difficulties in using hydrofoils without expensive control apparatus.

2. Partial hydrofoil support of a hull similar to *Incredible* might be attractive, as a means of reducing high speed drag, but it was felt that development of such a concept would involve too extensive and expensive a test programme.

3. The use of abnormally high deadrise, particularly in the forward sections, was considered the most practical approach.

Since existing single hull deep-vee boats incorporate about as much deadrise as can be used without impairing lateral stability, any effort to reduce pounding by a further increase in deadrise suggests a multi-hull or a similarly stabilized design. This approach is followed in *Incredible*, whose deadrise in each hull varies from 65° at the forward

end of the water line to 38° at the transom—considerably more than the current practice in single-hulled boats.

Incredible thus represents an extreme answer to an extreme requirement, i.e., the desire for complete elimination of high speed pounding. As with any extreme design, certain undesirable characteristics are noticeable.

1. A great deal of power is needed to push the boat through the water at high speed. Elimination of pounding and loss of lift go hand in hand, so that the wetted surface is not reduced by planing action at high speed to the same extent as in more normal designs.

INCREDIBLE—McLear and Harris

2. While the 15 ft. prototype has proved safe under some rather terrifying test conditions, it must be noted that she does bank outward in sharp high speed turns. Also, the lateral motion of the boat in a cross sea is sharper than in a single hull boat, since the catamaran form tends to align itself with the surface of the waves rather than to stay upright. The discomfort arising from this behaviour is, however, but slight as compared to the improvement in comfort realized through the virtual elimination of pounding.

MacLear and Harris Comment

Before either the 15 ft. or the 25 ft. *Incredible* were built and Mr.

H. T. White expressed his desire for a fast rough water boat for Buzzards Bay the first thought was to tank test a model. Mr. White was primarily interested in a soft riding boat and fuel consumption and top speed were far less important than the gentleness of the boat's motion in a head sea at 30 miles per hour.

Tank testing of power yachts is primarily to determine speed and horsepower and seldom considers pounding. It is possible to instrument a model to determine how many " g's " (gees) she pulls, to evaluate how hard she will jar her passengers, but this is relatively expensive and has been primarily done for the military.

After one visit to the Stevens Institute towing tank, it was decided that in Mr. White's case a small manned pilot model might answer more questions concerning comfort, spray control, and steerability than a tank test. At the same time it would also help predict the speed and horsepower of the larger boat. The 15 ft. pilot model was thus built in 1964 and tested in 1965 and has resulted in the building of the 25 ft. *Incredible* which will be launched in the Spring of 1966.

The 15 ft. *Incredible* was thoroughly tested in very rough water and was compared to the softest riding boats on the market today and was found to be substantially more comfortable and to pull considerably fewer " g's " in a head sea.

The explanation for this lack of pounding is probably twofold. First the two high deadrise bows can absorb the downward falling energy of the bow more gradually than a single, perforce flatter bow, and secondly the air trapped between the hulls must also help cushion the " fall ".

All persons who rode on the 15 ft. *Incredible* pilot model were impressed that it was the softest riding boat they had ever been in and it is hoped and expected that the 25 ft. *Incredible* will be the softest riding boat her size and speed in the world.

TSULAMARAN

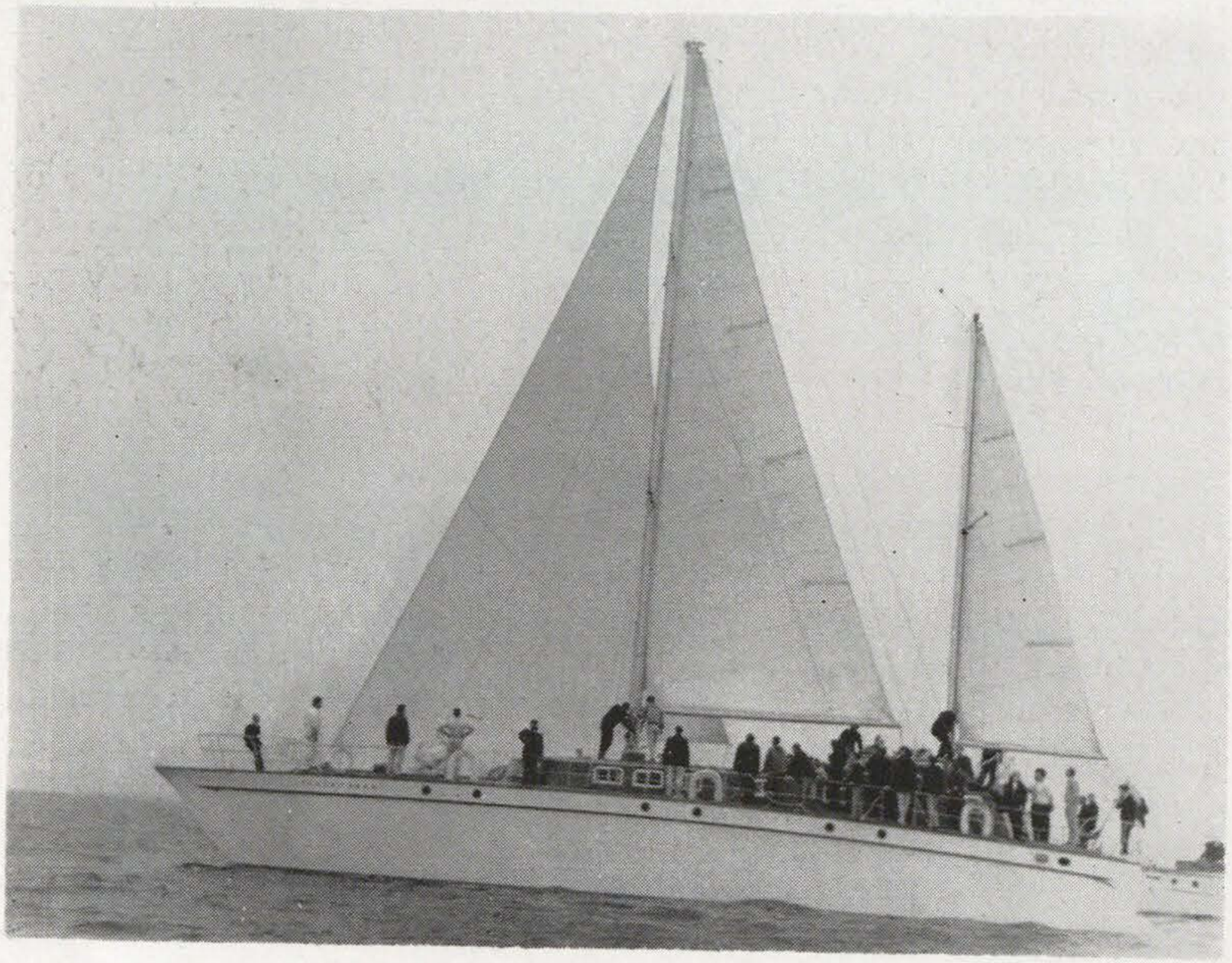
J. B. Moore looks at, and photographs, the 77 ft. Prout-designed and built cruising catamaran

(*Ex-Yachting Monthly, September* 1965)

On 14 July at Small Gains Creek, Canvey Island, the largest catamaran to be built in Europe was launched. 77 ft. L.O.A., 70 ft. L.W.L. with a beam of 24 ft. minimum draught of 2 ft. 10 in. and 6 ft. 6 in. with plates down, she is undoubtedly one of the most interesting craft to be produced in this country in recent years. She has been built to the special order of Mr. Patrick Hall of Longford

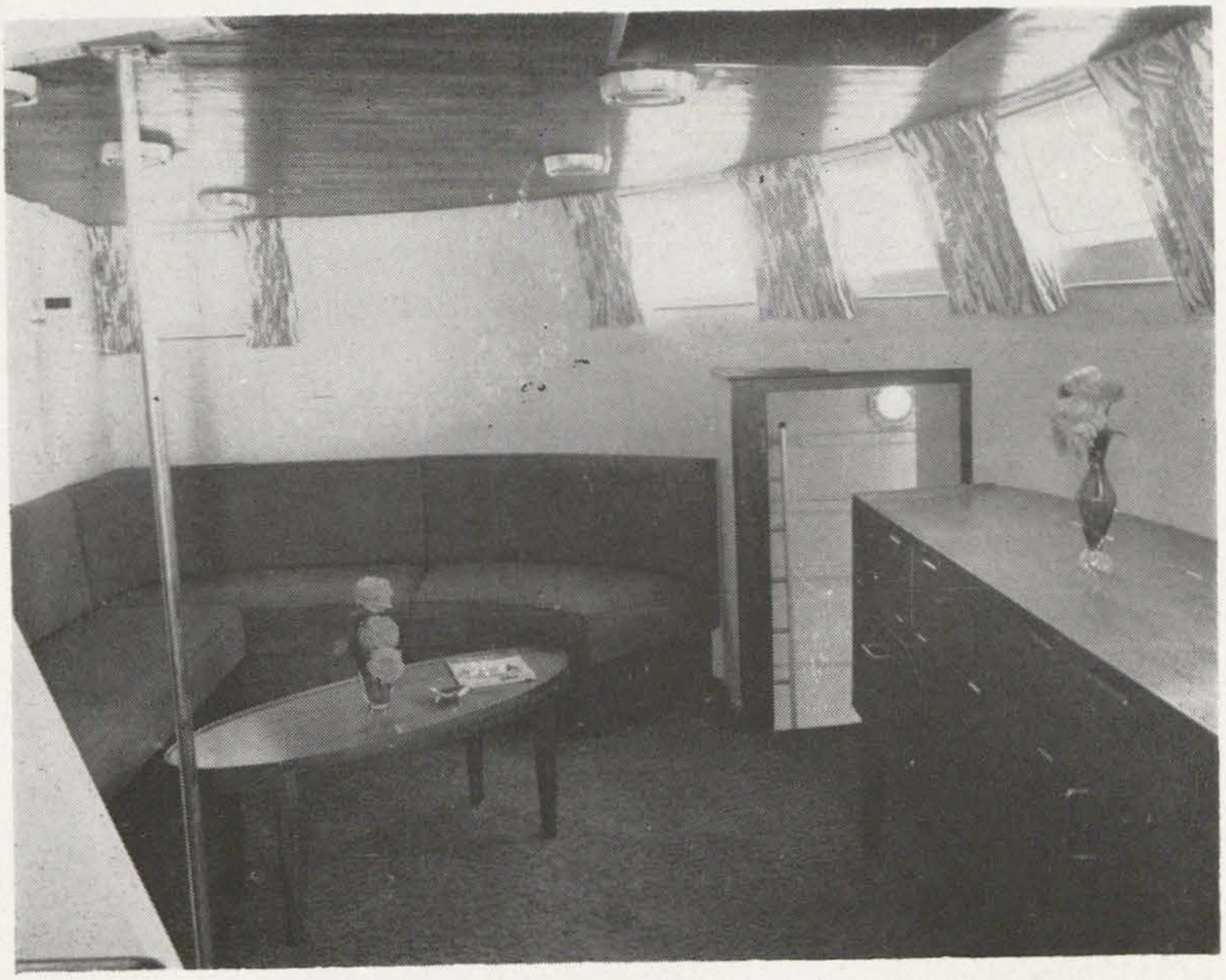
in Shropshire, a well-known industrialist who spends his free time on Anglesey where he has kept a series of catamarans in the last few years.

