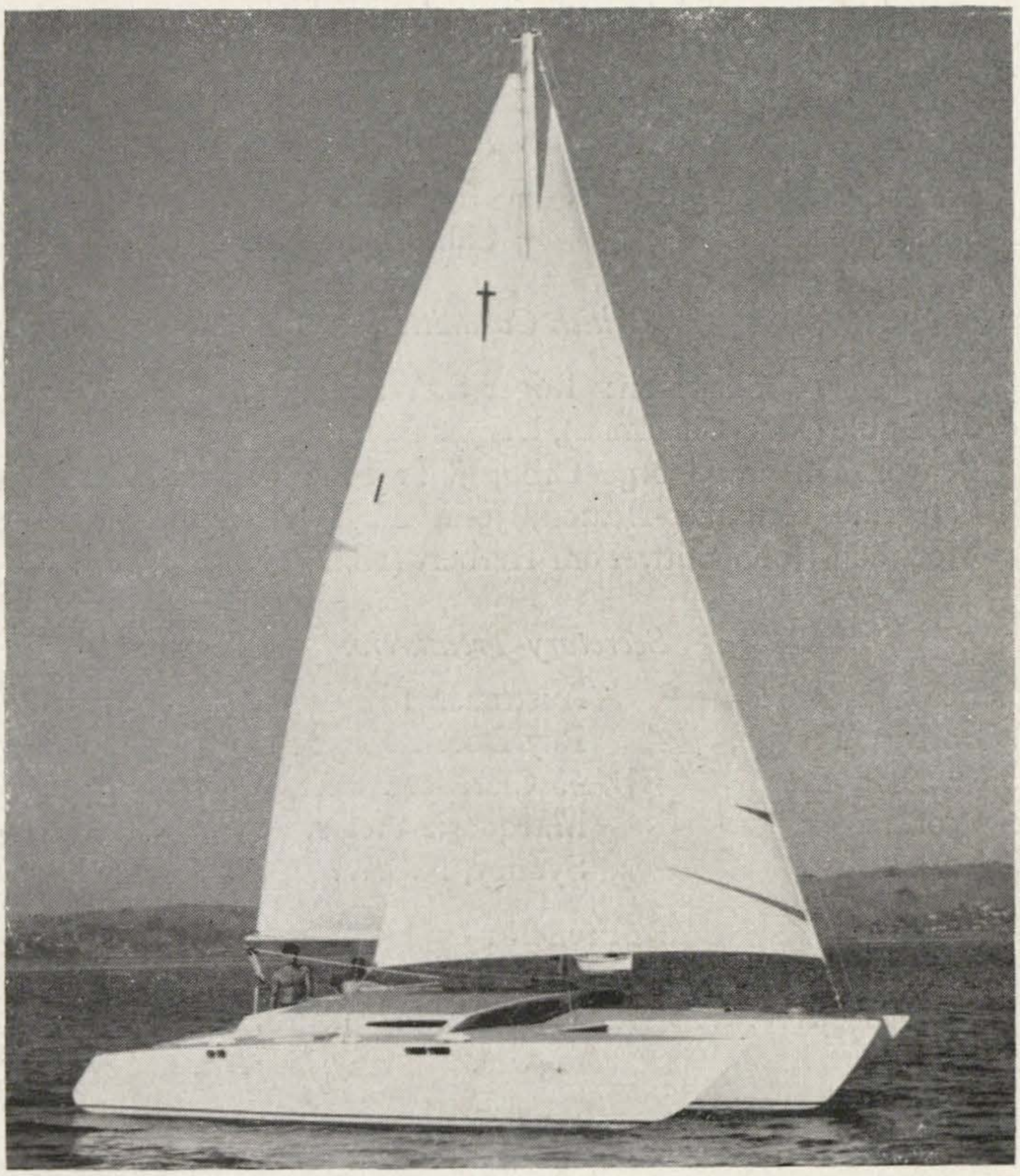
TRIMARANS 1965

A.Y.R.S. PUBLICATION No. 55



PIVER'S STILETTO—A pretty trimaran

CONTENTS

PRICE $1.00 *PRICE 5/-*

EDITORIAL

April, 1966.

The A.Y.R.S. Cruising Yacht Design Competition. We have now changed the title of our competition to the preceding. The races of the models we had at the Boat Show had to be postponed because the Round Pond was frozen but they will take place on April 3rd. We have 9 entries, though only 6 were ready for our Stand at the Show. Catamarans, trimarans, single hullers and hydrofoil stabilized boats were all entered and we will see how they all go.

The A.Y.R.S. Cruising Yacht Design Competition (1966). The A.Y.R.S. Committee feel that our competition this year was a success and that, if run every year, its greatest value would appear. We will therefore hold the competition again this year. We have not fully decided the rules as yet but any model built to the rules of last year will be eligible. The only major alteration is likely to be that the full size yacht can be of any size but the appropriate scaling factor has to be used to bring the model to 36 ins. L.O.A. A copy of the last year's rules will be sent to anyone on request, and the full rules will be published in July.

Diddington Reservoir. Inland members who wish to sail on the new Diddington Reservoir, alias Grafham Water, are advised to write for particulars to the Hon. Sec. of the Grafham Water Sailing Club, Mr. F. R. Parson, O.B.E., D.F.C., whose address is Aldermans House, Farndish, Wellingborough, Northants. When full, there will be an area of 1500 acres, and sailing is expected to commence in 1966. The Reservoir lies a few miles to the west of the A1 about 55 miles north of London.

The Great Ouse Water Authority are willing to provide the necessary amenities for the new club, who will bear the charge for these at an economic rent. The subscription for membership of the G.W.S.C. is understood to be £4 per person and those aged 18 or over pay an entrance fee of £4. The boat fees are understood to be at the rate of £1 per foot length overall. The cost of these amenities, including clubhouse, slipways, safety boat and car parking facilities, has been estimated at £60,000.

The International Boat Racing Association, 39, Steppingstone Lane, Kings Point, L.I., N.Y. will be holding the *World Multihull Championship* on September 22, 23 and 24, 1966 at the United States Merchant Marine Academy, Kings Point, L.I., N.Y.

A cordial invitation is extended to all multihull sailors all over the world to participate in this historic event. The following trophies will be presented :

Daysailers. Handicaps using the modified Yachting *one of a kind rule.*
William Randolph Hearst Jr. Trophy—Catamarans under 20′-0″.
L. Francis Herreshoff Trophy—Catamarans 20′-0″ and over.
Boris V. Sergievsky, Trophy—Trimarans under 20′-0″.
Victor Tchetchet Trophy—Trimarans 20′-0″ and over.
Handicaps using the *Pacific Multihull Assoc. Rule.*
Tom Varley Memorial Trophy—Catamarans and Trimarans with permanent berths and auxiliary engines.

Dear Sir,

My wife and I both thoroughly enjoyed the Weir Wood Meeting, particularly in view of the excellent sailing weather.

Would it not be possible to arrange a meeting further north next Summer ? Lake Bala in North Wales would be a good place, within reach of Liverpool, Manchester and Birmingham (60, 75, 100 miles respectively). The lake is larger than Weir Wood and has a large camping and caravan site on the lake shore from which boats can be launched. If you could publish this suggestion, I would be glad to hear from anyone who may be interested.

DON RIGG.
5, Wilmot Avenue, Gt. Sankey, Warrington, Lancs.

TRIMARANS 1965.

This publication is a tremendously satisfying one to me. Little did I think (ten years ago) as I studied the accounts of the Indonesian outriggers in the British Museum that the result would be an entirely new concept in yachting. Victor Tchetchet, Arthur Piver and a host of other people had used double outriggers to stabilise narrow boats but the isolation in which they worked, the lack of understanding of their friends and the active hostility of the conventional yachtsman all usually made them lose heart and give up.

It was, of course, the A.Y.R.S. which forced the development by putting trimaran designers in touch with each other. It provided a forum for the exchange of ideas. The competition to be first to produce a wholly satisfactory trimaran advanced the craft into OUR lifetimes.

The first breakthrough was the concept of the right angled V section (A.Y.R.S. No. 15) for the central hull and sheet plywood frames for the bottom of the hull. This was combined with the asymmetric "Box" float of square cross section set on edge (my *PARANG* design of A.Y.R.S. No. 18).

I sent this *PARANG* design to Arthur Piver who at first used the principles to build his *FROLIC* and later his *NUGGET*. However, the floats banged so Arthur redesigned them, producing the present form of these two craft. The *PARANG* stern also proved too fine and this had to be widened in the final designs.

Now came the next breakthrough, which was not so much a matter of design but of publicity. Arthur Piver turned himself into a human dynamo and built his *NIMBLE* and, with tremendous courage and confidence in his design, sailed her across the Atlantic, later building *LODESTAR*, which he sailed across the Pacific to New Zealand. These voyages proved the speed and seaworthiness of the trimaran and, through the A.Y.R.S., triggered off the stream of trimaran designs which it is our pleasure to publish today. However, the basic design principles as worked out by Arthur Piver are to be found in all of them.

The next stage in development occurred in the West Indies where Dick Newick, with his trice, showed that rounded central hull sections were really fast, while a slight modification of the bottoms of the floats to reduce wetted surface added again to the speed.

Now, we find the next jump forward comes from Australia where Hedly Nicol's *VAGABOND*, with rounded hull sections and fully streamlined cross deck, shows still more improvement. In fact, the *VAGABOND* and *WANDERER* designs might well be the ultimate in trimaran design, only being capable of very minor modifications as the result of test tank work.

Low Aspect Ratio Fins and Centreboards. Norman Cross, Louis Macouillard and Hedly Nicol all use low aspect ratio fins, while most other designers use either centreboards or fins on the floats. At the time of writing, there appears to be no speed difference between the two systems but this can be easily found out by simple trials in the racing trimarans or catamarans. A fin with an upward projection to fit into the C.B. box from below would answer our doubts in an afternoon.

Summary. The development of the trimaran is thus a fascinating process. Starting with Victor Tchetchet's designs, T 22 and *FLAMINGO* (A.Y.R.S. Nos. 6 and 10), the torch passed to Arthur Piver (*ROCKET* A.Y.R.S. No. 16) and to me with the trimaran built on an 18 foot *SHEARWATER II* hull. My *PARANG* design reacted with Arthur Piver's designs to produce *FROLIC*, *NUGGET* and *NIMBLE*. With *NIMBLE*, Arthur showed the world that the trimaran was seaworthy in the open ocean. Dick Newick refined the simple hull in the West Indies, while Hedly Nicol refined it still further, in Australia. It is extremely interesting to me that each great step took place at some point widely separated from the previous one. Undoubtedly, the catalyst was the A.Y.R.S. in each case. Otherwise, the French would have developed both catamarans and trimarans because they were first in the field with the Ocean cruising catamaarns *COPULA* and *KAIMILOA* and the trimaran *ANANDA*. Perhaps, the French, with their national flair for elegance, will be needed to complete the exercise.

TRIMARAN *DEVIL'S ADVOCATE*

BY

JOHN MORWOOD

The A.Y.R.S. has been publishing designs of trimarans for many years now which only from time to time hint at faults in these craft. I hope to collect in this article all the nasty things that people say about trimarans so that our members can make up their minds if a trimaran would suit them.

The Catamaran Addict's Say: " A trimaran in only an inefficient catamaran with a large hull placed between the two hulls." "If two hulls will do the job, why have the added expense and extra beam of three."

In the Australian magazine SEACRAFT, when Hedly Nicol's *VAGABOND* was flown off the water and capsized (as described later), trimarans were criticised and this brought a very interesting analysis of their good and bad points from the single hullers. Perhaps the best of these was an article by Peter A. Ibold who sailed from San Francisco in a *VICTRESS* trimaran across the Pacific to Suva, Fiji Islands where they left their trimaran and continued their cruising in a single hulled yacht out of preference. They list the disadvantages of the trimaran as follows :

1. Very quick, violent motion on the wind. As a "Devil's Advocate", I quote : "In spite of discomfort, we made 167 miles one day under a club jib and double reefed main, but it just wasn't worth it." This was hard on the wind, in the Trades. If one watches yachts at moorings, the trimarans motion in roll is about three times as quick as the single hullers but only about one third of the extent. One wonders if the total motion caused to a yacht by swell is the same whatever the configuration and it therefore is merely a matter of whether a quick short motion is better than a slow long one. However, the latter has an inertial effect which hurls people and things about more.

2. Relative instability as compared with keel boats. The meaning of this is a bit obscure, to me, especially in a *VICTRESS*. The only thing I can think is that it is another way of criticising the quick motion.

3. Extremely high stresses can produce signs of excessive structural strain.

4. Unproven seaworthiness in very heavy weather.

5. No absorption of noise in the hull. This will be especially so in plywood yachts. The article is a long one and we will get back to it later to list the advantages which Peter Ibold found.

Trimaran Capsizes. This is the ultimate, and reasonable fear of yachtsmen. So far, I have heard of three trimaran capsizes. The first was described in A.Y.R.S. No. 52 where a *NUGGET* tried to cross Salcombe Bar at low water. The second was Hedly Nicol's flying capsize, described in this publication. The third was a *NIMBLE* which got in irons while putting about near the shore. She drifted backwards and a float got stuck. The sheets were pinned in and the crew were waiting for forward way to appear which never came, the yacht lying beam on to the wind. An exceptional puff came in the force 7 wind and she just rolled over. There are no recorded instances of a trimaran which was fully loaded being capsized at sea and, as Hedly Nicol says, it would take a wind of 312 knots to do this to one of his.

TRIMARAN ADVOCATE

BY

JOHN MORWOOD

The Catamaran Addicts. A trimaran has a much more "Natural" accommodation for the human frame than a catamaran. One does most of one's sailing in light winds when the main hull does nearly all the work so why have a huge hull to leeward for sailing stability. A trimaran is very far from being a "Three hulled catamaran". It is much more a modified single hulled yacht, with floats instead of ballast. On the whole the floats prove to be cheaper to make than either an extra hull to make the main hull a catamaran or than the ballast and stronger construction of the single huller.

Peter Ibold in SEACRAFT lists the advantages of trimarans as follows :

1. Very stable and comfortable off the wind.
2. Lots of space on deck and below.
3. Very comfortable at anchor, even in heavy swells.

4. Shallow draught (about 34 inches for the *VICTRESS*) is ideal for negotiating channels and coral reefs.
5. A sense of light and space which is a great advantage on long passages.
6. Ideal for day sailing or weekend sailing.

In reply to the list of disadvantages Peter Ibold lists, these can, in fact, be reduced to two only 1: the violent motion and 2. the unproven seaworthiness. The high stresses which are produced are simply a matter of design and noise can be quietened by a layer of rubber or other paint or a sheet of foam plastic.

The Violent Motion. If anyone wants or needs to go 167 miles to windward in the Trades in one day and stay on the surface of the water while they are doing so, they may expect a lot of motion in a 40 foot yacht. After all, you cannot expect to ride a switchback fast with the same comfort as if you rode it slowly. Obviously, the answer is to slow the boat till the sea motion is what is wanted. If now, the *VICTRESS* is comfortable at anchor, it will be comfortable if hove-to at sea or only moving slowly on its course.

Unproven Seaworthiness in Very Heavy Weather. At this moment, trimarans are crossing all the oceans of the world in an ever increasing stream and none, to our knowledge, has been lost. Most certainly, losses will occur in the course of time but, if one looks through the list of causes of yachting accidents as given by Peter Tangvald in *Yacht Electrics*, A.Y.R.S. No. 48, one finds how immune trimarans will be to many of them.

Loss of Life : Drowned falling overboard : Very unlikely with trimaran. 27 lives were lost from 9 yachts which foundered. If these had been trimarans, they would not have sunk and many would have been righted and brought to port if they had capsized. The major cause in the single hulled yachts of loss at sea appears to be the weight of the ballast keel tearing off the garboard in gale conditions.

Stranding, which involved 27 yachts would not have been serious with most trimarans and would not have occurred with many due to the shallow draught. Fire is less likely due to the lesser amounts of petrol or diesel fuel carried. One can go through the whole of Pater's list and the trimaran scores each time.

Capsizing. Giant seas occur in the open ocean and, if met, could capsize a trimaran stern over bows. However, if the trimaran is running with warps from the stern, it is more likely to surf away from the advancing face than go over, the warps being carried towards the yacht by the top water. A huge beam sea of giant proportions could also capsize a trimaran but only if the advancing face was overhanging. As opposed to the single hulled yacht, the trimaran sits in the surface water and will be carried sideways by such a sea and survive while a deep keeled yacht will be capsized by its keel gripping the deeper water.

Finally, should a trimaran capsize in deep water, a hole bashed in the bottom of the leeward float will let that float sink and allow the yacht to be righted and sailed on, whereas, in the same giant sea, the single huller could well have sprung her garboards and gone to the bottom.

Catamaran Capsizes. Small racing catamarans often capsize but capsizes of large cruising cats are rare. I only know of two but both took place while sailing or at moorings due to a sudden gust. One modern 37 foot cat was capsized last summer but I have no details. She was righted and got sailing without trouble but it would have been a different matter on the open ocean. I feel that catamarans should have some high buoyancy on the cabin tops to render them self righting.

TRIMARAN SEA MOTION

BY

ARTHUR PIVER
Box 449, Mill Valley, California, U.S.A.

We note criticism in A.Y.R.S. No. 53 in relation to the motion of trimarans at Sea. There is no doubt motion in this type can be quick at times, but overall motion remains but a fraction of that of conventional craft. The absence of roll and heel is a revelation to those accustomed to ordinary types. We have motion pictures of these boats in gale conditions which would have everyone on a ballasted boat hanging on for dear life—while the trimaran merely bobs about unconcernedly—except when lying in the Trough—where a breaking wave upon the beam can knock her sideways. Repeated blows of this sort apparently do no damage—especially if the trimaran is lightly built according to our specifications. Lack of a centreboard or fin is an advantage.

We feel a discussion concerning different types in which to cruise is meaningless unless the protagonist has actually tried different ones under varying conditions.

One welcome development in multihull sailing is their acceptance by sailors in general and by race committees. The problem now seems to be to find multihull sailors who will participate in major races. We hope to have a good representation in the forthcoming (June 18) Bermuda Race, and in the succeeding race to Denmark. Even if for one reason or another there is no formal multihull class we would like to find some multihulled boats to compete with *STILETTO* during these events.

Strangely enough, often the most hysterical opponents of trimarans are catamaran sailors—the very ones you might expect to be open-minded concerning a multihull. Some of these have been ocean racing for almost 20 years, and apparently take great delight in proclaiming the superiority in speed of their often magnificent, expensive racing machines over ordinary cruising trimarans. This is tantamount to a driver of an Indianapolis racer bragging he had beaten someone's low-powered family sedan. We would like to see some of these catamarans in the above races.

