TRIMARANS 1961

A.Y.R.S. PUBLICATION No. 39

TRINE Photo Fritz Henle

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(Founded June, 1955)

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EDITORIAL

April, 1962.

Considerable progress has now been made in establishing A.Y.R.S. facilities and apparatus. We have been granted permission to use Weir Wood Reservoir, near East Grinstead as sailing waters but only in the winter months so far. F. Benyon-Tinker, 118a, Station Road, Redhill, Surrey has gone to considerable effort to lay this on for us and R. Gresham Cooke, Ruth Evans and others have helped him. It is hoped to have a sailing meeting there later this year. The number of boats which we can have sailing at any one time is limited and application to use Weir Wood Reservoir should be made to Mr. Benyon-Tinker.

Tony Millard is now trying to find club premises for us in London and has every hope of success.

The Yacht Wind Tunnel only needs a few finishing touches at the time of writing and it is hoped that we shall get it working in April. There will be an official opening when all the members will be invited but the date of this cannot be given at the moment. Members in England will be notified through the *NEWSLETTER* or by card.

Guy Morse-Brown has managed to get his laminar flow test tank and apparatus for us on a " Permanent loan " basis and this will be set up when we get premises.

SUBSCRIPTION RATE. Nearly all these things which have been laid on or which we hope to lay on will cost money and it is feared that the subscription rate for English members may have to be raised. Our present rate of £1 per annum is barely enough to cover the cost of publications.

THE BOAT SHOW. The 1962 London Boat Show has been a marked success for the A.Y.R.S. The Stand was very attractive, thanks to the efforts of Tony Millard. 145 members, joined or re-joined as compared with 73 the previous year. There was always a crowd of people on the Stand and the interest in our work and publications was immense. The little models of member's boats and ideas were very attractive and Erick Manners TRIFOIL, described in FLOATS, FOILS AND FLUID FLOWS was an outstanding feature. The photographs of members' experimental and unusual craft also attracted a good deal of interest

MANNING THE STAND. Manning a stand at the Boat Show is a hard and exhausting job. The following members manned the stand most effectively : Mr. Spiro, Miss Josephine Austin, Mr. S. Beal, Mr. Philip Patterson, Mr. Erick Manners, Mr. and Mrs. Owen Dumpleton, Mr. and Mrs. F. Benyon-Tinker, Mr. Graham Benyon-Tinker, Mrs. M. Robson, Mr. Tony Millard, Mrs. Ruth Evans, Mr. Ronald Kentfield, Mr. Crispin Lowe, Mr. Terry Sandell, Mr. B. Banham, Mr. Lloyd Lamble, Mr. E. Kenward, Mr. John Sogno, T. Herbert, G. Brewster, Dr. and Mrs. John Morwood. Our thanks are due to all these people for their efforts on our behalf and also to all the people who sent the models, plans and photographs which made the Stand so attractive.

THE ANNUAL GENERAL MEETING. The Officials of the A.Y.R.S. remain as before except that Henry Reid resigned from the Committee as he could not attend meetings. Roland Prout also found himself in the same position. Tom Herbert and P. H. Butler were elected unanimously to fill these two vacancies.

The main discussion at the meeting was the facilities at Weir Wood and the possibilities of getting club premises. The suggestion of using a house boat on the Thames was suggested later but it has its drawbacks.

Votes of thanks were given to Norman Pearce for doing the drawings for the publications through the year, Erick Manners for showing his boat at Earls Court and Mrs. Tett for doing all the A.Y.R.S. publishing and secretarial work throughout the year.

A.Y.R.S. TIES. Mrs. Robson, our membership secretary still has a stock of A.Y.R.S. ties in silk which cost £1 or $3 each. They are extremely attractive and every A.Y.R.S. member should have at least one.

THE OFFSHIRE POWER BOAT RACES AND HYDROFOILS. These races, both British and American have recently been won by Ray Hunt hulled craft—a hull shape with which the A.Y.R.S. is familiar at the length to breadth ratio of the catamaran or trimaran hull. Christopher Hook, however, tells me that he built a craft recently in Norway which rode over 4 foot waves and a slightly larger craft would ride over the waves met at the last 1961 British race. Undoubtedly, the Hook HYDROFIN hydrofoil craft is the most seaworthy of all and Christopher is ready, willing and able to design, make and sail such a craft in the most gruelling conditions. He needs a sponsor and anyone willing to back the venture for him may contact him at : HYDROFIN DESIGN CENTRE, " Coleraine," Grove Lane, W. Chiltington, Sussex, England. If the HYDROFIN can complete the course in the rough seas met last year, it will win because higher speeds can be maintained by a hydrofoil craft than a planning type. Should the HYDROFIN merely complete the course, however, it will prove that the hydrofoil craft has come and A.Y.R.S. members can then proceed to develop it for their own boats, thus competing the final A.Y.R.S. objective in boat development. We hope, therefore, that Christopher will find someone to back him.

INTERNATIONAL CATAMARAN TROPHY. Great Britain, represented by the Chapman Sands Sailing Club, have been challenged by the United States of America, for the International Catamaran Trophy. This trophy, which was won by the Chapman Sands Sailing Club represented by "HELLCAT" sailed by John Fisk and crewed by the designer R. MacAlpine Downie in the Autumn of 1961, is to be defended in September of this year in the United Kingdom. A meeting is being arranged at the end of March in London of Great Britain's leading catamaran designers, builders and helmsmen. Interested people who wish to design, build or finance a defender are asked to contact the Chapman Sands Sailing Club, Canvey Island, Essex.

AIRFLOW—A colour film describing simple aerodynamics for the sailor. This film, produced by Farrar Wilson Pictures, 13/15 St. Stephen's Lane, Ipswich, Suffolk, England was written by Major General H. J. Parham. It is a delightful film which combines moving pictures of smoke streamers in the wind tunnel with photographs of yachts to illustrate the various factors such as the increased windspeed on the lee sides of sails and the effect of twist. It should entertain as well as inform the novice while, at the same time the most astute aerodynamacist can enjoy it and, I feel, derive intellectual benefit. Cost : £45 per copy. Hiring charges : £3 3s. 0d. to £7 7s. 0d., depending on audience numbers.

THE AUSTRALIAN SECRETARYSHIP. Ken Berkeley has had to resign this post owing to his other committments. Ray Dooris has taken over the job and we all wish him every success.

TRIMARANS 1961

It seems a long while now since we started our studies of trimarans and outriggers in 1955. At that time, the only satisfactory trimarans in the world other than the traditional Indonesian craft, were Victor Tchetchet's *Egg Nog* and his later *Flamingo*. Nowadays, thanks to our A.Y.R.S. studies and the work of the A.Y.R.S. pioneers such as Victor Tchetchet, Arthur Piver and the other A.Y.R.S. members whose articles have appeared in our publications during the years since the A.Y.R.S. was started, a designer can with certainty design a trimaran which he knows will be a satisfactory craft, *though many craft in this Publication have floats which are too small.*

Mantua, designed by Owen Dumleton is a prototype craft which has been made and has proved to go well and comfortably, though some slight modifications are being made for the craft which is to be sold. I have sailed in this boat myself and can recommend it.

In this publication, we show the present range of Arthur Piver's craft and very nice they all look. It may still be possible to improve on some features of his craft in the matter of accommodation but, as they are, any one of them will prove to be a fast and seaworthy craft with an accommodation plan to which a lot of thought has been given. Only the thought of many designers over the years will produce the perfect accommodation plan for this configuration.

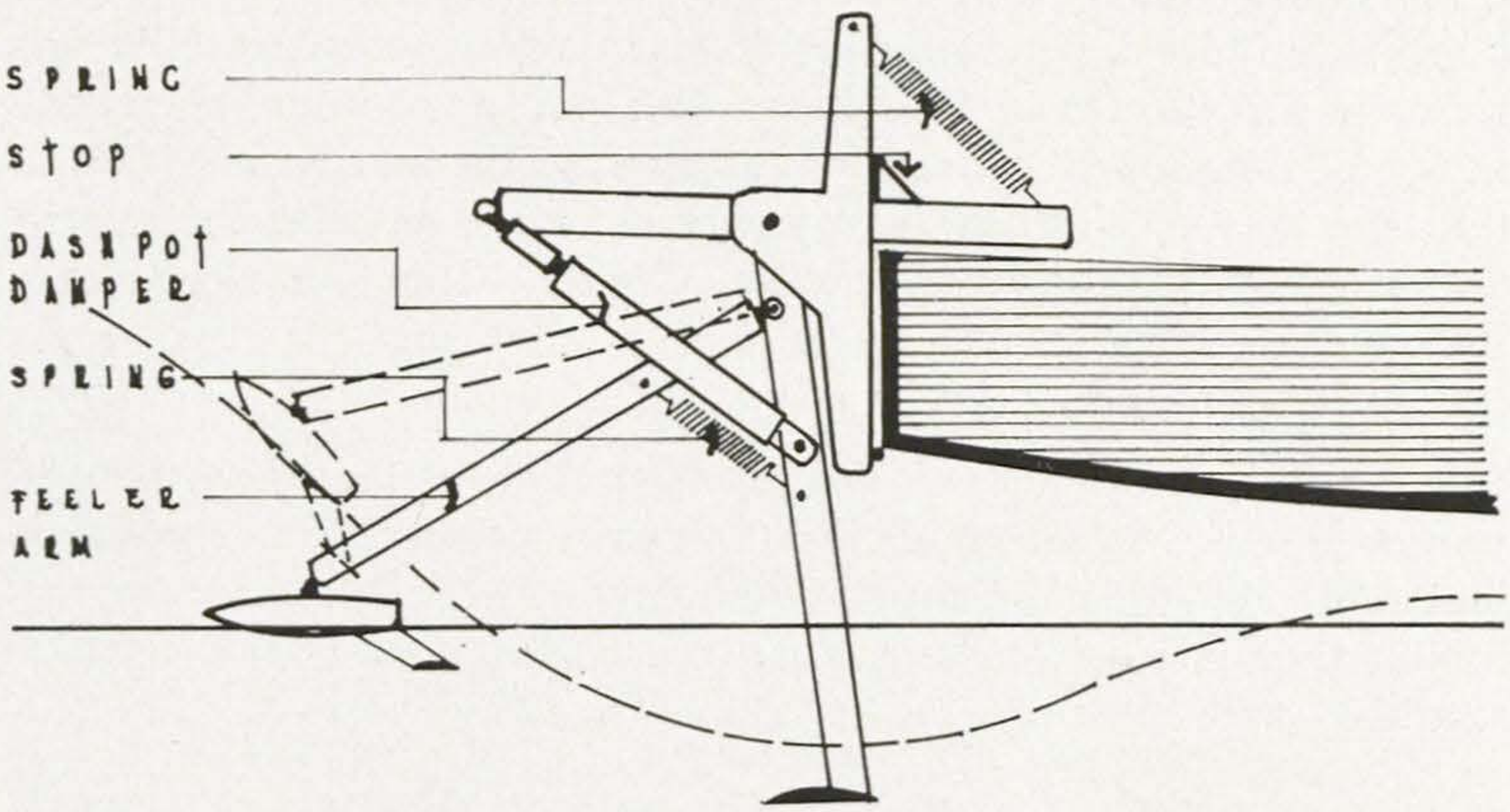
Our thanks are due to all the other people who have sent in designs and descriptions of the craft and the principles of their design thoughts

THE DAY RACING TRIMARAN. Just as it is now possible to design a good and satisfactory cruising trimaran from our A.Y.R.S. studies, the racing trimaran design is perfectly obvious. It consists of a single catamaran hull in the middle and two others from the L.W.L. downwards with a flat deck at the L.W.L. thus removing all the topsides. Two streamlined athwartships poles align the three hulls. The Result is what Tom Burnham calls a " Three hulled catamaran " but with less weight and wetted surface than a two hulled one. It is not known whether the windage will be greater or less than that of the comparable catamaran. Instead of buying three catamaran hulls, the floats can be made of the same length as the main hull but with forward sections of a right angled V triangle, the after sections being flattened somewhat. My *Padang* design of A.Y.R.S. No. 30 shows the idea. In my opinion, the narrow V keel angle of the cruising trimaran float would not be the fastest for the racing trimaran of small size.

THE HOOK HYDROFOILS. Due to the efforts of A.Y.R.S. members, the trimaran is now an established configuration and this leaves us only the job of developing a satisfactory hydrofoil craft.

Various governments have spent many millions of their money on these craft but so far no one has really shown that they are fully satisfactory for pleasure or commercial use. Both the Baker V foils and the Karl *Sea Wings* are being sold commercially. No reports on their value have as yet been given to the A.Y.R.S. However, from the films shown to us by Christopher Hook, it is quite obvious that his system is fully seaworthy in a seaway and that is where the other systems are suspect.

In A.Y.R.S. No. 36, a hydrofoil system was shown of roughly the Grunberg configuration, using a float forward. The drawing here shows the same system using a Hook hydrofoil mechanism forward



which can be steered. The essence of the mechanism is that the " feeler arm " works the hydrofoil strut through a spring. However, the foil strut movements are heavily damped so that the craft is not shaken by small waves but merely rides over them. This is carried out in the drawing by a " dashpot " damper which is fixed to another strut which is horizontal. Now, in any seaway of reasonable size, occasional exceptionally high and vertical waves are met to which the normal working of the jockey float and feeler arm will not give enough response. This situation is catered for in this drawing by having the feeler arm run up against a stop in the damper strut from the foil and this can tilt the horizontal strut against the spring placed over the bow of the boat.

It is believed that the original patents of the Hook "Hydrofin" have run out as they were taken out in 1941 but it is not known if any subsidiary patents cover any of the ideas suggested here.

TRIMARAN FLOATS

The design of both racing and cruising trimaran main hulls is now settling down to well tried out principles and little further can be said of them at present. Float design, too, is quickly being finalised but its present state of development is still somewhat fluid with some different schools of thought being apparent.

THE LENGTHS OF FLOATS. Like all boats, the top speeds of these long narrow shapes are governed by their length. The relationship is between 4 and 5 times the square root of the waterline length in feet. Therefore, if one expects one's design to have a top speed of 16 knots, the length of the float should be 16 feet with a transom. If the design is to go at 25 knots, the transom sterned length would be some 25 feet. At 30 knots, a 36 foot length would be needed. It will be noted that the ratio of 4 is used for the smaller boats, while the ratio 5 is used for the larger ones. This is because the relative displacement is greater with the smaller boats than the larger, even though these latter should be cruisers.

THE BUOYANCY OF FLOATS. It has been accepted so far that the total buoyancy of trimaran floats shall be less than the total weight of the whole boat so that they will submerge on heeling, in preference to lifting the main hull. It will be noted, however, that Arthur Piver's floats are larger than this critical amount but he states that they still submerge on heeling. The reason for this can only be the downward pressure exerted by the sails when the boat is heeled, or for that matter even when upright. (The sails of an upright boat deflect the wind UPWARDS as well as sideways.) The exact downwards pressure exerted by sails is not known at present.

THE THREE HULLED CATAMARAN. The definition of this is a craft whose total displacement can be carried by the lee float up to and beyond the point of capsize. It is thought to give some advantages by Tom Burnham who is using it for his new cruising trimaran—a motor sailer. The thought behind the concept is that the large cruising catamaran is extremely difficult to capsize because its sail area is relatively small. The cruising trimaran owing to its lesser wetted surface and weight has even less relative sail area and would therefore be impossible to capsize. This argument seems sound.

THE DAY RACING TRIMARAN. For this craft, where a capsize would not ordinarily be disastrous, floats can have any amount of buoyancy which improves speed. Now, the slight submersion of the lee float which would occur when racing must result in increased resistance and so the lee float must not ordinarily submerge. It therefore should be able to support the whole craft including the crew. The only exception to this concept would appear if submerged buoyancy proved useful but one must feel that hydrofoils must be better than submerged buoyancy.

THE FLOAT SECTION. Since 1955, we have moved from box-shaped sections which were narrow (Victor Tchetchet) or wide (Arthur Piver) through the right angled V keel angle (Morwood) to the narrow V keel angle at present being used by Arthur Piver to the very narrow keel angle used by Owen Dumpleton in his *Mantua.* Obviously, any narrowing from a right angled V is an inefficiency which we accept for ease of sea motion. As shown by Owen Dumpleton, long low floats do not function as hydrofoils as such, owing to their low aspect ratio. The special case of Erick Manners' *Trifoil* is considered later.

THE FLOAT PROFILE. The right angled V keel angle more or less dictates its own profile. But, when a narrower keel angle is used, there is a choice of profile which will dictate the stability curve of the craft in question. For instance, a long, low and almost straight keel line will give a high initial stability whereas a markedly curved keel line rising fore and aft will give a lower initial stability, an easier motion and less wetted surface. The boat will be easier on her gear and crew but there will be some heeling. Arthur Piver favours the high initial stability keel line and states that his boats "just don't heel." The prototype *Mantua* had an initial stability like a keel boat up to 15° of heel after which the stability became firm. When sailing *Mantua*, I found this pleasant but Owen feels that greater initial stability from a wider section angle at the keel would be preferable.

THE IDEAL FLOAT PROFILE. It appears from the above as if Arthur Piver is losing efficiency in his floats by having a keel angle of about 50° in order to have ease of sea motion but is acquiring more sea motion by having too great a length of float immersed when on a level keel. *Mantua's* fault (if it is a fault) was excessive ease of motion both from the fine keel section angle and the profile.

The ideal solution is to have floats of a curved profile and so adjust their buoyancy that the waterline length at an angle of heel is "ideal" for the close hauled speed to be expected at that angle of heel. Because we are dealing with a buoyant form, the curve of sectional areas at all levels of immersion should be even and fair and in accordance with what is usual, possibly a versed sine forward and trochoid aft. Neither Arthur Piver nor Owen Dumpleton are very far from this ideal at the moment but they and other people designing trimarans would be well advised to do some work on this problem.

THE MANNERS FLOAT IN *TRIFOIL*. *Trifoil* was described in A.Y.R.S. No. 36. The float consists of a plywood "box" some 12 feet long and pointed at both ends, the curve of the plywood being only on the side next to the hull. The principle section is 12 inch by 3 inch. The buoyancy is about 100 lbs. but dynamic lift appears while in motion and the stability of the craft is good while the craft is moving. Obviously, this float does not function as a hydrofoil as ordinarily defined but behaves like the Micronesian asymmetrical hull in general. However, the float is given some "slope-out" and "toe-in" and I feel that the dynamic lift is entirely due to the pressure on the flat, and angled outside surface. I cannot see any way in which negative pressure could be generated on the inside curved surface except for a very short distance at the bow. The rough water characteristics of this craft are said to be good.

JOE'S FOLLY

A First Venture into Boat Design

by J. H. Gill,
5, Chelmerton Avenue, Chelmsford, Essex.

Foreword.

This account is not for experienced amateurs. All I have for them is grateful acknowledgment for the many fascinating contributions they have made. It is on these that any ideas that I may have are based.

The only excuse for bursting into print, then, is to demonstrate yet again what fun it is to evolve one's own design, with always the hope that even the humbler experimenter may accidentally make some contribution of value.

The trimaran configuration was chosen because this seems more likely to be acceptable to those steeped in traditional craft, and is capable of being developed into more artistic designs. After all, the main hull is still a boat, and it seemed too that the traditional characteristics of sailing boats would be maintained in a large measure. Not the scientific point of view perhaps, but since we are concerned mainly with pleasure boats it is relevant that beauty of line should be preserved alongside improvement in performance. Not that any of this applies to *Joe's Folly* ! No less important is that float supporting structures in trimarans are relatively simple, and it makes breaking down for trailing easier.

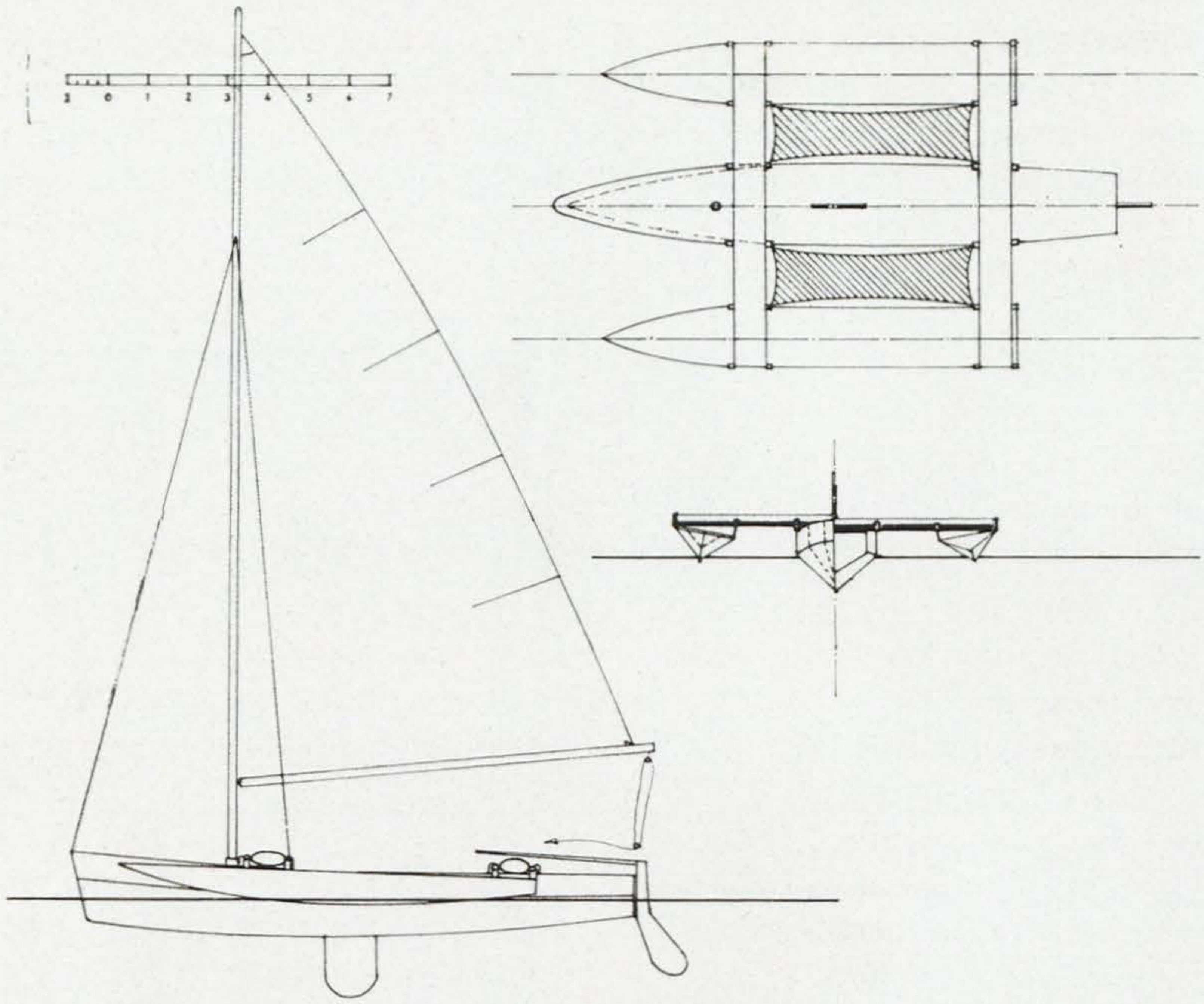
Joe's Folly

Design.