Tsulamaran is really a very large sister of the Shearwater, having twin transom-hung rudders and twin centre-plates housed in the hulls. The aim of the design, into which a great deal of original thought has obviously gone, is ocean cruising, particularly in tropical waters and the Mediterranean. This accounts for the extensive use of 2 in. thick polystyrene insulation on the walls and ceilings and the installation of air conditioning equipment in the main cabins.



TSULAMARAN—Prout

The hulls are wood with fibreglass sheathing to 2 ft. above the waterline. Five laminations have been used, the inner one being $\frac{1}{4}$ in. vertical teak overlapping, then $\frac{1}{4}$ in. diagonal teak, $\frac{1}{2}$ in. cedar fore and aft, $\frac{1}{4}$ in. vertical teak and finally a skin of $\frac{1}{4}$ in. diagonal mahogany, the latter wood taking the paint better. The paint finish, which is remarkably good, has been applied by a firm of coach painters, J. Payne & Co. of Canvey Island. No less than 30 gallons of white top coat alone were used. All decks are solid laid teak over $\frac{1}{2}$ in. ply.



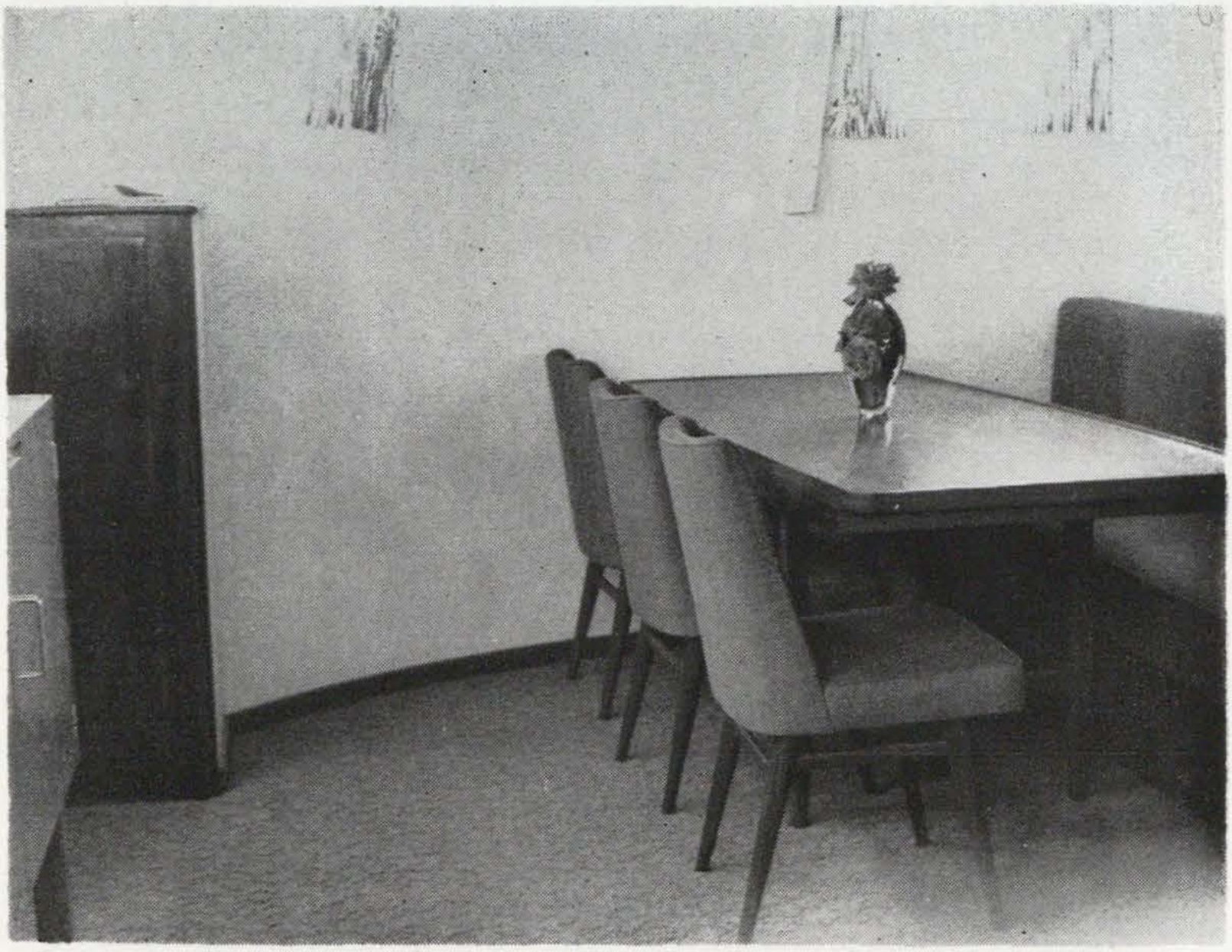
Saloon

Built into the superstructure on the bridge deck is the most spacious and airy accommodation, the main saloon, 20 ft. by 10 ft., extending full-width across the forward end. It is striking in its contemporary elegance, the teak furniture and ceiling contrasting well with the peacock-blue upholstery and fitted carpet and the silver-grey fabric wall covering. There is an L-shaped cosy corner with coffee table to port, a large dining table to starboard and a sideboard and cocktail cabinet athwartships on the forward bulkhead. Access to two single-berth cabins in each forecastle is by companionways from the corners of the saloon. The owner's (port) and guests' (starboard) staterooms, which open off from the corridor leading aft from the main saloon, are very tastefully furnished in sold elm, the owner's with bathroom and w.c. attached. Both have two low berths with drawers under, beside tables, wall reading lamps and full-height wardrobes. There is a second bathroom adjacent to the guest cabin.

Moving farther aft on the port side there is the galley, more like a small kitchen in a flat. It is equipped with teak drainer sink, ample drawers and cupboards, a stainless steel oil fired range and a refrigerator. A second fridge is cunningly fitted above the companionway to the starboard engineroom.

Opposite the galley is the chartroom which also accommodates a good many of the navigation aids. *Tsulamaran*, is particularly well equipped in this respect, having a Woodson radio and telephone, Decca navigation unit, depth sounders, Brookes & Gatehouse speed indicator and distance log and Jib Master wind indicator. To assist in smooth operation under way she also has Tannoy intercom throughout with loud hailers on the deck fore and aft.

The bridge, running full width of the ship aft of the main accommodation, has the wheel and control panel to port, but there is a second steering position on deck on the starboard side. Immediately aft of the bridge is the skipper's cabin to port, well fitted out in mahogany and reminiscent of an officer's cabin on a freighter. To starboard is the crew's washroom with shower and w.c. A wide poop deck opens out beyond this.



Dining area

Power is provided by two Mercedes-Benz diesels each of 94 h.p. with Mercruiser outdrives, giving 12 knots. The engine rooms, with full standing headroom, are aft and adjacent to the crew's quarters, which both have two pipe cots. A diesel generator set is also installed, providing 24 volt lighting and power throughout, even to the windlass.

There is also a 240 volt circuit with power points for shore leads. A water pressurisation system ensures instant hot and cold water in all cabins and bathrooms. The main fuel tank of 1,200 gallons gives a cruising range under power of 2,000 miles. The fresh water tanks in the centre section of the hulls hold 600 gallons.

For ease of handling a ketch rig has been chosen but she can be cutter rigged with a 720 sq. ft. Yankee jib. Masts are by Sparlight, the main being 64 ft. high and the mizzen 40 ft. A total sail area of 2,000 sq. ft. can be carried the largest single sail is a genoa with an area of 1,120 sq. ft. She can expect sailing speeds up to 20 knots. All the rigging is stainless steel with nylon and terylene ropes, the fittings are stainless steel, Tufnol or bronze.

A 14 ft. motor launch is carried aft of the mizzen mast.