We admire the way Myers & Ewing have worked out *EUNIKE'S* lines (A.Y.R.S. No. 54) by mathematical means, but when Hugo Myer visited us some months ago we were able to show him the lines of *STILETTO*—surprisingly similar but worked out in a different manner.

This consists of using constant radii—one each for topsides and bottom of central hull, and another for the floats. The main hull thus develops into a circular section at mid-point. Laying out frames, etc., with this method is as simple as straight V shapes—with reference points of deck, chine, and keel being joined by a line traced alongside a template.

BROACHING

BY

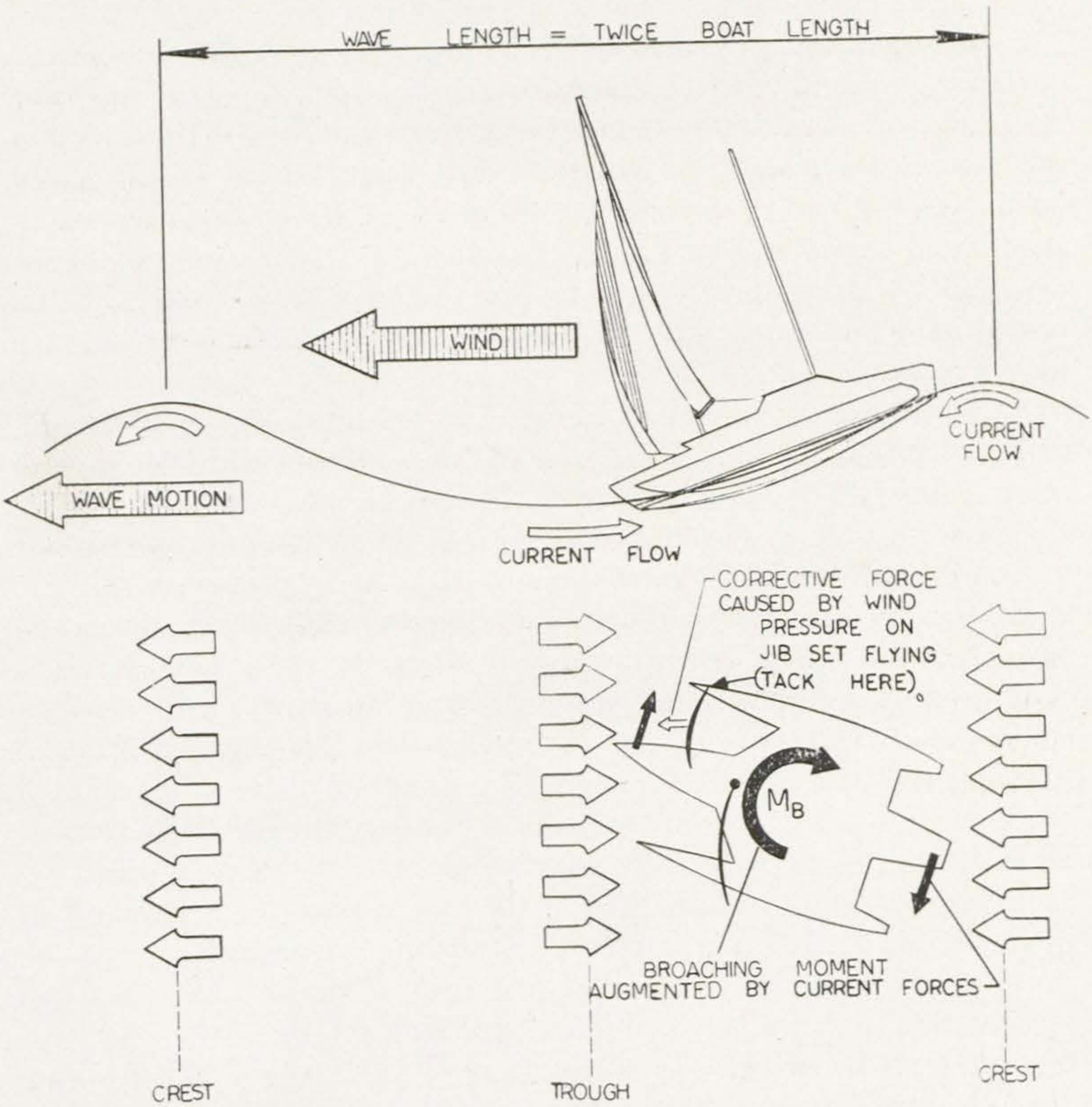
ARTHUR PIVER

Just about the most terrifying experience during a period of large waves is broaching. Because this phenomenon is little understood and because the sailor invariably blames the boat instead of his own lack of knowledge, we would like to dwell upon this subject :

Broaching is an uncontrollable swing into the wind, and in a trimaran can be particularly frightening, because speeds well in excess of 20 knots are possible, and if an already apprehensive sailor suddenly finds himself flying along entirely out of control, terror added to dread can add up to a fervent wish he had stayed home !

As far as steering is concerned, our designs with three parallel hulls just want to go straight, and non-heeling tendencies which do not change underwater shapes—have far more directional stability than the monohull.

Why then do these easily-controllable multihulls broach ? The accompanying diagram gives some idea. It is drawn showing the conditions in which broaching would be most likely. This occurs when the wave-length is twice the length of the boat—so when the bow is digging into the trough the stern is being lifted.



If you will look at the current arrows in the illustration you will see that the entire surface of the Sea does not move in the same direction as the wind, but in the trough actually runs counter to the wind. This is because water particles comprising the wave itself do not move with it, but execute an orbital motion which results in their completing their orbit in just about the same place they started.

A similar reaction takes place when you flip a line or a hose—a distinct wave travels its length—but the actual particles of matter forming the line or hose do not themselves change position. Thus a wave is a reaction to a pressure disturbance caused by wind blowing over the surface of the water.

If the boat is not travelling directly down wind you can see how the counter-current at the bow pushes this sideways—aided by the following current at the wave crest pushing the stern the opposite way—combining to form a strong turning moment.

On larger waves the boat is usually in either one or the other of the currents—presenting less turning force. The following currents near the rudder further complicate matters as they are moving in the direction the boat is travelling, and so reduce the actual speed of the water passing by the rudder—which can result in a considerable decrease in steering efficiency.

Other factors contribute to the development of a broach. If the bow is indeed dug into the water ahead, the centre of lateral resistance moves forward, and the boat tends to pivot about the bow. There is also the weather-cocking effect of the wind on the sails—when running or broad-reaching the mainsail can partially blanket the jib—moving sail pressures aft and tending to turn the boat into the wind.

The jib may be fastened to the bow of the weather float—giving it maximum exposure to the wind and thus maintaining proper sailbalance.

There is a marked difference in steering skill among even experienced helmsmen. Some may practically never allow their vessels to broach—while other have this humiliation repeatedly thrust upon them.

The difference in skill lies in anticipation of an incipient broach. The sensitive helmsman will recognize the possibility, and will straighten the boat to a more direct-down-wind heading until the danger eases. He will do this perhaps instinctively, and can be amazed when the same boat broaches with another at the helm—after the first man had privately decided that particular vessel was broach-proof !

The Skipper was horrified on the completion of a deep-sea trip to hear one of his mates complain to a stranger that "the boat was fine—but she broached."

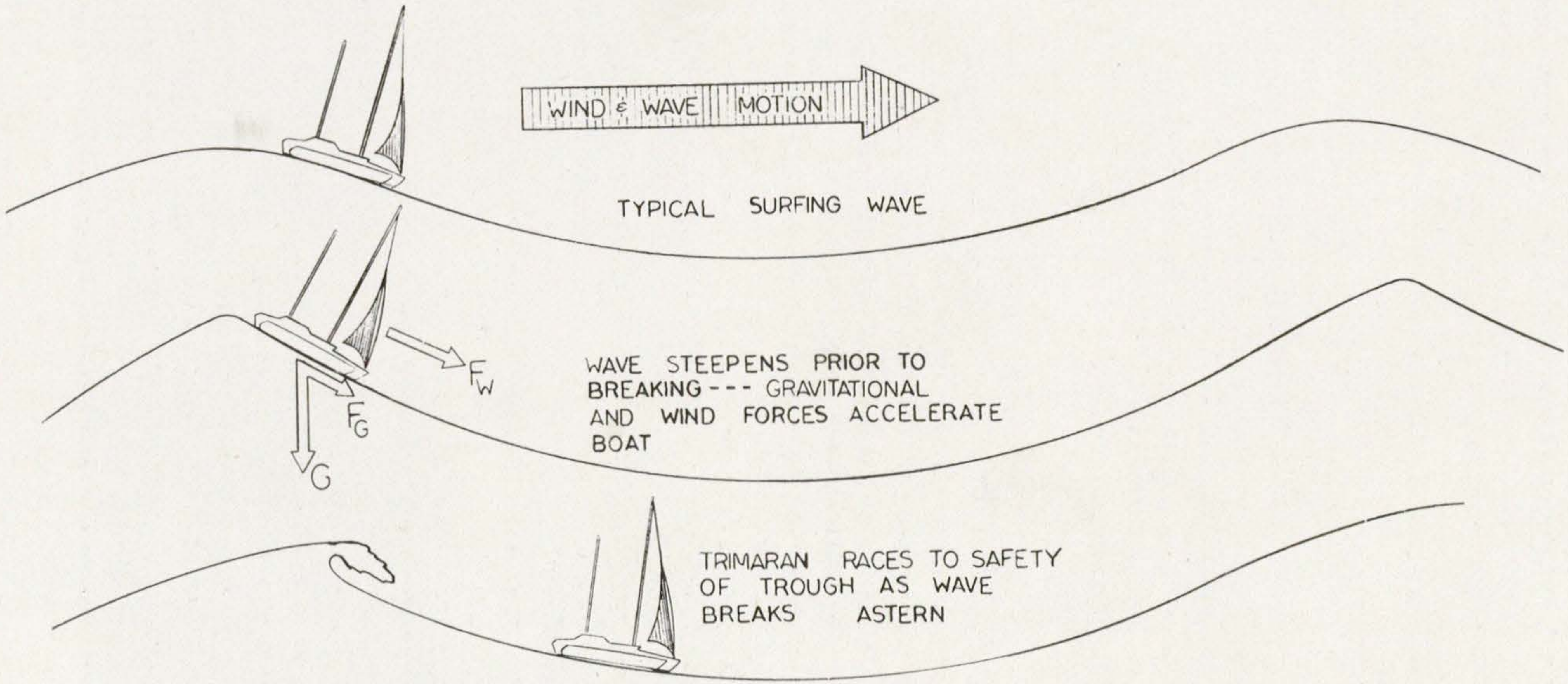
The boat had indeed broached—but only twice during the sailing of several thousands of miles—each time with the relatively inexperienced man at the tiller.

Another example of experience versus inexperience occurred during a run down the California Coast. Rich Gerling had joined the ship just North of San Francisco—and had so much fun in the surfing conditions then present he refused to surrender the wheel for five hours.

The boat was going like a train of cars—and everything was lovely. There was apparently not the slightest tendency to broach—probably because as an experienced helmsman he was making the proper correction movements without even realizing it. Within several minutes after he relinquished the helm to another crew member—away they went in a wild broach, with the helmsman white with terror !

A broach in a properly designed trimaran is safer than the same maneuver in any other type.

Overwhelming broaches have been experienced — without even any water on deck !


WIND & WAVE MOTION
TYPICAL SURFING WAVE
F_W
F_G
G
WAVE STEEPENS PRIOR TO
BREAKING --- GRAVITATIONAL
AND WIND FORCES ACCELERATE
BOAT
TRIMARAN RACES TO SAFETY
OF TROUGH AS WAVE
BREAKS ASTERN

THE TRIMARAN IN STORM CONDITIONS.

BY

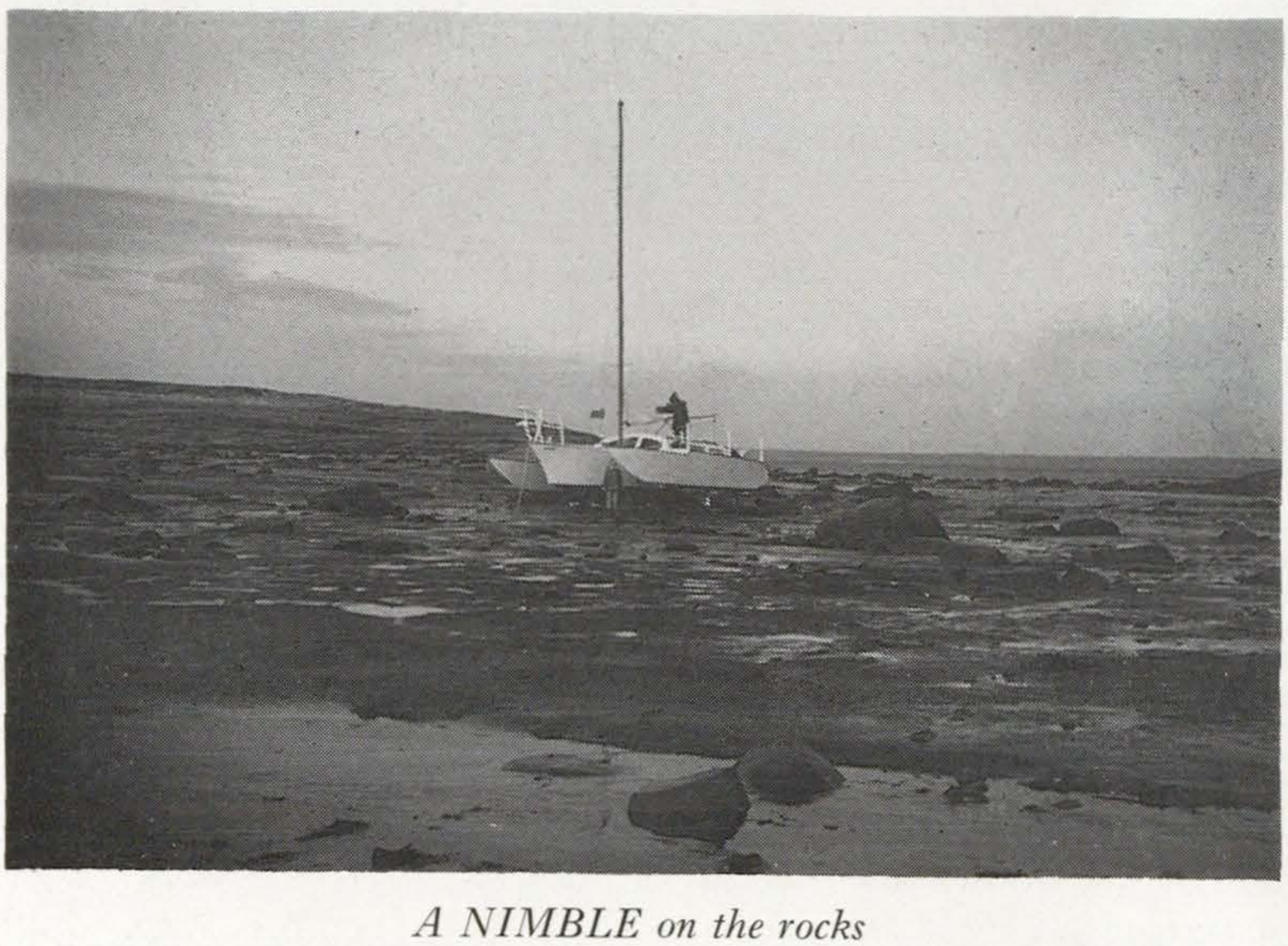
JOHN MORWOOD

Many People have, I feel, failed to appreciate Arthur Piver's "Trimaran seamanship" which he worked out on his first Atlantic crossing in *NIMBLE No.* 1. The item which appears to baffle people is the fact that a trimaran can surf away before a storm sea so as to avoid being engulfed by it. This is an entirely new concept of seamanship for small boats and it must have needed a bit of courage, as well as insight, to put it into force for the first time.

The drawing we show appears in Arthur Piver's TRIMARAN THIRD BOOK available from him at P.O. Box 449, Mill Valley, California. As it explains the procedure far better than any words, it is not necessary for it to be described. This is, however, one of the safety factors in trimarans because it allows a trimaran to escape a bad sea which a single hulled boat must accept.

A *NIMBLE* ON THE ROCKS

Fort Chimo lies at about 60° of north latitude on the north coast of Canada about halfway between Hudson's Bay and the Atlantic. Conditions there are indeed rugged. Icy winds of gale force are almost daily occurrence. Fierce tide rips, 40 foot tidal rise and fall and a wild



A NIMBLE on the rocks

rocky shore make the conditions far from what we usually think of as yachting conditions.

George Cooper edits the local newspaper in Fort Chimo and needed a boat. He chose to make a Piver *NIMBLE* but thought he had lost her on his very first trip when she was blown ashore and left to pound herself to pieces in a gale. His account of seeing her again was as follows :

"Two days later I went back at low water and my poor boat was hanging up on the rocks at an 80 degree angle. You could have knocked me over with a feather when I couldn't find any holes in her. Most of the anti-fouling was scraped off and a square inch of fibreglass mat from the bottom of the port fin. When I got her back at moorings, I could not find one bit of leaking.

"The float fin smashed pieces of rock on the shore. One picee of granite weighing several hundred pounds was chopped off as cleanly as a stone mason could have done it. My Eskimo saw it but seemed unable to believe it. In the future, I shall not worry unduly about rocks ; apparently *NIMBLE* just bounces over them."

Dear Sir,

You already have my account of my first trip down the Kodsoak River, in my home built *NIMBLE* trimaran.

I would like to tell you about another two incidents involving rocks, if I may ? The first happened on my next trip downriver. After negotiating the first twenty miles without too much trouble we were on a fairly wide stretch five miles above the narrows. My daughter had a cup of tea ready so the local Anglican Minister (first mate) and I relaxed with a cup of tea while my daughter took the wheel. At the time we had the wind on the starboard beam (strength about fifteen M.P.H.) and the log reading eight to nine, the ebb tide with us about seven knots, which was a fair speed over the ground.

Halfway through our cup of tea we were flung from the port settee on to the starboard side as the port float struck a rock and bounced over it, almost immediately the starboard float struck and threw us to the floor, I got to the wheel and we were in a veritable maze of submerged rocks running off a point. As I pulled her as hard over to starboard as possible without losing way we struck again on the main keel, slid off and smacked the rudder.