Originally I thought in terms of a 12 footer, to fit comfortably in my workshop. Preliminary calculations soon showed that a reasonably narrow hull of that length would provide insufficient buoyancy, so she grew to 14 feet.

The main hull is of typical chine construction, with frames of common deal of one inch square section and chines, gunwales and hog of parana pine. The latter I would not use again, as it is rather brittle and heavy. Planking is in builders grade w.b.p. 4 mm. mahogany ply. As will be seen from the plans, the main sections are of right angle " V ", fining off to the bow and flattening slightly aft.

Similar, but lighter, construction is used for the floats, with the same planking material, but in this case the right angle section is carried right up to the pointed bow, though there is rather more flattening aft. I spent a long time debating the size of these floats, and compared to some designs I have seen they appear to be large.



The net buoyancy of each float is around 400 lbs., and while they look large in plan they appear much more reasonable in profile. As even these have been awash at times I have yet to be persuaded that they could be much smaller while retaining the moderate overall beam of 8 feet. Even so, I have a feeling that their length to breadth ratio is on the low side, and a longer float would probably perform and look better.

In the planning stage I thought of many ways of joining up the floats and the main hull, but rejected the more elegant methods on account of lack of confidence in my design calculations. In the end the scheme shown was adopted, consisting of two immensely strong and rigid hollow streamlined cross beams, with the space between the hull and floats filled with canvas supported like hammocks. In the event this is the least satisfactory part of the design, though it did give me wonderful opportunities for studying wave formation and also made adjustment of float position and angle of incidence easy. Having sailed the boat quite a bit now I have a very much better idea of where the floats should be, and the position for the crew.

The total cost so far has been under £50, though I was lucky to get a secondhand Albacore mainsail, and the mast, albeit severely bent and in two pieces, was kindly lent by a friend.

Performance Trials

I picked a day of light wind for the initial trials. Evidently my calculations and guesswork were not too far out, as the boat sailed off right away with reasonable trim of the helm. She seemed a little slow in stays, and failed once or twice until I adopted the method of remaining on what was the weather side until the sail filled on the new tack. I think she should be altogether more certain in this respect when a foresail is added.

A good deal of minor adjustments followed, a notable one being an increase in the angle of incidence of the floats. From being parallel to the main hull they are now depressed at the rear end by about 2 inches. This overcame a tendency to bury in strong winds.

While the boat goes well in light winds, the real fun is in a blow. I had her out on a day when all racing was cancelled at our club, and those who ventured out in dinghies had to indulge in particularly strenuous gymnastic exercises. Yet though I set off full of trepidation it turned out to be a most delightful sail, with no special exertion necessary, and while I had doubts about Folly's ability to cope with the short steep seas we get in the River Blackwater, she stormed to windward over them like a show jumper. Turning downwind onto a broad reach in these conditions is most exhilarating, and while the speed may not be very great in fact, it certainly seems so. Observers on shore describe this form of progression as a head and sail sticking out of a haze of fine spray.

Incidentally, I think I have located the source of much of this spray. The stem has rather a large mahogany capping, rounded off, about 1 inch wide on the waterline and about 4 inches on top. Surprisingly enough, water runs up this narrow edge like a fountain, spreads out and breaks underneath the gunwale. Obviously there is good reason for razor sharp bows on this type of craft, and the remedy is easy.

Comparative trials with other boats in moderate winds indicate that going to windward she can hold her own with Enterprises, but in a broad reach can overtake planing Albacores and has passed a 505 in the same conditions.

Future Developments

During the winter there will be much cleaning up to do. The bow will be sharpened off and come forward about 6 inches and the stern must follow through for at least another 18 inches. The cross-beams will be replaced by a central platform about 6 feet wide, with light ash brackets outboard to support the floats. Some thought will be given to making the latter look more elegant, and above all ways and means must be found of reducing the present rigged weight of about 300 lbs. Finally I shall add a foresail of 30-40 square feet.

TRIMARINA

A fifty-fifty Trimaran

21 ft. L.O.A.	2 ft. 8 in. W.L. Beam.
19 ft. 9 in. L.W.L.	9 ft. 6 in. over outer hulls.

Designer : A. Walling, 14, Sunbury Court Island, Sunbury-on-Thames, Middlesex.

About ten years ago, realizing that Anno Domini would restrict the writer's dinghy racing activities, a Trimaran was designed and built for experimental purposes. This was 11 feet L.O.A. x 6 feet over outer hulls. This first attempt was a complete failure.

The next effort was 13 feet L.O.A. x 2 feet 6 in. W.L. beam and had box section outer hulls fixed to two tubes which permitted the hulls to be moved athwartship as desired, i.e., the leeward hull was about 5 feet from the centre hull. This craft was only moderately successful mainly because the outer hulls were the wrong shape.

Trimarina the third and latest attempt was designed and built in 1959 and had to meet the following specific requirements.

1. A craft to sit in—not on !
2. To be reasonably fast under power. We like to reach the Medway River and back to our moorings, which is 20 miles up the Thames from London Bridge, in one day. Three locks have to be negotiated also.
3. Minimum wash on the upper reaches of the Thames.
4. No pounding to enable speed to be maintained in an estuary chop.
5. Self draining or baling.
6. Low power for (a) economy (b) low fuel consumption for 14 hours cruise without re-fueling (c) minimum weight.
7. Rigged for sailing. The rig to be handy for passing under low bridges.

To meet these requirements *Trimarina* embraces the following features.

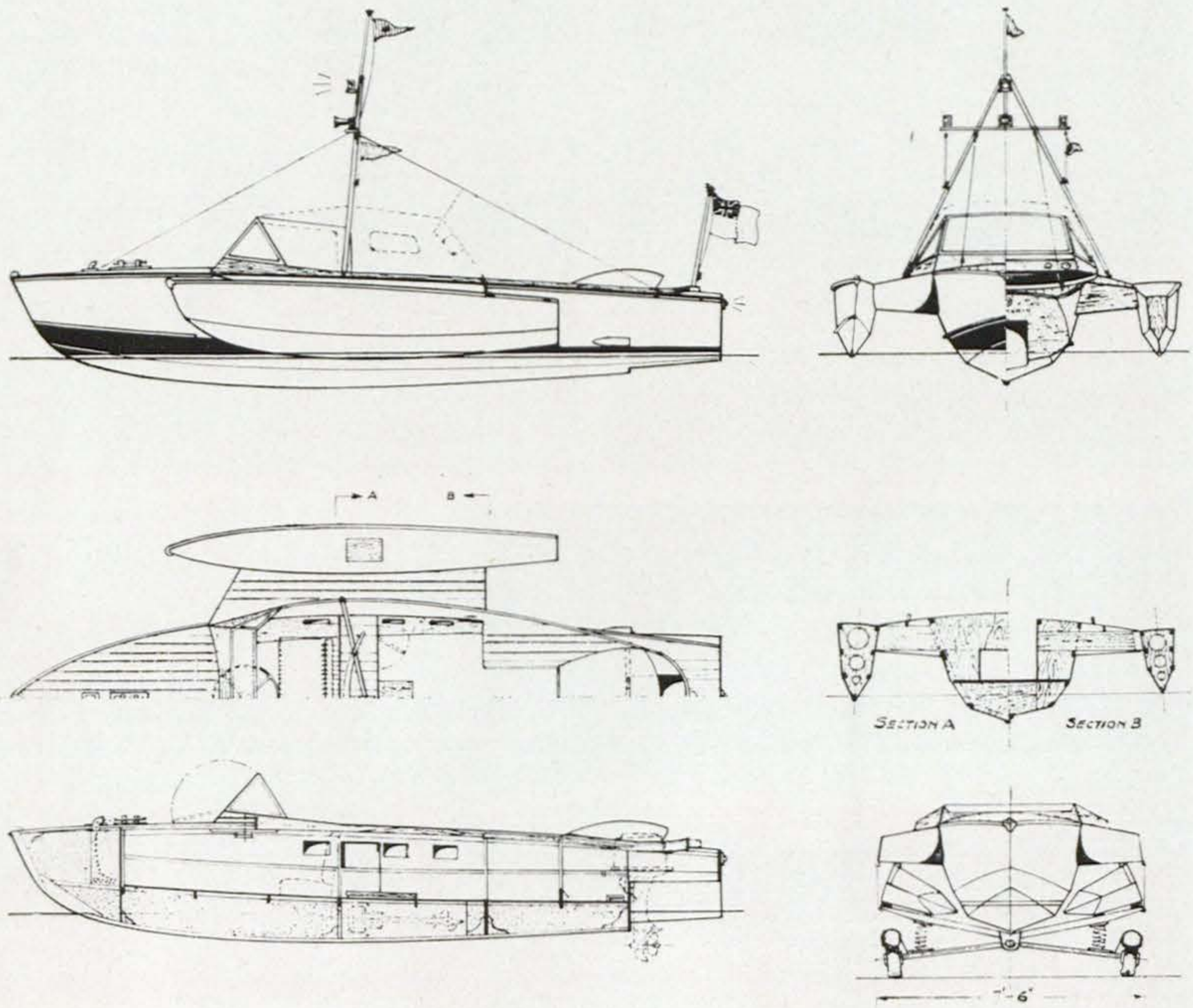
1. When under power we sit forward behind a collapsable perspex screen with removable hood if required. Steering is by horizontal wheel 2 feet 6 in. diameter half of which is under the foredeck. The wheel is coupled to the outboard motor and is on the centre-

Trimarina

line of the foredeck. Either of us can steer without changing position.

2. When sailing the outboard is retracted. The helmsman steers from aft by extension tiller steering to hinged rudder.
3. Speed under power 15 m.p.h. with two crew—14 gallons fuel etc., total weight about 950 lb.
4. At top speed a long low swell, about 9 inch deep is produced. There is no broken water.
5. Because of the fine entry and clean run there is no pounding ; at top speed in broken water the motion is very " soft."

6. The " lower " deck is located at chine level all of which is above L.W. line—water drains through non-return scuppers aft.
7. " Johnson " 10 h.p. short shaft, standard prop.
8. Rig is stay'sl and gunter main—aluminium mast and spars—mast hinged and can be raised and lowered from forward steering position. Sail area 185 square feet.



TRIMARINA II. L.O.A. 19'-6". BEAM 9'-6" DRAFT 11½"
COPYRIGHT. Registered Design No 894475.

Trimarina has proved to be a very satisfactory and versatile craft. Construction is marine ply and positive buoyancy is built into the main hull, and outer hulls. Total displacement of buoyancy 1,200 lb.

Conclusions : We believe that the main hull and outer hulls are correct regarding shape and proportions but the overall beam of outer hulls is not sufficient. 12 feet overall beam would be more satisfactory as has been proved by the other designers during the last 2-3 years.

Finally, it is hoped that *Trimarina* a day boat, may be superceeded by a fourth attempt which will be a cruising trimaran about 35 feet L.O.A.

EXPERIMENTAL TRIMARAN

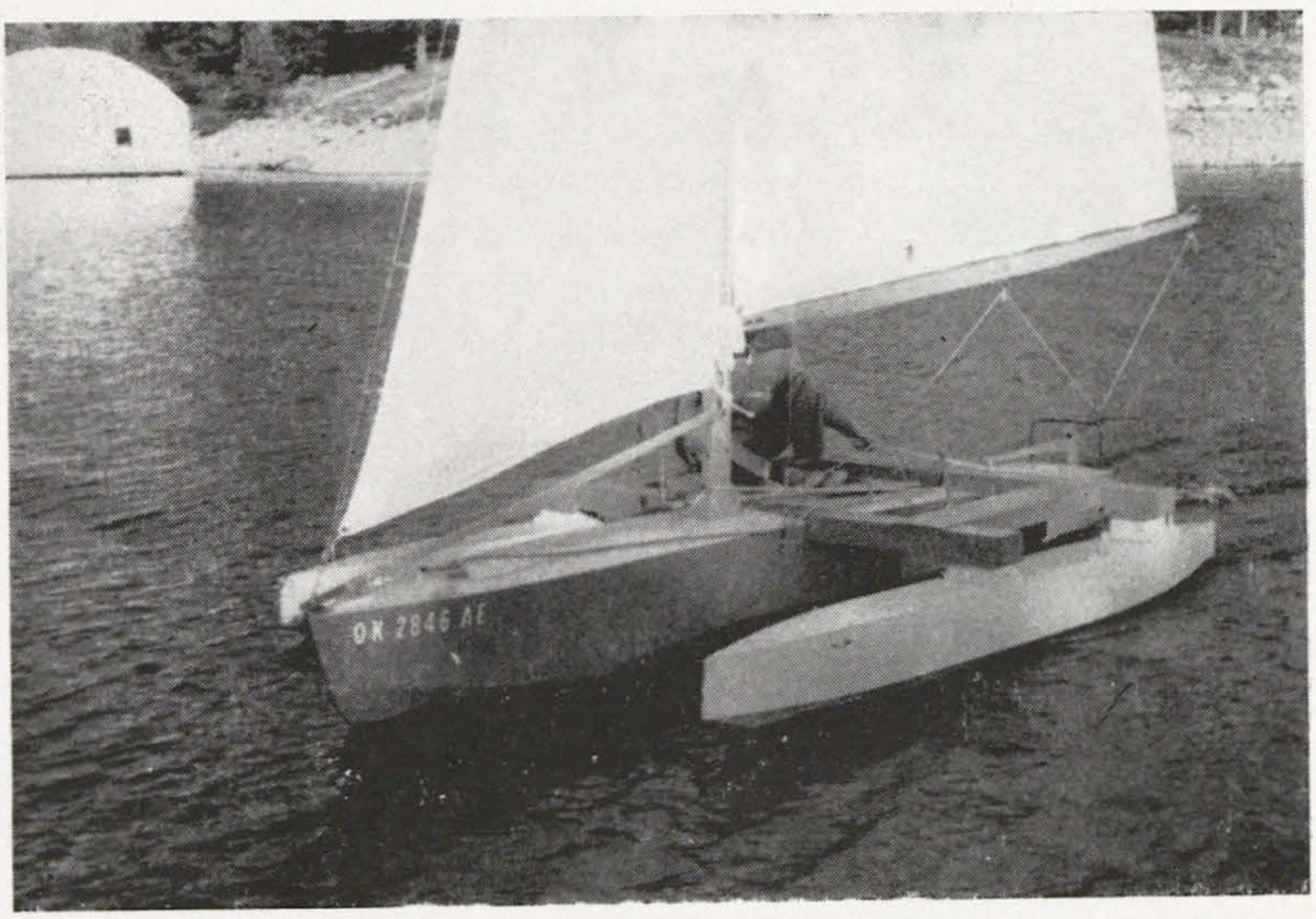
L.O.A. 15 feet 9 inches
Beam 7 feet 9 inches
Draft (Board Up) 7 inches

Weight 350 lbs.
Displacement 450 lbs.
Sail Area 150 sq. feet.

Designer and Builder : James H. Burkhart, 1001 S. Lewis Avenue, Pryor, Oklahoma.

The purpose of building a trimaran was to develop a design of a hull form which if successful could be used as a mold to construct two hulls for a catamaran.

The main hull is concave forward changing to a vee, then to round midships, flattening on the bottom toward the stern. The floats are 90° V bottom. The bottom or curved portion of the main hull is glue strip construction, sides and deck are of $\frac{1}{4}$ in. plywood. Floats are $\frac{1}{4}$ in. plywood with no framing except at the seams. Cross-beams are $\frac{1}{4}$ in. plywood box construction.



J. H. Burkhart's Trimaran

While light weight was the goal during design and construction, results fell far short of intentions and overload conditions prevailed with a crew of one. Launching was late in the season so a stretched canvas bottom was never installed between the hulls, leaving two open areas and resulting in a very uncomfortable ride.

A one week trial in light to strong winds indicated that in spite of the overloaded condition even with one aboard, a catamaran with similar hull design would be worth the work of construction. The trial ended with a shroud and subsequent mast failure.

Sails were not full battened and were much too full for sailing in any wind heavier than a light breeze.

As a method of testing a compound curved hull, a trimaran offers an obvious advantage over a catamaran for an amateur who must construct his own boats, although overloading and other problems complicate the results.

CATAPULT

L.O.A. 16 ft. 0 ins.	Floats : 12 ft. L.O.A.
Beam 7 ft. 6 ins.	Beam 1 ft. Rocker : 4 ins.
Weight 200 lbs.	Sail area : 150 sq. ft. (with jib).

Designer and builder : J. A. Cochrane, 30 North Brink, Wisbech, Cambs., England.

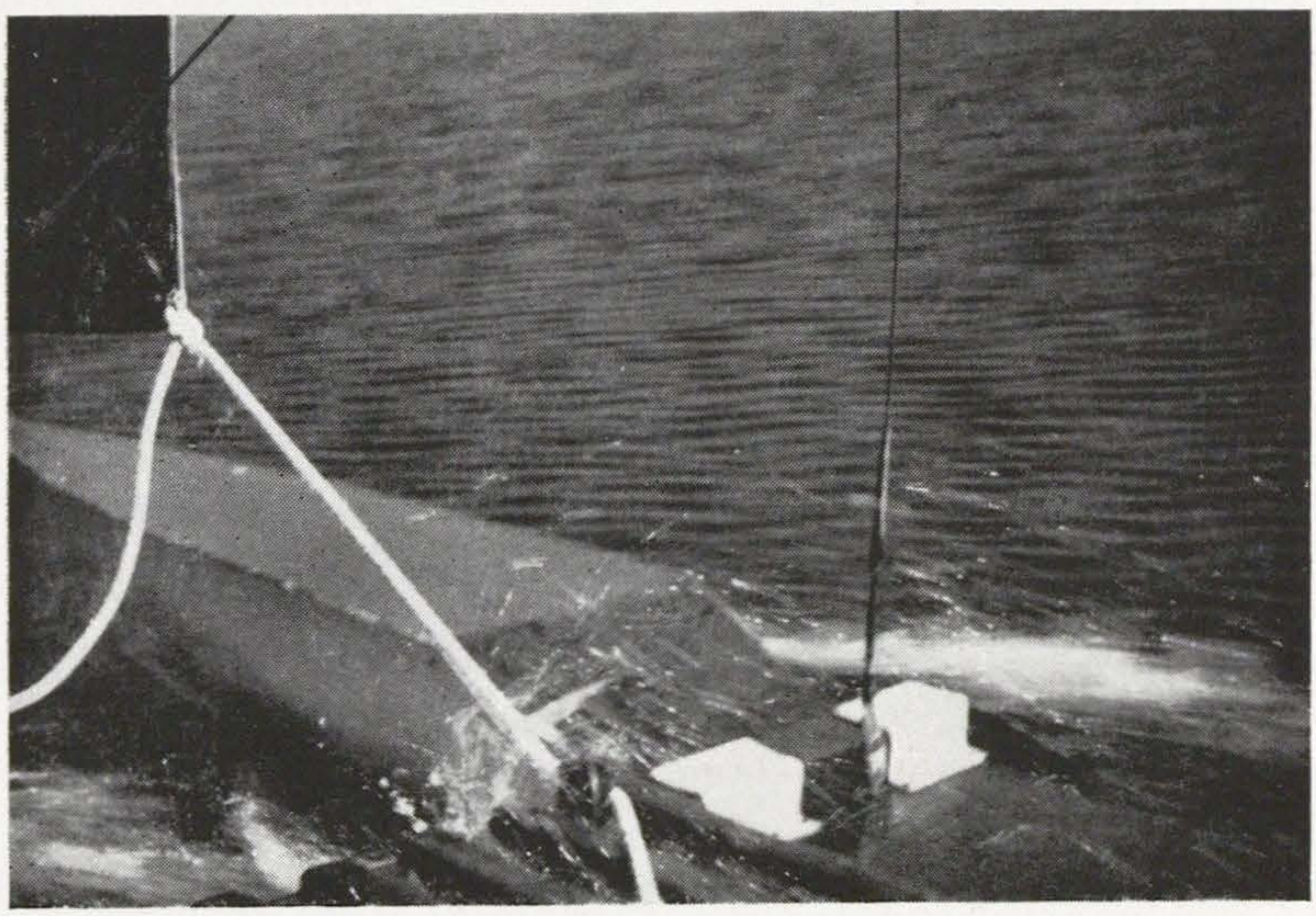
I have pleasure in enclosing details of the Mark III version of my trimaran *Catapult*, of which any constructive criticism would be welcomed. She started three years ago as a mock-up which could easily be torn to pieces and re-built as ideas came along.

The Main Hull. This was built of edge glued $1\frac{1}{2}$ inch by $\frac{1}{4}$ inch fir covered with fibreglass mat and rubbed down to a smooth finish. She is chined forward and round bilge aft (almost a semi-circle) and has 7-8 inches of rocker, making her very fast to come about. The entry is very sharp with flared sides to midships. This keeps down all spray from the main hull.

Experiment I. Floats 5 feet by 1 foot, filled with expanded polystyrene, were put on folding cross beams to give an overall beam of 12 feet. These were too short and small and would submerge in a puff, dragging the cross beams in the water. I was misled to believe that at speed planing of the floats would appear but this never happened.

Experiment II. Hydrofoils were then made to fit on the floats amidships. These helped quite a bit and a certain amount of lift was produced but they gathered a lot of weed and rubbish and it was decided to scrap the floats and foils.

Experiment III. Two more fibreglassed floats 12 feet by 1 foot were made and fastened to cross beams giving an overall beam of 7 feet 6 inches. With an *Enterprise* rig, the results were very satisfying. In extremely light airs the *Enterprise* has a slight edge on *Catapult* but at a wind speed of about 5-6 m.p.h., *Catapult* comes into her own and carries this advantage throughout the whole wind speed range. So far, the maximum speed between two fixed points has



Catapult

been 14 m.p.h. She has done better than this, I feel sure, but we have no facilities for assessing this. In the photograph showing spray from the lee float, I am sure she was doing over 10 knots and there was not much wind that day.

K.I.