Altogether a most luxurious craft, beautifully built and one of which the Prouts can be justly proud. She has already occasioned a great deal of favourable comment among the many local people who have watched her with interest during the two years she has been building. After cruising to Ireland and Scotland she will be stationed at Anglesey until her owner decides to go foreign.

LETTER FROM ROLAND PROUT

Dear John,

Regarding the sailing qualities of *Tsulamaran*, Francis and I sailed with her on the maiden voyage from Canvey Island to Holyhead, but due to pressure of time and lack of wind we motored a great part of the way. We had a fine passage, and it was more like travelling on a comfortable passenger steamer than a cruising yacht.

We left Canvey at 4 a.m. on Sunday, 18th July and were moored alongside the quay at Penzance Harbour on Monday 19th at 9.30 p.m. We set off again early in the morning and arrived in Holyhead at 10 a.m. on Wednesday 21st July.

Our best sailing was for a short period coming out of the Thames Estuary on a beam reach to Margate, and again on a close reach across Lyme Bay when we reached 13 knots for a brief period when the wind freshened to about force 4 and finally a beat to windward into Penzance. We had light north winds all way up the Irish Sea and motored all the Way. Under motor, we were making a steady $9\frac{1}{2}$ to 10 knots through the water.

Since her delivery to Holyhead, I have had regular reports from her owner and her skipper. They have sailed over 1000 miles in the Irish Sea; to Belfast, Dublin and along the West Scottish Coast during

August. Most of the sailing was in strong winds or gale conditions and Skipper Owen has said that she has reached 18 knots on many occasions.

Tsulamaran has proved exceptionally sea kindly, comfortable, dry and gives every confidence as a really remarkable sea boat. Undoubtedly, we shall hear much more of her exploits in the future as I believe a long programme of sailing is being planned for her.

ROLAND PROUT.

EUNIKE

AN EXERCISE IN MATHEMATICAL HULL DESIGN

L.O.A., 46 ft. 0 ins.

Hull characteristics :
Displacement, 9600 lbs.
Draught, 2 ft.
Beam at L.W.L., 2.5 ft.

Centre of buoyance 25.4 feet from the bow.

Sail area : 735 sq. ft. Genoa 765 sq. ft.

Spinnaker : 2000 sq. ft.

Designers : Myers and Ewing, 8011 Yorktown Avenue, Los Angeles, California.

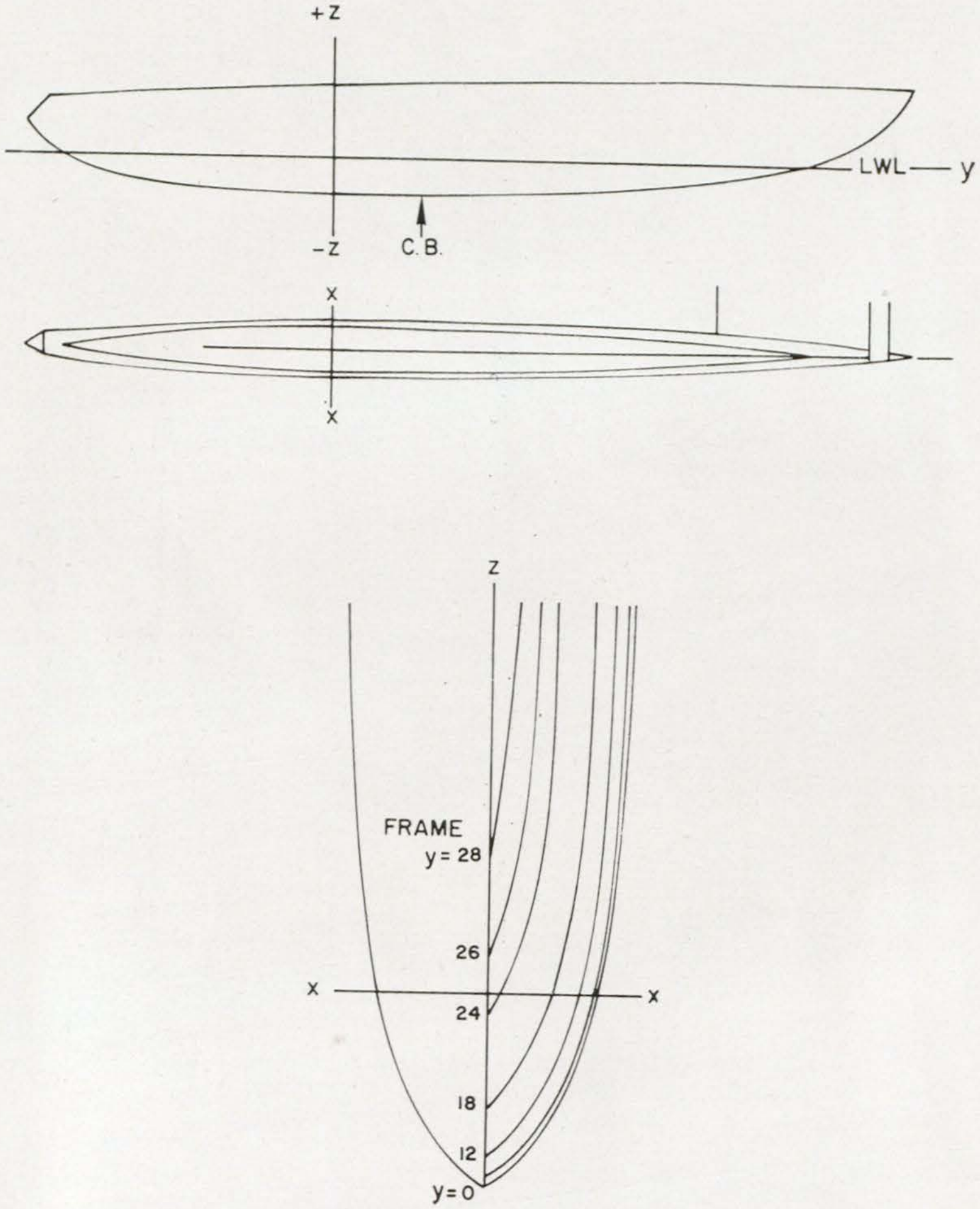
Mathematics is a wonderful subject. If one is knowledgeable enough, one can produce wonderful things with it, even hull shapes as offset figures. No doubt various hull shapes can be produced by mathematics but Myers and Ewing have produced their very pleasant and seakindly hull shape by using the following formula :

$$Cx^2 + Dx + Gy^2 + Jz^3 + Lz + 1 = 0.$$ Where x = Beam
y = Length
z = Height

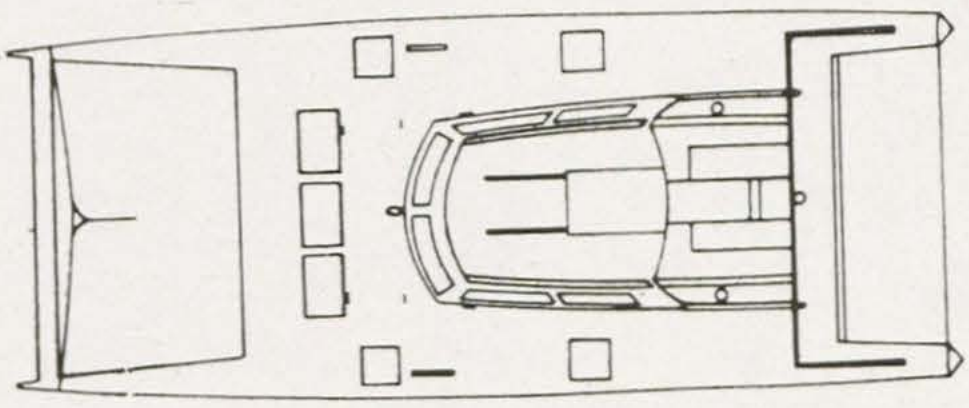
The designers say " The offsets obtained by solving the equations at the desired stations lie on gentle, perfectly fair lines. The result is a beautiful hull for which full scale lofting is not required. In addition, the curves are so gentle that single sheets of plywood can be bent around them, eliminating the tedious and expensive laminating process."