After negotiating the narrows we got aground on the first likely looking piece of bank in the mouth of the river, all floorboards were removed and the bilge was dry as a bone. As soon as the tide went out we got underneath and checked her over, both fins were a little splintered on the forward edge and the fibre glass mat stripped off the bottom, the main hull only showed the mark of the rock running from about six feet from the bow to a little aft of amidships, the fibre glass was intact. The bottom of the rudder was polished clean and there was a slight bend which suggested a horizontal crack inside the fibreglass.

I may add here that three weeks ago a 50′ longliner strongly built and sheathed with Ironka to withstand the icepacks up here, struck a similar submerged rock and split her keel for sixteen feet, sprung both her garboards, stripped or sprung off most of her sheathing and had to run aground immediately before she sank. Even after putting a tarpaulin over her stem and stuffing the garboards with sacks, rags, pitch and mastic she had to be pumped continuously till we towed her up here to make permanent repairs. She was steaming against the tide.

I realize there are many factors involved in the above instance, weight, the angle of collision, the greater draft, shape of hull etc. but the fact remains that had the two boats been in deep water off-shore and struck deadfalls or what have you, the longliner would have gone down in twenty minutes, that is the skipper's opinion; not mine.

On my next trip, the Minister, an Eskimo pilot and I went across the Ungava Bay to the nearest settlement, some eighty miles from the mouth of our river. We had an uneventful trip except for seals which would pop up alongside to get a close look at this odd boat which did not roar like the outboards on the boats which hound them down. On one occasion we started our outboard and they immediately vanished.

On our arrival at our destination two of the local natives showed us where to anchor, I was a little dubious as my echo sounder only showed 22′ but as it is a heathkit model which goes around the dial twice and the natives said 122′, we put out two anchors and went ashore.

In an isolated settlement like this visitors are always welcome and we were given sleeping accommodation. The wind blew up to galeforce that night and rattled the shingles but we were warm and comfortable and the boat was securely anchored, it was a pleasant evening. At noon the next day the wind had dropped to around 25 M.P.H. and I took our hosts out to the boat for a sail. She looked a little low in the water and one look below confirmed this, she was full of water to the chine (which is the water line on this type). Again the sounder read 22′; we moved her another fifty feet out then the sounder went right around the dial to 150′. Naturally we kept going till we were well clear of the shelf. I tried to pump her out but couldn't get the level down, this meant taking up all floorboards and locating the leak which proved to be under the forward crossarm.

There was a crack right through the skin running from the keel to the chine. By cutting a suitable sized piece of plywood, coating it with "mastic" and fastening it with screws right through the hull the leak was reduced enough to pump out, it was not that simple actually as one can only keep their hands in Arctic water for a minute or so at a time. When she was empty the screws were tightened thoroughly and the leak reduced to a trickle.

The floats of course are half full of foam in place. Therefore a hole there would not affect her overly much. The range of tide at that location is 36′. On the low water, I walked out to the original anchorage to a sharp reef which was then exposed and found (by the white fibreglass markings) a 'V' in the reef where she had been trapped and pounded in an onshore wind of some 40 to 50 M.P.H. I estimate she must have pounded on the falling tide some two hours and the same amount on the rising tide. We sailed the 120 miles home without pumping once and only shipped about ten gallons.

You may say I am a very careless sailor. On the other hand these waters have not been surveyed and charted, plus 40′ tides are commonplace and 8 kt. ebb and flows are moderate, they can reach 14 to 16 when the spring breakup takes place. Candidly speaking it would take a very sharp salesman to get me out in anything other than a trimaran as my own experiences (mishaps) have shown me that their relative strength is phenomenal.

Just for the record this boat has logged 18 Kts. with a 45 M.P.H. wind abaft the beam and a wind against tide condition, with no heavy water on deck and a comfortable ride although she did have a pretty heavy weather helm, probably caused by the jib being reefed much more than the main, the main being only twenty-five feet up the mast.

GEORGE S. COOPER.

Fort Chimo P.O.Que. Canada.

Dear Sir,

I wish to recall an article written by Reg Miller in A.Y.R.S. publication No. 52, in which he states that "in a well designed trimaran the righting moment does not decrease to zero when the craft is sharply heeled". From this, any members might infer that such a cruising trimaran will always right itself after 90° knockdown. I maintain that this is not necessarily so, and as a basis for discussion I refer to the author's Figure 1 on Page 68.

To be realistic, all factors as listed below must be considered :

(1) It is most likely blowing a gale.

(2) The seas will be rough.

(3) The craft will have forwards momentum.
(4) The craft will have clockwise rotational momentum.
(5) The submerged float will be dragging badly.
(6) The main hull could be carrying some bilge water which would be in the cabin roof.
(7) Many of the provisions, squabs etc. will be thrown to the cabin top, not to mention the crew who may or may not be inside (and if outside may be lost overboard if not on a lifeline).
(8) The rough seas will be slamming at the main hull from somewhere to windward, I expect that green water would pile up under it and give a resultant centre of buoyancy far lower than that shown.

Bearing all these possibilities in mind, it is easy to see that the chances of survival (in open sea, if anyone foolish enough or unfortunate enough to get a trimaran into this 90° capsize position) are very small. The logical answer to this of course is never to let a trimaran heel more than say 70°, where there should be ample righting moment to cover all contingencies.

It is unfortunate that through A.Y.R.S, yachtsmen are brainwashed by the executives of big business and their New "Physicist" Approach. I like trimarans, but if some are not foolproof, members should be the first to know.

Yours faithfully,

JOHN CHAPPLE.

27, View Road, Campbells Bay, Auckland, New Zealand.

VAGABOND

BY

JOHN MORWOOD

L.O.A. 36 ft. 0 ins.	Main sail 375 sq. ft.
L.W.L. 33 ft. 3 ins.	No. 1 jib 150 sq. ft.
Beam o.a. 20 ft. 6 ins.	No. 2 jib 245 sq. ft.
Hull Beam at WL. 4 ft.	Genoa 314 sq. ft.
Hull beam OA 10ft. 6 ins.	Accommodation for 6 persons

Designer : Hedly Nicol, 43, Cambridge Pde, Manly, Queensland, Australia.

VAGABOND, with Dick Newick's *TRICE*, are the two most fascinating trimarans in the world. Both of these have beaten huge numbers of large conventional yachts in classic races. *TRICE* was only beaten by *STORMVOGEL* and the superb *NINA* in the Bermuda race while *VAGABOND* beat ALL the large Australian yachts in the Brisbane-Gladstone races in both 1964 and 1965. Both trimarans are similar in hull and float shape, the difference between the two being the means of getting the extra lateral resistance needed . . . *TRICE* uses a centreboard (as far as I know) while *VAGABOND* uses low aspect ratio skegs on both floats and main hull. The details of *TRICE* are not known to me but I do feel that the floats of *VAGABOND* are designed in such a way that, on heeling, they will take the load with the minimum of resistance. Of course, there is much more to yacht design than such a simple assessment and, from the photograph of the construction of *WANDERER* (*VAGABOND'S* cruising version) which we show it will be seen what an attention to detail has been given in construction.

Low Aspect Ratio Skegs. These appear to have been used almost simultaneously by Norman Cross and Hedly Nicol. Both, by their continued use of the system appear to be quite satisfied that it is worth while but the point has still to be proved to the hilt.

VAGABOND's Rudder. This is placed below the main hull and is of a very low aspect ratio. Obviously, it must work, but it does seem to be placed rather far forward.

Dear Sir,

Some time ago you asked me for details of Hedly Nicol's trimaran, *VAGABOND.* I have procrastinated on this, partly because I was waiting to see how *VAGABOND* would perform in the Easter Brisbane-Gladstone ocean race, in which she was matched against several much larger keel boats as well as a variety of multi-hulls. I have asked Hedly's business partner Bruce Goodson to send you some of the literature which he has on the boat Meanwhile you might be interested in my own comments, as I have no vested interest in *VAGABOND*, and was in fact rather suspicious of multi-hulls in general until about six months ago, when I first responded to Hedly's invitation to "come shake hands with *VAGABOND*". Since then I have been on *VAGABOND* several times and have watched her race, and it would be difficult to survive these experiences without becoming a convert.

One often reads about boats that "should be capable of" doing 20 or 30 knots, but it is rare to find one that consistently lives up to expectations. We are all used to watching sailboat races in which the lead is won by a boat painfully creeping ahead into first place, often losing it several times before finally crossing the line a few minutes or a few seconds ahead of the nearest rival. *VAGABOND* can be last over the line but will pace the whole fleet within the first mile and will be well over the horizon while the other boats move along far behind, in the usual close formation, battling for second place. In a race of any length, *VAGABOND's* winning margin is likely to be at least an hour over any other boat, and may be measured in many hours or even days over more conventional boats of similar size. She proved her superior speed at sea last year in her first Brisbane-Gladstone race, beating the 59-foot ketch *ILINA* by an hour in severe gale conditions with rough seas. She proved it again this year, beating *ILINA* by nearly 1½ hours in very light airs with smooth seas. Not bad for a 35-foot boat ! *VAGABOND's* performance against the other multi-hulls in the area, including a sloop-rigged *VICTRESS* design, is no less spectacular. I expect that Bruce Goodson will send you the times of this years' race which will tell the full story.

It should be understood that *VAGABOND* is not merely a "machine" but is sufficiently roomy and comfortable to be a very fast and liveable cruising boat. I have been in her cabin with over a dozen people and she generally races with a crew of six. Hedly is selling plans for a heavier and beamier version of *VAGABOND* called *WANDERER*, which should be slower but a better weight carrier for long passages.

VAGABOND may well be one of the fastest sailing boats in the world today and is certainly one of the most controversial over here. Last year Hedly took her out in flat water in a 50-knot off-shore wind and succeeded in capsizing her while doing 27 knots to windward, with 500 square feet of sail sheeted flat. *VAGABOND* planes at speeds above 15 knots, and evidently under these conditions she simply became airborne and flipped. *VAGABOND's* capsize has received far more publicity than her successes, and recently has been the excuse for severe and unsubstantiated warnings about the danger of multi-hulls in some of the local yachting magazines. Those of us who know the circumstances of the "flip" on the contrary feel that it demonstrates the exceptional stability of this very light weight boat.

VAGABOND's performance must arise from a combination of factors. The narrow (4 foot maximum) beam of the main hull, the round-bilged cross section, and good aerodynamic treatment of wing and cabin structure evidently provide an almost ideal combination of factors. The wing is built as an aerofoil section without heavy cross beams. Hedly claims the wing provides additional lift, and this may well be true at least to windward. The floats are round-bilged with graceful rocker and low angle of entry. They are very fine in section but apparently provide considerable dynamic lift at planing speeds, as *VAGABOND* develops her best speed sailing almost upright even in a good press of wind. Planing ability is evidently enhanced by the round-bilged main hull section, which is slightly flattened aft. The round-bilged section must also improve light air performance by giving minimum wetted surface and draft for the weight carried. From the cruising point of view, this hull form also offers much better accommodation and weight carrying ability as compared to deep-v section.

In this year's race the multi-hulls were definitely in the doghouse and had to start one hour after the keel boats, without the blessing of royalty.

With best regards,

WILFRED B. BRYAN.

280 Indooroopilly Road, Indooroopilly, Brisbane, Australia.

QUEENSLAND TRI EXPERIMENTS

BY

HEDLY NICOL

From TRIMARAN, Box 4820 G.P.O. Sydney N.S.W., Australia.

Over the past few years we have been working on the development of a range of trimarans incorporating the soft round bilge with simple double diagonal skins, and the aircraft-like aerofoil wing deck to impart lift. Up to the 1964 Brisbane to Gladstone Race, the major portion of practical work was devoted to the construction of *VAGABOND*, which is 35′ by 20′ by 15½″—a straight out ocean-going speed machine. The race itself, in full gale conditions, thoroughly demonstrated the soundness and seaworthiness of the design, and proved that *VAGABOND*, handled with commonsense and due respect for "Sea Lore", can be driven across raging, breaking seas at full pelt, in perfect safety and comfort and with no anxiety at all.

After a "Paradise Islands" cruise home to Brisbane we went all out on the development of the cruising trimarans.

By using *VAGABOND* as a trial horse and test bed we have been experimenting to incorporate the spacious comfort needed for family cruising whilst maintaining the wondrously successful features of *VAGABOND*, and preserving her abundant speed as far as possible. Most experiments we recorded on movie film.

One of our most important points was to preserve the *VAGABOND* two finger steering which is feather-light and positive at all times, even under the most trying conditions of wind and sea and on any angle of the breeze. This feature seems rare in trimaran designs, but we consider it of major importance. Our success in this field is achieved with a rudder less than two square feet in area. A real trump card.

The secret of this easy steering will go into all our designs.

Another point we met was the complete absence of reliable data as to the extremes to which a trimaran can be driven in safety, and this being the case we decided to go all out after this information ourselves. As far as we know, we are the only ones to go to these lengths.

We commenced practical heeling tests aimed at calculating maximum sail-carrying ability. For this purpose we crammed on huge sails broadside to heavy winds and by restricting our speed by drogue to 3-4 knots we were able to accurately observe the effects of heeling moment and righting moment without the complications of planing surfaces, the dynamic lift which is incorporated in our float design, or the considerable lift imparted by our aerofoil wings. These observations vindicated the common theories of heeling moment-righting moment and we concluded that the enormous reserves of righting moment far exceed the maximum heeling moment which can be developed and thus the possibility of a capsize is eliminated unless other factors are introduced.

We decided to introduce these factors and measure their effects.

Firstly we removed the drogue and found the stability factor greatly increased by the dynamic lift of the lee float. The gale run to Gladstone had already proved that so little water comes on deck that it need not be considered. It also proved that buffeting by waves and breaking seas such as met with at notorious Breaksea Spit also provided no problem. We found that *VAGABOND* planes along at 15 knots, riding 5 inches above her static position, and that at 22 knots her static waterline is 8 inches out of the water all around. These speeds were attained across and down wind, as necessary wind speed normally created seas not conducive to these speeds upwind. For this reason, the high planing position was no cause for concern and added greatly to speed. For the same reason, the aerodynamic lift of the wings was a factor of calculation we were till then unable to assess, in the absence of these speeds in head winds.

The promotion of our experiments took another step with the arrival of the seasonal mid-winter westerly gale. This was an offshore wind, and within one mile of the flat shoreline the 55 knot wind blasted across perfectly flat water 4 to 5 feet deep. This rare combination provided the conditions needed. We stripped out all cruising gear, water, fuel and stores to leave the trimaran virtually an empty shell. The cameras £700 worth, went aboard and cameramen Barry Dunn and Ian MacTaggert took their stations. Up went the largest sails we could hoist and out we went. Back and forth we went and in three runs we had three valuable reels of 16mm film.

On the fourth run the surface of the water was flat, and wind at 55 knots and gusty. *VAGABOND* was tearing along close hauled and pointing between 50 and 55 degrees to the wind with sheets tight on. She was clocking 22 knots and planing 8 inches high. A tremendously hard gust hit and she accelerated to 27 knots, rose higher on the water, then gently rose clear, borne by her aerofoil wings alone. She went up several feet, then, robbed of the stability imparted by the water, she arched over and executed a perfect "victory roll" till the tip of the mast ploughed into the water. The mast exploded and *VAGABOND* crashed down on her back with a thunderous roar.

It was absolutely fantastic—a once a lifetime experience, witnessed by numerous persons on the shore nearby and recorded on the tripod-mounted 16mm camera, but alas, this grand film was destroyed by the salt water.

VAGABOND floated high upside down and crew had no difficulty working on the under-wing decking. She was righted easily but slowly by submerging one float and flipping her over. Inspection showed that although the mast was broken, no other damage of any description was done. The fact that *VAGABOND* stood up without a scratch to the terrific crash of impact when she landed is itself reassuring proof of the strength of the wing and hull design and construction. She was sailing again a couple of days later and since has continued her race-winning career.

The camera equipment, speed recording instruments and the two way radio gear all of which is valuable and intricate equipment, though dunked, were not seriously damaged. The "Marina 60" two-way radio, though enclosed in a cupboard, was not bolted in and it battered its way out of the cupboard and went to the bottom. It was found seven days later—full of muddy sand, and the fact that it required only a simple cleansing treatment is a great tribute to its rugged nature.

Though robbed of the recording film, we are able to analyse the 'flip'.

The circumstances were :

1. Flat water—allowing high speed to w'ward.
2. 55 knot (plus) wind.
3. 500 square feet of sail.
4. Yacht stripped down to 2500 lb. weight.
5. Planing attitude 8 inches (plus) high.
6. 432 Sq. ft. aerofoil wing.
7. 27 knots attained to windward.

Our conclusions from these are that a capsize is to all intents and purposes impossible. An 'airborne flip' such as occurred in this case can take place only with these seven points existing. Removal or reduction of any one of them eliminates the possibility.

This is the factual basis for calculation which we have sought for so long, and it is proving of priceless value. For instance, it proves that one of our cruiser designs can be expected to flip with full sail when the wind velocity reaches 312 knots.

Our latest design, the family cruiser *WANDERER* now incorporates all the knowledge gained from our extensive experiments and the benefit of our experiences. Being a cruiser, she is a little heavier, much roomier inside with accommodation to spare, and has a comfortable sail plan.

She has all the sterling features of *VAGABOND*, however, she forgoes the spirited scintillation of high speed racing spray for the docility, safety and comfort of the family saloon cruiser.

Dear Sir,

I am building Hedly Nicol's *VAGABOND*, Mark II, and plan to enter the Round Britain Race this summer. I would appreciate any information you have on the location of the race, the date, the entrance fee and the final date of entry. Hedly Nicol and myself will be sharing the helm.

J. Ward Grant.

Trimaran Consultants, 4230 Glencoe Avenue, Venice, California.

Ed. ; Details of the race can be got from the Hon. Sec. Royal Western Yacht Club of England, West Hoe, Plymouth, England. From the information I have had, several really fast trimarans and catamarans as well as a huge entry of single hullers will be entering. If the catamarans and trimarans do well, it will finally establish them as seaworthy boats in the minds of yachtsmen.

WANDERER

Designer : Hedly Nicol, 43 Cambridge Pde, Manly, Queensland, Australia.

WANDERER is the cruising version of *VAGABOND*. The same dimensions, the same principles of design and a slightly heavier construction make a cruising yacht with a high performance and comfortable accommodation. The drawings and photographs show the trimaran in course of construction and in the finished state. Plans are for sale which are drawn for amateur construction and this, though undoubtedly taking far more time than the person who tries to make such a craft expects, will be quite possible for any semi-skilled man to do.

The end result will be a boat of which the builder and owner can be proud and which will have an exceptional performance.
Price of plans £59 Australian, £48 Sterling, from Hedly Nicol at Multi Hull Pty., Ltd., 43 Cambridge Pde., Manly, Queensland, Australia.