BY

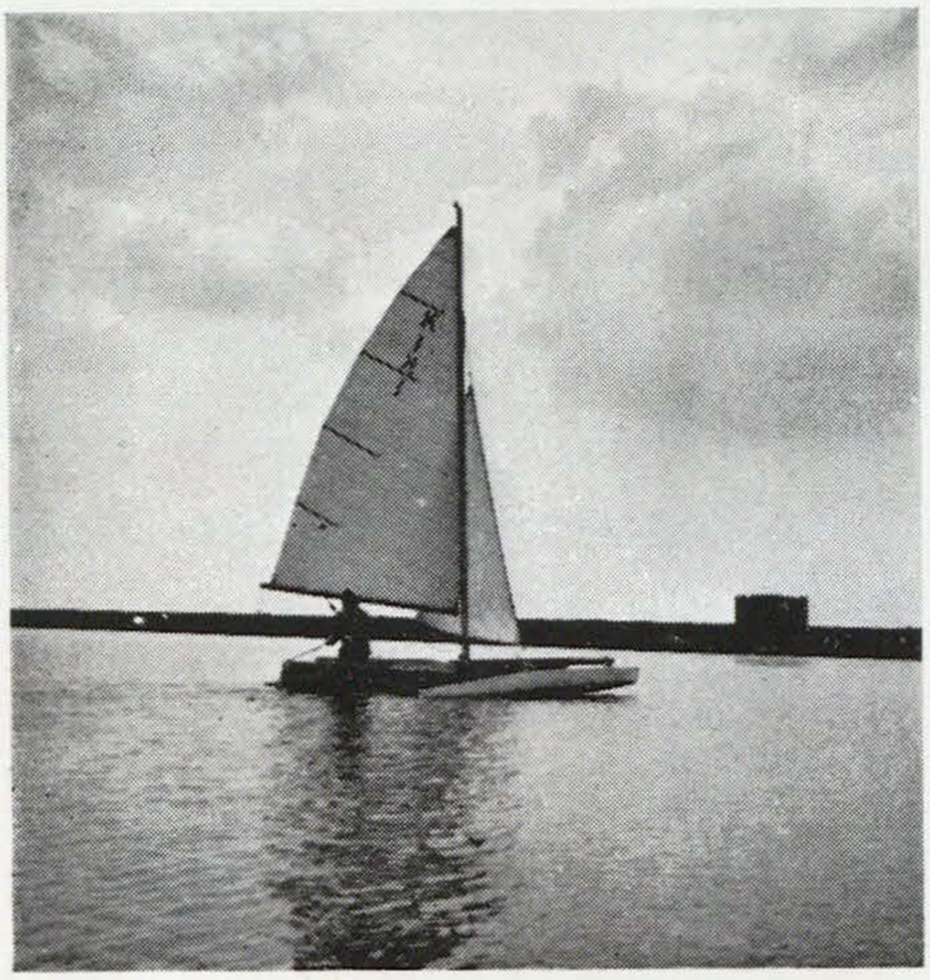
WALTON MACKEY

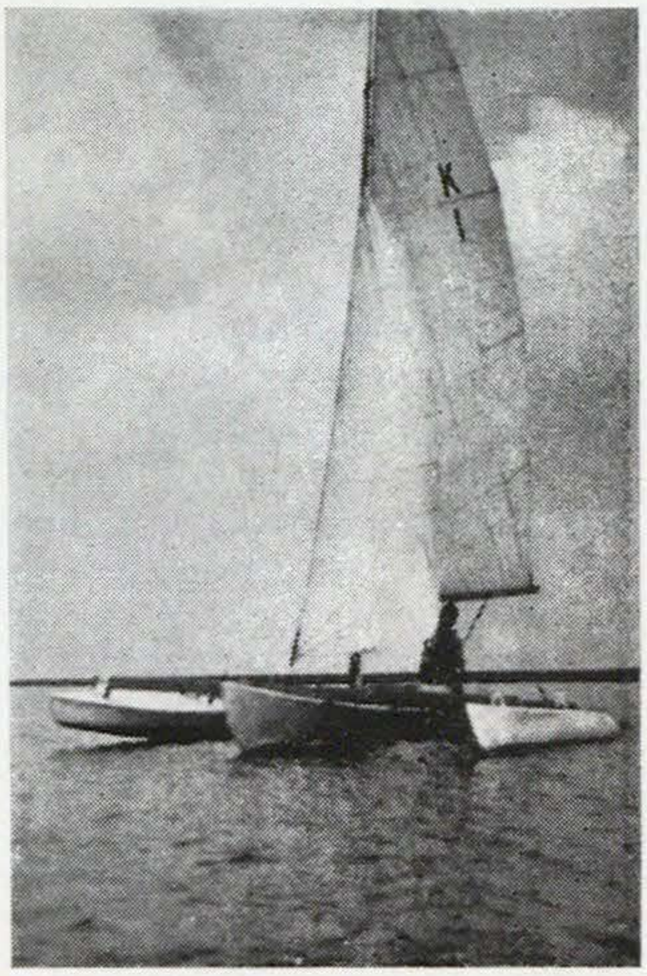
33, Broadclyst Gardens, Thorpe Bay. Essex.

L.O.A., 20 feet.	Float L.O.A., 17 feet.
Beam O.A., 12 feet.	Float Beam, 1 foot 6 ins.
Main Hull Beam, 3 feet.	Float Weight, 120 lbs.

Sail Area 170 sq. ft. on a 24 ft. aluminium mast.

The above are the main features of my trimaran, built in January 1961. It weighs about 200 lbs. too much, being made of fibreglass. Each float is made as a miniature of the main hull so that it would not pound and take the seas easily. One advantage of having such large floats is that they are never driven under but just skid along on the aft two thirds. They, like the main hull, are round bilge in section and they taper to a point aft so they leave practically no wake.





K.I.

Performance. There is a dagger board in the main hull, and due to this and her shape she comes about on a sixpence and goes as close hauled as a racing dinghy. She is a fast dry boat and no sitting out is required. In a fresh breeze the windward float is clear of the water and the trimaran has a slight angle which, unlike the dinghy, does not increase in gusts, but makes it go faster.

Future Plans. I now want to try an experimental hydro-foil float in place of one of my ordinary floats and, when I have one which works, I should like to construct a 30 foot cabin trimaran. My present ideas tend towards a low aspect ratio float-foil similar to Erick Manners'.

TRINE

L.O.A. 32 feet.	Float L.O.A., 23 ft. 8 ins.
Beam O.A.	Float beam 2 ft. 5 ins.
Sail area : 475	Float displ., 2950 lbs.

Designer and builder : Dick Newick, 1 Company St., Christiansted, St. Croix, U.S. Virgin Islands.

Ed. : See Cover photograph. Members will remember the very pretty and nice catamaran AY-AY by this designer. Dick Newick writes :

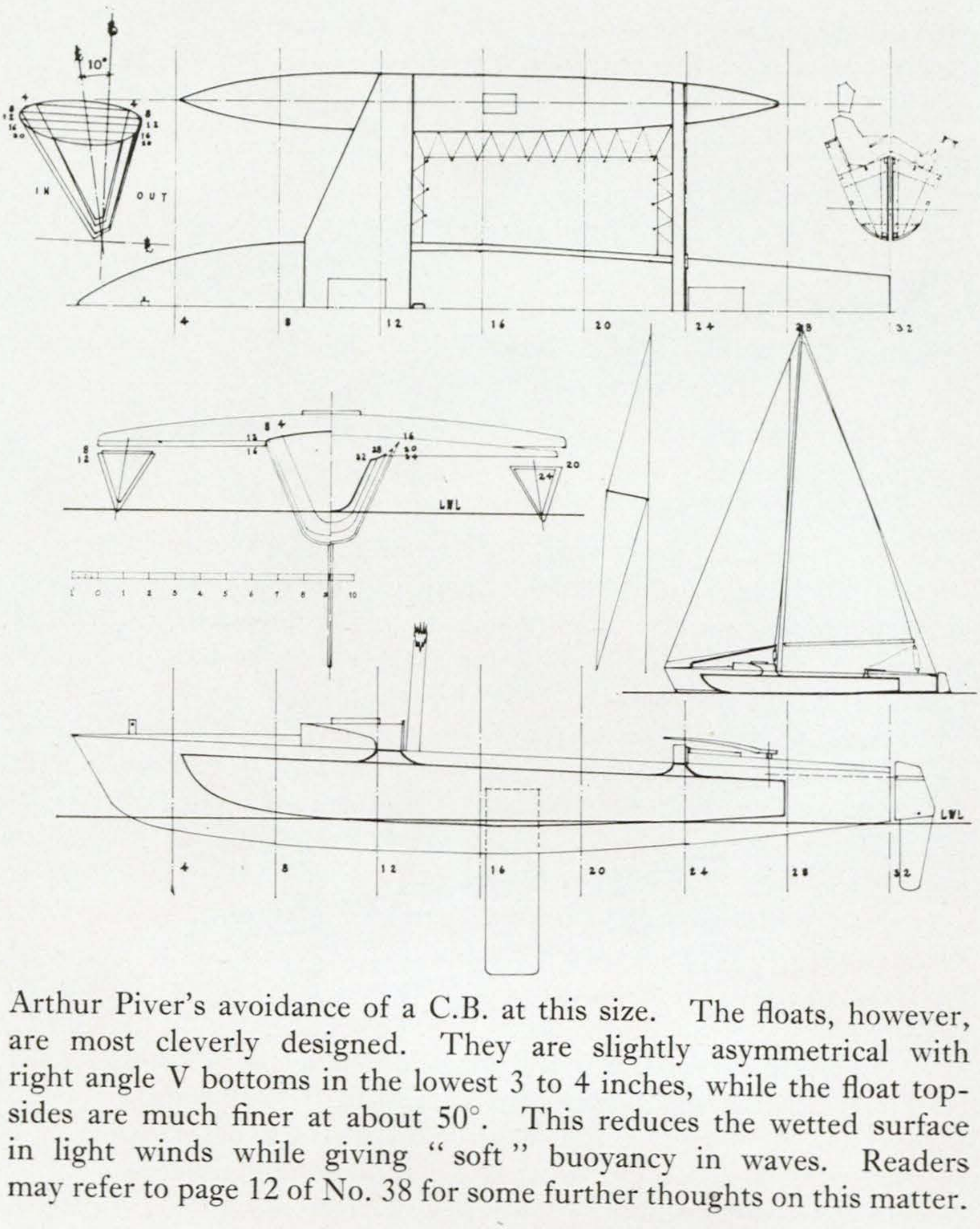
She is basically my design, but I retained Maclear and Harris as consultants and got some valuable help from them. They suggested larger floats and more sail area than I originally intended and practice has proven them right. In fact, for these waters and strong winds, I would like to increase the float displacement by several hundred pounds so we would not have to carry our crew to weather quite so soon when it starts to blow. Unless we have a considerable weight to windward in winds over 18 knots, we must start reefing.

Along with the Maclear-Harris help in the design, I am also indebted to the A.Y.R.S. publications and your own kindness in answering some vexing questions, plus valuable suggestions from Erick Manners, Victor Tchetchet and Louis Macouillard, all of whom have had considerable trimaran experience and were kind enough to share it.

Trine is often used in taking passengers for hire and occasionally on 40 mile inter-island passages so she is strongly (and slightly heavily) built. She is delightful for cruising these warm waters where we are never far from a sheltered cove for an overnight anchorage. She can sleep four with waterproof awnings and hammocks but, primarily, she is a day boat, and one good man can handle her with six passengers.

She is a delight to sail under any conditions but throws considerable spray in a rough sea at over 10 knots. Fifteen knots is easily reached on our speedometer and the best reading go over twenty. I'm quite certain that under ideal conditions (surfing down a large sea with 30 knot winds) we have approached 30 knots in short bursts.

Ed. : The main hull has plywood topsides and strip planked bottom. The shape is ideal of the rounded bottom type but it may be a little too full forward which may be the cause of throwing spray. The large size of centreboard should be noted, as compared with



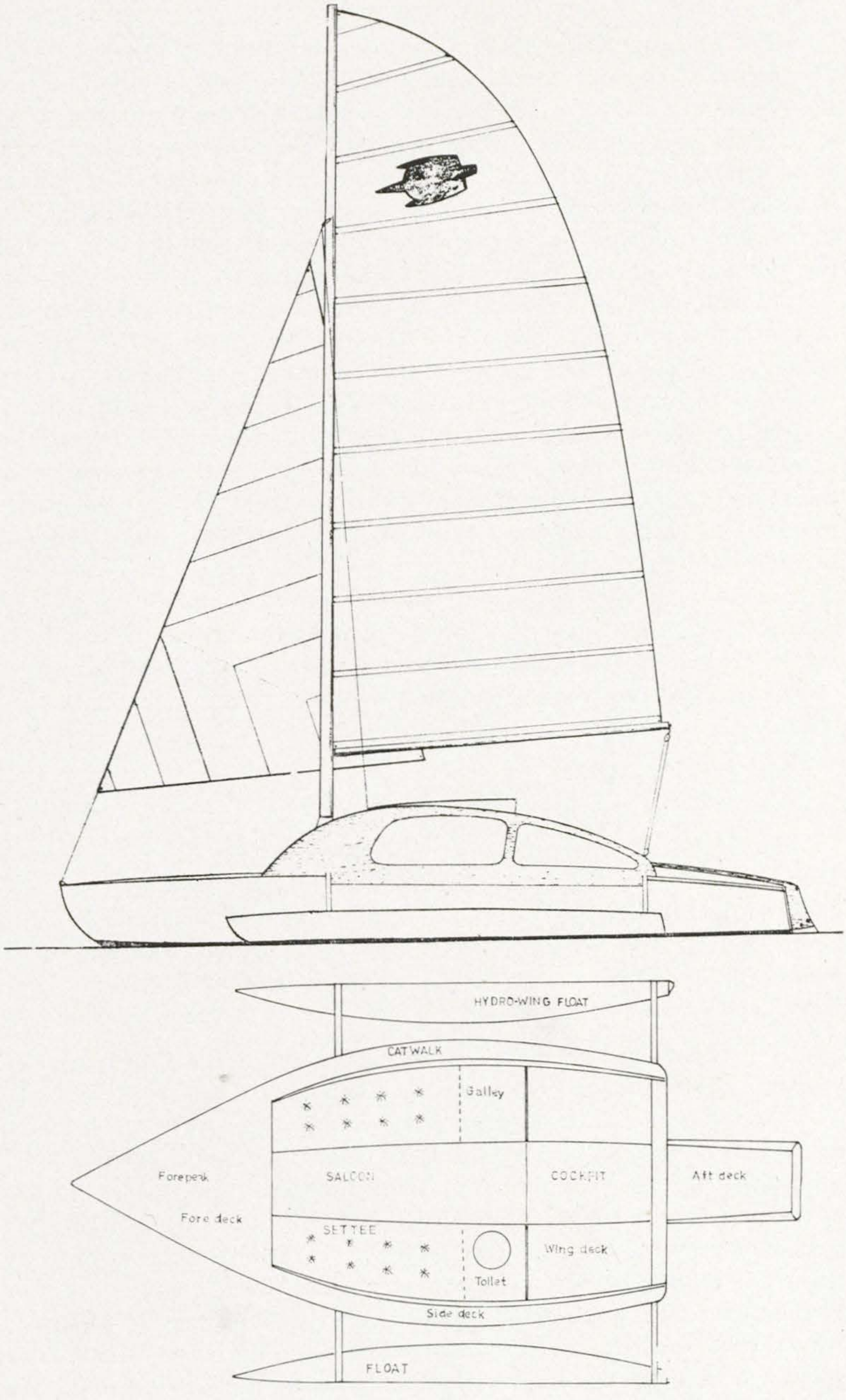
Arthur Piver's avoidance of a C.B. at this size. The floats, however, are most cleverly designed. They are slightly asymmetrical with right angle V bottoms in the lowest 3 to 4 inches, while the float topsides are much finer at about 50°. This reduces the wetted surface in light winds while giving " soft " buoyancy in waves. Readers may refer to page 12 of No. 38 for some further thoughts on this matter.

TRICRUISER

An Express Cruising Trimaran

L.O.A., 20 ft.	Berths, Two
W.L.L., 18 ft. 9 in.	Cockpit length, 3 ft. 6 in.
Overall beam, 10 ft. 10 in.	Draft (less board), 10 in.
Cabin length, 7 ft.	Sail area, 190 sq. ft.

Designed by Erick J. Manners, M.I.E.I., M.I.N., A.M.B.I.M., 93, Ridgway, Westcliff-on-Sea, Essex.


HYDRO-WING FLOAT
CATWALK
Galley
Forepeak
SALOON
COCKPIT
Aft deck
Fore deck
SETTEE
Wing deck
Toilet
Side deck
FLOAT

Tricruiser

The objective of the 20 ft. Tricruiser illustrated here is to provide an economic express cruiser that the amateur can readily build in sheet ply. To ensure its high speed potential the cabin has to be small, low and centered amidships. To make a longer, higher cabin and to bring the cockpit aft would quite defeat the speedster object in this design of the fastest possible weekend boat retaining the joys of two snug berths and a cooking stove. For more comfort at moorings the cabin top can be made lifting. The front part of the coach roof simply consists of ply bent down to the streamlined curvature shown in the side elevation. There is a large perspex port either side set in neuprene rubber, the aperture aft of the cabin is a plain opening with a fixed or hinged top rail to stimulate the continuity of line.

In the covered cabin to either side of the deep leg well cockpit entrance there is provision for a galley with sink and tiny stove. On the opposite side is a round 12 inch hole to take a plastic wash basin, removed to empty and voila a trouble free overboard toilet without heavy plumbing costs.

In the plan view the cabin, shown with the roof off to portray interior, measures 7 feet x 6 feet 6 ins. and the cockpit 3 feet 6 in. x 6 ft. There is a side catwalk leading to a spacious foredeck whose overhangs hold down spray to give a dry boat.

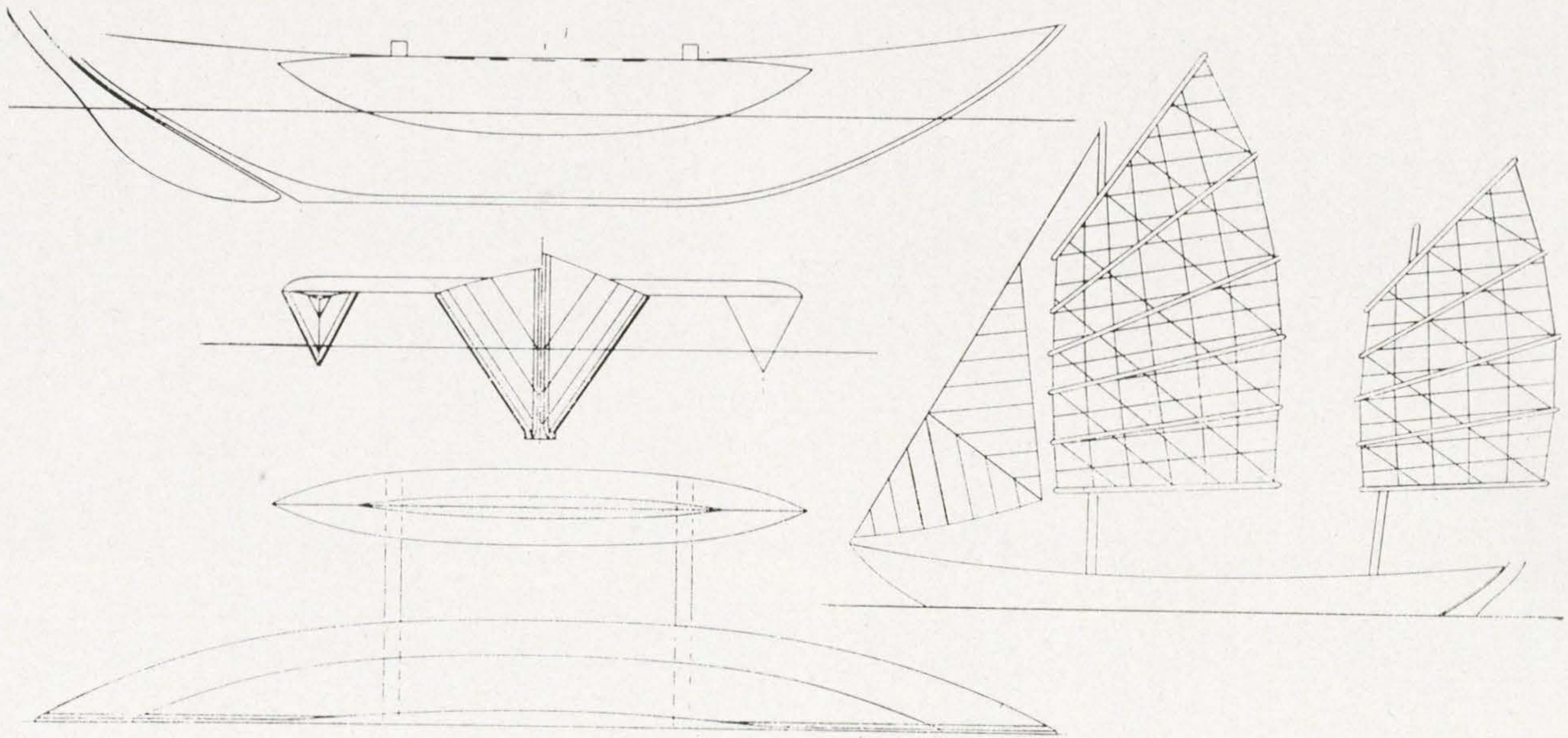
ANANDA

L.O.A., 43 ft	Draught, 4 ft.
L.W.L., 34 ft. 3 in.	Displacement 8.7 ton.
Freeboard, 2 ft. 7 in.	Sail Area, 600 sq. ft.
Beam O.A., 22 ft. 1 in.	Float L.O.A., 22 ft. 9 in.
Main hull 9 ft. 1 in.	Float volume, 2.3 ton.

Designer : Andre Sadrin (in 1946).

A. E. Bierberg has kindly sent us the account of the Trans-Atlantic crossing of *Ananda* in 1946 from *Les Cahiers du Yachting*.

Ananda took 10 days to go from Casablanca to the Canaries—a distance of 900 miles and a further 20 days to go from there to Martinique. The crew was not happy about the ship. On the second day of the second trip, the wind blew at force 9-10 ; the sea was high with breaking crests of up to 25 feet in length. *Ananda* then apparently became a submarine and the crew shut themselves below with poor ventilation. She was uncontrollable with the wind free or with the wind astern and the steering exhausted the tough crew after 4 hour spells. The tiller also had the habit of kicking the helmsman in the stomach which they didn't think funny.



Ananda

A.Y.R.S. members will see in *Ananda* many features of trimarans which have now proved to be useful and will wonder where her bad behaviour came from. A list of faults can be stated as follows :

1. The main hull is too heavy with a canoe stern and steeply rising buttock lines. The 60° V gives more wetted surface, and directional stability. All these factors tend to give a hull which will overpower a helmsman.
2. The floats are too short and beamy. When the weight of the wind is on one, it would drag the boat to that side. The main hull shape will also turn the boat to the side to which it is heeled. A finer keel angle of the floats would have been better to ease the motion.
3. The Chinese style sails have been often tried and found wanting from the practical point of view. In general, it may be said that these sails must be of exactly the Chinese pattern or of a well tried type before they can be recommended.

Summary. *Ananda* was a fast boat with many features found in the most modern trimarans. The general design had the touch of genius so often shown by the French and it is a great pity that the faults which appeared in her ocean crossing allowed the concept to be put aside.