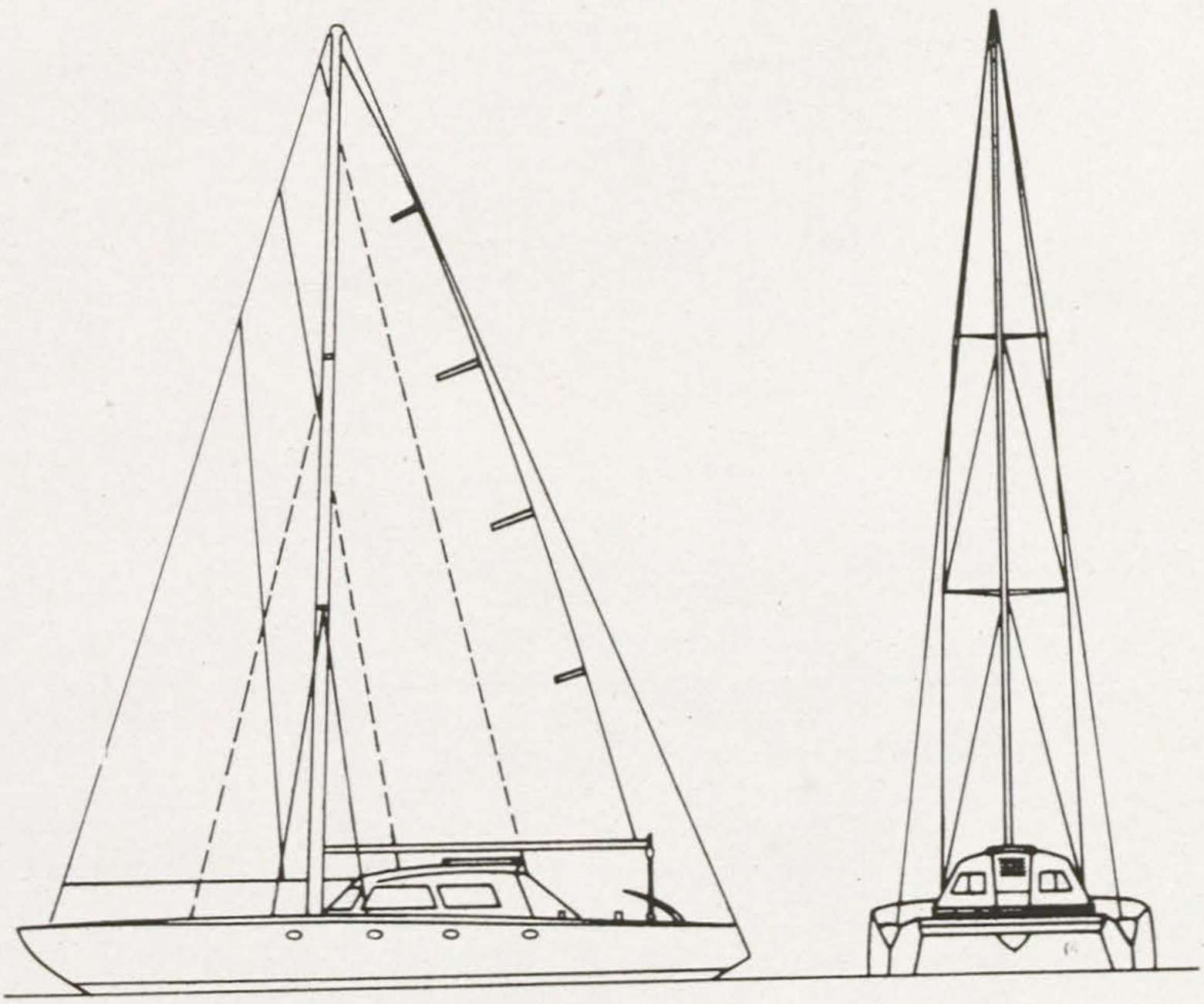
The end result of this process is *Eunike*, whose lines and sections sail plan and photograph we show. The general hydrofoil shape of the hull will be noticed but this doesn't apparently give enough lateral resistance as boards are needed, though low aspect ratio keels might be just as good.

EUNIKE—Myers and Ewing

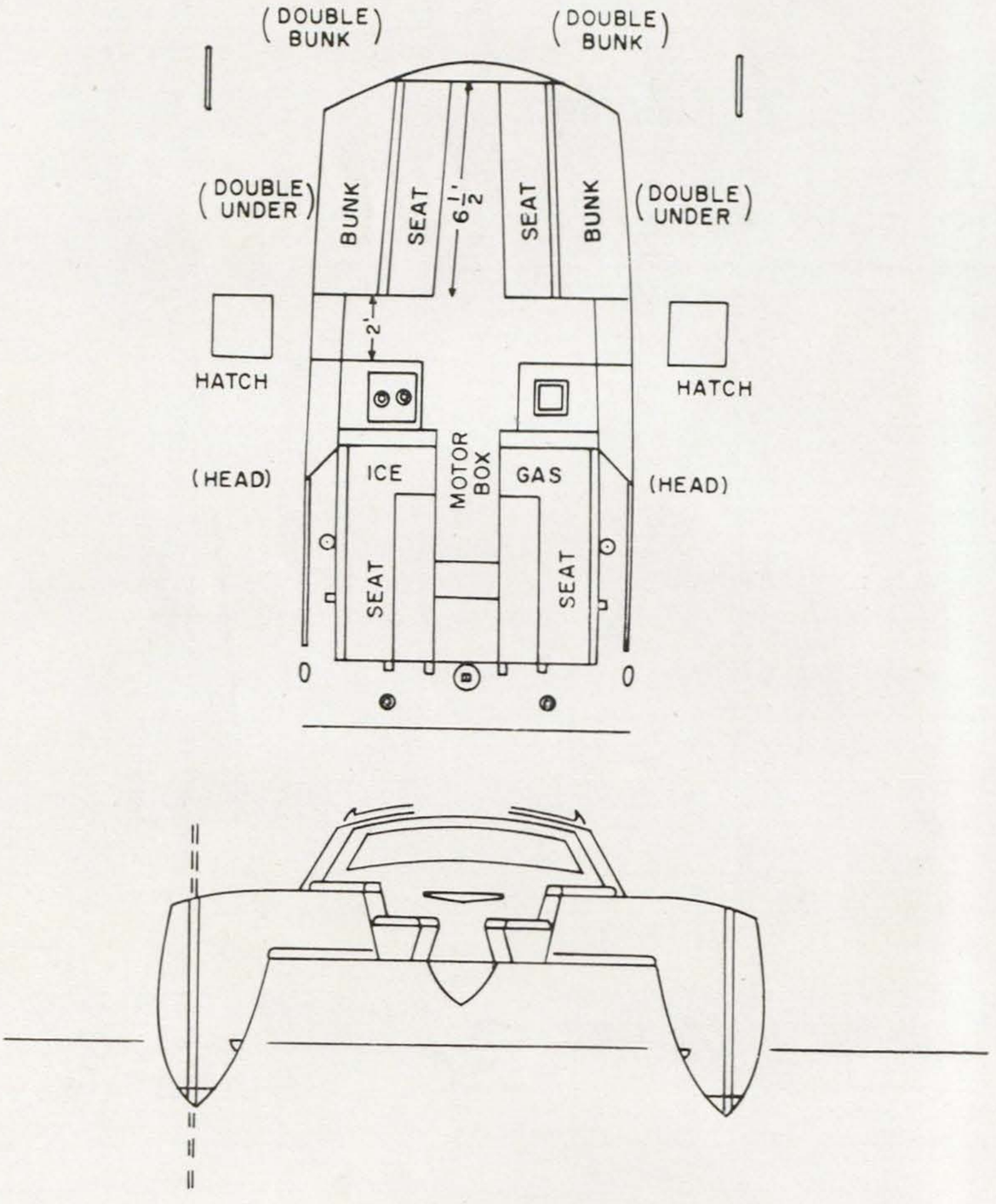


EUNIKE'S lines and Sections





EUNIKE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EUNIKE

C/S/K NEWSLETTER NO. 2

By Rudy Choy, Warren Seaman and Alfred Kumalae
2602 Newport Boulevard, Newport Beach, California.

September 3, 1965.

Because of the wide expressions of interest when we published Newsletter No. 1 on August 5 last year, we have decided to bring you up-to-date with some of the performance highlights since then of catamarans built to C/S/K designs. This will probably be an annual practice since individual letters are time consuming and sketchy.

Great Lakes Racing.

1. *Chicago-Mackinac Race.*—July 17-19, 1965 : There were over 130 entries for this major event. Chicago Yacht Club was very courteous and started the " Multi-hull Class " (unofficial) 10 minutes after the start of Class A, monohulls. The two multi-hull entries were Charlie Kretschmer's 42 ft. *Helani*, skippered by Al Stresen-Reuter, and a Piver-designed 45 ft. trimaran.

For the first time in history, nearly the entire race was a beat to windward except for the last several miles. The direct route lies approximately 330 nautical miles. *Helani* sailed over 400 miles in headwinds varying from light to fresh. She was fourth-to-finish behind the 57 ft. yawl, *Blitzen*, the 12 metre, *Mitena*, and the 54 ft. sloop, *Gypsy*. However, *Helani* finished ahead of about one dozen Class A entries, including the new 62 ft. *Amorita III*, the 62 ft. yawl, *Esbro* and the new Tripp-designed 54 ft. *Avenir II*. Chicago Y.C. gave us the finish gun as we crossed the line.

Competition was first class, as good as can be found anywhere. We honestly felt that if *Helani* had been tuned, if we had been more familiar with her sailing qualities, and if we had played the shore rather than the lake, *Helani* would have improved her position.

Lake Huron Storm—July 21-22, 1965 : We left Mackinac Island two days after the Chicago Race. The first night out we ran into a small but intense (un-forecasted) storm typical of this region. It was right on the nose averaging 35-40 knots, gusting up to approximately 50 knots and lasting 17 hours. Under a mainsail reefed down to the second batten and an eased (luffing) working jib, we sailed *Helani* at between 4-8 knots into 10-12 ft. short seas which occasionally became 15 footers. Though half the height of storm seas I've experienced in the Pacific, they were very steep and short, as steep as I've seen anywhere. Several " Monos " were caught along with us, and they fled to port. We were too far out in the Lake and had no

appetite for approaching a treacherous shore on a very dark night. The drop-outs never made the Port Huron-Mackinac Race. After it was over, we agreed the experience proved rewarding to our crew of six : Al Stresen-Reuter, his two sons, one daughter-in-law, one friend and myself. *Helani* performed beautifully and comfortably with no wing pounding. Occasionally the motor box under the wing slapped, but this was due to its box shape.

Port Huron-Mackinac Race—July 24-26, 1965 : Again, *for the first time in history*, this race was to windward the entire distance except 1½ hours under spinnaker about midway. The course lies 235 miles, but all entries sailed nearly 400 miles in order to get back to Mackinac Island. There were 166 entries including *Helani* and *Halar* (a new 37 ft. Maclean-Harris cruising catamaran) in the Multi-hull Class.