35 *ft. WANDERER*

WANDERER

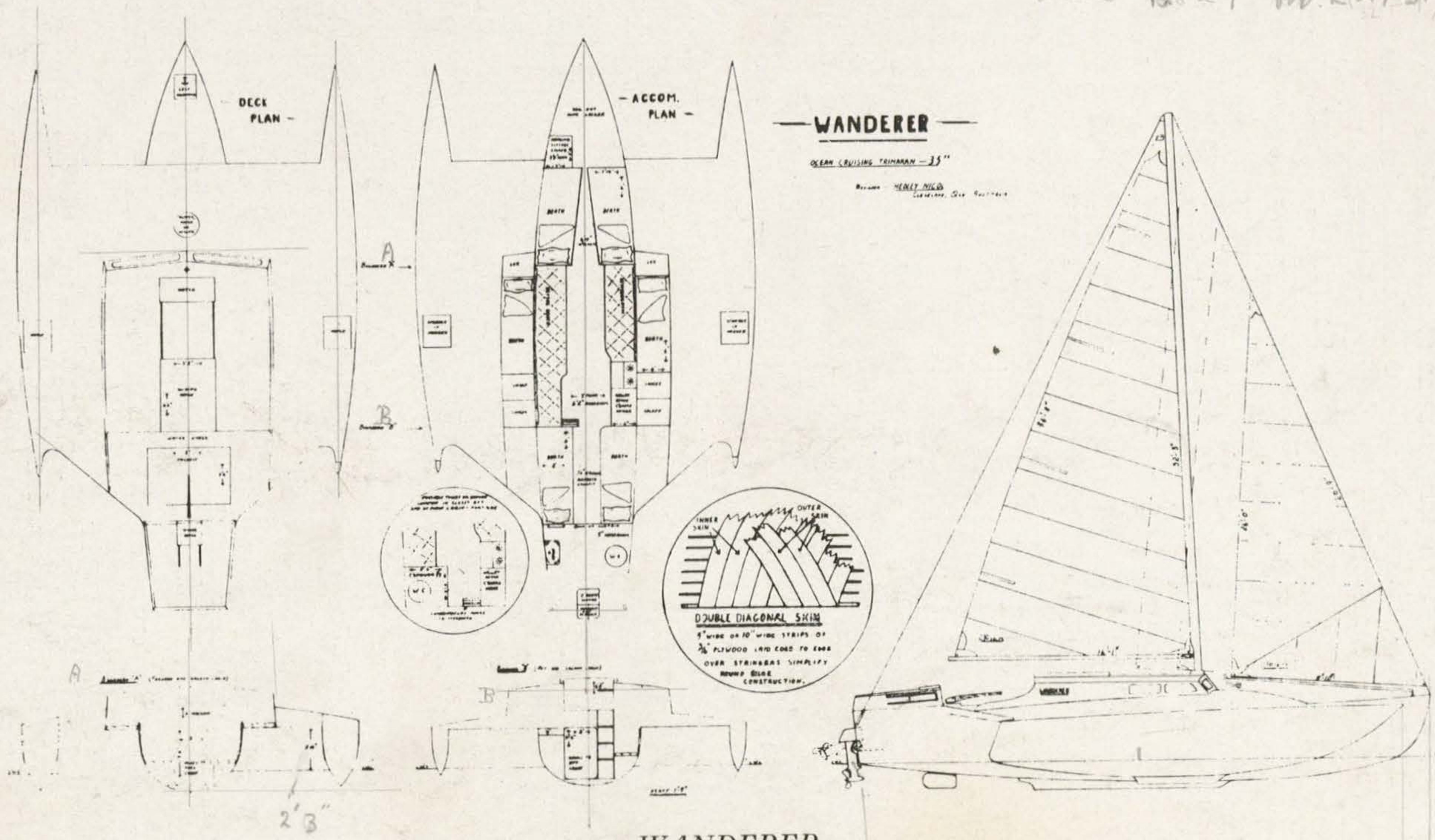
Simplicity is the keynote. No heavy machinery is needed. This design calls for none of the skills of the tradesman shipwright, so that no previous experience is required. The designer supplies full size patterns, by the use of which the builder marks out three sheet-plywood bulkheads and the stern or transom. These are set up to simple directions, bottom uppermost, and around them is wrapped the keel and stringers. The stem, constructed to the pattern shape supplied by glueing together five thin strips of oregon bent around blocks nailed to the floor, is then added. This completes the simple skeleton of the hull.

This skeleton is then clothed in the skin of double diagonal plywood strips. For this operation, 8′ x 3′ sheets of 3/16″ marine plywood are cut into strips 5″, 6″ or 7″ wide as desired. For this operation, a 'handyman' circular saw is desireable. The first strip is laid diagonally on the skeleton about midway between stem and stern, and glued to the keel and stringers at points of contact, and lightly nailed. The second strip is then laid alongside the first. It may be necessary to trim one edge slightly to allow it to fit snugly against the first strip. This strip is attached similarly to the first, and the process is continued till the whole skeleton is clothed in one skin. The first sheet of the second skin is then laid over the first skin at a diagonal in the opposite direction and it is fastened down to the first skin with glue and nails. To add further pressure to the glue joint, it is usual to supplement the nailing with staples between the stringers. There staples are driven in with the aid of a "Staple Gun" or "Tacker" which is a spring loaded adaption of the simple paper stapler, and which is obtainable from all packaging equipment companies for about £5. A recent development is the introduction of rustless stainless steel staples, thereby removing the necessity of removal of these staples.

The hull and floats are set up upon blocks and joined together by an immensely strong—yet simple—wing structure. This wing structure is designed to be added piece by piece, as per detailed instructions, and upon completion, the whole yacht is one stout unit. Decking is then added, and once again the protection of fibreglass is strongly recommended.

The use of light stringers and plywood in this design allows the whole unit to be light in weight, whilst provided with the fantastic strength of moulded compound curves. The designer has gone to great care to preserve the simple 'step by step' process, which completely eliminates all building 'headaches'.

Mr. Nicol's designs are the product of many years of study, Scale 1/12" = 1' for L(OA 31')



WANDERER

Beam OA 20'6"
LOA 33' 3" 30'6"
LWL
Hull D.WL 4'

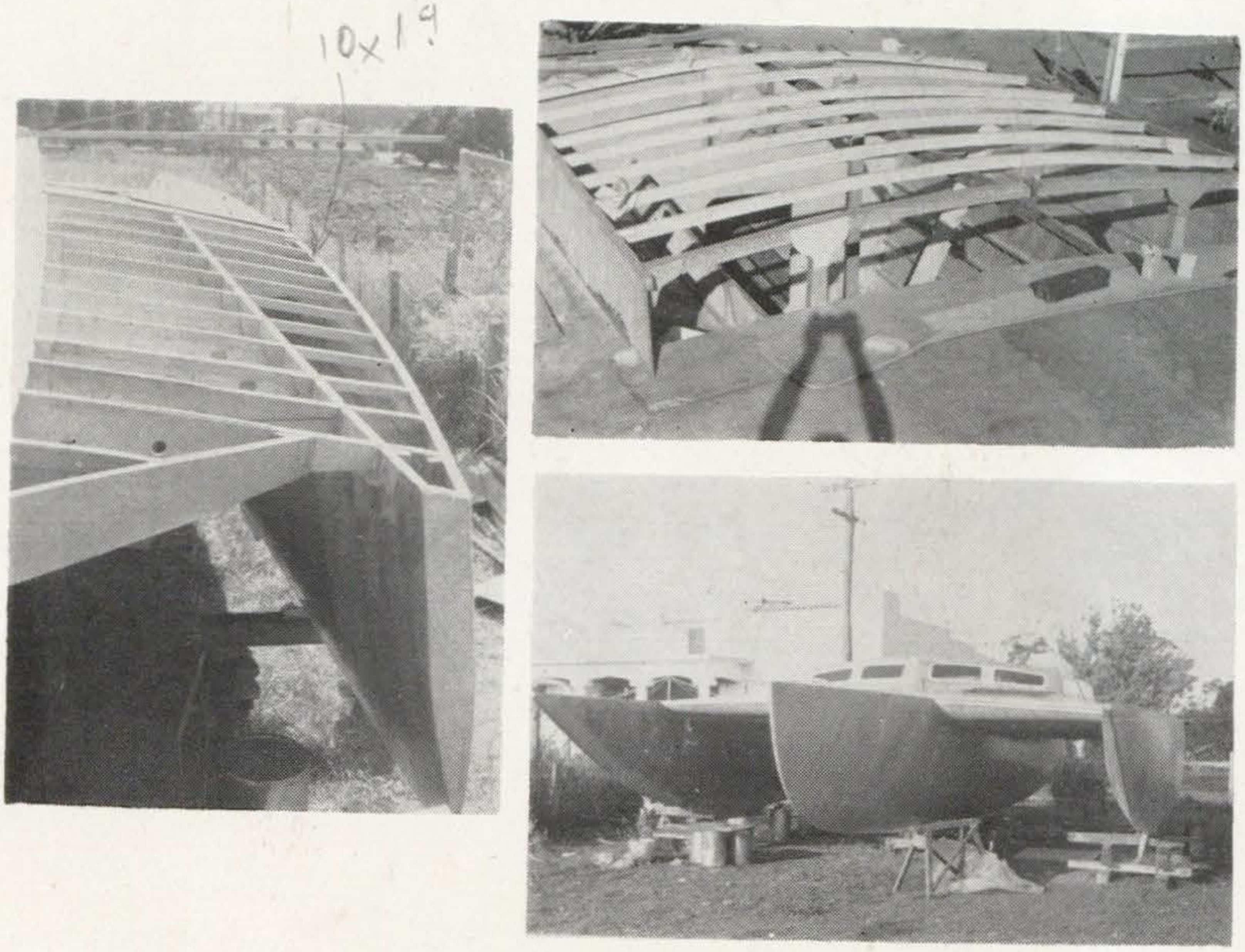
Aft Shelter increase to 6'6"

4°

W/Hull Keel 5'0"

Floats = 2×2 - 4°

experiment and experience in multihull craft. He has spared no effort in perfecting his designs, and has undertaken a strenuous and expensive programme of practical testing to investigate the various problems involved. Every feature of his designs has been thoroughly tested under the most rigorous conditions to eliminate all possibility of mal-function. Tests have been varied from drifting 'mirror' calms to raging seas and blasting gales, and in the course of perfecting each feature, same has been subjected to excruciating punishment.



35ft. WANDERER under construction

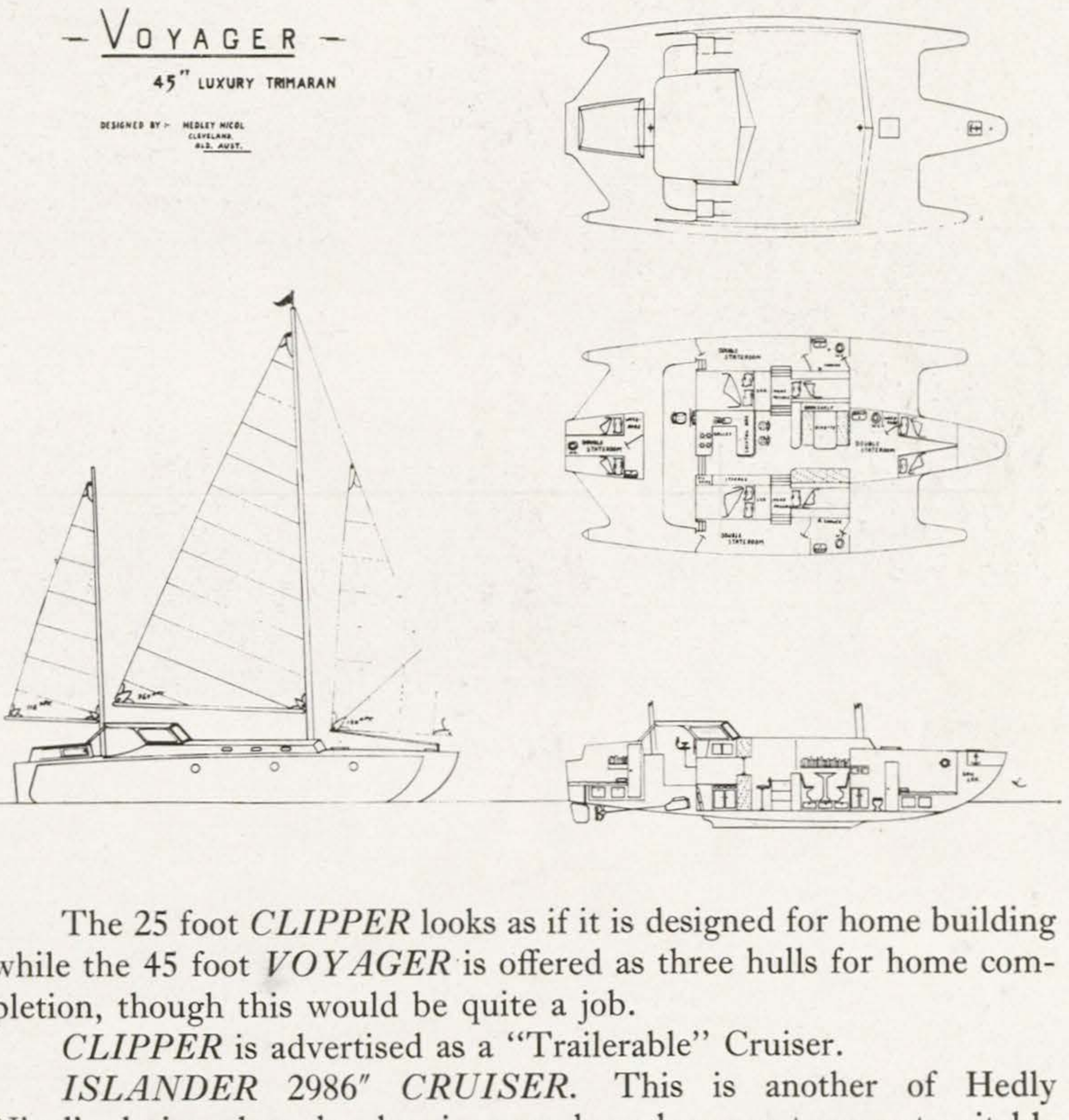
A swift mental calculation and you will realise the extremely low cost involved and the method of construction is such that materials can be purchased as and when required, so that construction can be commenced with very little cash on hand and continued out of 'pocket money' right through to conclusion.

Full plans and specifications, together with details, building instructions and helpful suggestions designed specially for inexperienced builders are available.

THE 25 FOOT *CLIPPER* AND 45 FOOT *VOYAGER*

Designer : Hedly Nicol, 43, Cambridge Pde., Manly, Queensland, Australia.

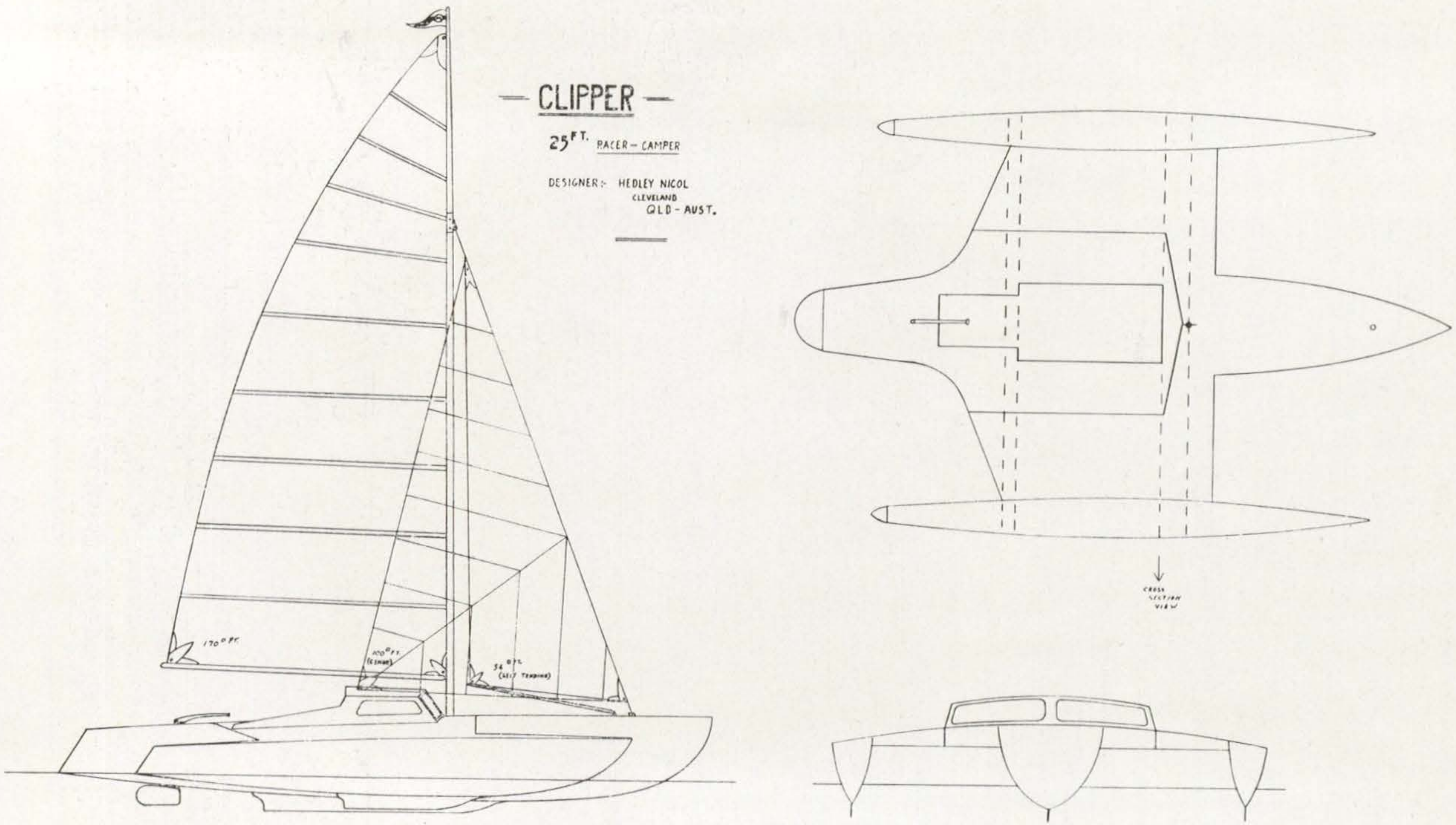
The two sheets of drawings show the general layout and design. The same hull shape and float design as *VAGABOND* are used but in the 25 foot *CLIPPER*, the hull is designed for less wetted surface. Again, the shallow rudders are placed far forward to keep them immersed in a seaway. Both have a better balance of the shapes of the three bows than *VAGABOND* or *WANDERER* which make them look more handsome.