MANTUA

Trimaran Cabin Cruiser

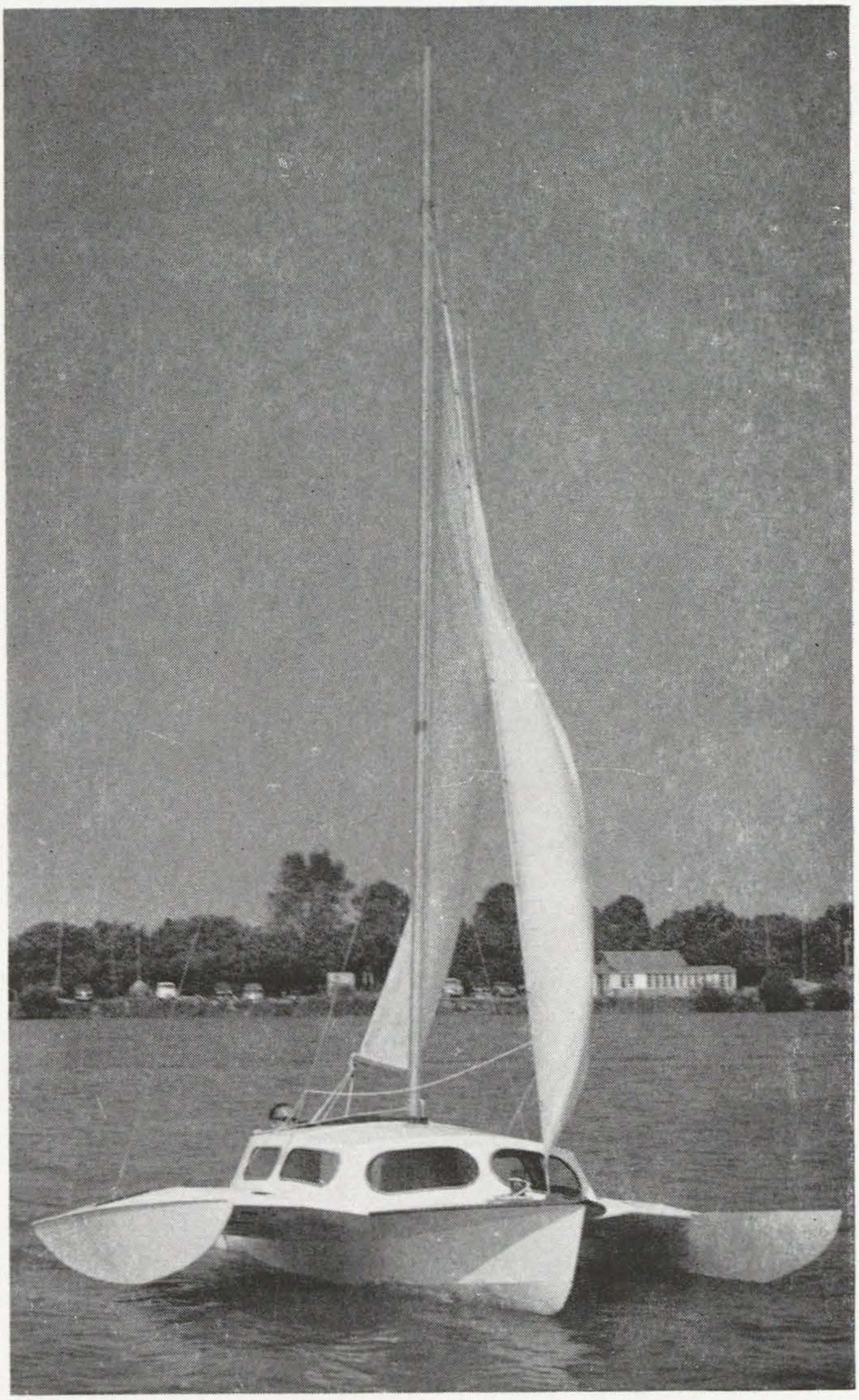
L.O.A., 19 ft.	Draft (ex. plates) 1 ft. 3 in.
B.O.A., 15 ft.	Beam (trailing) 7 ft. 6 in.

Sail Area, 216 sq. ft.

Designer: Owen Dumpleton, 26, Fleetwood Way, South Oxhey, Herts.

These dimensions and the line drawings apply to the Mk. II version. The photographs and performance reports apply to the Mk. I which was 18 ft. long by 14 ft. beam. This boat was designed as a result of A.Y.R.S. activity and it aims to incorporate many of the ideas published (indeed pioneered) by the Society. A small model was shown on the A.Y.R.S. stand at the 1961 Boat Show and, as a result, a commercial builder took an interest and gave very substantial help with the building of the first boat.

She was launched in the sea for the first time at Stokes' Bay on 8th July 1961, and was under way most week-ends for the rest of the season. As a result of an announcement in the A.Y.R.S. newsletter, a number of members sailed in her and all reported most favourably on her performance. The results were so encouraging that arrangements have now been made for commercial production of the Mk. II design, which is being offered to the public at £650 including sails.



Mantua

Of course, like many another boat, the first prototype had her faults, and it is just as well to acknowledge these, bearing in mind, of course, that the designer is also aware of them and has made suitable modifications for future boats. The one big error in the original design was in the estimate of the all-up weight, which was taken at far too low a value. This led to the lines being too fine and the yacht floated well below her designed waterline. Transom drag was therefore excessive. It also led to insufficient buoyancy in the floats and a consequent reduction in sail carrying capacity. Actually she could carry full sail up to force 4, but with the new larger floats, it will be possible to increase the working sail area and consequently the light-weather performance quite considerably. The sails were rather poorly cut and must have detracted from the potential windward ability of the hulls. Also, as an experiment and in deference to the

Mantua

builder, we started sailing with no plates, relying solely on the sharp vee floats. Our experience indicates however, that low aspect-ratio " foils " do not work, and steel plate leeboards are now fitted to the floats.

When sailing without any leeboards, one could sometimes see streams of bubbles leaving the keels of both main hull and lee float at an angle of some 3° to 5° to the ship's centreline, also there was considerable pressure on the tiller even at zero helm angle. These faults were largely corrected by fitting temporary plywood leeboards to the sides of the floats and it was with these temporary boards in place that *Mantua* sailed on one occasion a distance of 10 miles in 30 minutes. Both boards were eventually broken off by pounding on different beaches in rough weather, and the steel plates have been designed to withstand a reasonable amount of such treatment. They are arranged to retract partially into recesses in the outboard sides of the floats, and to be covered by removable fairing pieces which preserve a smooth exterior to the floats.

The prototype has a hollow wood mast and this turned out to be more expensive than a light alloy mast would have been. The new boats, therefore, with the larger rig, will have alloy masts and booms. Also, the rig is to be altered to a masthead sloop, as this gives stronger staying to bear a mast-head float to meet J.O.G. requirements, and to facilitate setting a large genoa.

The accommodation was planned for two people only but in practice it was not unusual to have four or five people on board. The seating has therefore been re-arranged with the settee along the port side of the main hull and the table extending out from under the starboard bunk. It will now be possible to seat four in the cabin, although the sail area and safety calculations are still based on a crew of two.

After getting several quotations I find it is just as cheap to build this sort of boat in FRP as in plywood. I have therefore designed a round bilge main hull and will have the boats built by Connoisseur Boats, Ltd., of Bushey, Herts. We are having four moulds, one for each hull and one for the cabin. Mouldings will be available to members for home building from The Trimaran Company Ltd., 11, Herbert Road, London, S.W.19.

THE PIVER TRIMARANS

It must be the primary objective of every yacht designer to draw up designs for every size and purpose of yacht. Once this has been accomplished, he will then spend his remaining life (if there is any left) in refining this series in accordance with rating rules and the whims of individual yachtsmen. Arthur Piver has now completed the first part of this process by producing a line of ten stock trimaran designs, all of roughly the same hull and float design but with different accommodation plans according to their size and purpose.

A.Y.R.S. members will remember Arthur's early trimarans *Rocket* and his 12 footer which we called *Triumph*. Both these were nice craft but the break-through appeared with his *Frolic*, a 15 ft. 9 in. craft which, with the right angled V section and the easy to make construction method of plywood partial bulkheads to above the chine (first shown in A.Y.R.S. No. 18 in *Parang*). This was an immediate and outstanding success. This was followed by *Nugget*, 24 feet L.O.A., *Nimble* 30 feet L.O.A., *Lodestar*, 35 feet L.O.A. and *Undine* 52 feet L.O.A. We have pleasure in showing the last two of these in this publication. *Lodestar* has sailed to Hawaii and back last year 1961, thus showing the ocean keeping qualities of these craft once more.

Arthur now has completed his range of craft with the designs which we are showing here.

Encore, at 28 L.O.A. is just that little larger than *Nugget* to give comfortable accommodation for 4 or 5 people.

Herald, at 32 feet 6 inches L.O.A. is the smallest size which Arthur thinks is suitable for permanent living aboard. She is only 2 feet 6 inches longer than *Nimble* but this has given her the extra accommodation.

Victress, at 40 feet L.O.A. shows a fine big craft with the accommodation of a palace whose performance would indeed be startling by orthodox standards.

Medallion, at 45 feet L.O.A. completes the cruising range.

It is obvious that Arthur's main interest is in cruising craft though all his early craft were racers. However, he has now produced a 20 feet fast " Day Sailer " called *Banner*, with which we start his series in this publication. In my opinion, *Banner* is not an " all out " racer but a comfortable day sailer. Its length of 20 feet, however, is the minimum for trimaran speed with a two man crew.

The Secret of Success. The secret of Arthur Piver's success as a trimaran pioneer and yacht designer is his ability to work hard. He has built boat after boat in a continuous stream and tried them out, in each case observing any faults and correcting them in his next boat. He has also the ability to make these craft in a remarkably short space of time, due to the easy construction method. Arthur's contribution to trimaran design is to make practical and very seaworthy boats from the theoretical concepts, though the modern cruising trimaran float development is, both theoretically and practically, entirely due to him. The clever and subtle accommodation plans are also Arthur's.

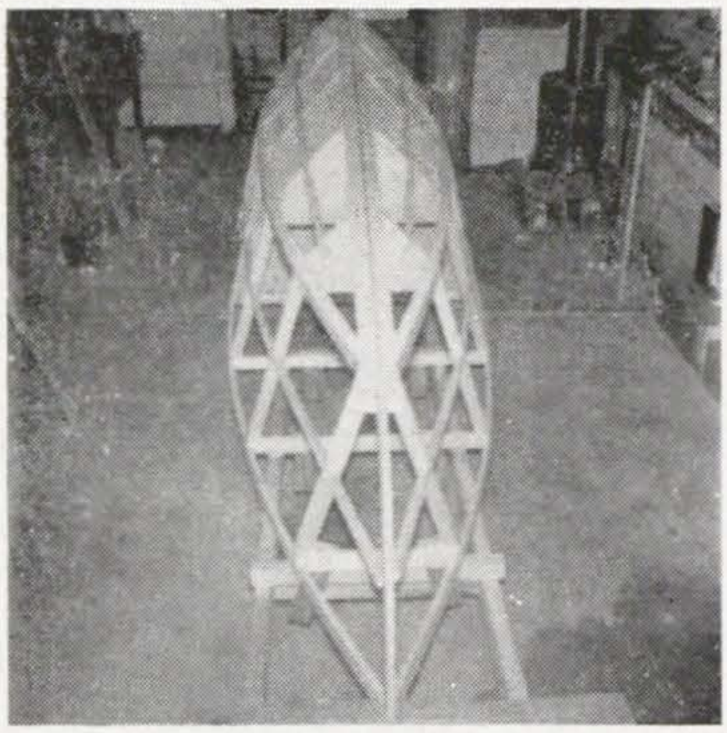
20 FOOT TRIMARAN *BANNER*

Beam O.A. 12 feet.	Draft 14 in. (Board up)
Beam Trailing 7 feet 6 in.	Weight 500 lbs.
	Sail Area 200 sq. ft.

Designer : Arthur Piver.

The 20 ft. trimaran *Banner* is a four-place day sailing, trailable boat.

It features seats within the side deck, convertible to sleeping space,



Banner

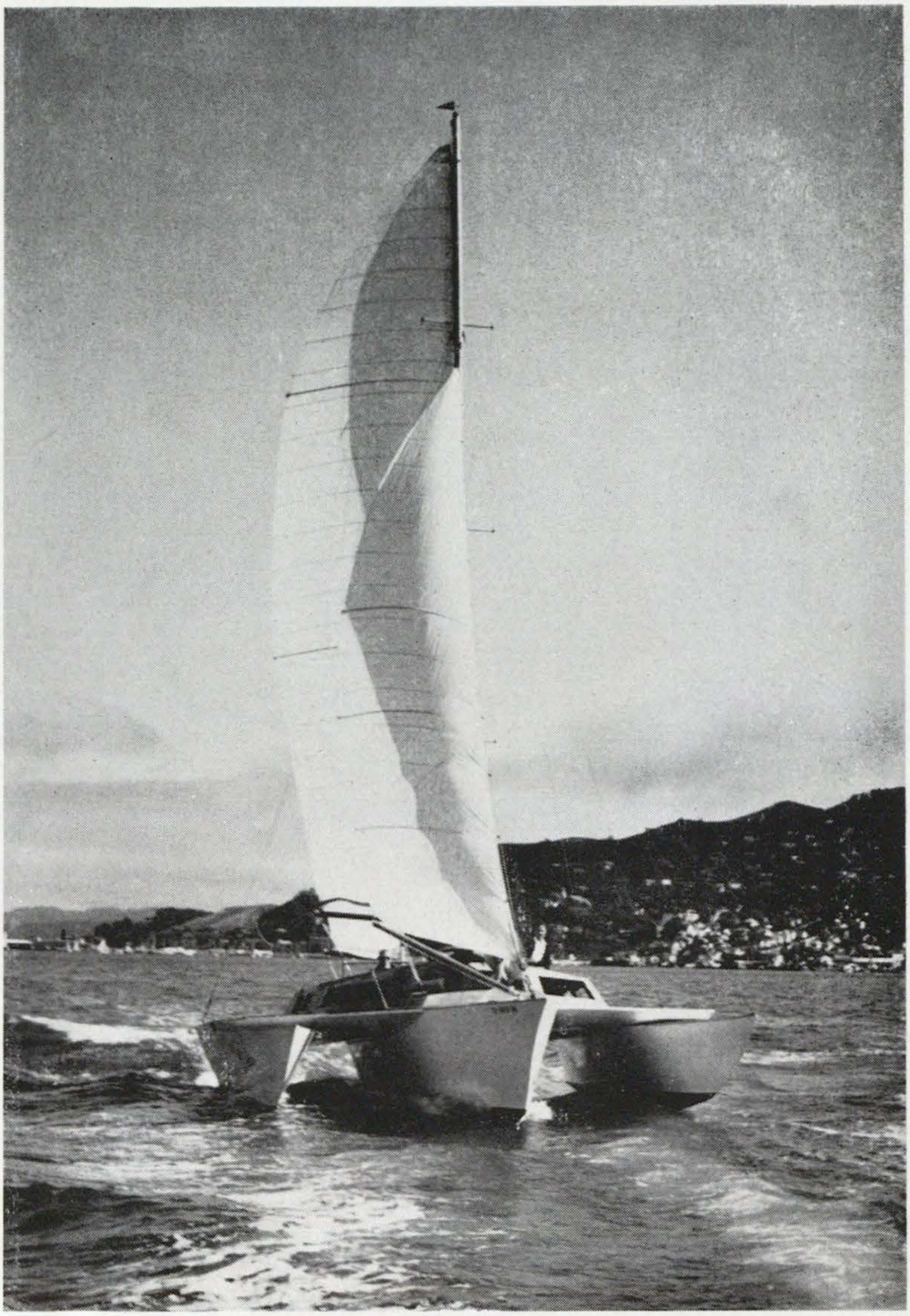
and with a boom tent and spacious side decks, makes a comfortable camping cruiser.

Although this boat (capable of 20-knot speeds) is not as fast as the racing catamaran, it has found its place as the family man's speed machine. Because of the generous beam (12 feet) there is impressive stability, affording comparatively great safety.

In winds so strong that the catamaran must be luffed, *Banner* continues to drive because of her effective beam.

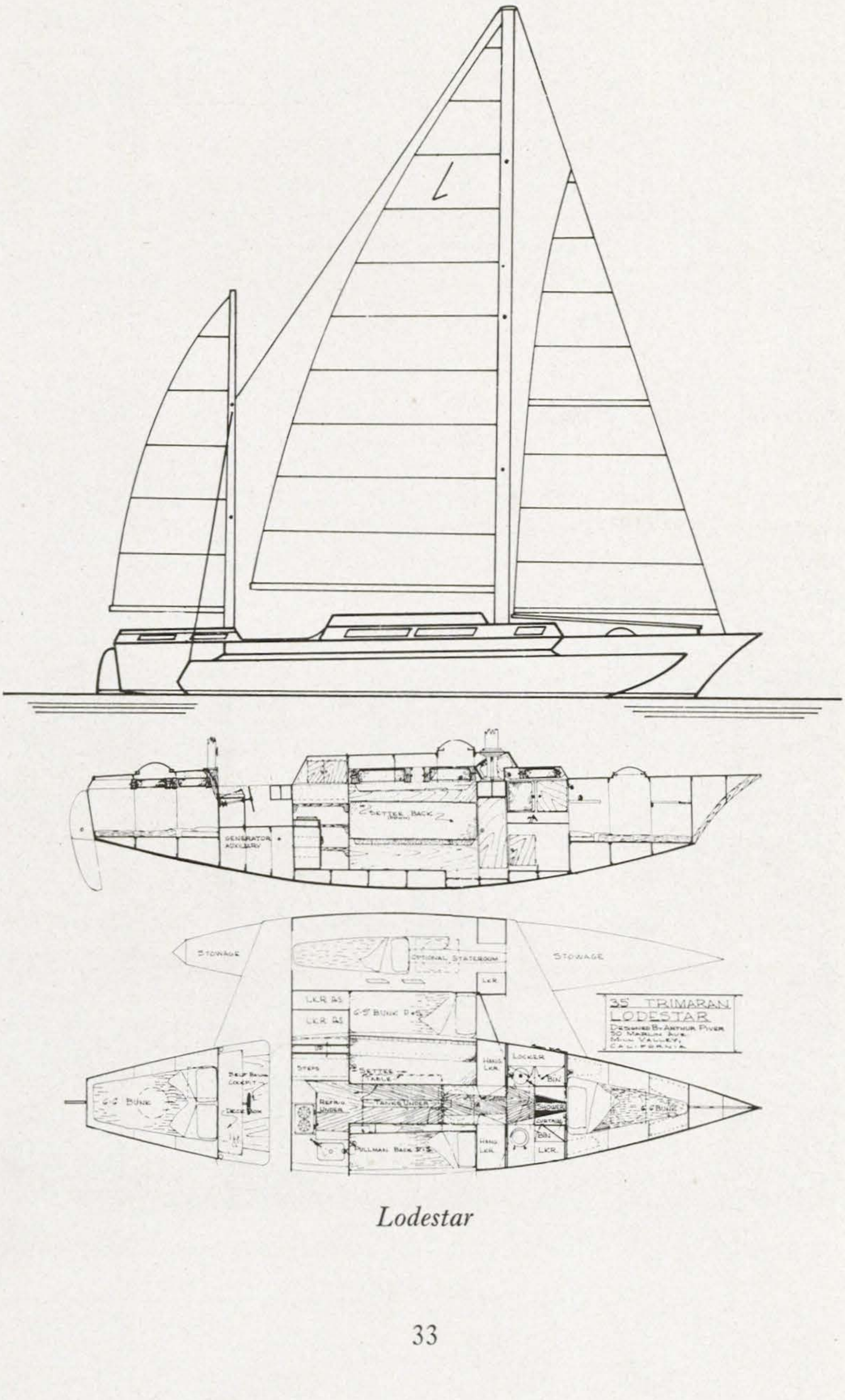
Outer decks and floats fold inward, making a compact package for trailing. The 26 ft. mast may be erected by one man when mounted on a hinge and fitted with a lifting strut.

The boat is V-shaped and constructed almost entirely of $\frac{1}{4}$ inch. plywood. All external surfaces are fibre-glassed—using but 2 oz. cloth, which results in a permanent finish weighing little more than paint alone.

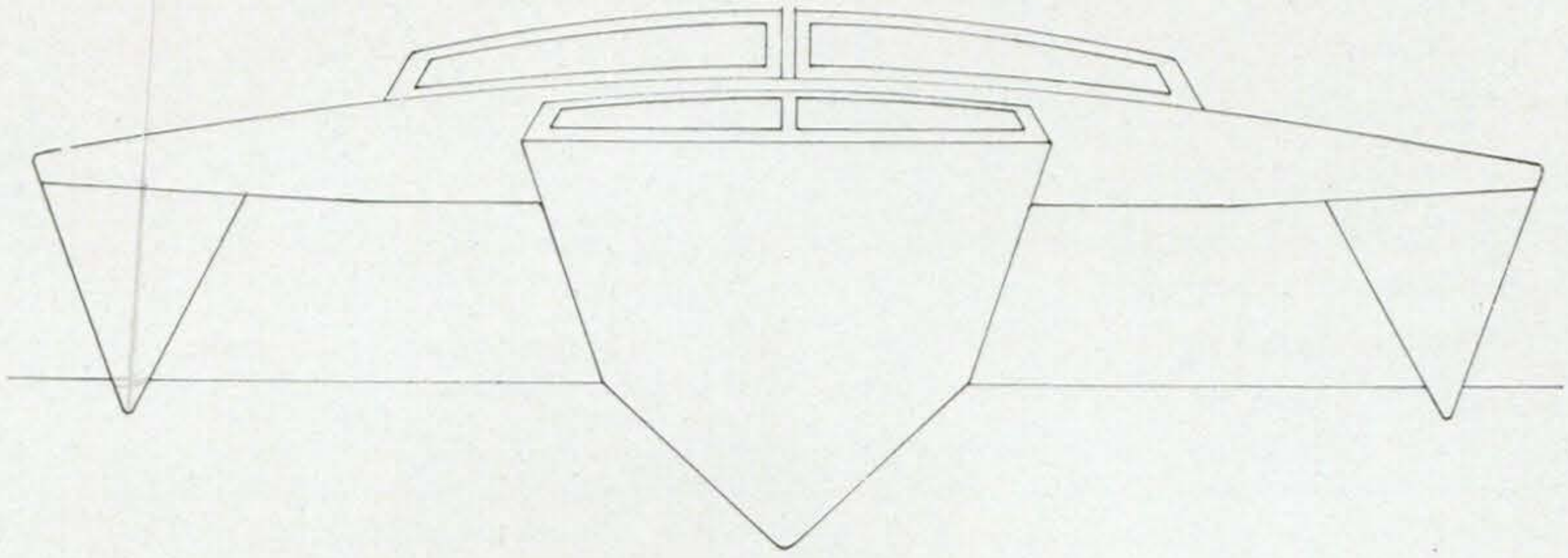


Lodestar

35 × $\frac{2}{19}$ $\frac{70}{19}$



Lodestar



Lodestar's Cross Section

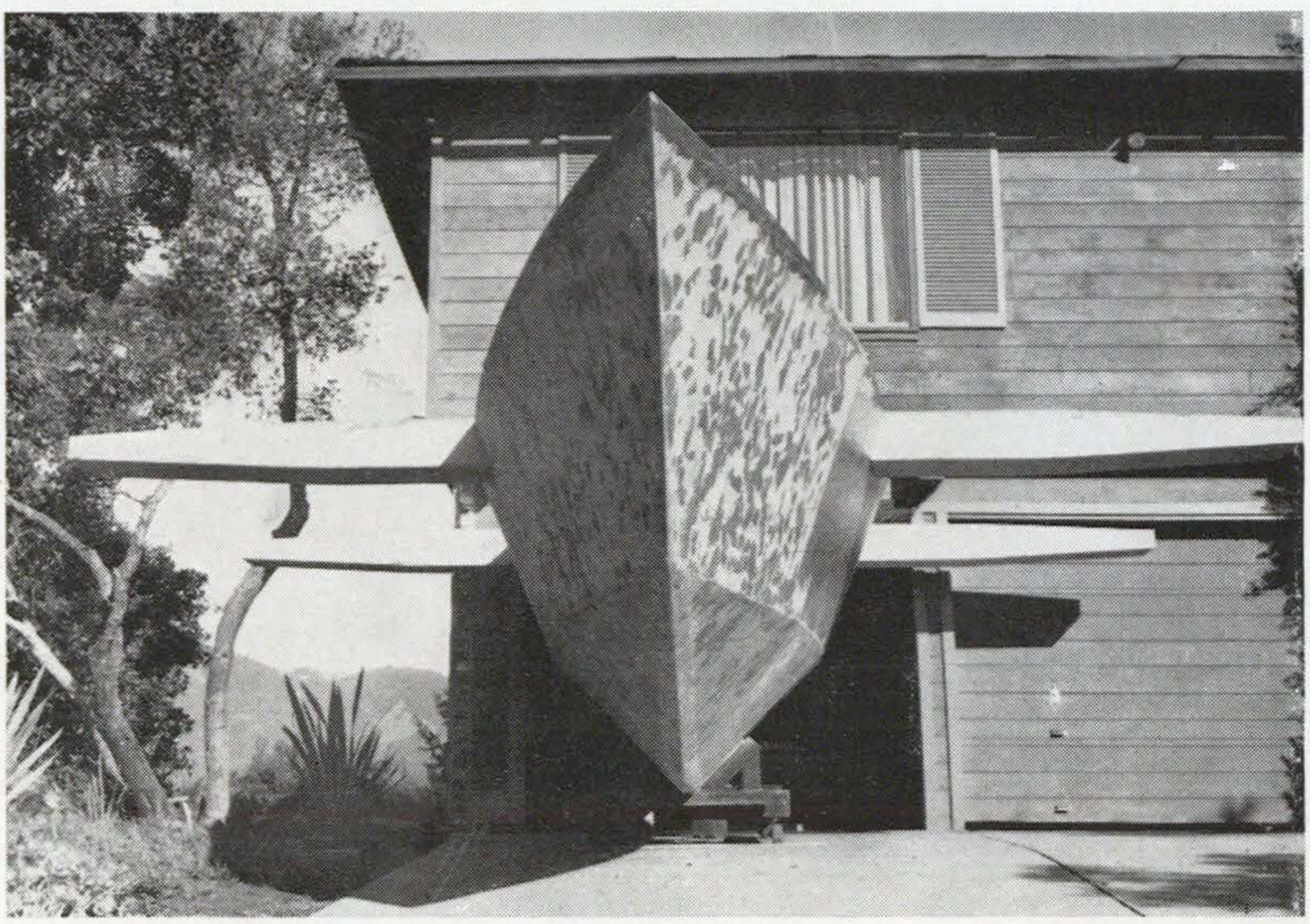
35 FOOT TRIMARAN *LODESTAR*

L.O.A. 35 feet. Draft 30 in.