Bayview Y.C., the Race sponsors, went out of their way to be courteous to *Helani* and *Halar*. The two cats were started 15 minutes after Class A. By sundown, *Helani* had worked out in front of the entire fleet. She was now tuned and we had learned what sails to use and when. A major navigational error at night enabled *Gypsy* to overtake and pass us, and we just could not close the gap again. *Helani* was second-to-finish behind the beautifully-sailed *Gypsy*. *Halar*, the other cat, crossed the finish line, 4th from last place. In fairness to her, *Halar* was just-launched, un-tuned and with a few bugs to eliminate, I'm sure she'll do better in the future.

The Detroit Free Press described this race as . . . " one of the most challenging in history " and " The storm whipped waves as high as eight feet pounded the fleet right on the nose. All the early finishers reported broken equipment from the pounding, including *Gypsy*, which had a sail ripped (*Helani* had no problems). Twelve of the entries failed to make the grade. Six missed the start and *Windbag*, *Truant V*, *Hornepipe*, *Sea Chantey*, and *Jolie Jamie* were knocked out of the race by the rough seas."

Summary : Helani is a C/S/K cruising design similar to overall characteristics to *Imi Loa*. She is not an ocean-racing machine like *Pattycat II*, *Allez-Cat* or even *Imua* ! But she is rugged. The consensus of informed yachtsmen was that *Helani* accomplished more good and won more respect for catamarans by finishing 4th and 2nd in two major windward races than by finishing first again under spinnaker, as she did in the 1964 Port Huron-Mackinac Race. I agree. *Helani* explored *forever* the myths that a cat can't perform to windward, that it can't point, that it can't take rugged going, and that it comes about poorly, so far as the informed Great Lakes yachtsmen are concerned.

Most encouraging was the sportsmanship, genuine interest and courtesy of the majority of Great Lakes yachtsmen. We are happy to report that one of the top racing skippers in the Great Lakes has decided that he wants one of our new 52 ft. ocean-racing designs. Next year, there might be two 52 footers plus *Helani* and, we hope, some other multi-hull entries.

West Coast Racing

As in past years, our designs are managing to stay in front, though we expect competition to get a lot stiffer in future years as our competitors acquire more knowledge and experience.

San Clemente Island Race—April 3-4, 1965 : This Race covers about 125 nautical miles. There were only four multi-hull entries and over 50 monohulls. The wind was very light to moderate and seas generally smooth. The four official cat entries were : *Pattycat II*, *Imua*, *Imi Loa* and *Lani Kai*. An unofficial entry was the Class D (500 sq. ft.) day-racer, *Wildwind*. Dr. John Pursell's *Pattycat II* was first to finish, overall, but disqualified. Jack Swart's *Imua* was officially 1st elapsed and 1st corrected. *Wildwind* finished third, *Imi Loa* fourth and *Lani Kai* fifth (2nd corrected).

Newport-Ensenada Race—May 1, 1965 : The results of the Ensenada Race were as follows :

Elapsed Time Order of Finish*—Boat	Description	El. Time	Corr. T. (Cats)	Corrected Place (Cats)
1—*Pattycat II*	44 ft. Cat	22.246	22.093	6
2—*Gusto*	29 ft. Cat	22.560	22.992	10
3—*Kai Kane*	36 ft. Cat	22.589	21.105	3
4—*Imua* !	36 ft. Cat	22.646	21.011	2
5—*Serena*	83 ft. Schooner	22.688		
6—*Allez-Cat*	43 ft. Cat	22.738	22.093	5
7—*Kialoa II*	73 ft. Sloop	22.775		
8—*Hilaria*	10-Meter (59 ft. Sloop)	22.871	(OR & Class A Winner)	
9—*Branta*	10-Meter	22.950		
10—*Makai*	36 ft. Cat	23.071	21.297	4
11—*Imi Loa*	43 ft. Cat	23.109	20.527	1
12—*Aikane*	46 ft. Cat	23.170	24.941	14

* Note : To find Actual Time order of finish, add 0.167 to El. Time for Cats only (Cats started 10 min. after OR-Class A).

The wind was gentle, averaging less than 8 knots while it blew with the maximum velocity about 12 knots. For most of the distance, it was a close reach to a reach. All of the entries were becalmed for not less than 4 hours each. *Pattycat II* almost took corrected-time honours as well as first-to-finish. She sat in Ensenada Bay only 9 miles from the finish line for $3\frac{1}{2}$ hours before any other sails were sighted astern growing larger over the horizon. They brought the wind while we swore in frustration. C/S/K lucked out again. Seven of the first twelve across the finish line were ours and we also took the first six places on corrected time. There were 473 entries including 18 in the multi-hull division (13 cats and 5 trimarans). The 3-hullers came in last, as usual.

Catalina Island Cruise—August 28-29, 1965 : *Pattycat II* was first to finish in moderate winds. Course was close-hauled all the way. *Imu Loa* took first-corrected, *Pattycat II* won second-corrected and *Imua* ! took third-corrected.

Summary : There were one dozen coastwise races but these are of lesser importance. Two races coming up this fall are the NOSA Alamitos Bay Argosy and the NOSA 14-Mile Bank Race. *Pattycat II* is the official record-holder for the 14-Mile Bank Race. She broke the old course record, averaging 9.5 knots in a 10-11 knot wind, last November, 1964. Bob Jones' *Allez-cat* is the record holder for the Alamitos Bay Argosy. Both *Pattycat* and *Allez-cat* are hitting full stride after last summer and performing as intended. In both races, the combined fleet is usually more than 125 boats, all ocean-going.

Ocean Cruising

Dushka's Trans-Atlantic Crossing : The major cruising achievement by a C/S/K design this past year was accomplished by the 48 ft. ketch-rigged *Dushka.* She is owned by Byron (Dinty) Moore, a retired pilot for American Airlines (65 years old). With a crew of three inexperienced young men, he made a Trans-Atlantic Crossing of 22 days, including 4 days becalmed halfway. This is possibly the fastest *multi-hull* Trans-Atlantic passage to date even though *Dushka* is not a " fast cat." Byron also ran into a Mediterranean blow. These are his words :

" Left Port of Pollenze in light air and halfway to the mainland (beginning of October) we hit that grand-daddy storm when wind surpassed capacity of annemometer (60 knots). We figured we'd seen enough and turned back—made Palma in $3\frac{1}{2}$ hours doing up to 18 knots downwind with storm jib . . ." " It gave me a chance to shake down the ' new ' *Dushka* and my crew. Both behaved admir-

ably. You can tell Prout or McAlpine-Downie that even with the gigantic biggest waves I've seen in the Mediterranean, *Dushka* had no tendency to yaw or broach, even when sliding down the steep falls of these waves at a hell of an angle ! Perfect control at all times, even at 18 knots or better ! And so stable ! Even partly broadside turning into Palma Bay—waves breaking clear over the lighthouse ! —she was a baby buggy. I figured we had gusts from 70-80 knots, perhaps nore as they had over 100 at Alicante."

Summary : How many " youngsters " 65 years old can claim such an accomplishment ! What Byron doesn't say is that he overcame some major problems and at all times was a credit both to himself and to catamarans.

Other Cruises : Other extended cruises were made this past year by A. L. Mechling's 51 ft. motorsailer, *Flying Cloud*, along the Atlantic Coast and Bahamas, John Hornburg's 48 ft. sloop, *Calypso*, and Bernie Van Ingen's 49 ft. *Nai'a*. *Calypso* sailed from Bermuda to Miami on her way to Trinidad and *Nai'a* sailed from New York to Bermuda to Miami. *Nai'a* was sold and, at last report, was being sailed back to the New York area.

Some New Designs.

Design No. 71 : This catamaran is Al Stresen-Reuter's 52 ft. ocean racer. We expect that this power-house should be able to do well in the Great Lakes next year. She is intended to be our fastest design to date.

Design No. 74 : This is 49 ft. yawl-rigged ocean-racer cruising catamaran should give a good account of herself in the 1966 Trans-Pacific Catamaran Race. When finished she'll be the largest foam-fibreglass yacht ever built. Much credit should be given to owners Jay Johnson and Chuck Gardner for their technical and engineering skill with this modern material plus their unusual interest in the design.

Design No. 54 : This is *Imi Loa*. All of a sudden this model has " caught ". There is one under construction in Brazil and one starting in England shortly. Three owners so far have contracted to have this design built by Multi-Craft Co. of Redondo Beach, California. All five will be yawl rigged whereas *Imi Loa* is a sloop. *Imi Loa*, you may recall, finished the " Trans-Cat " Race last year in 10 days 9 hours. She'll be Trans-Pac-ing again in 1966, according to skipper, Vic Stern.

Design No. 68 : This was an interesting project undertaken jointly by General Dynamics/Pomona and C/S/K. We designed and built a scale model of an 85-ft. catamaran-hydrofoil patrol vessel with a performance potential of 70 knots. She was tank-tested exhaustively at the General Dynamics/Convair Test Basin in San Diego for one week. Tests completely verified both the performance goal and the design philosophy. The model exceeded a scale-speed of 70 knots (in seas). The test tank's director remarked that *no other configuration* had ever been able to successfully achieve both speed and seaworthiness under the specified test conditions. We'll see what the future will reveal.

Design No. 72 : A preliminary design of a 75 ft. moto-sailer catamaran has been completed for a prospective Argentine yachtsman. Though final design has not, as yet, been undertaken, the study and design proved extremely interesting. We anticipate that such a catamaran is not only nearly " fool-proof ", for all practical purposes, but is at least equivalent in luxury to a 100 ft. plus monohull yacht. Under power, she is intended to cruise at 14 knots with a top speed (utilizing specified engines) of nearly 18 knots. Though Design No. 72 is not a racer, *under favourable conditions*, she should be capable of easily achieving speeds in excess of 25 knots under sailpower.