The 25 foot *CLIPPER* looks as if it is designed for home building while the 45 foot *VOYAGER* is offered as three hulls for home completion, though this would be quite a job.

CLIPPER is advertised as a "Trailerable" Cruiser.

ISLANDER 2986″ *CRUISER*. This is another of Hedly Nicol's designs but the drawings we have been sent are not suitable for publication. The design is similar to *WANDERER*, though slightly smaller.



— CLIPPER —
25 FT. PACER — CAMPER
DESIGNER:- HEDLEY NICOL
CLEVELAND
QLD - AUST.
170 □ FT.
56 □ FT.
CROSS SECTION VIEW

PLANS for *CLIPPER* are £29 Aust. £24 Stlg. *ISLANDER* £39 Aust. £32 Stlg. *VOYAGER* £150 Aust. £125 Stlg. All are available from Hedly Nicol at Multi Hull Pty. Ltd., 43 Cambridge Pde., Manly, Queensland, Australia. This firm also sells plans of the Piver range of trimarans, those of Norman Cross and Lock Crowther.

THE CROWTHER RACING TRIMARANS

BY

LOCK CROWTHER
Barnsdale West, Victoria, Australia.

KRAKEN is the result to date of a series of four successive trimaran designs, each improving on the previous one with the ultimate aim of developing a safe and really fast ocean cruising and racing trimaran.

1959 *BUNYIP* is a two man, one trapeze boat 18′ x 10′ x 167 sq. ft. sail area, 90° hulls and floats and hydrofoil stabilisers through the floats.

Original BUNYIP (1959)

TRIO

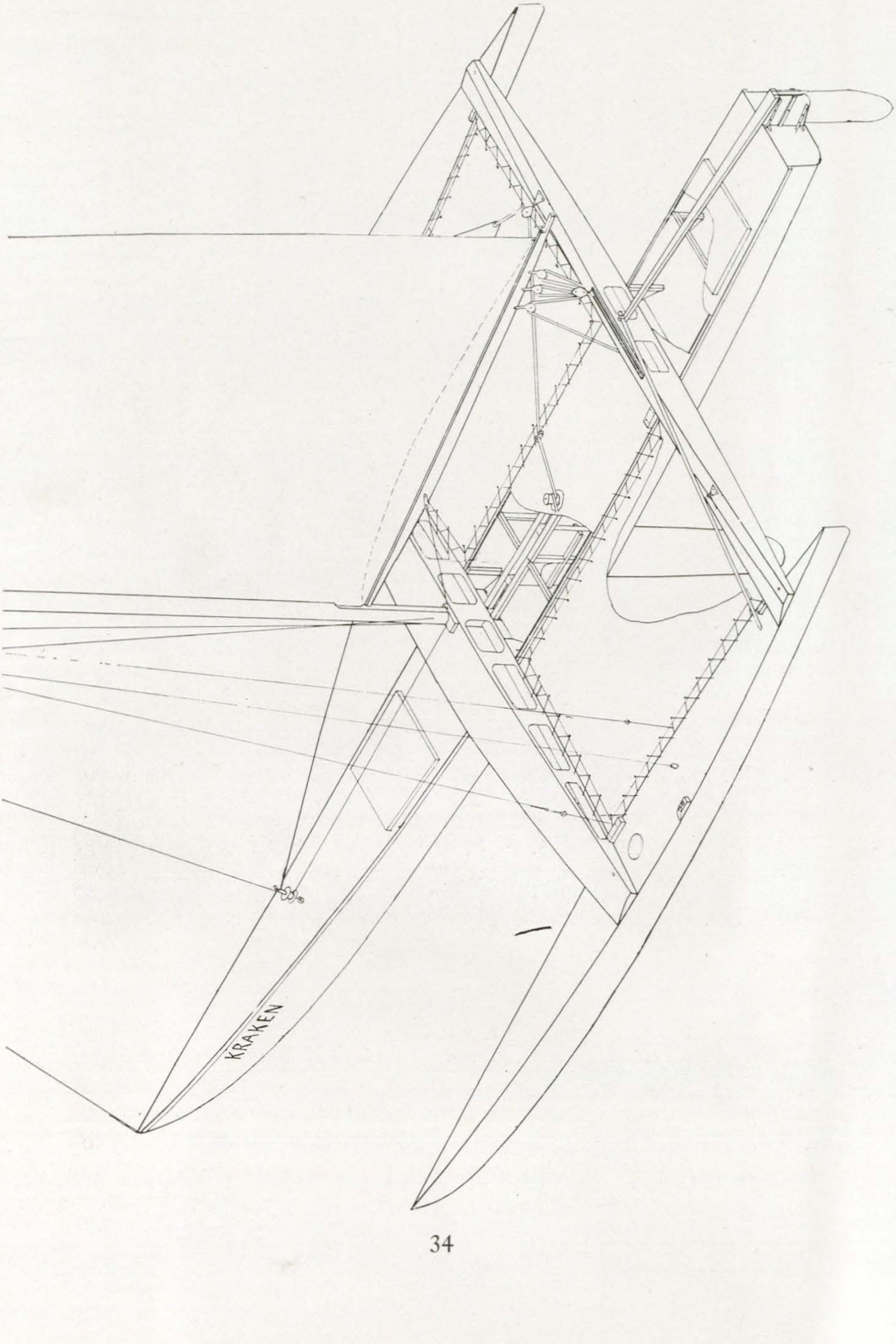
1962. *TRIO* is a two man, both on trapezes, boat 20′ x 12′ x 280 sq. ft. sail area, fibreglass *AUSTRAL* 20 catamaran hull, 60° floats and trampoline decks.

1962. *KRAKEN* is a two man, both on trapezes, boat 25′ x 14′ x 300 sq. ft. sail area, cold moulded plywood hull, 60° V floats and trampoline decks.

KRAKEN was inspired by the original *HELLCAT* C Class

KRAKEN Mark I

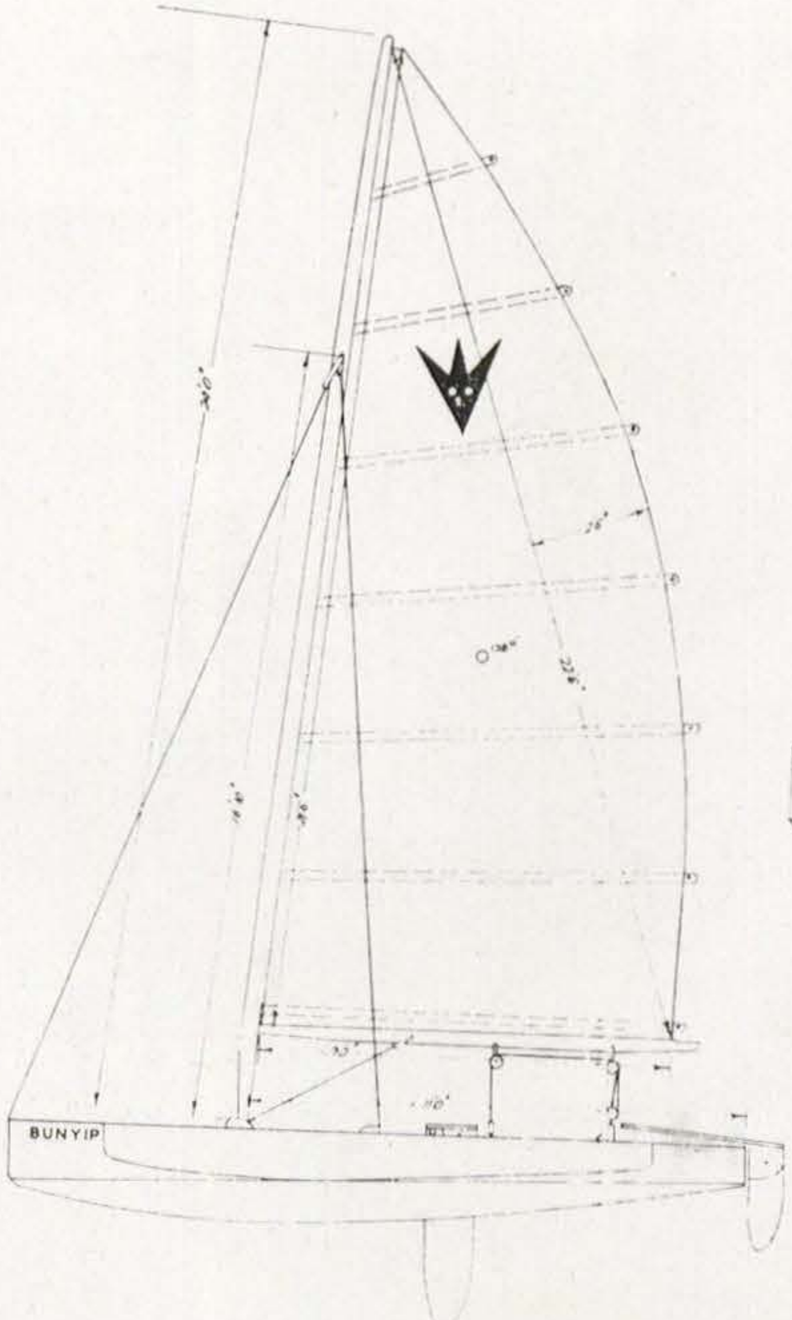
catamaran and was built to the same rules. *KRAKEN* proved to have an outstanding performance but it was felt that some improvement could be made to the floats and that the rear cross beams should be faired. The opportunity to do this was forced on us when we collided with a 60 foot cruiser (anchored) whilst gybing after a rudder gudgeon collapsed (fatigue failure). The locals thereupon re-christened the boat *BROKEN* not *KRAKEN*. Although we only grazed the cruiser

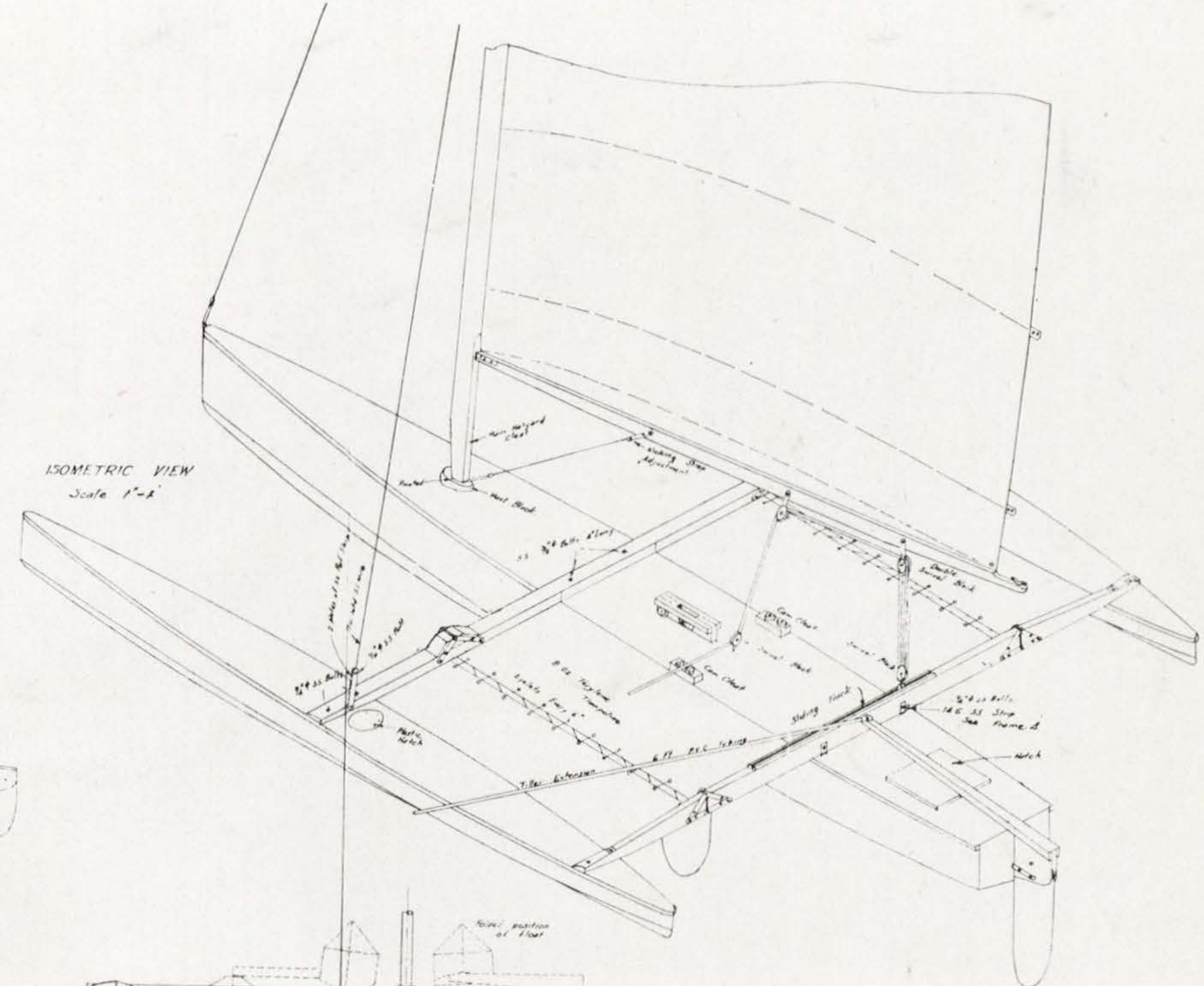

KRAKEN

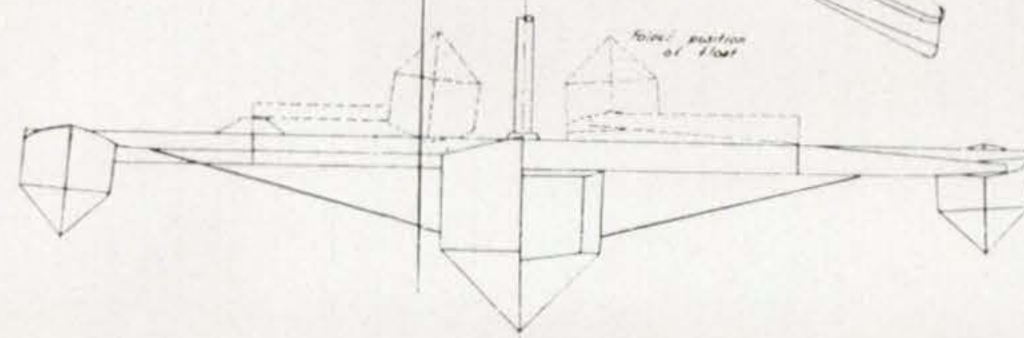
JABBERWOCK—25ft. KRAKEN

with the bow of the windward outrigger, our speed of over 30 m.p.h. (estimated by bystanders) was sufficient to snap off the front half of the outrigger and split the rear crossbeam.

New moulded ply floats and a faired rear crossbeam were added to form *KRAKEN* Mk. II. She now has a much improved performance especially in strong winds and sails on a Portsmouth Yardstick figure of 55 at the Gippsland Lakes Y.C. We have had a few opportunities to







SPECIFICATIONS

LOA 16'0"
LWL 16'0"
Beam 1'0"
Draught 0'10½" - 3'3"
Beam Main Hull 1'9"
Can be folded for trailering

Displacement 400 lb
Sail Area 139 sq ft
Outrigger LOA 12'0"
Beam 1'0"

Note: Only one boat to be built from each set of Plans

DESIGN BY B.R. CROWTHER
BAIRNSDALE VIC.

BUNYIP

race against C Class catamarans and, although in an untuned state due to lack of competition, we have managed to beat some, including *MATILDA*. We feel after racing our own C Class catamaran *NEMESIS* that *KRAKEN II* is potentially faster in light weather and is more fun to sail but the performance falls off slightly in rough seas compared with the catamaran. This is due to the drag of the cross beams in wave tops.

A few other *KRAKEN II*'s have been built, *JABBERWOCK* being the best to date. However, the demand for a smaller version was so great, *KRAKEN* 18 was designed on the same lines as the 25 footer. Several of these boats have been built and their performance appears to be almost as good as the larger boat and relatively better in rough seas. *KRAKEN* 18 has been adopted as a class by the Victorian Branch of the Trimaran Association of Australia.

Whilst cold moulding plywood hulls is simple, it is tedious and so we designed a sheet plywood chine version of the *KRAKEN* 18 known as *BUNYIP* 20. The first of these was launched recently and in its first race defeated the local champion (an *AUSTRAL* 20 catamaran) by 10 minutes in 1 hour.

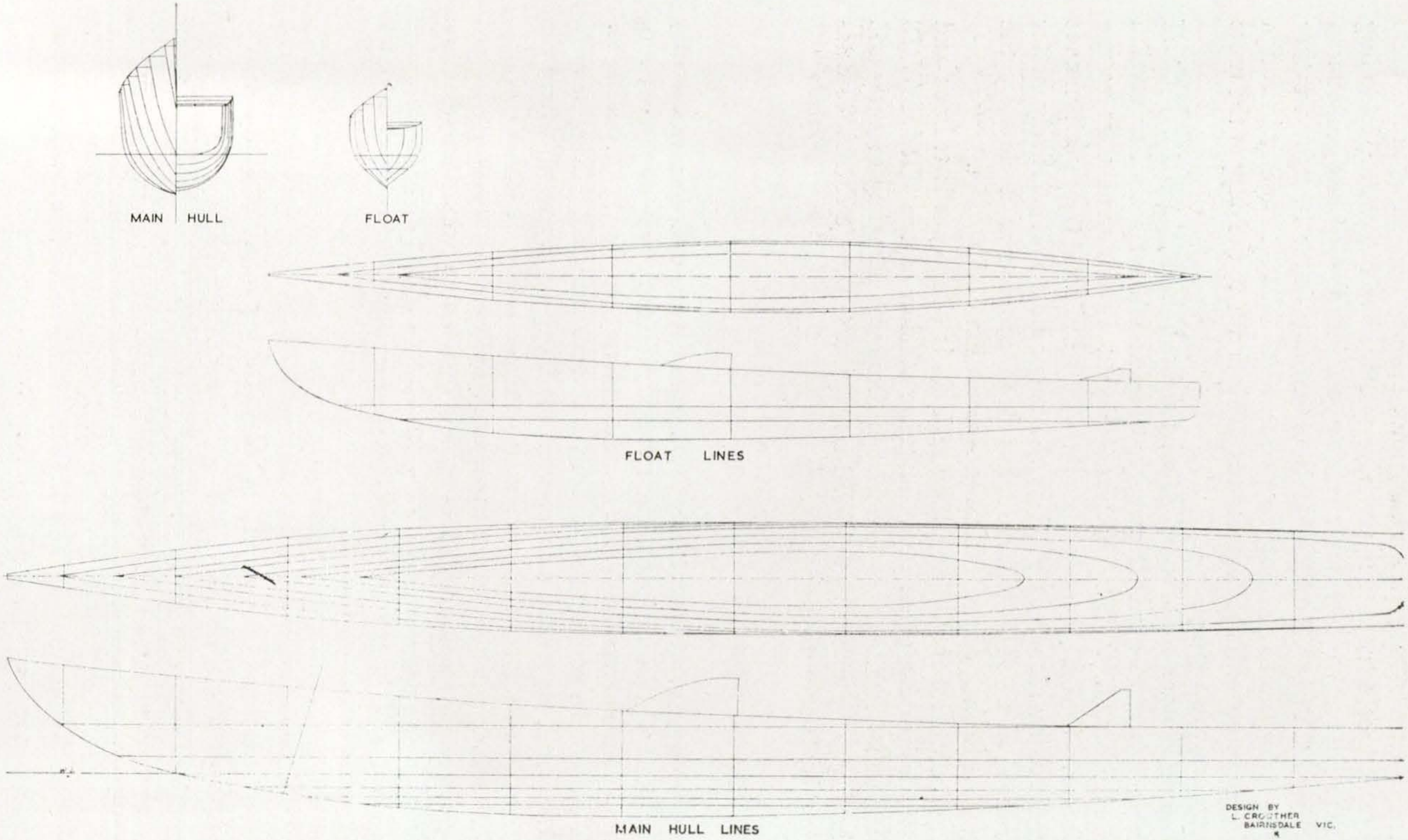
Comments on Trimaran Design.