Beam 20 ft. S.A. 400 sq. feet.

Designer : Arthur Piver.

This is an enlarged version of the 30 ft. *Numble*, which achieved recognition in 1960 by an Atlantic crossing in which the comfort afforded by a non-rolling boat and the safety of a surfing craft which easily keeps ahead of breaking storm waves was revealed.



Lodestar

As the accommodation plan shows, bunk space is available for as many as eleven ; the floats being available for sleeping in an optional deck arrangement.

These boats are designed especially for the home builder, and because of the lightness of the simple structure, which is possible due to the absence of ballast, the cost for materials is modest. *Lodestar* cost approximately $3,000 to launch, complete less sails.

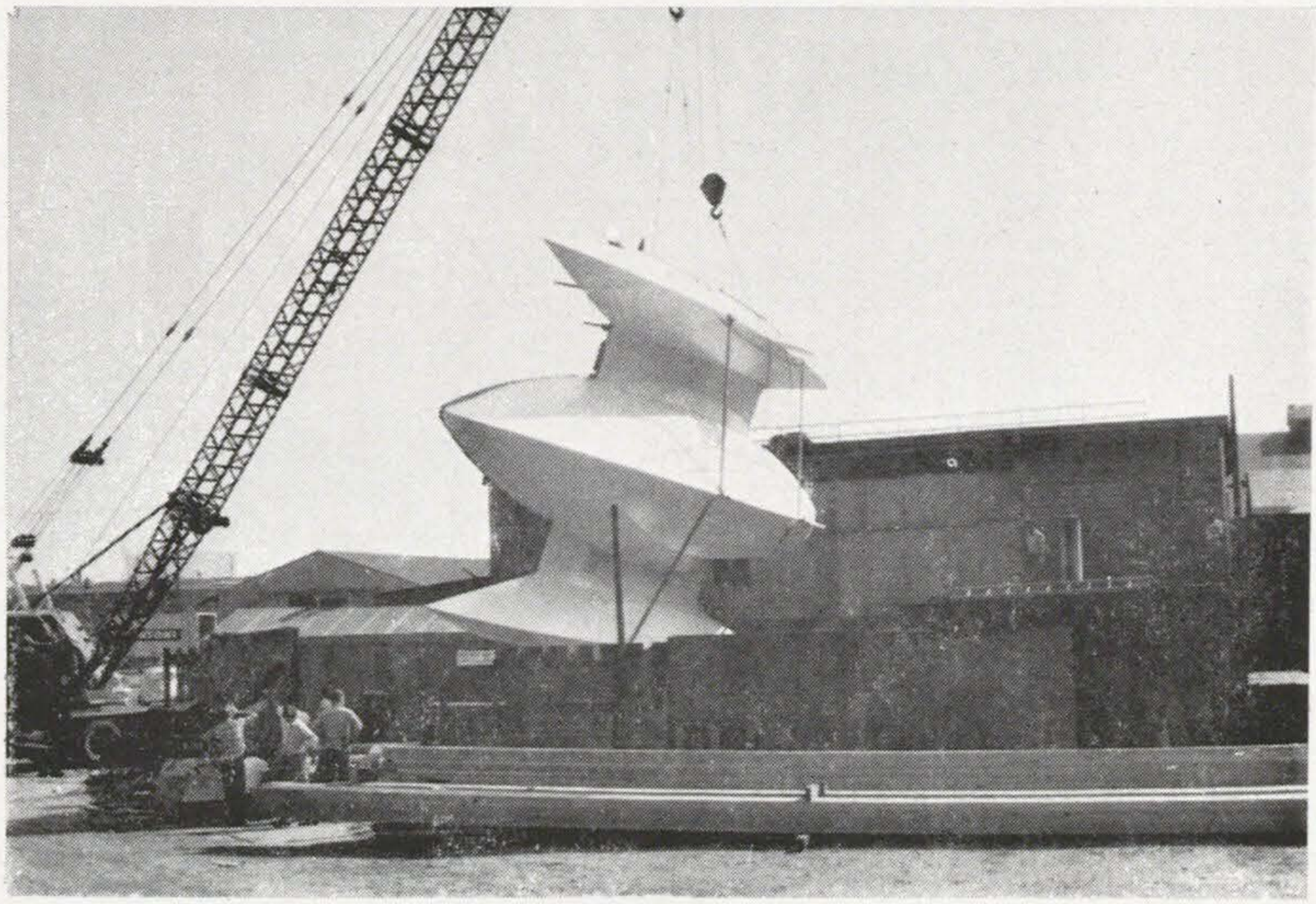
The new boat has no centreboard, and is easily beached, with a draft of but 30 in. She is said to achieve speeds of thirty knots under favourable conditions, with only several degrees of heel. Auxiliary power is optional.

Several dozen *Lodestars* are now being built.

52 FOOT TRIMARAN *UNDINE*

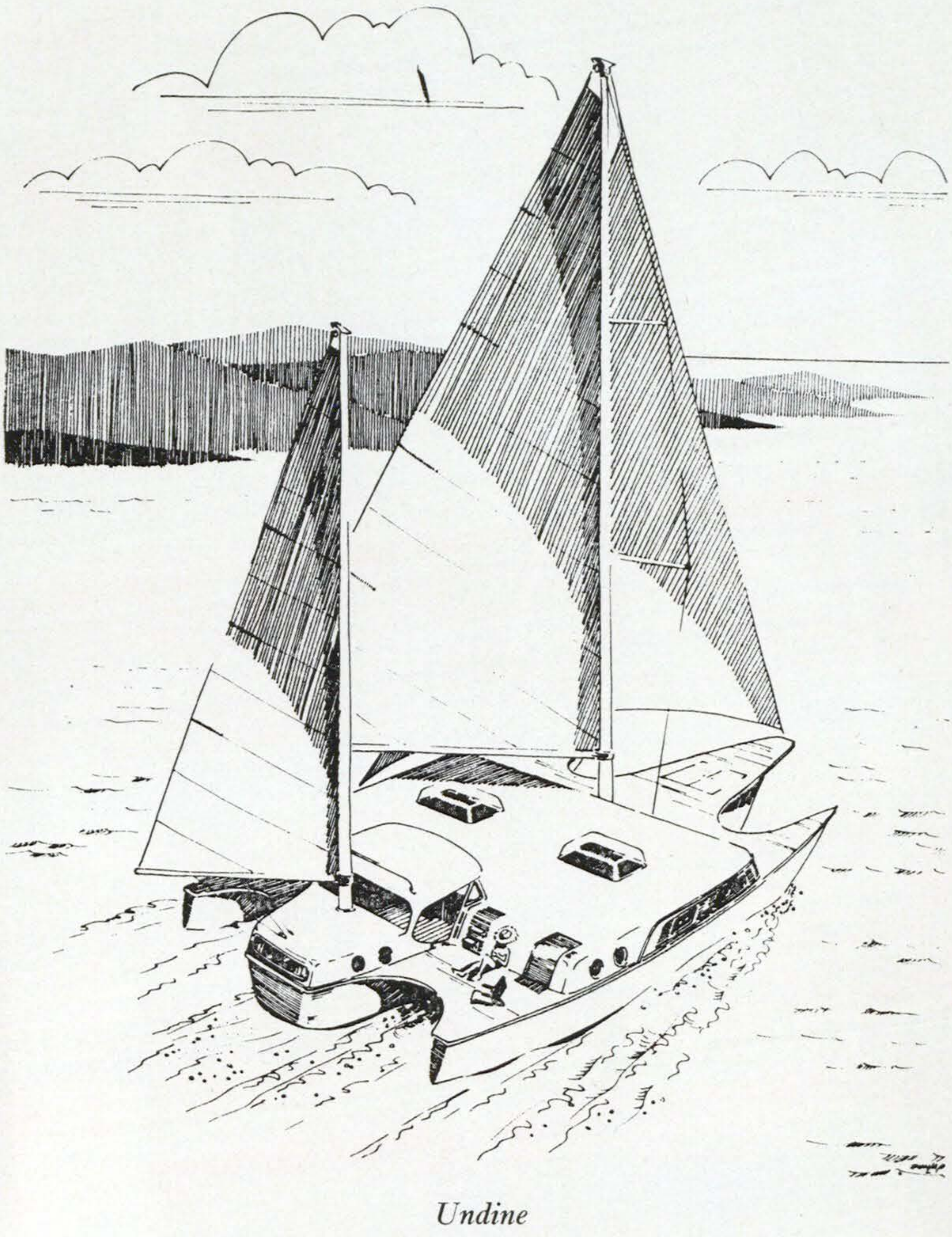
Length O.A. 52 feet.	Draft (Board up) 42 ins.
Length W.L. 46 feet.	Gross Wt., 26,000 lbs.
Beam, 28 feet.	

What promises to be the fastest vessel in sailing history is this 52 feet trimaran, now under development by a West Coast group which is designing and building *Undine*.



Undine

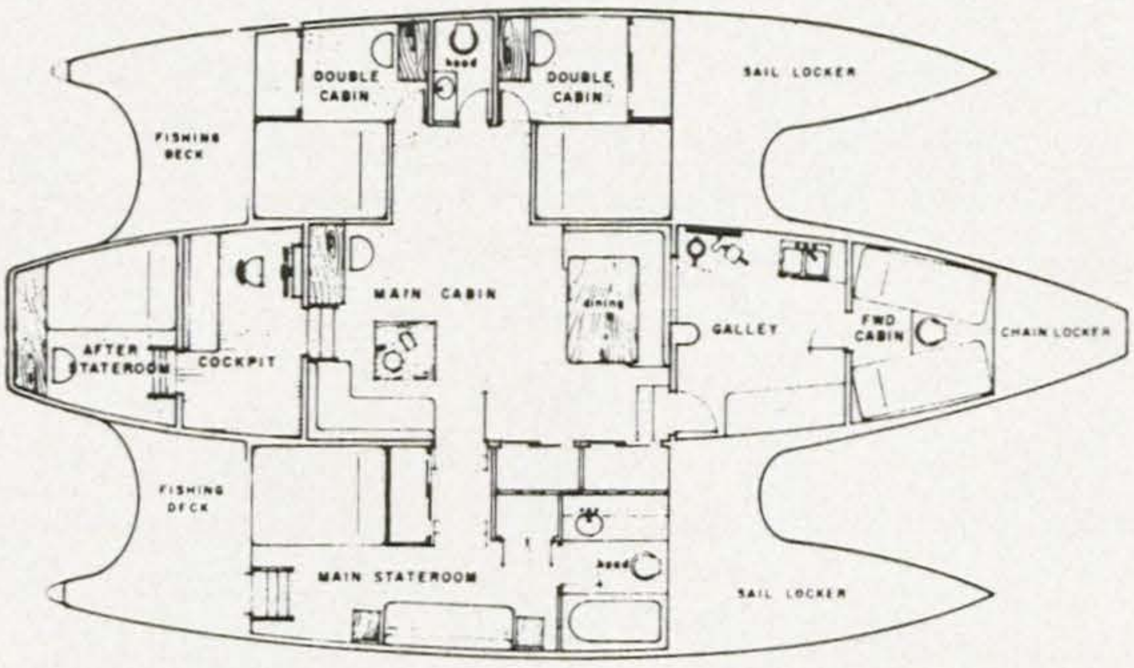
Because of the sea-keeping qualities of this type, it is expected that she will sail with greater speed, comfort, and luxury than a modern power yacht ; at the same time have the long range, low-cost operations, and safety of a sailing craft. Using modern radio gear to keep track of weather fronts, the 30-knot speed of this boat will enable the crew to sail around the weather, utilizing the favourable winds.



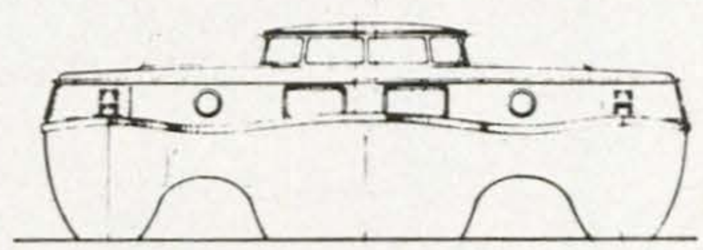
Undine

In addition to the great stability of this craft, together with the fact that a multihull does not roll, is the sheer luxury of the layout. There is a master stateroom 20 ft. long, with a private dressing room ; four other double staterooms ; a 12 x 16 main cabin ; an 8 x 12 galley completely equipped ; three heads—even a bath tub.

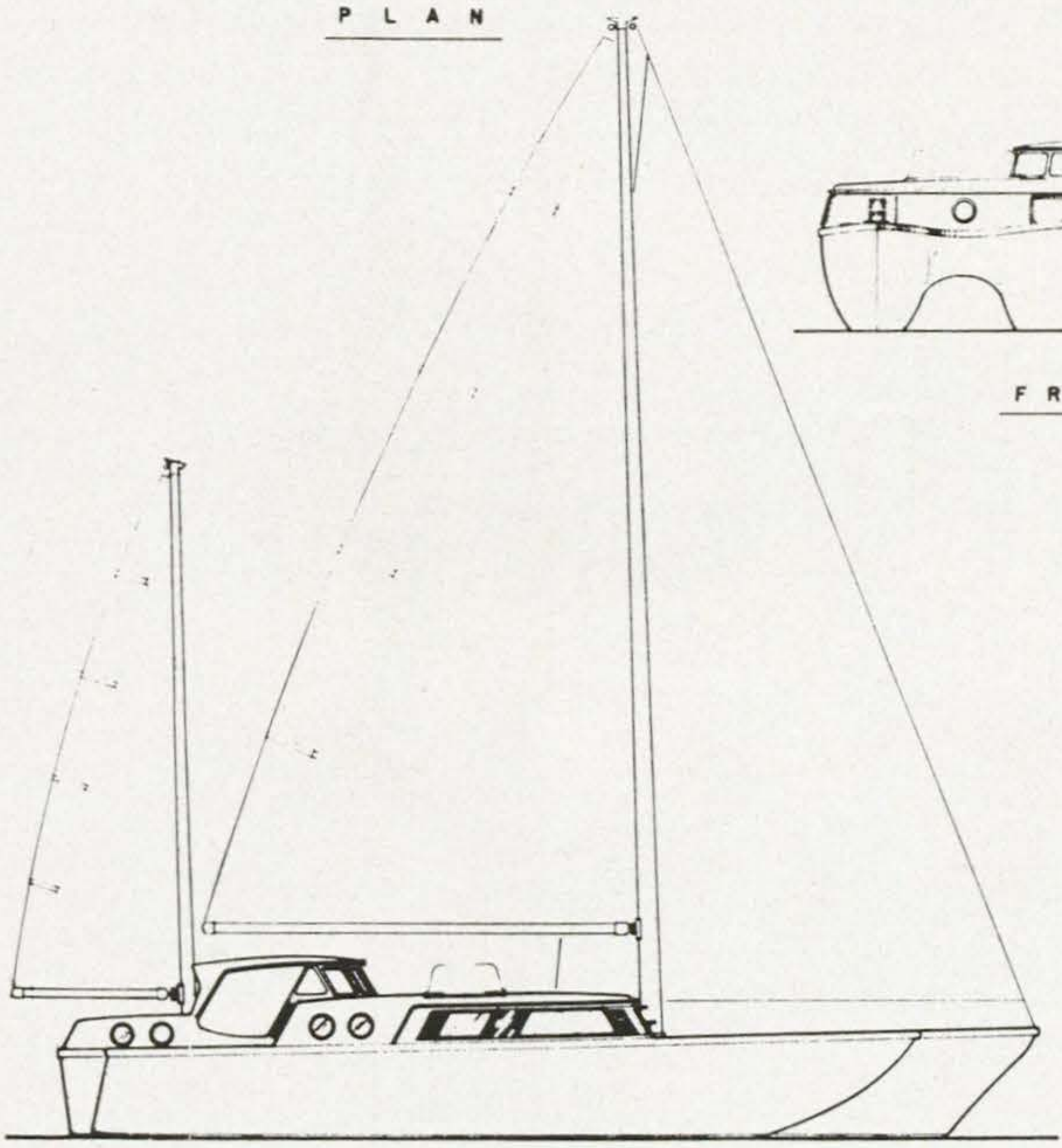
Based upon the designs of Arthur Piver of Mill Valley, Calif. originator of the cruising trimaran, Marine Architect Cal Giles and



PLAN



FRONT



"UNDINE"

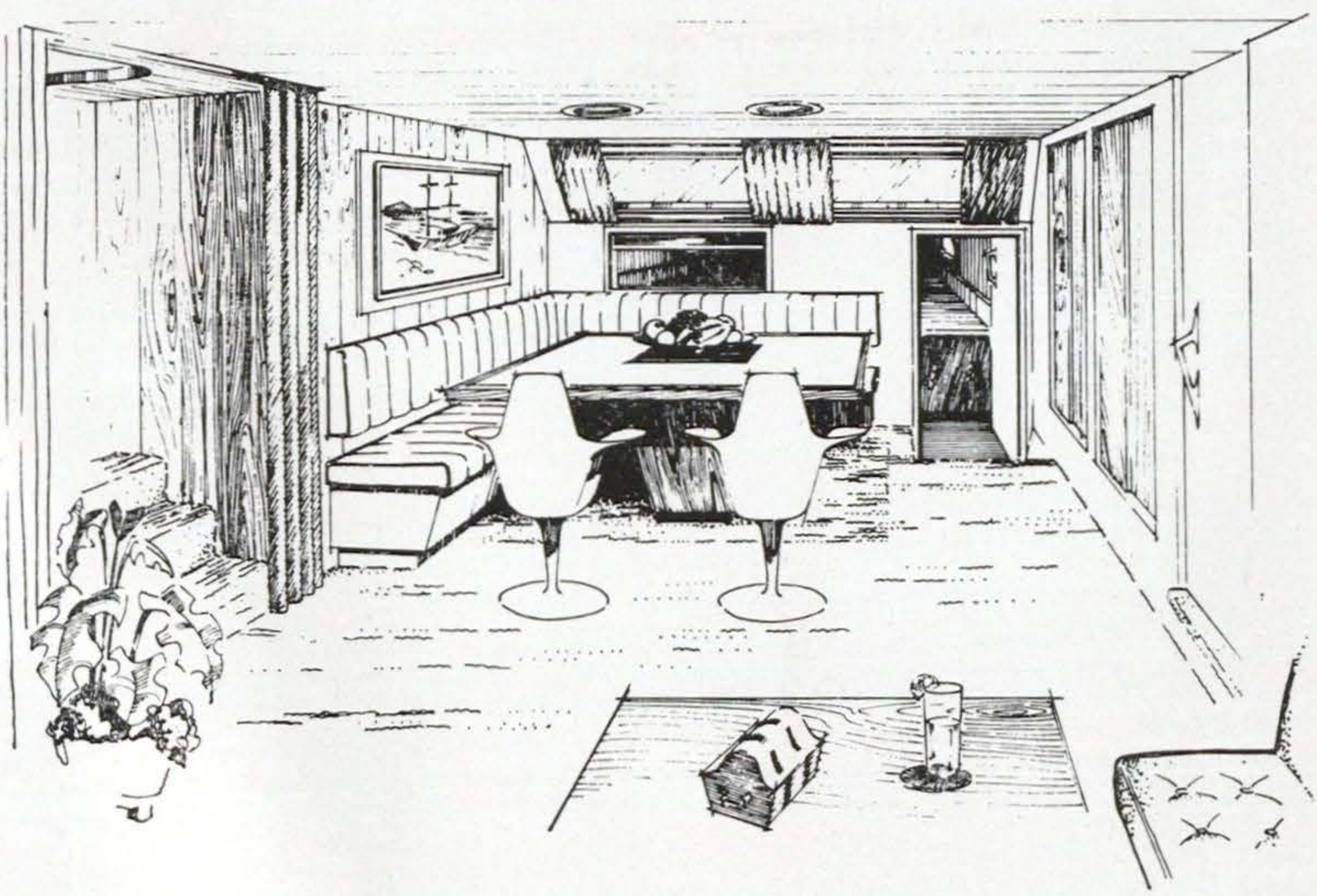
Designer Paul Dunlap have collaborated to strive for the production success of the design and at the same time have evolved what they feel is the ultimate in tasteful luxury.