Conclusion : C/S/K would like to express to all of you our deepest appreciation for your continuing faith and interest in our designs. We have made real progress in the last few years despite a few disappointments which, nevertheless, helped to mature us as catamaran designers. We would especially like to thank Dr. John Pursell, *Pattycat II's* skipper, and Bob Jones, *Allez-Cat's* skipper, for their unusual understanding of the nature of *advanced design* which is necessary for progress. Their boats have now lived up to their promise and are winning ocean races, as we had hoped.

RUDY CHOY,
for C/S/K Catamarans.

* * *

THE RATE OF EXCHANGE BETWEEN WEIGHT AND WETTED SURFACE

BY

J. SIDGWICK

Leigh Cottage, Freshford, Bath, Somerset.

The Editor has asked me to expand on my letter to him on this subject, published in A.Y.R.S. No. 53, p. 83.

The theme is simple—added weight increases the displacement, sinking the hull deeper in the water, thereby increasing the wetted surface. For any hull, there is a "rate of exchange" between weight and wetted surface.

Fig. 1. shows a slice of a hull between the two water-lines before and after adding a small weight.

The volume of this slice is the increase in displacement, and the area of its edge is the increase in wetted surface.

The volume equals the area of the water-plane times the sinkage :

$$V = A \times d \qquad (1)$$

The edge area equals the perimeter times the sinkage :—

$$S = P \times d \qquad (2)$$

Combining these two equations, we get :—

$$S = P/A \times V \qquad (3)$$

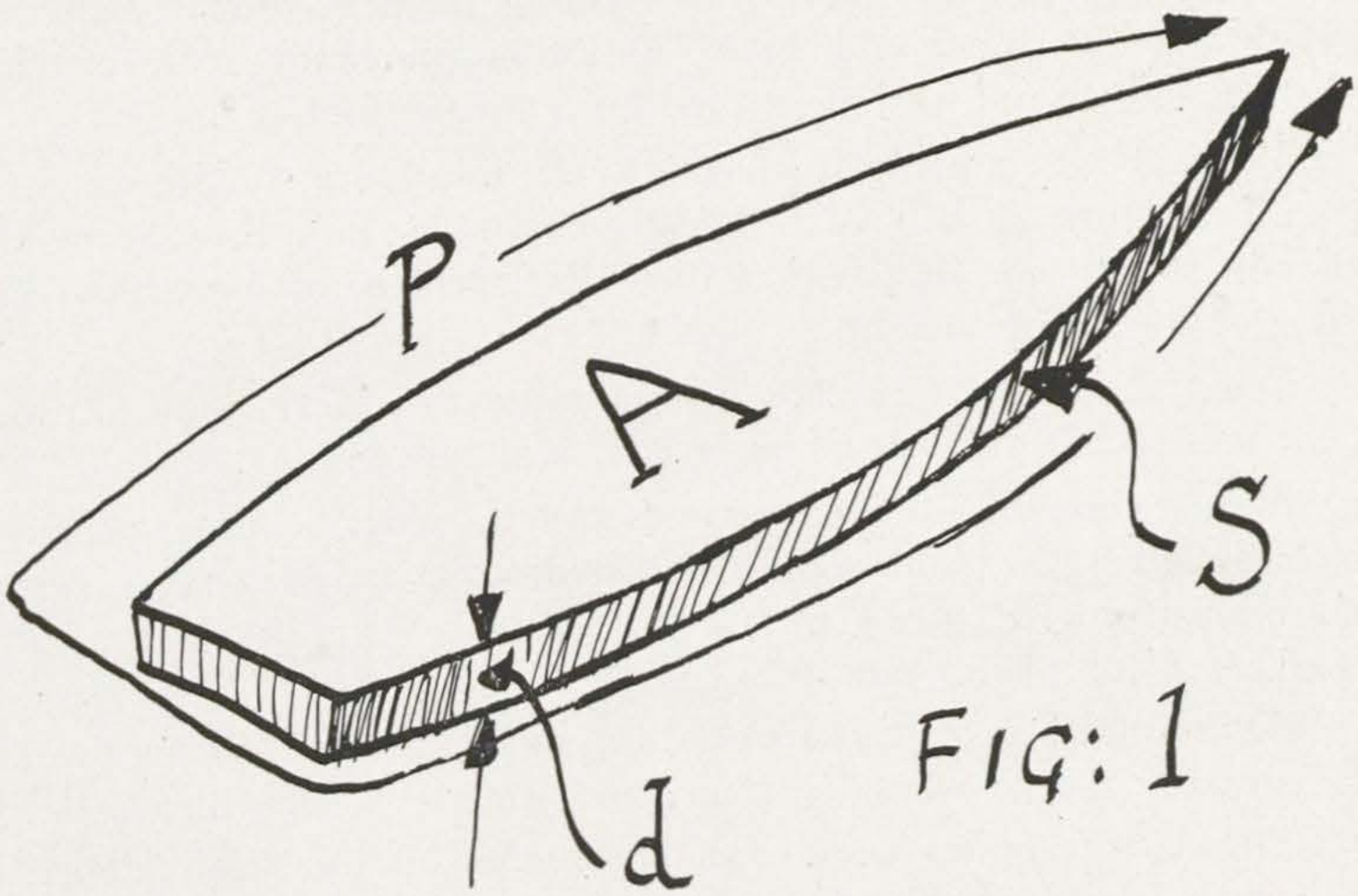


FIG: 1

In words, P/A is a factor relating, or the " rate of exchange " between, the increase of wetted surface and the increase of displacement.

The larger P/A is, the greater will be the increase of wetted surface for a given increase in displacement.

There are two things to note about P/A. The first is a size effect—P varies directly with the size of the hull, but A varies with the square of the size, so that, other things being equal, P/A is inversely proportional to the size ; being large for small hulls, and small for large hulls.

The second thing is that P/A is small for beamy hulls, but large for fine hulls.

From these two considerations, it is evident that the hulls that will be worse off will be small fine ones—catamarans.

Hence the figure quoted in my letter of seven square feet for an increase of 200 lbs. : say 1 sq. ft. for each 30 lb.

Comparative estimated figures are :—
12 ft. Dinghy ... 1 sq. ft. for each 80 lbs. (because of the beamy hull.)
5 ton Yacht ... 1 sq. ft. for each 150 lbs. (because of the greater size.)

So—racing catamaraniacs must be extremely weight-conscious both in design concepts, and in every detail of design and equipment, not forgetting crew weights.

Other thoughts that occur to me—

Why not make the wetted surface that one must carry in keels and rudders work for its living by making them of thicker section ; hollow and buoyant ? An extra 30 lb. of buoyancy achieved this way will reduce the wetted surface by a square foot.

What about reducing freeboard to the minimum to save weight ? Even if one does not believe in the submerging lee hull, there seems no point in having one hull with a total displacement of more than say 120% of the all-up weight.

What about lift from sails in this context ? Here again, 30 lbs. of lift will reduce the wetted surface by a square foot.

A final thought—It is sometimes stated, when lift/drag ratios of displacement hulls, planing hulls and hydrofoils are being considered that buoyancy gives lift " for free ", without the induced drag inseparable from planes and foils.

But beware ! From this article it can be seen that weight supported by buoyancy means wetted surface, and wetted surface means drag.

This latter applies equally in arguments on the relative merits of light and heavy displacement in conventional ballasted yachts.

CATAMARAN RIGHTING METHODS

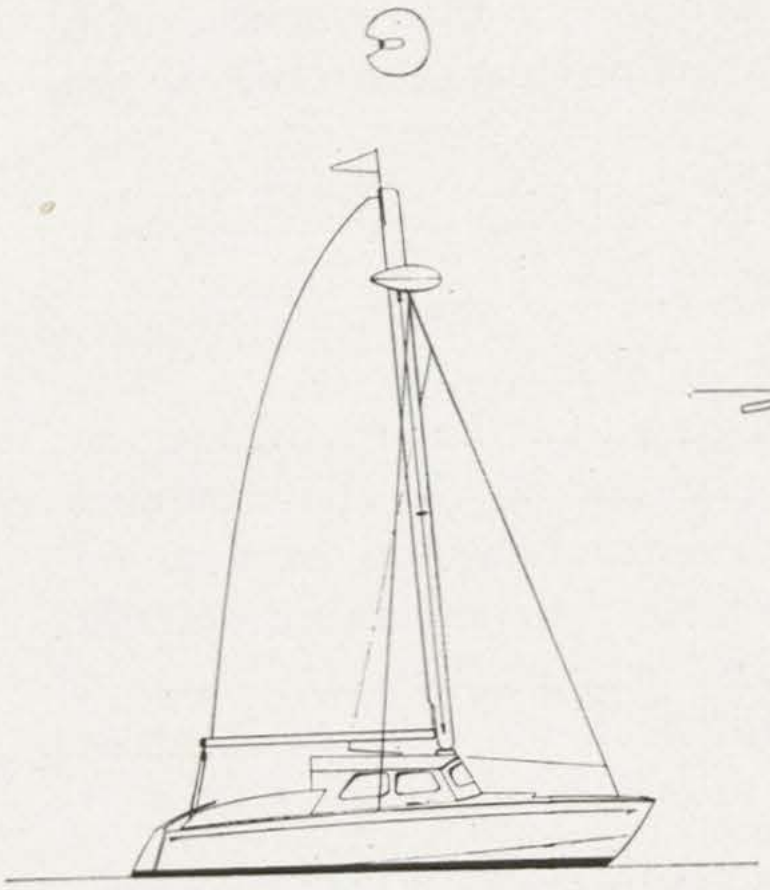
BY

PAUL ASHFORD

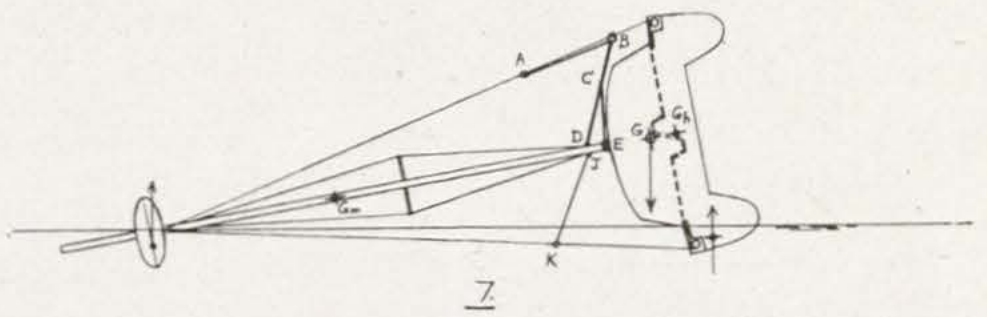
Holly Lodge, Strumpshaw, Norwich, NOR 77 z.