1. Dynamic stability by means of planing floats or hydrofoils is not necessary. Displacement floats are better. Maximum stability is required when on the wind and close reaching. When on the wind, the boat travels relatively slowly and displacement floats have a higher L/D ratio. In addition, if the foils are made sufficiently large to work on the wind, they become unnecessarily large off the wind, where the crew can easily level the boat. The only direction in which dynamic stability does any good is close reaching. However, this is only a small percentage of the average racing course whereas windward distance through the water is usually 50% or greater of the total.

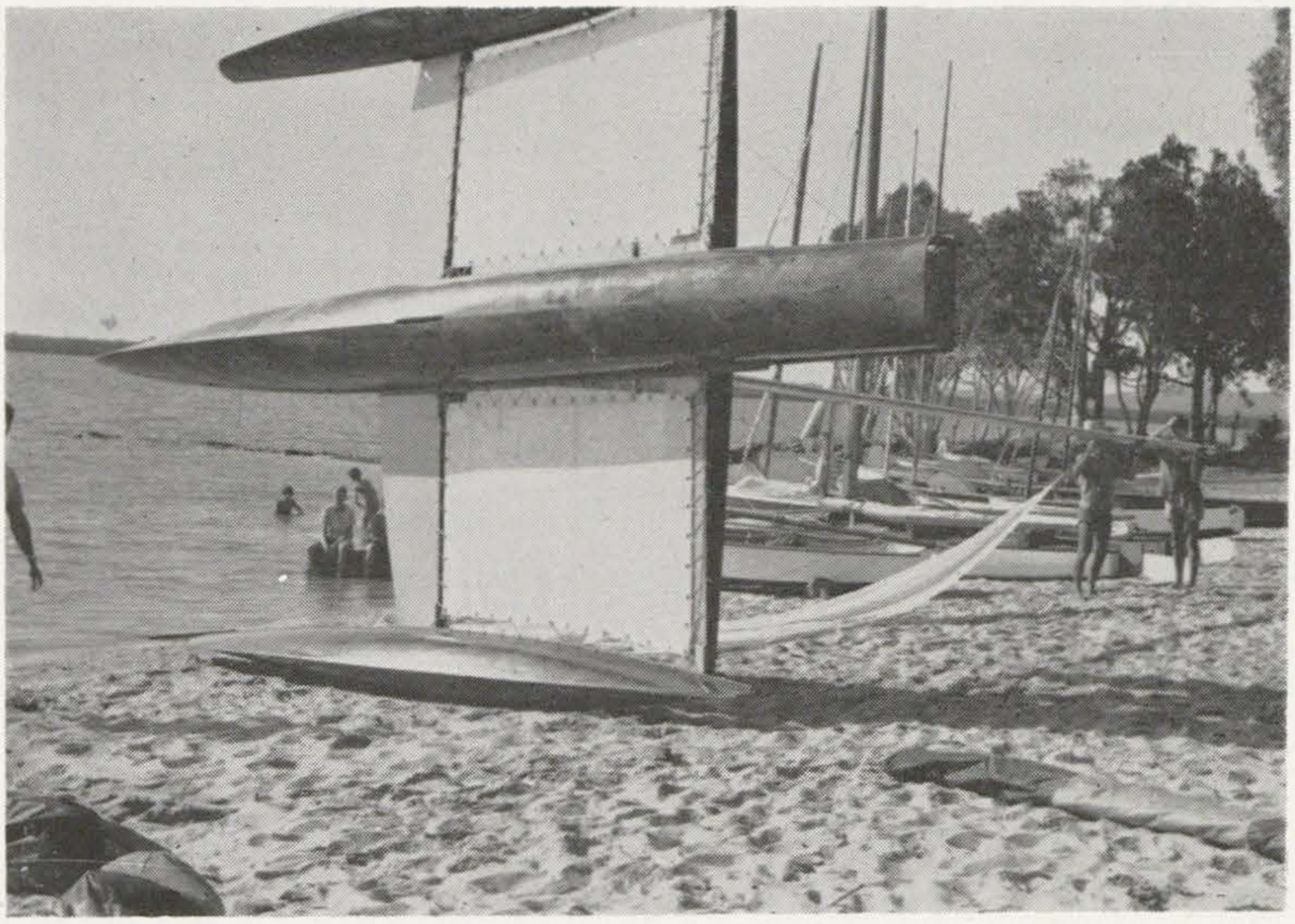
2. 60° V floats have a concentration of buoyancy close to the deck where it is least wanted as the cross beams are dragging in the wave tops before 1/3rd of the float buoyancy is used. *KRAKEN II* floats overcome this and in addition the canoe stern is much better than a transom for floats because of the wide range of depth of immersion.

3. As the floats have little fore and aft stability, the main hull has to provide this even when it is carrying almost no load, hence the wide flat stern. Flat sterns have an additional advantage that bow burying at speed is prevented by suction when the stern lifts.

4. The cross beam design has taken a lot of development. The depth of section and fairling have been made as fine as possible to reduce water and wind resistance. Water resistance on the cross



Lines and sections of KRAKEN



JABBERWOCK on her side

beams appears to be the biggest disadvantage of trimarans in rough water and hence our first ocean racing design being built in Sydney by Martin Cooper has the cross beams raised up off the decks of the floats. This boat should be launched this comming season and we are expecting a better performance than that of *KRAKEN* as it has a higher stability to weight ratio. This ocean racing trimaran is 33 feet long and 23 feet wide with accomodation for four in short distance cruising and offshore racing. It will be sloop rigged, have netting decks between the cross beams and be of moulded ply construction (two layers of 3/16 ply) with the mould frames and stringers left in the hulls.

Dear Sir,

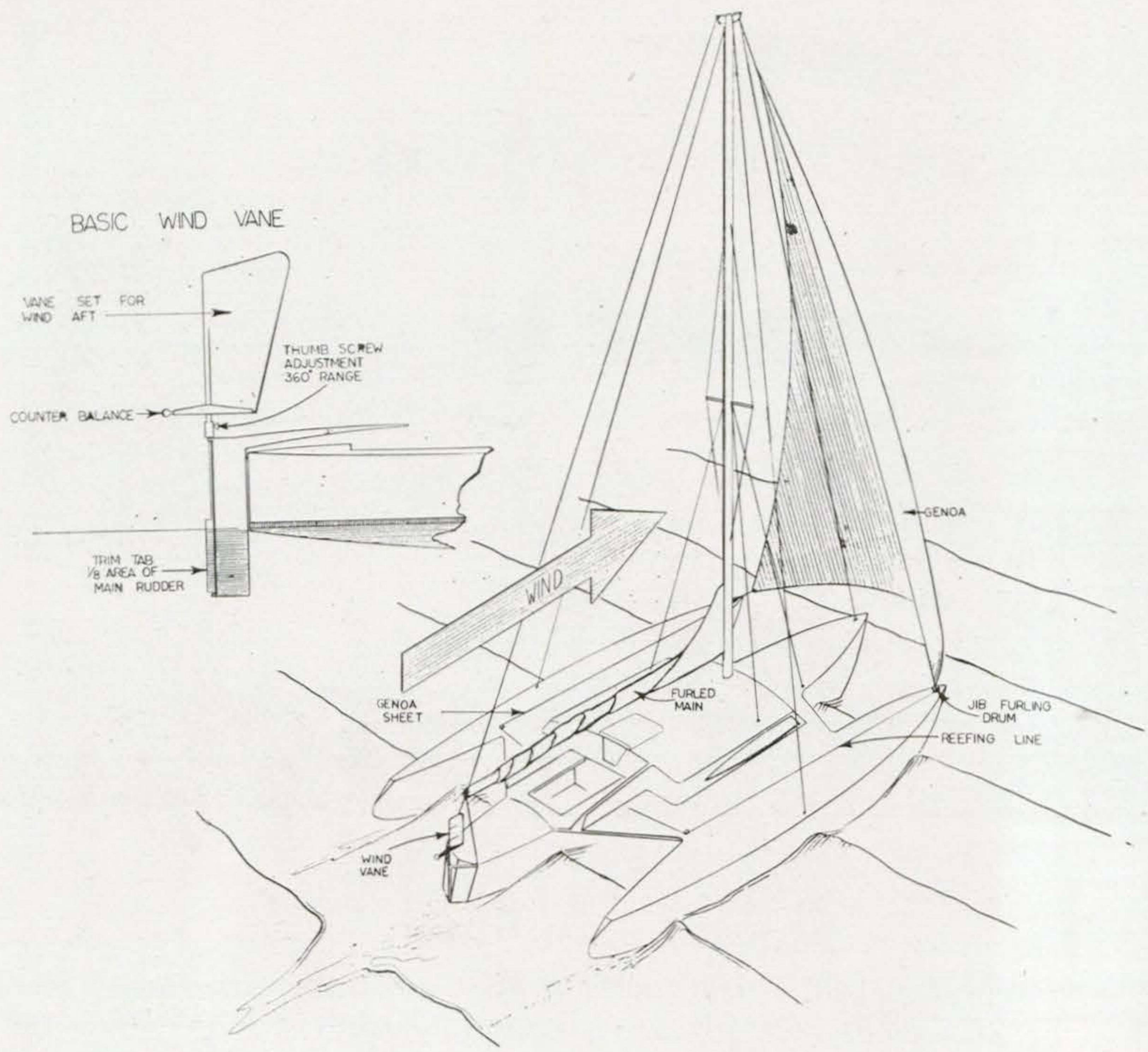
You might be interested in the enclosed drawing of our Trade-Wind rig—which will appear in my new Trimaran Third Book.

The combination of this rig—along with the Piver Trimaran —makes cruising in a conventional boat a deliberate seeking for discomfort and danger.

Regards,

ARTHUR PIVER.

P.O. Box 449 Mill Valley, California, U.S.A.



Arthur Piver's Trade-Wind rig

Dear Sir,

I had an 8 month round-trip tour (covering 11,000 miles) of Mexico, Marquesas, Tahiti & Iles sous le Vent' and Hawaii in *NIMBLE* No. 1. In all those miles, I hit no gales. Some of my passage times for the longer legs of the trip were :

Mazatlán, Mexico to Nuku Hiva, Marquesas	24 days
Nuku Hiva to Papeete, Tahiti	8 days
Bora Bora to Hilo, Hawaii	17 days
Honolulu to San Francisco	23 days

Based upon great-circle distances, port to port, this figures out to be 110 nautical miles per day. On the Honolulu to San Francisco run, we were forced to travel 2600 miles, an extra 500 miles, by unfavourable wind conditions. However, these same conditions helped the Transpac racers to set new records. You'll recall that Art Piver averaged 135 miles a day in this boat on his Atlantic crossing. Part of his faster time may be explained by the greater working sail area that *NIMBLE* No. 1 had at that time.

In regard to *NIMBLE* No. 1's performance, I would like to go into a bit more detail to make sure that we are giving it a fair comparison to other cruising boats. So many different factors enter into the daily speed average that a comparison is difficult. First I should mention that there were only two persons aboard, and so self-steering was used when practical, especially at night and going upwind. The Genoa jib was almost always taken down at nightfall. The rather lightweight mainsail was reefed fairly early to ease strains on boat and helmsman. The best days, and there were quite a few of them, gave us 170 nautical miles of progress. The overall average for the longer legs of the trip—110 miles/day—resulted in part from weak Mexican coastal winds, two crossings of the doldrums, and tacking against light headwinds around the region of the North Pacific high pressure region. For the optimum comparison purposes, let me go into performance in the trade winds. Here the winds varied Force 2 to 5, were fairly constant in direction day after day, and the waves tended to be well developed so that surfing action was not of much importance. (Only fresh waves seem to give good surfing.)

Mazatlan to Nuku Hiva—115 miles/day average

NE Trades, Jan. 14-18, blowing from SE and ESE; boat heading SW; 4 day average: 145 mi./day

SE Trades, Jan. 26-Feb. 3, blowing from SE and NE; boat heading SW; 8 day average: 153 mi./day (aided by 10 mi/day current but reduced almost as much by 2 nights self-steering at half-speed under jib alone)

Bora Bora to Hilo—130 miles/day average

SE Trades, June 2-6, blowing E and ENE; boat heading N; 4 day average: 139 mi./day (adverse current 5-10 mi./day)

NE Trades, June 13-19, blowing from NE; boat heading NNW; 6 day average: 158 mi./day (aiding current 5-10 mi./day)

Correcting for currents, you'll notice that this comes out to be just a shade under 150 naut. mi./day. Being for typical trade wind conditions, it should not be too dificult to compare with monohull performance . . . You'll notice from the figures that upwind performance is as good as downwind performance. This happens because sail plan, mast profile, and a 5 sq. ft. centreboard all favour upwind performance. Also, *NIMBLE* No. 1 has a more slender main hull and "stiffer" floats than the standard *NIMBLE*.

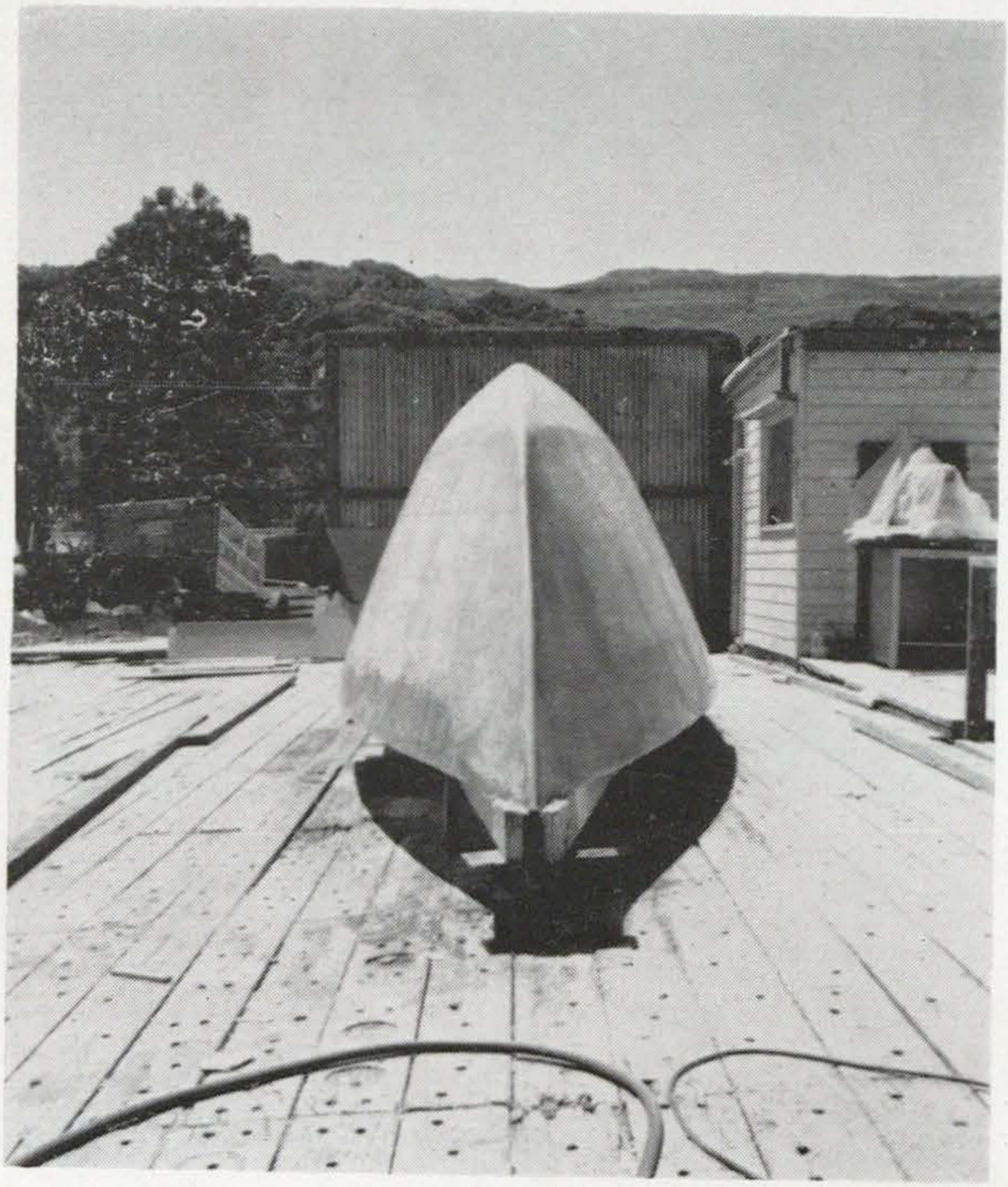
David A. Keiper.

95, Mistletoe Lane, Black Point, Novato, California 94947.

STILETTO

Length overall : 33 feet.
Designer: Arthur Piver, Box 449, Mill Valley, California.