Among the very practical innovations is a sea water converter which operates off the diesel-generator exhaust. It will not be necessary to carry large amounts of fresh water, yet sufficient clean sterile water will be available. Another practical item is the deep freeze unit.

West Coast Industrialist W. D. Barton of Danville, Calif. is heading the group. A successful pioneer of the aircraft, plastics, and atomic reactor fields, Mr. Barton says, "The *Undine* is built on proven hydrodynamic theories, using aircraft principles and modern plastic materials (she is non-sinkable) ; thus she represents a whole new breakthrough in modern marine engineering."

Present plans are to complete three prototypes which will be used for the scientific selection of final details and a thorough testing programme, just as is done in the heavy aircraft industry. After completion of this programme, public deliveries will commence.

Barton states the profit potential is promising, and that there has been a great deal of interest in purchasing stock in the *Undine* operation, and as a result there will be no stinting in the production plans. Stockholders will have preference on deliveries and due to



Undine's Saloon

being owners in the company they will receive the benefits of any profits from their own boats.

There has also been a good deal of interest expressed by large rental operators, as the *Undine* appears to be an ideal way for them to enter the charter business. She is safe, comfortable, and has a great deal of privacy for guests. Barton further states they have firm interest from several commercial fishermen who consider the design (with optional power) an ideal stable work boat for their business. The speed, low cost operation, little maintenance, and utility all mean more profit for marine operators, according to the builders and fishermen.

With confidence bred from experience aboard Piver-designed trimarans, Barton says, " I don't even look around when we sail by a power boat these days."

ENCORE

L.O.A., 28 feet. Draught, 22 ins.

Beam, 17 feet. Sail Area, 300 sq. ft.

Designer : Arthur Piver, 50 Marlin Ave., Mill Valley, California.

This craft (with the sail insignia E) has the accommodation and speed of a much larger single hulled craft, combined with a small sail area. The plans show all the main features.

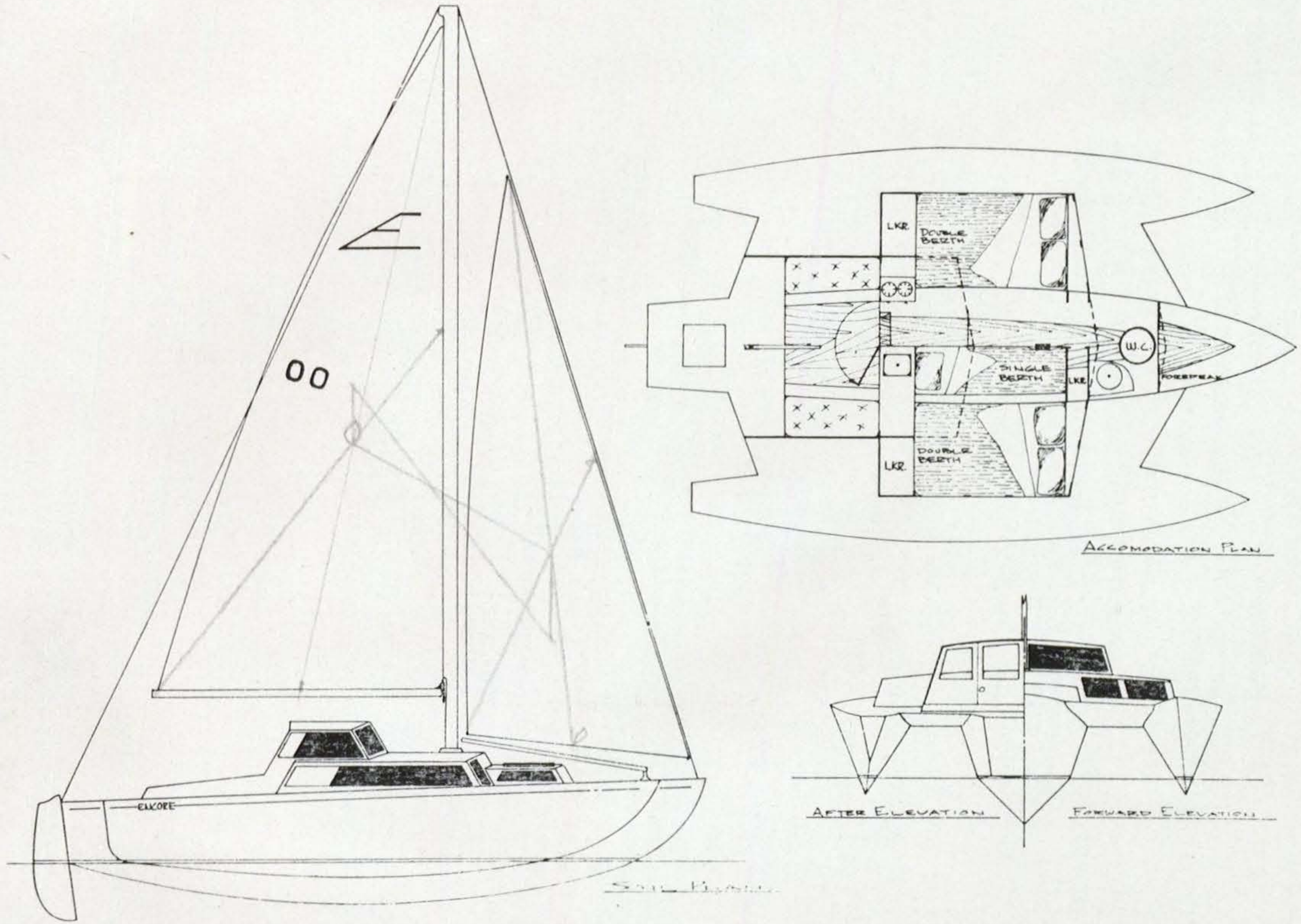
HERALD

L.O.A., 32 feet 6 ins. Draught, 27 ins.

Beam, 19 feet. Sail Area, 365 sq. ft.

Designer : Arthur Piver.

This craft has the sail insignia of an H altered to look like a hypodermic syringe pointing backwards. This is doubtless to give slower boats the " needle." The windage with this larger craft is beginning to get less, relative to the smaller ones and performance may be expected to be relatively better.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ENCORE
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Encore

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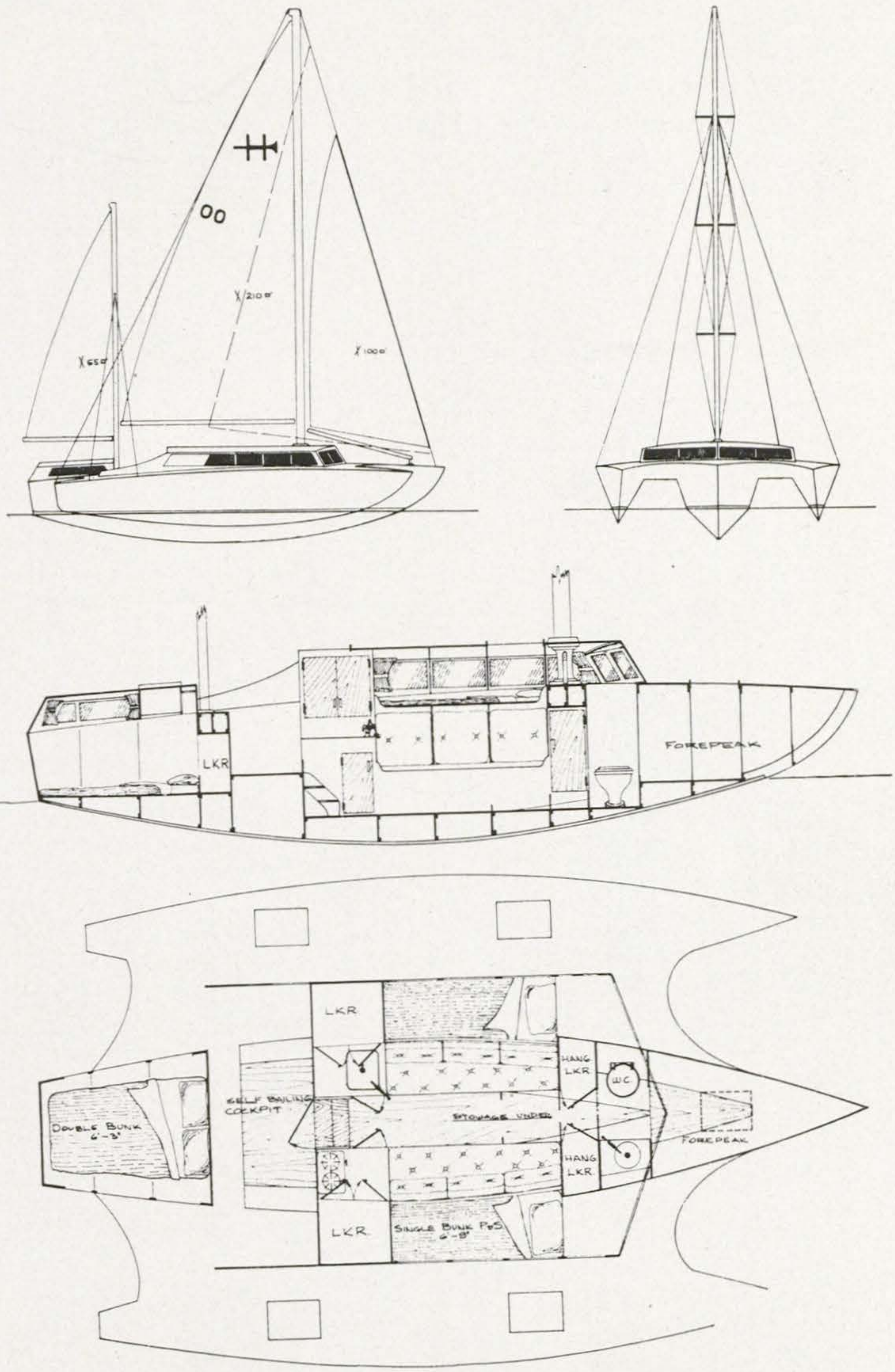

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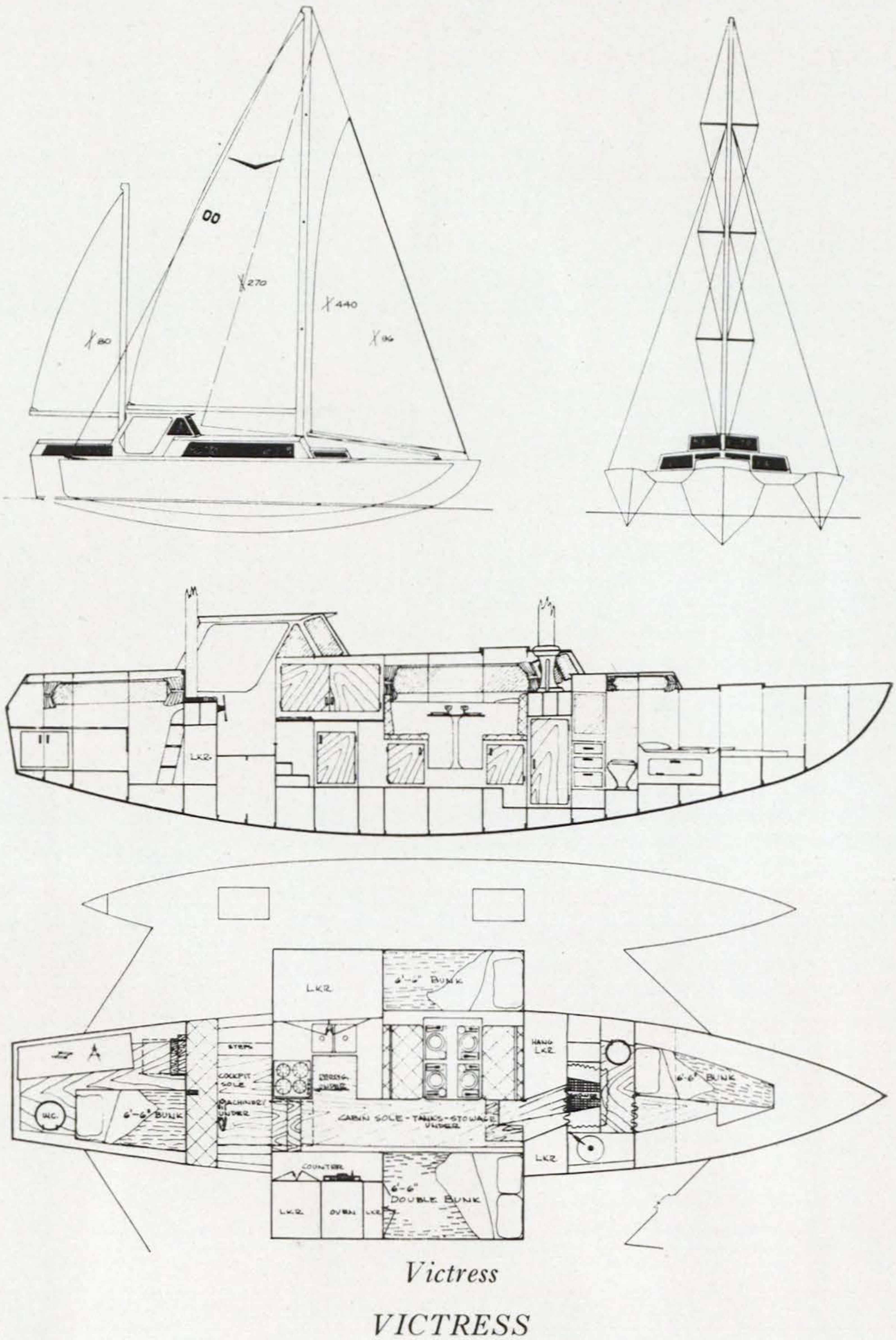
LKR
HANG LKR
W.C.
SELF BAILING COCKPIT
STOWAGE UNDER
DOUBLE BUNK 6'-3"
HANG LKR
FOREPEAK
LKR
SINGLE BUNK P&S 6'-8"

Herald

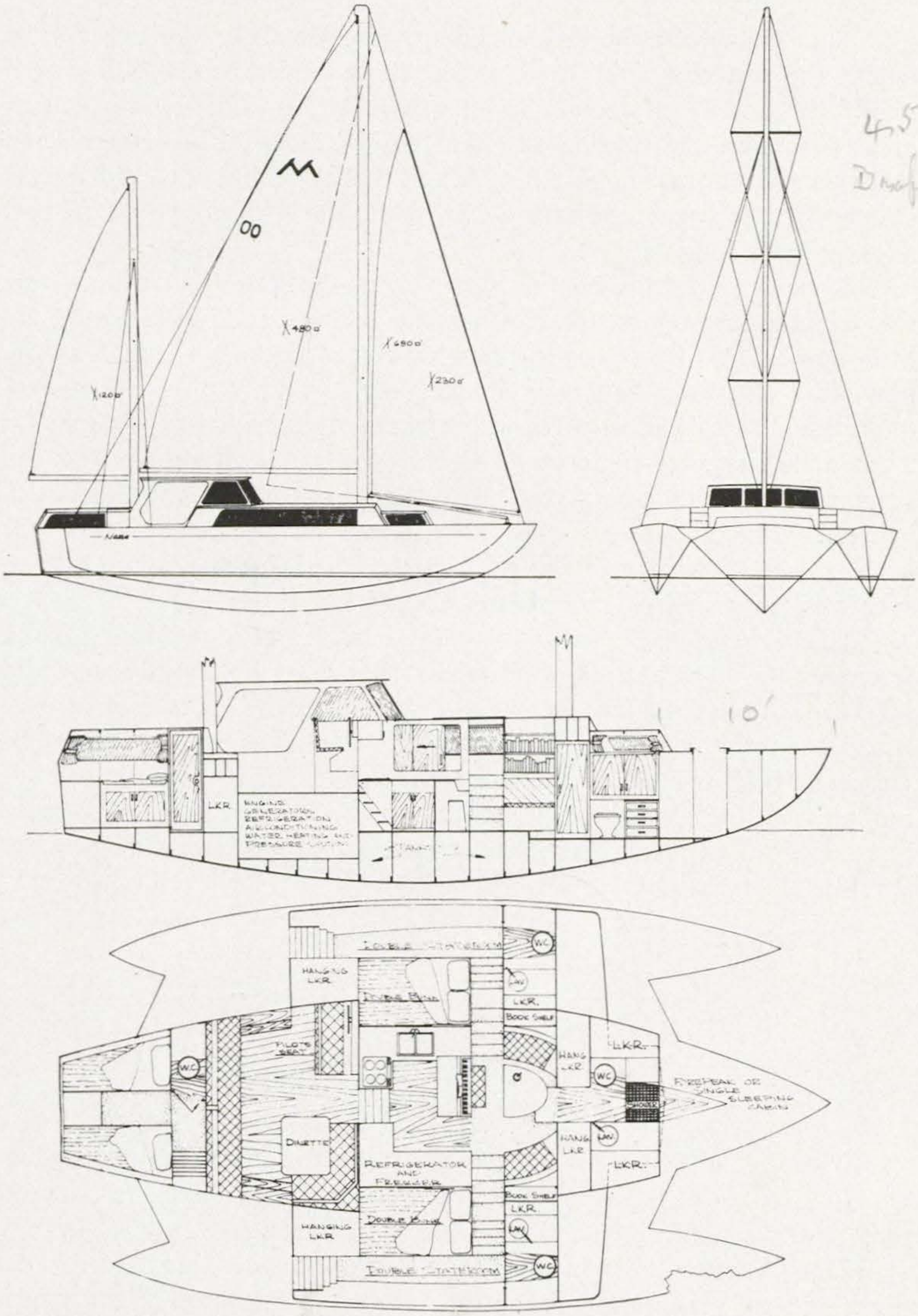


Victress

VICTRESS

L.O.A., 40 feet. Draught, 28 ins.
Beam, 21 feet. Sail area, 450 ft.
Designer : Arthur Piver

This craft with the sail insignia of a very wide V is merely a larger version of the other craft. The accommodation plan merely shows berths for 5 people but alternative arrangements would, of course, be possible.



45' x 24'
Draft 36"

Medallion

MEDALLION

L.O.A., 45 feet. Draught, 3 feet.

Beam, 24 feet. Sail area, 830 sq. ft.

Designer : Arthur Piver with Genoa, 1290 sq. ft.

This craft with the sail insignia of an M is like the other craft below the waterline but there is no chine in the main hull which makes the main hull section an enormous right angled triangle with great deck area and internal accommodation. It will be remembered that this section was suggested in A.Y.R.S. No. 36 but it would appear that when this suggestion was being made, the *Medallion* designs had already been roughed out.

Summary. In these four most recent designs by Arthur Piver, the trimaran configuration has become a beautiful, useful and safe little ship. The floats have grown almost to the same length as the main hull and have had their shape blended with it to prevent eye-offending dissimilarities. The value of the right angled V triangle for a main hull section right up to deck level has been shown and the value of the trimaran to give really spacious accommodation has been proven. The blending of the deck houses with the structure has been most adroit, throughout. The soft sea-riding comfort and speed of the trimaran need no emphasis.

The Trimaran of the future. This is not likely to differ greatly from Arthur Piver's present designs. Rounded hull sections would save some wetted surface but would probably need to have a centre-board even at the largest sizes with little overall gain. Slight modifications of the main hull and float design might bring lesser resistance but only sailing experience or the test tank will tell us if this could be so. From our experience with racing catamarans, any improvement would only be slight.

DOWN CHANNEL IN "GEM"

(A 36 Foot Trimaran)

By John Morwood

The fifth of July 1961 will always remain in my memory as a day which gave me some concentrated experiences and education, for on that day, we sailed down the English Channel in *Gem*.

Dan Campau, the owner of *Gem* and I slept aboard on the previous night and we really appreciated the value of a multihull at moorings. There was neither roll nor pitch in the wash of steamers and we would have been extremely comfortable but for the block which kept hitting the metal mast. Being too drowsy to go up and fix it but not sound enough asleep to ignore it, I had a disturbed night.

Gem was at her moorings in the outer harbour at Dover where we had put her after the winter, during which we had raised the floats five inches each and raised the bows four inches more than the sterns. We hoped to sail her down to Cowes for the Round the Island Race on the eighth of July. Dan Campau had just come back from Italy and had taken her over from us. He had had two weeks getting everything ready but several things still remained to be done.

At first light, Dan and I got up and had something to eat. We used a little camping stove which was the only one we had aboard. This was unfortunate because even a multihull needs a stable stove if one is to have anything hot under weigh. We then went around making *Gem* as seaworthy as we could. Life lines were rigged and metal tubing was put around the cockpit aft. This was attached by only eight one inch long screws and thus was not really worth while but we ran the life lines by it and thus hoped it would do some good. It will be bolted on later. *Gem* tends to float a little bow heavy so we stowed all the moveable and heavy gear as far aft as possible, putting many things right up near the transom.

The floats appeared nearly full of water but, of course, they had a lot of polystyrene in them. Dan felt that we need not worry too much about this. We had no pump aboard so couldn't shift their water anyway but we plugged the deck holes as best we could.

We then set the two *Cougar* mainsails which, incidentally, were the ones used by the Prout brothers in the *One of a Kind* races in Miami, Florida in 1959 when Bob Harris's *Tigercat* first showed her paces. The fully battened sails set well but at that moment and throughout our trip I couldn't help feeling that both sails and rigging, while perfectly suitable for racing were not what I would consider really seamanlike. The sails were hard to set and stow and, while sitting fairly well had a lot of twist and appeared to be losing a lot of drive close hauled. Surely A.Y.R.S. members could devise not only more seamanlike sails but more efficient ones. The rigging, too, was all interconnected and depended for its integrity on a mass of shackles, bottle screws and tangs. I feel sure that, despite modern practice, some reduplication would make one feel more secure.

By this time, Fred Redding was waving his towel on the beach and we put in for him. Again, the multihull showed its advantages as we went right to the shore and he hardly got his feet wet. Dan's floats, too, having such a low freeboard were especially convenient. Fred stepped aboard and we got his bags in with the minimum of trouble. If one compares this with the dinghy bother which one constantly runs up against with deep keeled orthodox yachts, one can appreciate the multihull still more.

Finally, at 8.05 hours, we took our departure from the Eastern entrance of Dover Harbour, travelling west by south in a force three N.W. wind. The wind was true neither in strength nor direction owing to the cliffs between Dover and Folkestone but we made the five miles to Folkestone in an hour against a 3-4 knot tide, giving us 8-9 knots speed through the water. Off Folkestone, we let her off a little for Dungeness, a distance of 15 miles, which we reached in an hour and a half, making ten knots over the ground. During this time, the wind was force four with occasional five gusts.