The drawings show two methods of righting capsized catamarans, the first is that devised by V. E. Needham and shown in A.Y.R.S. 35, Page 72. The second uses the boom instead of the mast for the righting spar. The first set of drawings show the problems which arise with Needhams's method when the mast is stepped above the level of the chainplates and the centre of gravity is fairly high. I think one can sum up by saying that this method would work if well engineered in detail, but this would add significantly to cost. If not done thoroughly, it should be left alone, as otherwise there is plenty of opportunity for losing the mast.

With the boom-end buoyancy method, one is playing with a much shorter spar and the penalties of a mistake in handling need not be so serious. This method could perhaps be improvised, using a rubber dinghy. This method requires little gear not useful in ordinary sailing apart from the inflatable buoyancy and imposes no particular restriction on the choice of standing rigging. It appears that the



6. SAIL PLAN



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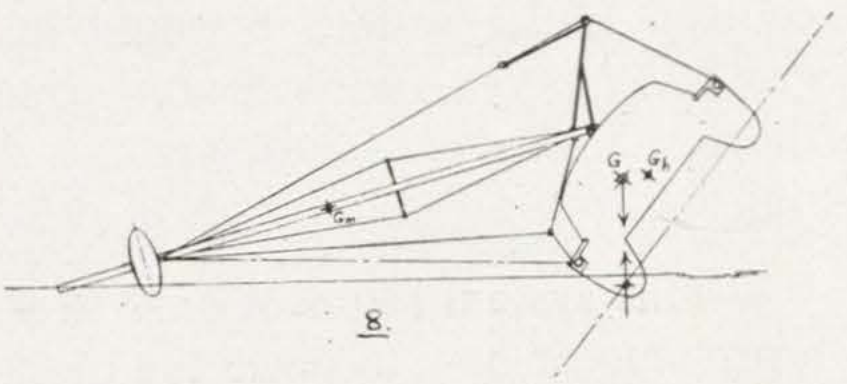


8.

· 25' CAT - RIGHTING BY V.E.NEEDHAM'S METHOD.

¼" = 1'-0"

boom length should not be much less than the cat's overall beam for it to work well.

Of course, prevention is better than cure in this matter, and I am very hopeful that we shall soon produce a virtually unballasted cruiser stabilised by one or two small floats with foils which will self right from the masthead in the water.

Needham's Method. The mast is arranged to pivot sideways and may also rotate. In place of rigging screws and chainplates, the shrouds are fitted with flexible wire tails led to winches set in self draining wells and arranged for operation inside the cabin. A hatch may be provided close aft of the mast from which, after a capsize, the crew :—

1. Get off the sails.
2. Rig strut BD. This involves fixing the link AB to the shrouds at A (which can be done from the hatch if link AB is a rod or tube fitted with a suitable snap hook), then putting fork B over the shroud (with spring latch to prevent accidental disengagement) and securing D to the mast fitting. A third strut CE is taken to a fitting E several feet aft of the mast to avoid BD collapsing fore or aft when position 8 is reached.
3. Rig link JK.*
4. Crew retire inside cabin and cross-connect the winches, with handle as shown or flexidrive connection to the handle of the lower winch.
5. Operate winches until position 8 is reached and the catamaran rights.
6. Reverse the winches until the mast is vertical.

* The link JK is a means of arranging that the shroud lengths released and wound in are almost identical and would allow parallel drum winches to be directly coupled. Since K would have to be coupled under water, it would be preferable to substitute spirally grooved tapered winch drums arranged to take in the extra slack in the lower shroud. Both shrouds should be taut at the moment of righting to avoid the danger of damage to or loss of the mast.

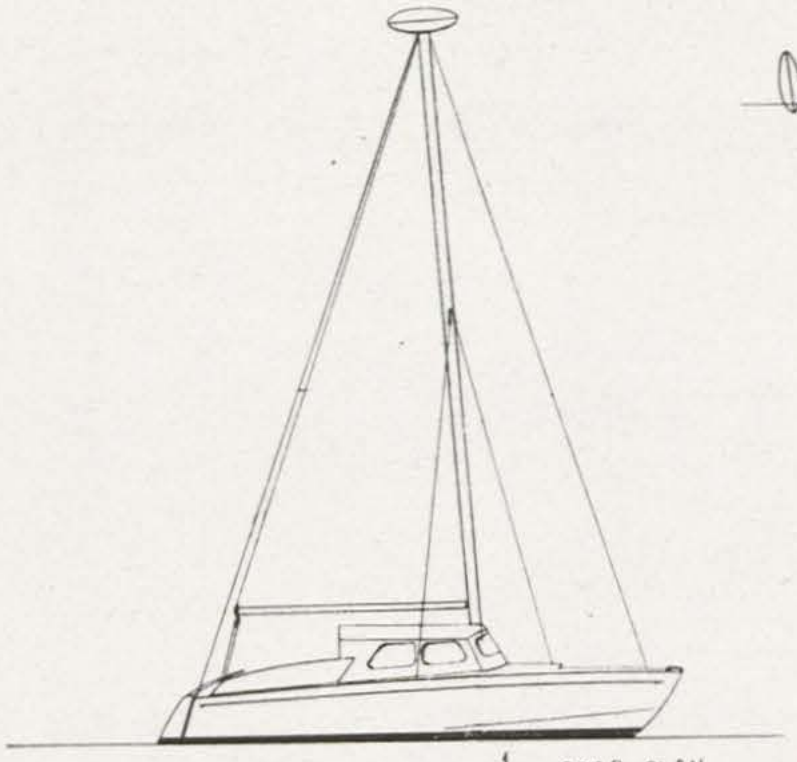
This system requires only two shrouds to the deck. This poses a problem of how to place the mast-head buoyancy. If at the truck, there will either be a cantilever length of mast; or alternatively shrouds and forestay must be taken to the mast head, giving a long length of mast stiffened only by diamond stays, to carry the full compression load. Either way, a stiff and strong mast section is needed. Fig.

6 shows a compromise arrangement, but this requires rather more buoyancy and may spoil wind flows over the sail.

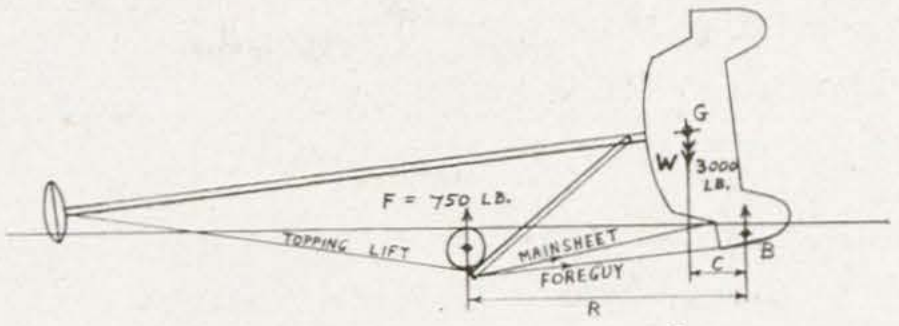
G = Centre of gravity of the hulls, wing and mast.
Gh = Centre of gravity of hulls and wing only.
Gm = Centre of gravity of mast.

Boom End Buoyancy Method. It is assumed that adequate mast head buoyancy is provided, the crew on deck wear lifelines and sufficient hand holds are available for them to move about on the capsized cat.

It is also assumed that foreguys are rigged in readiness, that the mainsheet and foreguy can be led to winches placed where they can be safely operated from inside the cabin in the capsized position, and that the topping lift can also be cleated where accessible from the cabin.