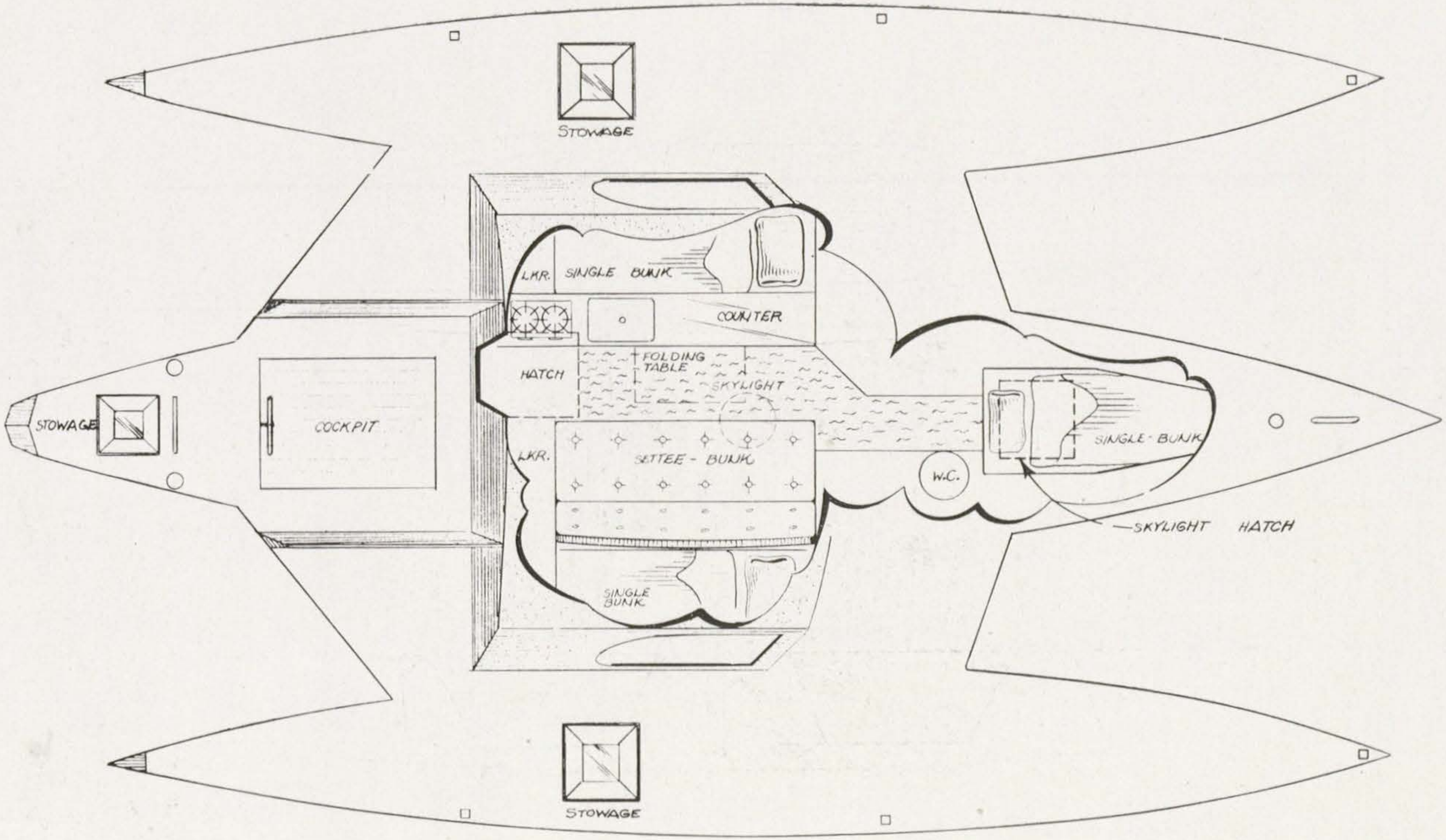
The plans and the cover photograph of this publication show the main layout of *STILETTO* which is described as an "Ocean Racing Trimaran".



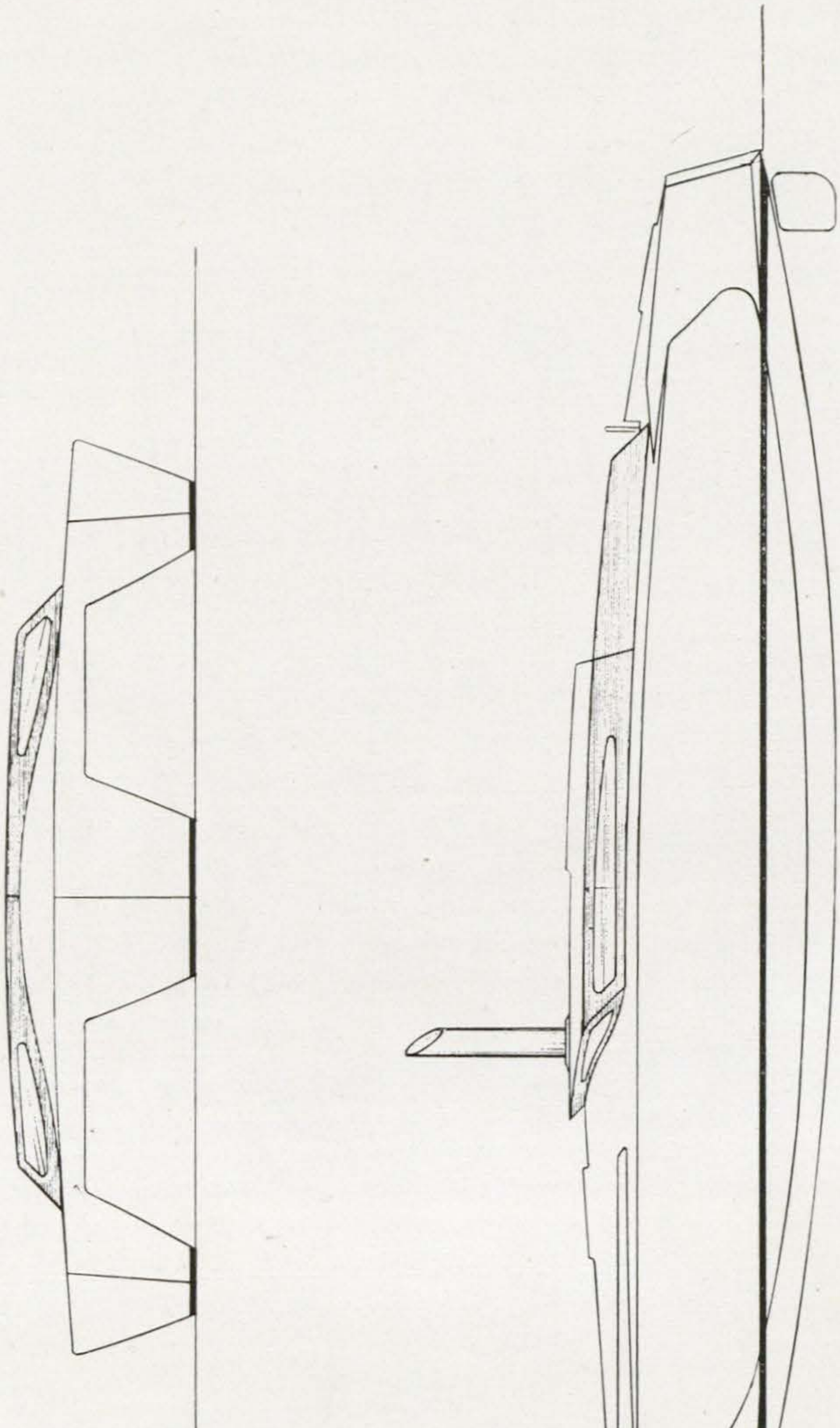
STILLETTO hull

Main Hull. This is of sheet plywood topsides and, below this, the bottom is a rounded shape though also made from sheet ply. The topsides and bottom fair into each other so well that only the least suspicion of a chine remains.

The Floats. Each float has double the buoyancy of the weight of the entire boat. Even so, they do not appear to lift the central hull when pressed. The lee float depresses more and more.


STOWAGE
LKR.
SINGLE BUNK
COUNTER
FOLDING TABLE
HATCH
SKYLIGHT
STOWAGE
COCKPIT
LKR.
SETTEE - BUNK
W.C.
SINGLE - BUNK
SKYLIGHT HATCH
SINGLE BUNK
STOWAGE

STILETTO



STILETTO

Summary. *STILETTO* is the prettiest trimaran I have yet seen, if not the prettiest yacht. She is obviously designed for maximum ocean speeds as a competitor for Dick Newick's *TRICE* and Hedly Nicol's *WANDERER*. Such competition can only do the trimaran design a whole lot of good.

AUXILIARY TRIMARAN *MATAMONA*

L.O.A. 40 ft. 9 ins.	Draft 2 ft. 6 ins.
L.W.L. 35 ft. 4 ins.	Floats 31 ft. by 4 ft. beam
Hull Beam 11 ft. 3 ins.	Beam Overall 28 ft. 0 ins. (17′ 0″)
Hull Beam at W.L. 6 ft. 0 ins.	Displacement 14,400 lbs.
Sail area 730 sq. ft.	

MATAMONA (named from a Gilbert Islands goddess) was designed by John Westell of Honnor Marine Ltd., Totnes, Devon, and built by them for Commander L. G. Turner, R.N. (Retd.) of Dittisham Court, Dartmouth. Commander and Mrs Turner cruise with their four small daughters and the requirement was essentially for a spacious auxiliary cruising yacht which would sail fairly upright. That a multi-hulled yacht would have shallow draft and be capable of being beached easily was considered a valuable bonus. In a similar way, the fact that she would probably make faster passages than a conventional yacht was a useful bonus but speed was never a requirement of over-riding importance.

Designer and owner were both rather worried about the very large horizontal areas exposed to wind and wave action by the more usual type of multi-hulled craft and so it was decided at the beginning to depart from the accepted types of layout and work from a different concept. This was to have a central hull and rig making use of normal yacht practice in the main but, instead of gaining stability by hanging about five tons of lead underneath, to gain it by providing a pair of outrigger floats. It was thought that this would give several advantages such as reduced wind resistance when sailing and elimination of the possibility of damage from waves against the under surface of a "wing". There would be no tendency for the craft to lift due to wing effect, however hard the wind might blow.

Exploration of the various means of carrying the wing hulls soon raised the possibility of swinging arms which would permit them to fold back and inwards. The light all-up weight of the yacht also called for a very slim central hull with a small waterline beam and, to provide the needed internal space, it had to be flared out above the waterline.

MATAMONA

This meant that about half of the beam of the wing hull could be tucked underneath the flared topsides of the central hull and a very neat "variable geometry" configuration was arrived at, which allowed the extreme beam of 28ft. to be reduced to 17ft. in a few minutes. When the wing hulls are in the sailing position they are held rigidly in place by crossed wires tightened by rigging screws. In the harbour position the beams are secured fore-and-aft. It takes about five minutes to stow them or rig them outboard and this can be done at rest or under power. Sailing with folded "wings" is not recommended, however.

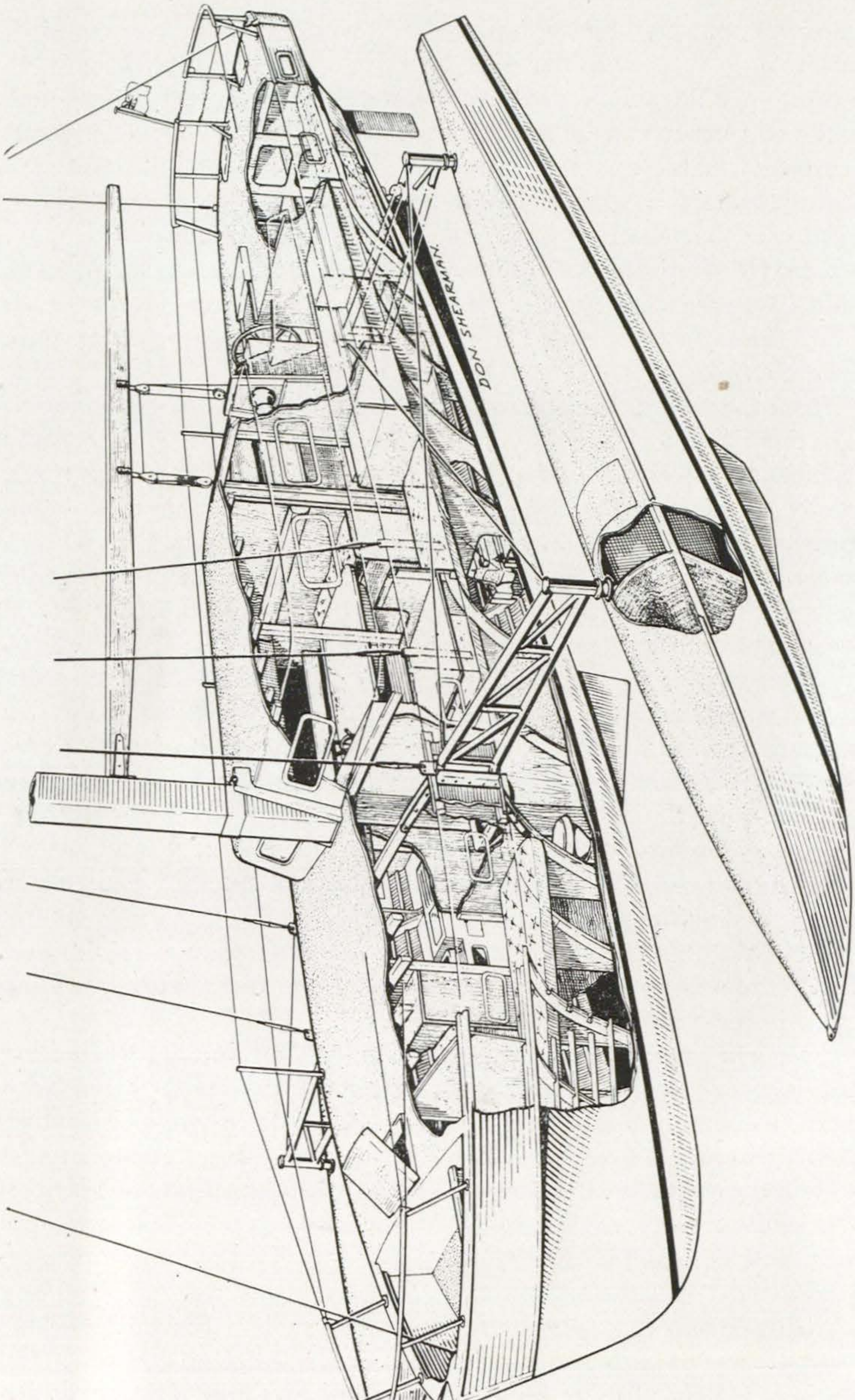
A further advantage of an unbalasted craft over a ballasted one is that the former can be made into an unsinkable life-raft without difficulty. Those who point to the theoretical possibility of the multihulled craft capsizing should bear in mind the, at least equal, possibility of the ballasted hull to sink if she should be holed or swamped. *MATAMONA* would float quite comfortably and remain stable even if fully swamped by reason of the expanded polystyrene foam which fills both ends of each wing hull, the bow and the under-cockpit space of the main hull.

From the start it was agreed that the auxiliary should be an inboard rather than an outboard and a 1500 c.c. Ford petrol engine, fully marinized by PNP-Duerr Ltd. of Burnham-on-Crouch and fitted with one of their feathering/reversing propellers, was chosen as being adequately powerful, light and not too expensive. The direct-coupled, rather small propeller would not be highly efficient under power but could be expected to do all that was required without appreciably affecting the sailing performance.

Although the two wing hulls had to be given short fins in order that the yacht would lie upright when aground, a centreplate was fitted to the centre hull to ensure good windward performance. This does not get in the way of the accommodation at all and is wound up by a winch from the cockpit. The rudder was drawn deep and narrow, going well below the keel to ensure good control in a seaway, and it has a lifting metal blade in a plywood and steel stock. Steering is normally from a large wheel in the centre of the cockpit but a second position at the fore end of the saloon can be clutched in. It is mostly useful for steering under power but has also proved fine for sailing in the rain in lightish breezes.

Only six permanent berths were called for and the resulting layout is very spacious. Forward there is a two-berth cabin with drawers, a hanging locker, and sail stowage. Abaft there is a lavatory compartment to port with w.c. and wash-basin—large enough to be used with the door shut ! Abreast this and extending aft into the saloon but at a lower level, is the galley, fitted with a Junior Star calor gas cooker, sink, draining board and ample stowage for food and crockery.

The most interesting feature of the saloon is the raised dining area with seats on three sides of a large fixed table. Sitting here, one can see all round through the windows in the sides and front of the house. It is very pleasant both at sea and in port and entirely eliminates the slightly claustrophobic feel of many conventional yachts. The saloon has a settee berth each side. A wine locker is fitted forward to



MATAMONA

port and the chart table is just inside the door on the port side. Here are to be found Brookes and Gatehouse radio/direction finding, echo sounding and log/speedometer instruments, together with chart stowage and other lockers. An oilskin locker is fitted inside the door to starboard. Beneath the sole and under the settees are enormous lockers, while the engine is readily accessible by lifting the sole immediately inside the cabin door.

Two levels in the cock-pit provide deep, sheltered corners forward on each side and a raised platform for the helmsman, who normally sits on the afterdeck. Dominating the cockpit is a central pylon which serves several purposes. On its after side and conveniently placed for the helmsman are the throttle and pitch controls of the power unit, together with a 6 in. Constellation compass. The after slide of the mainsheet traverses a raised length of track while its fall passes down the aft side of the track and leads through the bottom to a winch on the forward face. Also on the forward face is a massive geared sheet winch set with its axis horizontal. The jib sheets are led to it from either side and it has proved a very good arrangement to allow two men to exert the strength required to flatten a 550 sq. ft. genoa in a 20 knot wind.

Beneath the helmsman is a sail locker and abaft that a comfortable cabin with upper and lower berths to port, wash basin and dressing table to starboard and a large hanging locker right aft. The structural transom forms the after bulkhead of this cabin but the deck is carried some 16 in. further aft to form an overhanging space which houses the steering quadrant and protects the transom-hung lifting rudder. Further protection for the rudder is afforded by the stout tubular steel boarding ladder which gives access from a dinghy to the after deck. At sea an inflatable dinghy is carried on the after deck, by no means occupying all the space.

Forward of the mast is a large area of entirely unencumbered deck and forward of that a well-deck with stowage for the anchor to starboard and its chain warp in a box to port. A single roller is recessed into the stemhead, with fairleads on either side. No anchor winch is fitted but the warp can be led aft to the jib sheet winch via snatch blocks if man power should prove inadequate to get the anchor.