Rounding Dungeness with its nuclear power station in course of construction and looking more like Stonehenge than anything historic, we came hard on the wind and still couldn't lay our course across Rye Bay to Fairlight cliffs so we had to go out into the Channel somewhat. The seas were now beginning to get up but *Gem* sliced beautifully through them at speed, though it was apparent that we could have had the floats raised still further than we had done through the winter. The weather float often had to cut through waves, giving a quick heave to leeward and putting unnecessary strain on the cross members. It would have been better if both floats had been raised another six inches so that the weather float would have been a foot higher when sailing.

We took long and short boards across Rye Bay to Fairlight cliffs and then onwards past Hastings and we were looking at Beachy Head in the distance when the wind, after veering and backing in some queer way which I didn't understand, set in at force five from the West. At this moment, the clew lashing of the fore mainsail parted and the sail pulled half out of the boom groove so we took it down. *Gem* sails well under her jib and mainsail so we continued to make good progress but the seas were getting larger and longer and were now some 30 to 40 feet long and about 6 feet from crest to trough.

These longer and larger seas must have put extra strain on the cross beams because they now started to flap like the wings of the Great Auk and the screws which held the plywood along their tops started to rise up like nymphs from the deep.

In the sail across Rye Bay, water was constantly getting into the starboard float deck through the pumping holes as evidenced by bubbles of air coming out. It was obvious that the float was now full and putting a great strain on the cross beams every time it was lifted off that water. The total displacement was about 2,000 lbs., though there was a lot of foam in it as well as water.

Under the circumstances, we deemed it better to get ashore fairly soon. It was obvious that we couldn't get around Beachy Head and we headed in just to the west of Hastings where we saw some fishing boats. When we got near, we were told to go down to Hastings Harbour and, though past experience had told us that anyone who saw *Gem* thought we drew six or eight feet and this might have been the reason for the advice, Fred Redding had seen Hastings Harbour and, though it merely consisted of a wall jutting out a bit, he reckoned that there would be more shelter there than on the open beach.

We now pulled down the after mainsail and coasted downwind under jib alone. While we were still in the bigger seas, we had some nice spurts on the longer waves *à la Piver*, reaching some 15 knots and sliding up the back of the wave ahead. It was most interesting. The floats were still flapping a bit and the starboard one liked to submarine but this didn't seem to be dangerous. In fact, I remember trying to work out if there were any danger at all and came to the conclusion that there wasn't. The float cross beams might break about quite severely but I didn't think they would come off. The foam in them would hold them on the surface so I couldn't see us capsizing and, even if this did happen, we couldn't sink and would get ashore somehow.

In the end, we coasted around the Harbour breakwater and onto the beach. The fishermen then asked us to move and this was accomplished by a man who was swimming who just took the bow line and swam, pulling us to the new place, a feat which would have been quite impossible in a conventional boat.

Lessons learned. A 36 foot trimaran is a most convenient and comfortable cruiser. It is pleasant to sail with and far safer when in trouble than a deep keeled yacht. The right angled V triangle sectioned floats are quite satisfactory but should slope up 10° or 15° forwards.

2. The conventional racing sails and rigging are not the best for cruising. The schooner rig used on *Gem* was convenient as to sail combinations. I thought that it was not very close winded but Dan disagreed with me and thought it sailed at four points from the wind.

3. The floats of trimarans should be very secure against leakage from above or below. Foam in place would have been best for the *Gem* floats but time did not allow this to be done. *Gem* type floats should be above the L.W.L. at rest.

4. Each of *Gem's* four cross beams only went 1 foot 6 inches into the cross-ships "tunnel" and were held in place by only four

bolts ($\frac{3}{8}$ in.) We reckoned that the shearing stress on each bolt was about one ton and a quarter. It would have been better if a single cross beam had run from float to float. When Dan took out the bolts at Hastings, some were straight. Others were badly bent and must have torn through the wood.

5. *Gem* floated bow heavy. The cabin should have been placed a little further aft.

6. The main hull was satisfactory but could have had a flatter floor amidships to make coming about easier. The rather fine stern, too, tended to fuss above ten knots. However, it is likely that the resistance of the present design below twelve knots would be fractionally less than that of one having a flatter floor and wider transom. A flatter and wider transom would have made the pitching easier, in my opinion.

Gem is now at Shoreham, Sussex. Dan Campau, Via 2, Fornaci, Pordenone, Italy is willing to sell her.

LETTERS

Dear Sir,

I'd like to propose one maverick idea growing out of the bulletins that would shock anyone but you : a *backwards* micronesian single outrigger. Why ? Many comments on trimarans seem to indicate that the buoyancy of the leeward outrigger is more useful than any amount of weight to windward, and of course buoyancy is far cheaper in terms of dead weight than any sort of counterbalance. So why not a back-and-forth single outrigger with the float always to leeward ? The crew in the main hull always provide the weight, together with the weight of the main hull itself ; the leeward outrigger is designed to submerge rather than let the main hull flip, but with a beam approaching half the length, its stability should be about *twice* that of a trimaran, with a half-beam of a little over a quarter the length. No weather float waving about slapping the waves ; cheaper and lighter ; exciting rig possibilities, from your triangular square sail (made to order for this ! !) to the *Janus* rig. In fact, reduce the leeward hull of *Janus* to a mere float and you almost have it. Only worry-making point : a dead run. I think this might have enough possibilities for you to drop into a bulletin for idea stimulation. Want me to pursue at all ?

For myself, I've just about finished the tentative plan of a 27-foot single-handed ocean trimaran that can only be described as by Morwood out of Piver. I *may*—the gods of finance and spare time willing—start building this Winter. Only one thing I'm completely unhappy about : invading the integrity of an elegant slim hull with the abomination of a centreboard trunk. Has anyone tried bilge keels on a 90 degree Morwood hull ? With a $3\frac{1}{2}$ waterline beam on a 27-foot hull, bilge keels angled out about $22\frac{1}{2}$ degrees from the chine could go 18 in. deep each without increaxing the draft.

For *Padang*, you mentioned plans to experiment with leeboards. Any results ? I wonder about non-angled short keels on the floats ; peculiar steering, perhaps, or wave slap on the weather one, or both ? Perhaps your experiments with foil leeboards might throw some light on this. Perhaps bilge keels plus small float keels would combine to do the job ; the main loss, of course, is getting into deep water for a real grip. But I'd pay something to get a weakening, accommodation-ruining centreboard case out of the hull.

Thought for vane steering downwind, where Piver indicates a regular servo setup won't work ; remove the counterbalance ? Even weight the vane ? Then the boat would tend to go straight downhill, with (perhaps) enough wind going up a wave to overcome the weight.

I feel like writing a book-length letter, but mustn't impose too far. Of the single-handed race I was most impressed by Hasler. We (Doubleday) are about to publish Chichester's book and I am impressed by his stamina, but not by the suitability of a standard Bermuda rig for single-handed voyaging. I've been in love with the China lug for some time and plan it for my trimaran. What is your theoretical opinion of it ? Not the ultimate efficiency, of course,—but seems close to the ultimate in efficiency, plus ease of handling plus safety plus cheap to make and maintain.

Perhaps the A.Y.R.S. might do a service by analising some of the unusual rigs such as this ; sometimes the newest development is only a twist on a very old idea. I seem to recall your mentioning the China lug favourably in your book *Sailing Aerodynamics*, but don't remember any technical rating of its probable efficiency to windward.

I'll close with an amusing story. Wanting to experiment with vane-servo wind steering, I slapped together a rig for my little outboard cruising boat (it is not a cruiser, Sir ; eight knots top speed and no tail finds). Didn't work ; wind kept forcing the rudder over and the boat stubbornly kept forcing it right back where it belonged as the boat went its own way, even setting up a wild oscillation. So I took it home and cut back the top of the main rudder to make it about half balanced, and also cut back the lower hinge portion of the servo tab to make it completely balanced. Then, while running at cruising speed, I stupidly tried to rig it. Gave the staff of the servo tab a slight twist with my finger tips to make the main rudder line up while I put in the vane, and ripped out the whole rig ! Just that finger pressure swung the rudder across the water and held it there while the admittedly light pintles tore away. Lesson : respect the awsome power of a balanced servo tab. Lesson II : No rudder can steer a fat, broad-transomed outboard boat without plenty of beef, and maybe not even then.

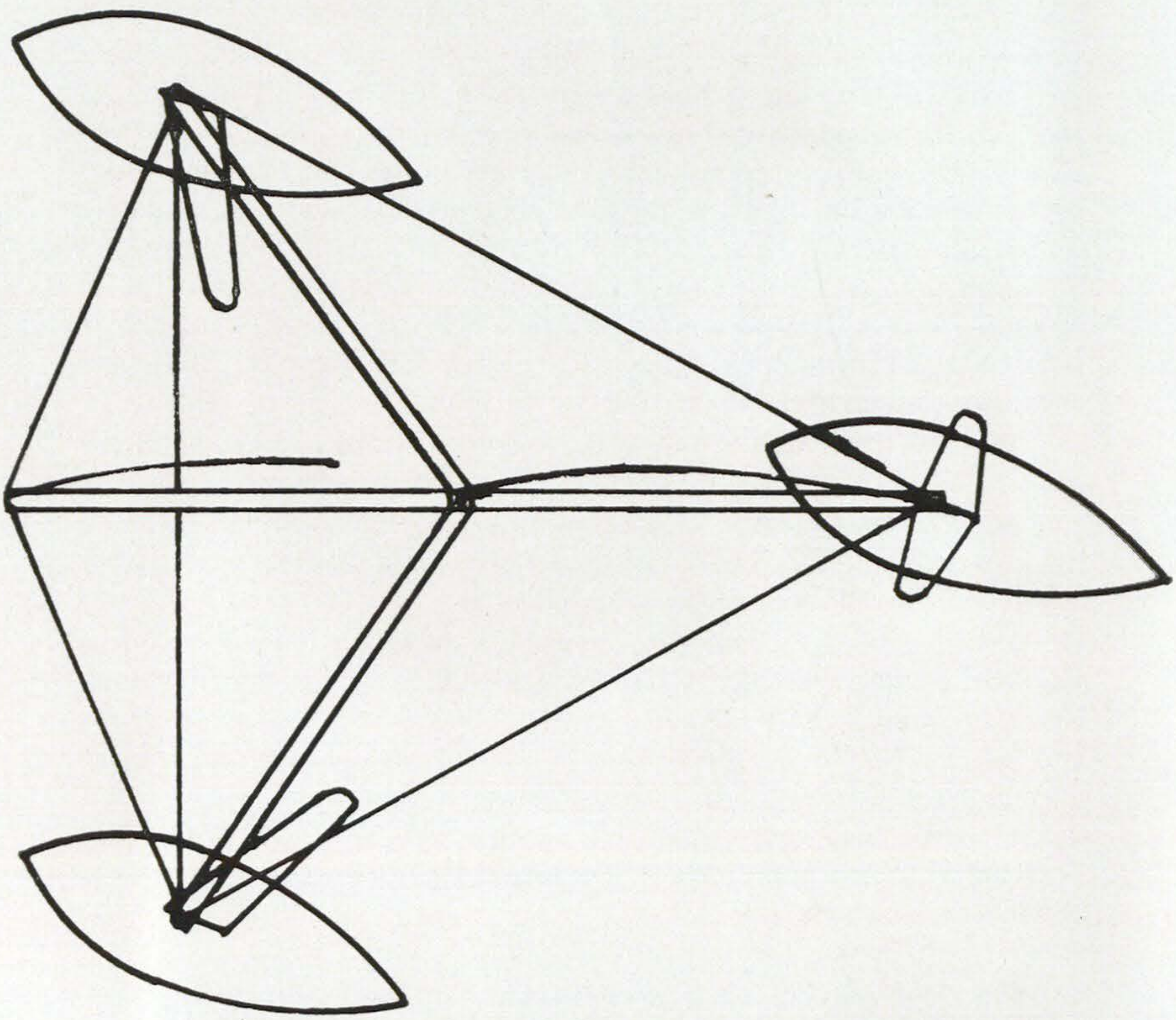
Enough. Once more , my respects and continued thanks for all your good work. You'll have me in a trimaran yet.

EDWARD G. STODDARD,
58 Intervale Place,
Rye, New York, U.S.A.

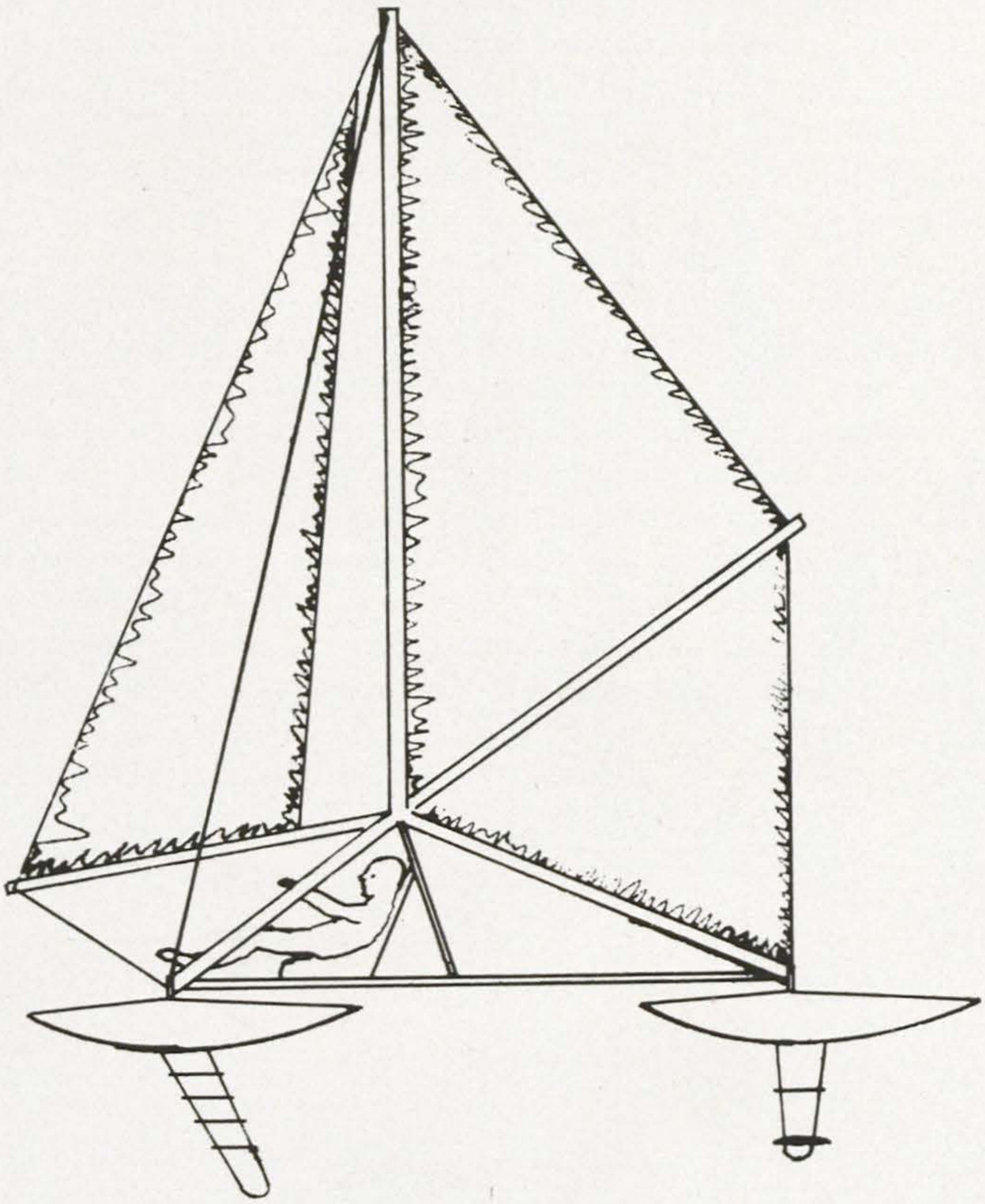
A FOIL-CRAB DESIGN

Dear Sir,

In his " Sand Yachts " article Ian Dibdin compares the merits of front-wheel and rear-wheel steering. Mention should also be made



of the third type which steers on all three wheels. Known as the "Crab," and developed at Gransden by Peter Shelton, this type works on the principle of a fore-and-aft sail fixed to the chassis, needing no manipulation, so that the yacht is always "crabbing" sideways. The two front wheels are steered by left and right hands and the rear wheel by two pedals, one to straighten it (like hauling in the sheet) and the other to turn it more to the side and luff up. All wheels have slight trail, so that the human element acts as a differential between them.



The " Crab " combines the advantages of both the other types with several of its own. It is more manoeuvreable than either, and safer. It may be luffed, backwinded or even braked to a standstill ; jibing is easy ; there is less variation in sail balance, and it puts about through half the angle (because its sail line is dead fore-and-aft). Owing to their high speed land yachts often sail closer to the relative wind on a downwind beat than any waterborne craft on a close one, and this suits the uniform flat trim of the " Crab."

The diagrams give my impression of a new type of craft in which the " Crab " principle is applied to floats and foils. I find that model angled and swept foils trail out sideways from a vertical king-pin without apparent flutter, and a small amount of built-in lift is obtained from the natural toe-in of a pair of these foils trailing free. Probably a sensitive control of the front foils would enable the craft to rise to the waves and so avoid air entrainment, but if this occurred the air could be quickly shaken off. The frame is a tripod held in compression by stays all round. A seat is mounted on a centre bar and supported from the focal point. The backstay is sprung out on a spar to give leech tension to an enlarged mainsail and a bowsprit stayed between masthead and the two front feet performs the same function for the foresail. I have not marked in the linkages, but these could be by a system of parallel arms and wires. The live weight is rather far forward, but if " fore " and " aft " are taken in the line of the craft's course then the more it " crabs " the further this weight moves aft.

Perhaps some reader who has had experience of foils will send me his comments.

William Garnett,
Hilton Hall,
Hilton, Hunts.

A DESIGN FOR AUTOMATIC INCIDENCE CONTROL OF HYDROFOILS

BY

M. A. T. Trasenster,

Lane End, Itchen Stoke, Alresford, Hants.

The basic principle of the system involves the use of drag elements to control the angle of incidence of the hydrofoil.

A variety of layouts are possible using this principle. Fig. 1. is the simplest, but obviously involves a considerable amount of appendage drag. In Fig. 1. the hydrofoil is free to rotate about an

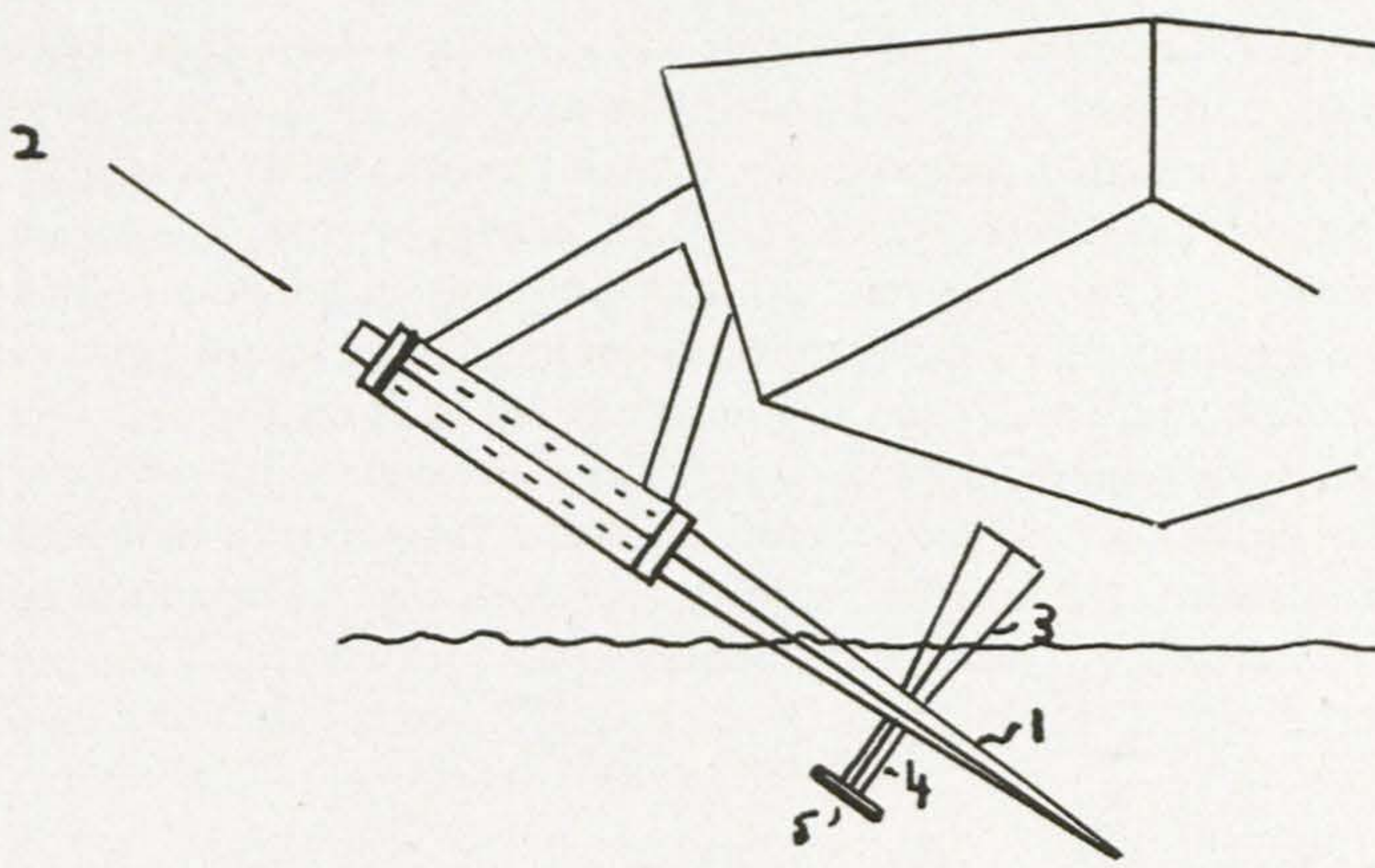


Fig 1

axis 2 transverse to the direction of travel. The angle of incidence is controlled by two drag elements projecting from the upper and lower surfaces of the hydrofoil. When the hydrofoil is running low in the water the upper element 3. is dimensioned so as to cause greater drag than the lower element, so increasing the angle of incidence and giving the necessary lift. When the upper element breaks through the water surface it will be subject to less drag, and the drag of the lower element 4. fully submerged will then tend to reduce the angle of incidence until the assembly is in equilibrium. Any rise or fall from this position of equilibrium will be automatically counteracted. A trim fin 5. is incorporated with the lower drag element.