1. SPAR PLAN



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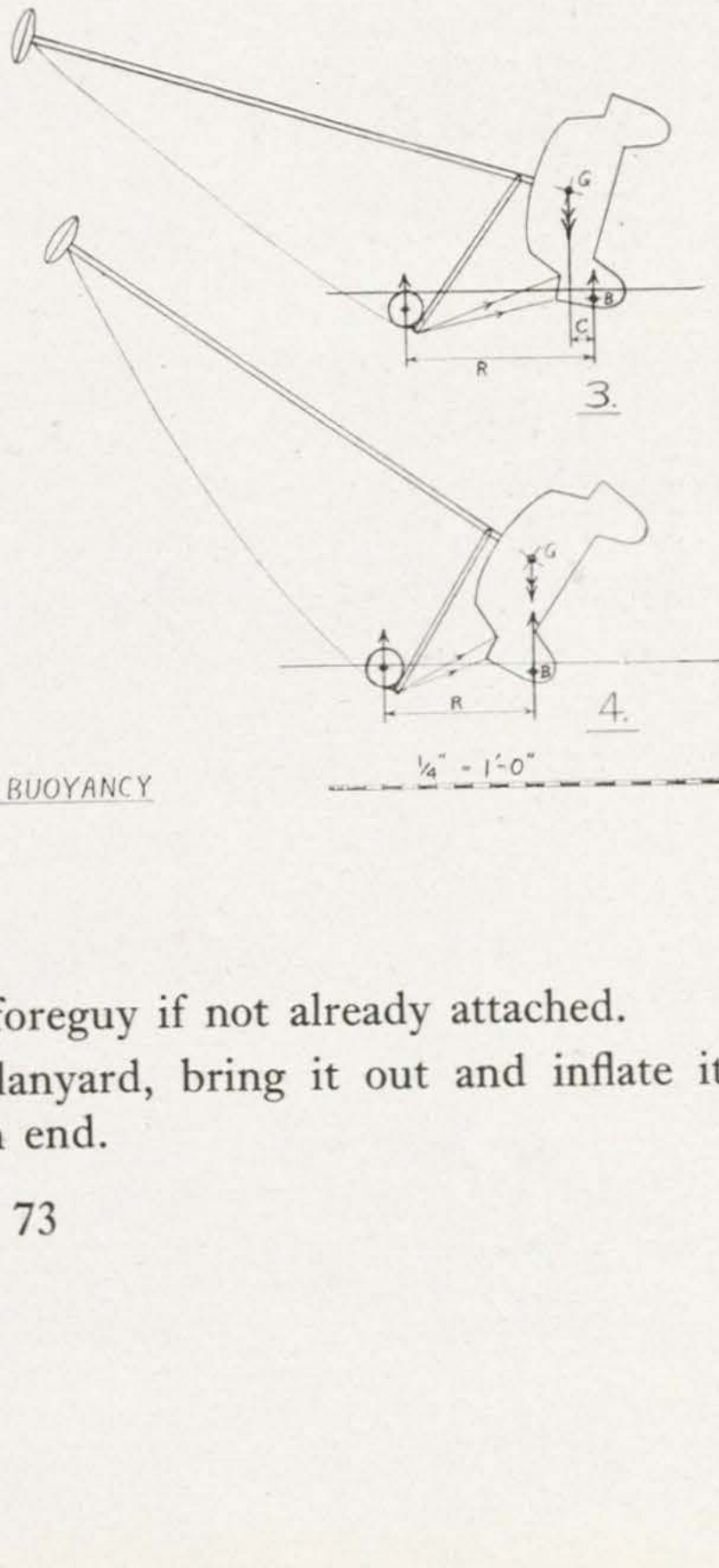

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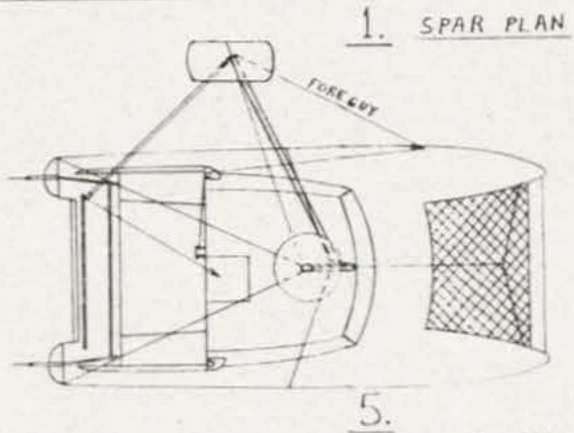

5.

25' CAT. - RIGHTING WITH BOOM END BUOYANCY

¼" = 1'-0"

After Capsize :—

1. Get the sail off, if possible.
2. Sheet in the boom, rig the foreguy if not already attached.
3. Secure the buoyancy to a lanyard, bring it out and inflate it. Then shackle it to the boom end.

4. Raise the boom by the topping lift (Fig. 2).
5. Winch in the foreguy and mainsheet (Figs. 2 and 3). Release the topping lift gradually to keep the boom under full control.
6. At Fig. 4 hold tight ! Sort out and sail on.

Note. Fig. 5 shows the set-up as reached at Fig. 4 and immediately after righting. Note that, due to the shrouds, the boom outreach from the centre line of the catamaran is less than the boom length and this allowance has been made in drawings Figs. 2 to 4 to scale. The standing rigging is not shown in Figs. 2, 3 and 4.

Calculations.

Assume :—Total displacement is 3,000 lbs. divided as follows :

Hulls and stores	1400 lbs.	1.6 ft. above W.L.
Wing, deckhouse and crew	1400 lbs.	3.4 ft. above W.L.
Mast and standing rigging	200 lbs.	20 ft. above W.L.
Overall centre of gravity		x ft. above W.L.

By moments above normal W.L.

$$3000 \times = 1400 \times 1.6 + 1400 \times 3.4 + 200 \times 20$$
$$= 2240 + 4760 + 4000$$
$$= 11000$$

Therefore $\times = 3.67$

The Buoyancy unit 4 ft. long by 2 ft. in diameter is approximately 12 cub. ft.

The Buoyancy is therefore approximately 750 lbs.

By moments about B.

Fig.	Righting moment F (lbs.) x R (ft.)	Capsizing moment W (lbs.) x C (ft.)
2	750 × 14.0 = 11,000	3000 × 2.9 = 8,700
3	750 × 10.7 = 8,200	3000 × 1.4 = 4,200
4	400 × 8.5 = 3,400	3000 × 0 = 0

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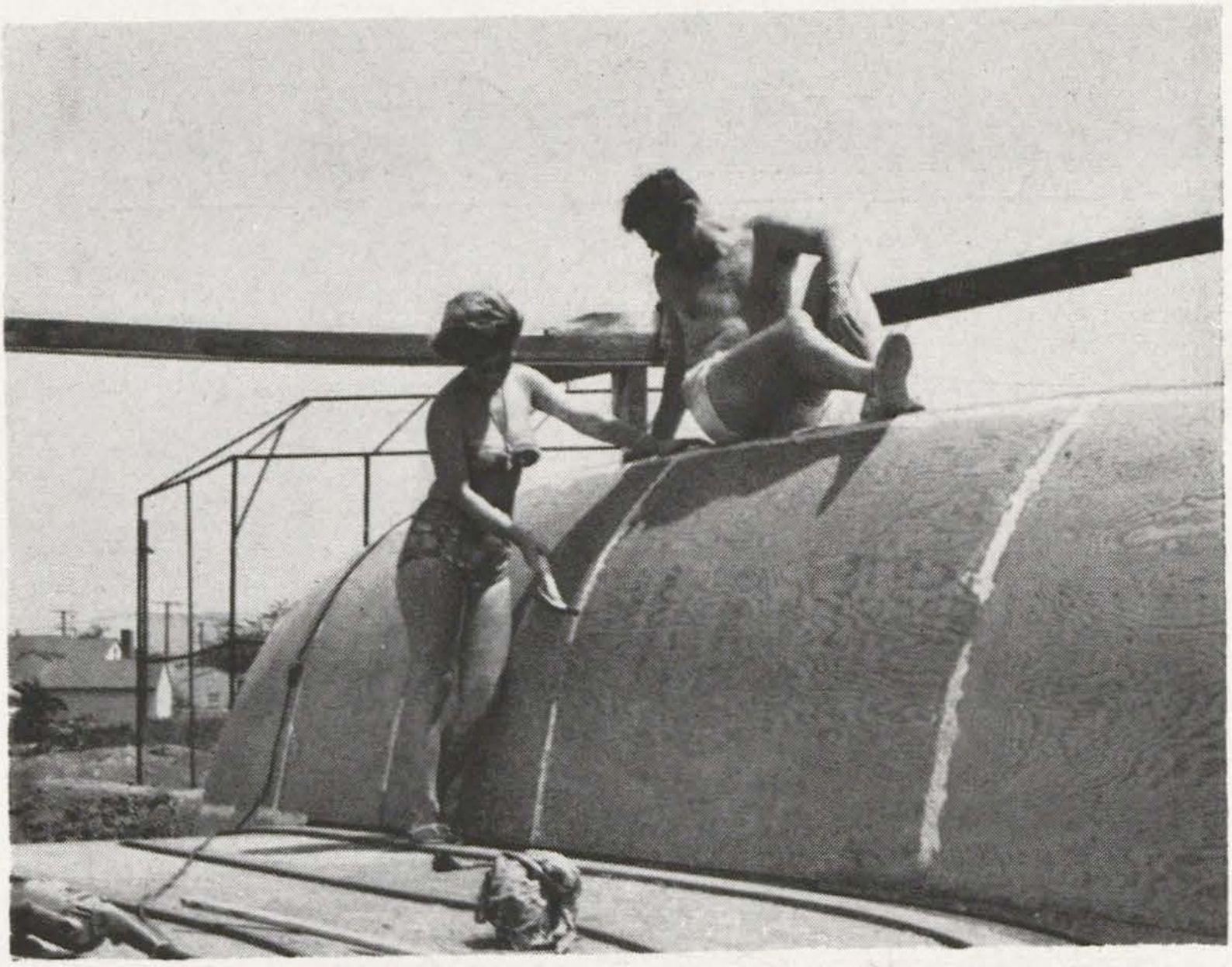

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