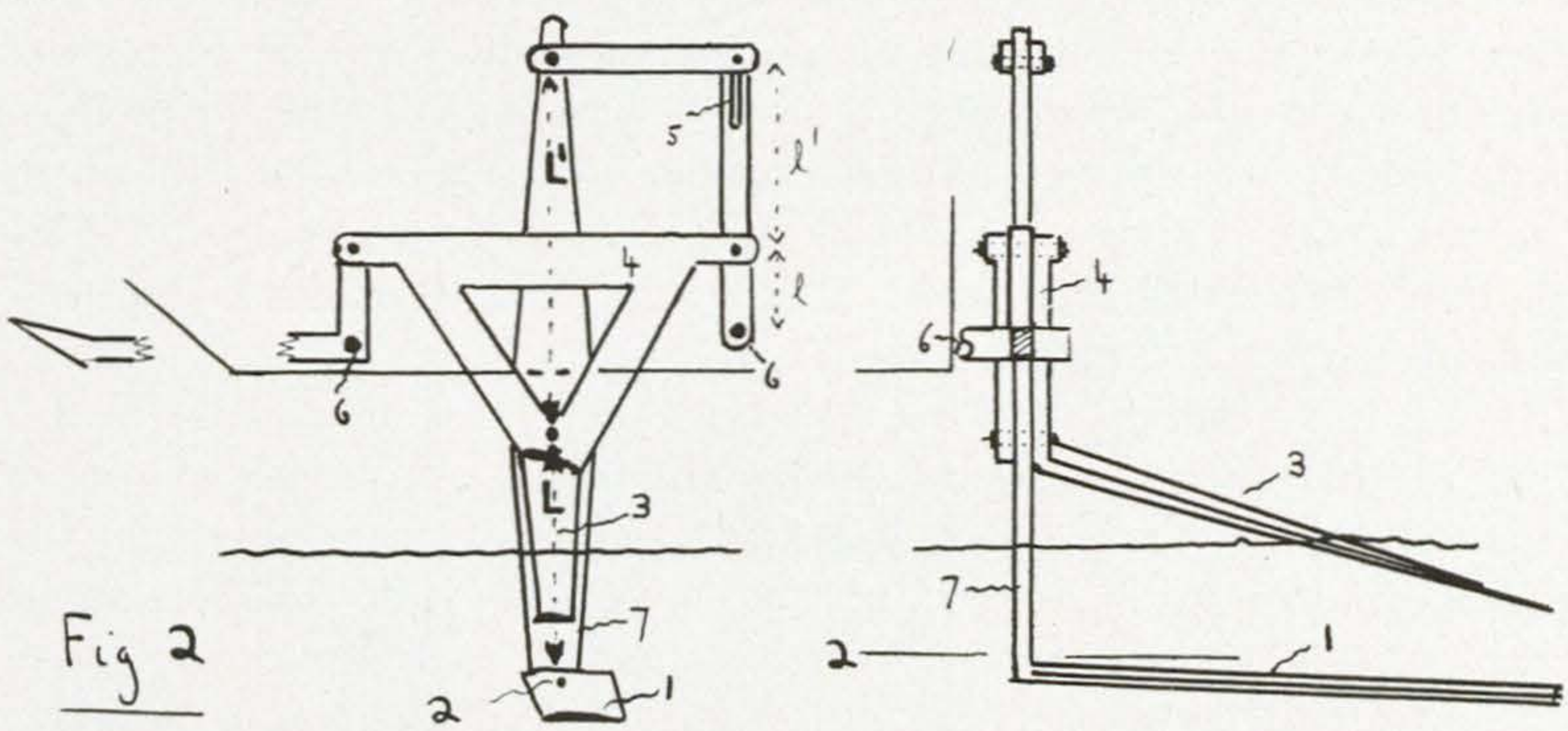


Fig 2

In order to avoid the unnecessary drag the linkage shown in Fig. 2. can be used. The supporting strut 7. operates as the upper drag element and the main hydrofoil 1. acts as the lower drag element.

The hydrofoil 1. is rigidly fixed to strut but constrained by the linkage so that it can only rotate around transverse axis 2. This axis is proportionately dependent on L and L^1 to 1 and 1^1 so that trim can be arranged by altering the length of 1^1. The linkage is attached to the hull at points 6. A subsidiary surface piercing foil 3. may be attached to the link member 4. The drag component of the subsidiary foil tends to increase the incidence of the main submerged foil.

The drawings in Fig. 2 are taken from an assembly mounted between the hulls of a twin-hulled craft. Overriding control, damping and resilient suspension can be fitted to the assembly. Retraction of the hydrofoil assembly is also fairly easily incorporated.

RHYTHMIC ROCKING AND THE SPADE BOW

Dear Sir,

If we want to study the curse of hobby-horseing in cats to find out its cause and cure, we would do well to consider its action in those inveterate " rockers " ocean liners. Let us discard the popular idea that rhythmic rocking has anything to do with rocker. Liners have none. But, come to think of it, their hulls have a lot in common with cats. Both have a long length to beam, long parallel mid bodies and similar sections. Their main difference lies in the magnitude of the momentum that carries through the swing. The cat gains some through its mast.

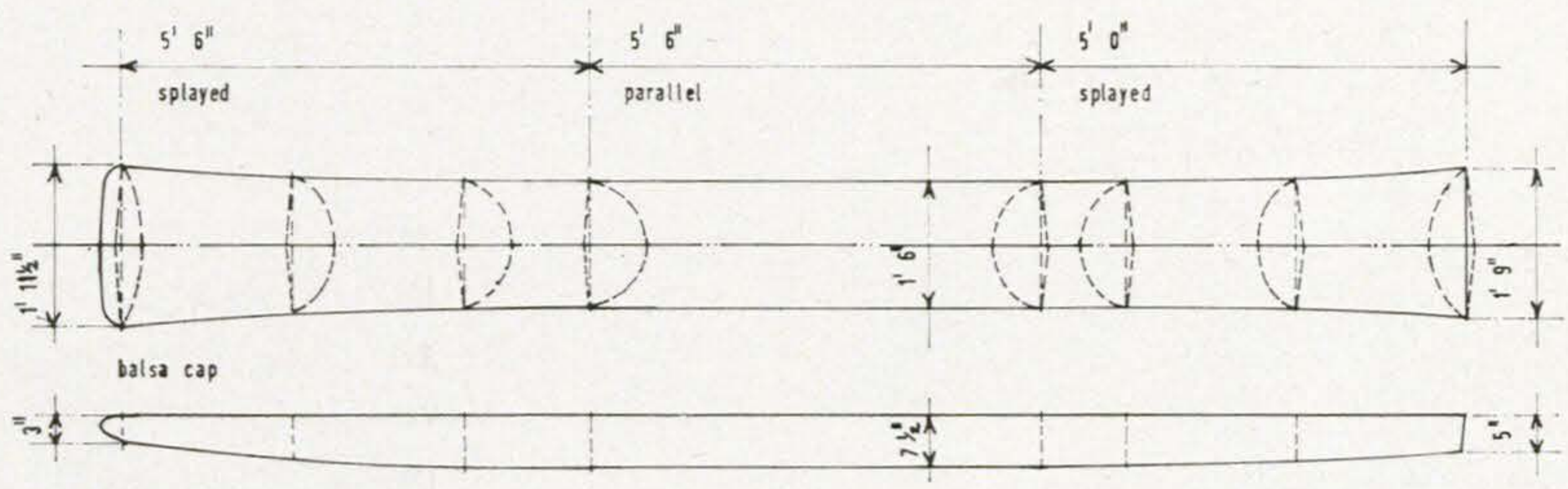
When the liner plunges its bow down and down, meeting ever increasing resistance through buoyancy increment till it stops, the stern rises higher and higher until it, too, stops, under the ever increasing gravity load. For an instant the liner is poised with a heavy double-acting charge of riposte potential, unleashed, to accelerate the return journey, over-shooting the norm and reversing the charges. This rhythm, once established, needs little in the way of fortuitous impulses to keep the pot boiling.

All this assumes that the end buoyancy increments are " soft," that is, that they develop gradually and equally in order to give a balance for the rhythm. In liners this occurs so invariably that the public regard it as an Act of God and harbour no rude thoughts about their earthly architects, but suffer patiently " ad nauseam." The ancient architects of Chinese junks and Arab dhows were, perhaps, unconsciously more scientific in that they built for " hard " buoyancy at one end and " soft " at the other.

Mr. MacAlpine-Downie, it is said, has recommended exactly the same treatment to put a stop to rhythmic rocking. His *Hellcat* has

" soft " fine entry bows and a flattened stern. But although the rhythm is confounded, his bows, with diminished lift, must plunge into waves they cannot surmount. And this bring us to the spade bow of the latest L.B.C. design which provides a " hard " buoyancy increment at both ends. This not only stops the rock, but brings other blessings in its train.

The Spade Bow. This type of bow is a natural outcome if we are to enjoy the goods that the L.B.C. provides. Having no more than three or four inches free-board a pointed bow and a vertical cut water would leave almost no terminal buoyancy. Given a horizontal cut-water we can get as much lift as we like. The particular degree of splay shown in the drawing comes of itself if we wrap around the hull plywood sheets of uniform width. As the rocker develops the



chords spread out and flatten. On meeting a wave there are no vertical planes for it to break against, sending up spouts of spray and showering the crew. Nor is there any shock to check the speed. On all sides the waves meet nothing but sharp edges and under-hung surfaces. In addition to the buoyancy lift at the bow is the upswept plane so that all but the steepest waves are surmounted. These steep waves have their tops sliced off like the top of an egg. The top half flows unchecked over the deck. The spray is smothered, and there is no wave slam. The most the bows get in a slight lop is a friendly pat. Lastly, the spade bow provides accommodating gangways growing wider as the bowman runs forward to fend off a collision.

JULIAN ALLEN, A.M.I.C.E.,
Kenstyle, Penally, Tenby, Pembs.

Dear Sir,

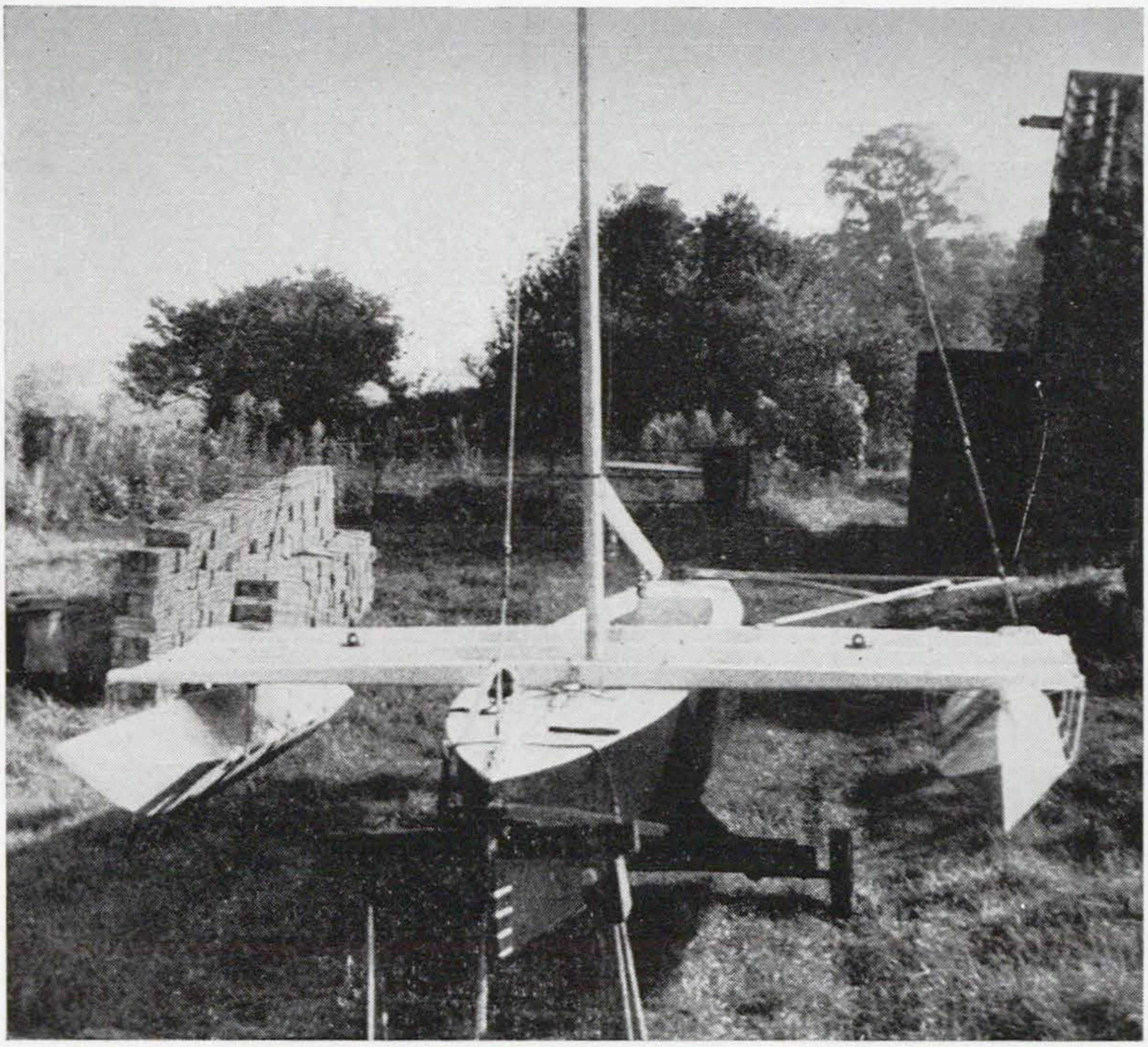
SUBMERGED FLOATS

My reply to Mr. Du Bois' letter printed in A.Y.R.S. 38 is not the one I sent, but a draft that got to you by mistake. My actual reply was less favourable. In it I explained that as the load shifts off centre, one side float will start rising while the other sinks. This movement assisted by the capsizing couple between the C.G. and the C.B. makes the submarine surface and it will resist efforts to get it down again.

Professor Nutku's submarine with the hydrofoils is different, but, so far as can be seen, it is likely to surface involuntarily.

Norman Pearce's version of an L.B.C. is typical of almost all the suggestions that come to me from members. They all feel that the body of the float should be cylindrical. But the fact is that for almost 100 per cent. of the time both floats are on the surface and for many reasons a semi-circular section is better. It has less wetted surface up to the moment of total immersion ; it has safe gangways and a sound fix for the crossbeams. This version lacks all these and is difficult to build ; also it will lead to plunging and rhythmic pitching owing to lack of terminal buoyancy.

JULIAN ALLEN, A.M.I.C.E.,
Kenystyle, Penally, Tenby, Pembs.



Parang

PARANG

L.O.A., 16 ft. 6 ins.

L.W.L., 15 ft. 9 ins.

Designer : John Morwood.

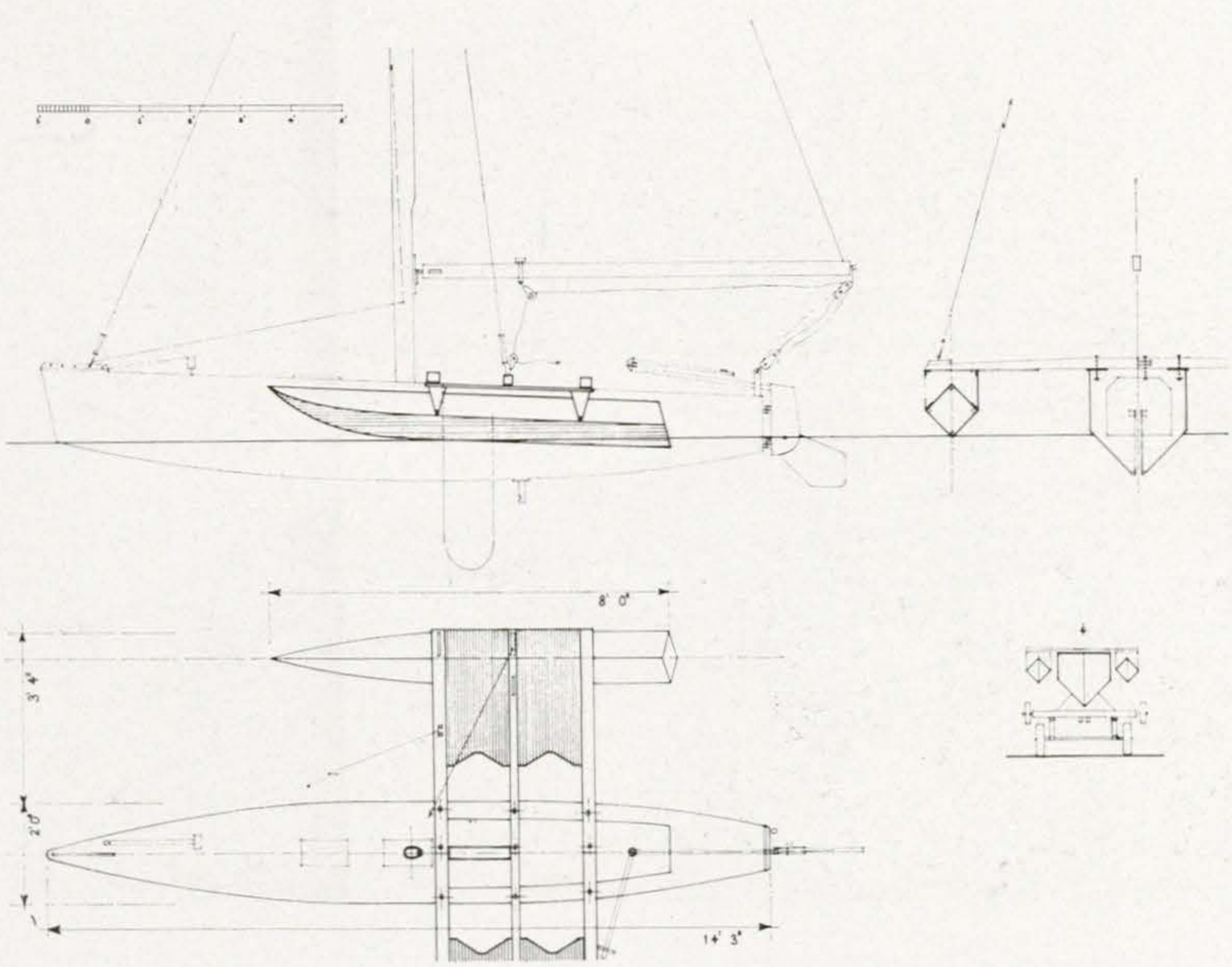
Builder : Ian Forbes, Top Common, Chipperfield, Herts.

Members will remember my *Parang* design of No. 18 and variations of it by Martin Ryle, and Peter Cotterill. This is a variation of the float design by Ian Forbes keeping the main hull the same as in the design.

THE FLOATS. These are as short as in the design but altered to make them slightly better looking.

PERFORMANCE. This was good as regards speed, indicating that the main hull design is satisfactory, though nowadays we would flatten the run aft more. However, the hull shape as drawn is probably as good as any being slightly faster than the flat floor type up to 4 or 5 knots.

FAULTS. The only fault was the smallness of the floats which needed some delicate balancing to keep the craft going in anything of a wind. In a gust, the lee float was driven under and when the

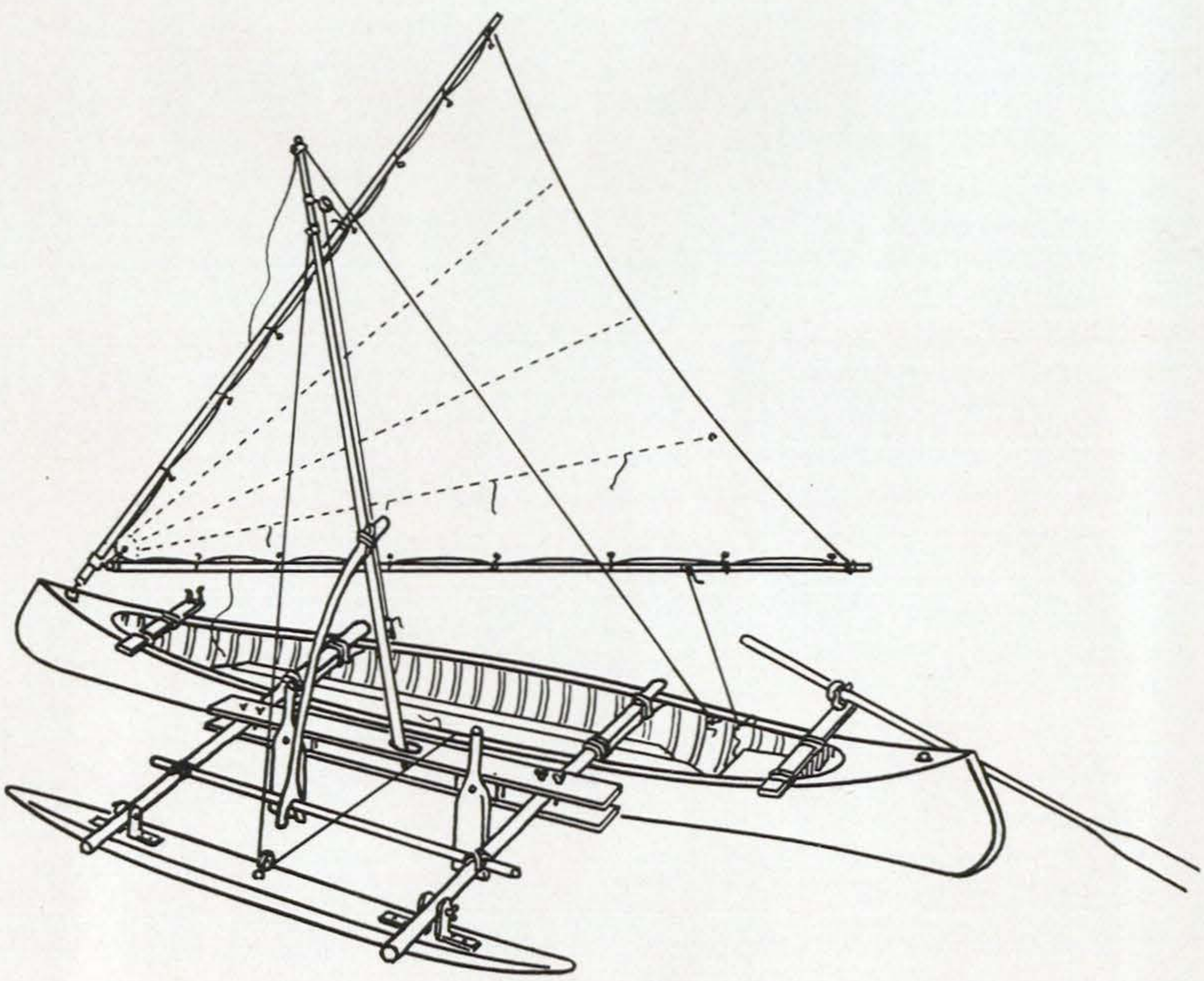


wind fell off the craft rocked violently to windward. The whole craft capsized more than once, indicating a severe fault.

SUMMARY. This craft proves once again that trimaran floats must be very large and that virtually NO DYNAMIC LIFT can be expected. In general, it indicates the progress which has been made since 1957 in trimaran float design.

THE MICRONESIAN CANOE

We finish this publication by once again reminding members of the Micronesian canoe shown here in a pen and ink sketch by A. E. Bierberg, Skovbrynet 23, Lyngby, Denmark. On the basis of the ordinary Canadian canoe, the constructional details are shown clearly in the drawing. Further details can be got from Mr. Bierberg.



Micronesian Canoe

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