Performance :

Before deciding on the final arrangement of the design—relationship of wing hulls to main hull, position of centreboard, wing hull fins and sail plan—some very useful trials were carried out with a one-tenth scale sailing model. Various things were altered and adjusted during these trials until the model performed satisfactorily and there is no doubt that without such a means of arriving at a balance of so many forces the result in the full size could not have been anything like as good.

Two characteristics shown by the model were very encouraging. It had been felt that one of the unpleasant tendencies about a trimaran arrangement might be that, if a gust of wind caused increased heeling the lee hull would dig in deeper and cause a tendency to bear away. If this happened it could be dangerous and so when it was found that the model behaved just like most conventional yachts and automatically luffed into severe squalls, this was a source of much relief. The other thing which gave pleasure was the undoubted manoeuvrability of the model, which, if the helm was lashed slightly to leeward, would tack and gybe continuously in circles until further notice.

Both these model predictions have been borne out in the full scale. In practice the stability is so great that the lee hull never tends to bury. Rather, when a squall hits, there is a slight increase of heel and she accelerates. The helm remains light, with only a slight tendency to luff up. Manoeuvrability is very good indeed under power or sail and in light to moderate winds with smooth water *MATAMONA* can be tacked under jib only. In fresh winds and a rough sea she loses way quickly and has to be tacked very firmly, like any other lightweight sailing craft. However, there is never any doubt about her coming through the wind.

Her best speeds in winds up to about fifteen knots are made with the true wind about abeam and the apparent wind well forward of the beam. On this course, up to about 8 knots, speed through the water is about equal to the true wind speed and this means that the apparent wind is about 45 degrees off the bow. Hardening in the sheets and coming close hauled means a drop in speed but the speed through the water is still high in comparison with the true wind speed and so she does not point so high as a slower craft. The optimum course for windward work in lightish breezes seems to be about 50 degrees off the wind.

Of course, as the wind increases the boat speed does not increase in proportion and at the time of writing the best speed obtained has been 13 knots in a wind estimated to be about 20 knots and slightly abaft the beam. At this time the limit of stability had nowhere near been reached and it is clear that speeds in excess of 15 knots are possible. What is more to the point is that speeds of 9, 10 and 11 knots are quite often reached in moderate conditions, while a speed of 8 to 9 knots is often averaged over a considerable distance. This opens up the cruising range. It means, for instance, that the owner can take his family aboard in the Dart after tea, put them to bed at the proper time, and when they wake up they are in the Channel Islands or somewhere on the coast of Brittany—given a normal sort of westerly wind. In their old yacht such a passage took 24 hours and a whole day spent with everything inclined 20 or 30 degrees and spray flying all over the decks, is terribly tedious for a six-year old.

Not a few people predicted that *MATAMONA*'s separated wing hulls would prove to be wrong because they would send spray flying over the cockpit whenever the wind was before the beam. The fact is that she has proved unexpectedly dry and only when she is being driven very hard into a steep sea does any spray at all come aboard. This is intriguing as well as gratifying, the explanation seems to be that the wind sweeps over the turtle backed windward hull and is diverted downwards and aft by the flare of the main hull, carrying the spray with it. However, this may be, she is undoubtedly dry and stable. When a 30ft. launch carrying a photographer was tossing spray all over him and causing him to hang on tightly, the crew of *MATAMONA*, also making 9 knots, were walking about the decks unconcernedly and needing no oilskins at all. Motion when driving at about 8 knots into a typical Channel sea caused by a Force 4 wind is quick and irregular but anything but violent. A bottle or glass will stay on the cabin table.

Under power, with the deep, narrow rudder set in the slipstream of the propeller, *MATAMONA* will turn very sharp round if the helm is put hard over. At slow speeds and with the wind abeam, she handles best with the centreboard lowered to give her something to pivot on. She can be steered without difficulty when going astern and is generally docile in all conditions. The variable pitch propeller, worked by a hand lever near the helmsman through a hydraulic circuit, gives perfect control when picking up moorings or coming alongside and the fine variation in pitch which is possible makes for economy and efficiency under the varying conditions of motor-sailing.

At full power the maximum speed achieved is a shade under 8 knots. She settles down to comfortable and economic cruising under power at about 6 to 6½ knots. When in a hurry to make a quick passage, the engine barely more than ticking over with the propeller in fairly coarse pitch, makes a tremendous difference to windward performance in light breezes. This is genuine motor-sailing—twice as fast as under sail alone and twice as comfortable as under power alone.

The various speeds quoted above are genuine. Water speed is measured by a Brookes & Gatehouse "Harrier" log and speedometer and the distance run indicated by this instrument agrees very closely with that of a Walker log towed from the stern. The wind speeds have been checked frequently with a high quality cup anemometer which is part of the yacht's equipment. Both instruments have served to check and modify the sometimes enthusiastic estimations of the crew and there have been occasions when *MATAMONA* with 8 or 9 knots on the "speedo" has swept bravely past a motor launch whose speed, estimated by her owner, has been 12 or 15 knots.

GOONRAKER—A SINGLE OUTRIGGER CANOE

Main Hull L.O.A. 15 ft.	Float L.O.A. 9ft.
Main Hull Beam 2 ft. 9 in.	Float Beam 6 in.
Main Hull Draught 5 in.	Float Depth 9 in.
Draught, Board down 1 ft. 10 in.	Beam O.A. 7 ft. 10 in.
Sail Area 65 sq. ft.	Total Weight Rigged 150 lb. appx.

Designed and built (mainly) by Don Rigg, 5, Wilmot Avenue, Great Sankey, Warrington, Lancs.

GOONRAKER was originally a P.B.K.20 rigid canvas covered canoe built from a kit and with sailing gear as recommended on the designer's drawings. The boat was built in and around a flat in Derby which the writer was sharing with three other Engineering Graduate Apprentices in the summer of 1958. The B.B.C. Goon Show (full of strange characters and contraptions) was then exerting a strong influence and the name *GOONRAKER* was bestowed by popular acclaim.

Much modification of the sailing gear was required before it could be said to be sailing, this not being hastened by the fact that neither of the co-owners had ever been in a sailing-boat before ! However, by the following summer, *GOONRAKER* was just about making headway to windward under three sails awfully set on main and mizzen masts at each end of the cockpit.

It was about this time that the writer became sole owner of the boat and, during an abortive attempt to sail on Hickling Broad, first saw catamarans sailing. This led to the purchase of several A.Y.R.S. publications including No. 23—Outriggers 1958—containing a description of *ISLANDER*, an American single outrigger.

The conversion to an outrigger was made in the spring of 1960. Masonite, (oil-tempered hardboard) was used for the float as it was felt that the experiment might not be successful and expense should be kept to a minimum. The float was designed to stow inside the canoe hull, which accounts for the rather boxy shape, The length of 9 ft. was fixed by the length of the Masonite, and the size and shape of the cross-section was limited by the size of the holes in the frames at the ends of the cockpit. It was expected that the float would last long enough to decide what modifications to the shape would be required and then

GOONRAKER—Don Rigg

a better one could be made of marine ply or glassfibre. The new float has not yet appeared but should definitely be built for next season !

The cross-beams, of open girder form, were made from 2″ by ½″ ramin. They were laid across the cockpit coaming about 30″ apart and secured by ¼″ hook-bolts and wing-nuts. The bolts passed right through the beams and gripped the lower edge of the coaming. To strengthen the hull for this purpose four 2″ by ½″ mahogany struts were added between the coaming and the bottom stringers, one adjacent to each hook-bolt position. The three corners of the coaming were fitted with reinforcing gussets. The float was also attached by hook-bolts, the idea being that, in the event of a knock, movement could take place without breaking or bending anything.

A pivoted "centre" board was hung from a stout fore-and-aft member running between the cross-beams on the float side, just clear of the hull. Slatted seats were fitted between the cross-beams for the crew and diagonally from the rear of the cockpit coaming to the rear cross-beam for the helmsman. The outer edges of the crew's seats were about 6″ outboard of the gunwales and the inner edges just outboard of the coaming. Twin push-pull tillers were fitted to a transverse arm mounted on the rudder stock.

Sailing was much improved mainly because of the confidence given by the extra stability and it was decided to continue development further. The modifications are summarised under headings.

Rig. A Bermudan sloop rig of 65 sq. ft. total area was home-made from cotton tent-cloth and the $1\frac{3}{4}''$ sq. solid spruce mast was stepped on the forward cross-beam.

Cross-Beams. It was found necessary to box in the forward cross-beam to take the mast thrust and this spoilt the fitting of the seats so the cross-beams were replaced by solid lengths of builders 3″ by 2″ deal, and the seats by solid 10″ by 1″ planks bolted on top of the cross-beams. The shrouds were attached to the outer edges of the seats.

Hull. At the greater speeds now achieved severe "squatting" occurred—the whole after-part of the hull submerged and a foot or so of the keel was out of the water at the bow. This was completely cured by fitting a plywood transom to widen the stern without reducing the length. 6″ was the maximum width that could be accommodated by the existing canvas skin. The last frame, about 18″ from the stern, was not disturbed but the sloping stern-post was removed and the vertical transom fitted in its place. The reduction in length was only about 1″ at the keel. As well as widening the last 18″ of the hull the opportunity was taken to curve up the line of the keel over this length and the base of the transom ended up $2\frac{1}{2}''$ above the original keel line. The keel profile was originally straight for the whole length and the small amount of rocker now added produced a surprising improvement in rudder response.

Another result of the increase of speed was that the "centre" board began to scoop large quantities of water into the cockpit. It was desirable to keep the main hull suitable for paddling as a canoe so a dagger-board could not be put through the centre of the cockpit. Instead, the case was built through the side-decking outside the cockpit on the outrigger side, and the seat on that side moved outboard slightly to enable the board to be inserted and withdrawn.

All the hull modifications were carried out without removing the skin which is the original 7 year-old canvas, so far undamaged.

Sailing performance is now considered very satisfactory. There is little difference in handling on either tack but the writer prefers having the float to windward, when it is easier to keep the float running along the surface with only the vee-bottom immersed. The boat has a characteristic feel when in this condition, even in roughish water, and it is immediately apparent from this if the float lifts off or is over-depressed. Flying the float is no advantage, in fact it is difficult to achieve for any distance as the response to rudder is not quick enough to spill wind, and heel has to be controlled by playing the main-sheet.

GOONRAKER is not particularly fast but, considering its sail area, the speed is reasonable and, with two aboard, it has beaten a Mirror dinghy round a triangular course. In normal conditions it can sail with three adults or, more often, with the writer and family of wife and two small boys. Where the single outrigger scores heavily is in ease of transport and storage and low cost. The total cost of the materials in *GOONRAKER* is about £26 and it is stored in a 19 ft by 8 ft. garage which it shares with a Dormobile van. The three main components—cross-beam and seat assembly, float, and hull—are easily lifted separately on to the roof of the van for transport.

The present ratio of sail area to stability is about right. More stability could easily be obtained by a larger float and extension of the seats outboard. Increase of sail area, however, would increase the side-load on the dagger-board case and extra stiffening would be needed in the hull.

Comparison with TABUARIKI (A.Y.R.S. No. 51).

It was interesting to compare *GOONRAKER* with *TABUARIKI* at Weir Wood last October.

1. When both boats were sailed single-handed *TABUARIKI* was faster and sailed closer to the wind, but with two aboard the performance was very similar. In the conditions at Weir Wood (gusty, Force 3 to 4) *GOONRAKER* required a crew to keep the float down and was something of a handful sailed solo.

2. *GOONRAKER* is longer and beamier which partly accounts for less reduction of speed with added weight.

3. *GOONRAKER* was much easier to put about mainly because of its sloop rig (backing the jib). In non-gusty conditions it will come about on main alone but both boats suffer from lack of rocker.

4. Push-pull tillers are easier to handle than the conventional tiller and extension in this type of boat. (The forward ends are threaded through rope loops on the cross-beam so they do not get "lost".)

5. *GOONRAKER* has far less alteration to the basic canoe structure, is somewhat lighter overall, and its main hull must be considerably lighter. As a paddling canoe *GOONRAKER* still handles easily. *TABUARIKI* may be rather heavy for easy paddling.

6. *TABUARIKI* is a much nicer-looking boat !

MANUREVA—1965

BY

A. Jeffrey

101, Milngavie Road, Bearsden, Glasgow.

As mentioned in my article in the April 1965 issue of the A.Y.R.S. publication (No. 51), I decided at the end of the 1964 sailing season that the original floats were too small and incorrectly shaped for anything other than smooth water and an agile crew. I also wished to provide more space for movement on board and thus I carried out the following modifications :

1. Two new floats were constructed as shewn in the attached drawing, with a total load carrying capacity (decks awash) of 800 lbs, a length of 16 ft. and a waterline beam of 10 inches, all constructed from 6 mm ply to BS 1088.

2. The area between the main hull and the floats were decked in for a distance of 8 ft. (fore and aft) with 6 mm ply.

3. The floats were given a "toe-in" of $2\frac{1}{2}$ degrees with a view to decreasing the leeway drift. The total side area of a float full immersed being 20 ft. 2 in.

The disadvantages of the above relative to the previous layout were :

(a) Heavier by approx. 300 lbs.

(b) Decked portion between floats and hull tended to collect water in very heavy weather (lee side only).

(c) Decked portion tended to catch wind on windward side to a very small extent (never an embarrassment).

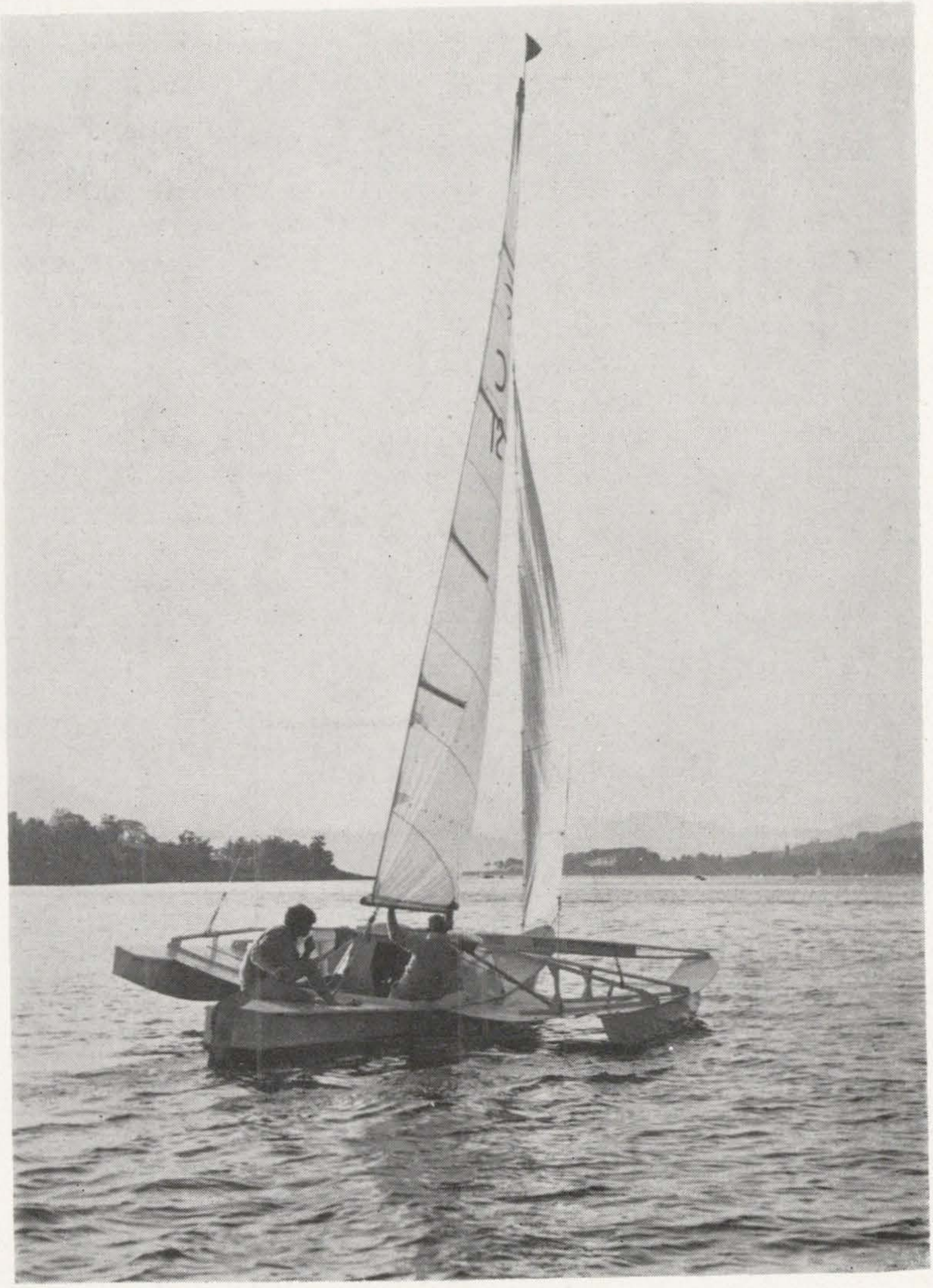
(d) Still insufficient lateral area to satisfactorily counteract leeway.

(e) Cross beams had to be considerably strengthened.

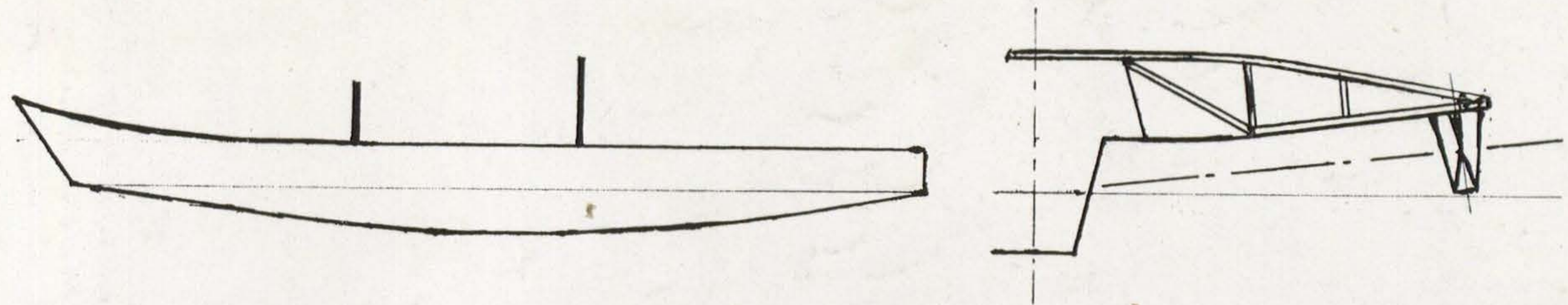
The advantages were many and the whole concept of the craft was changed as follows :

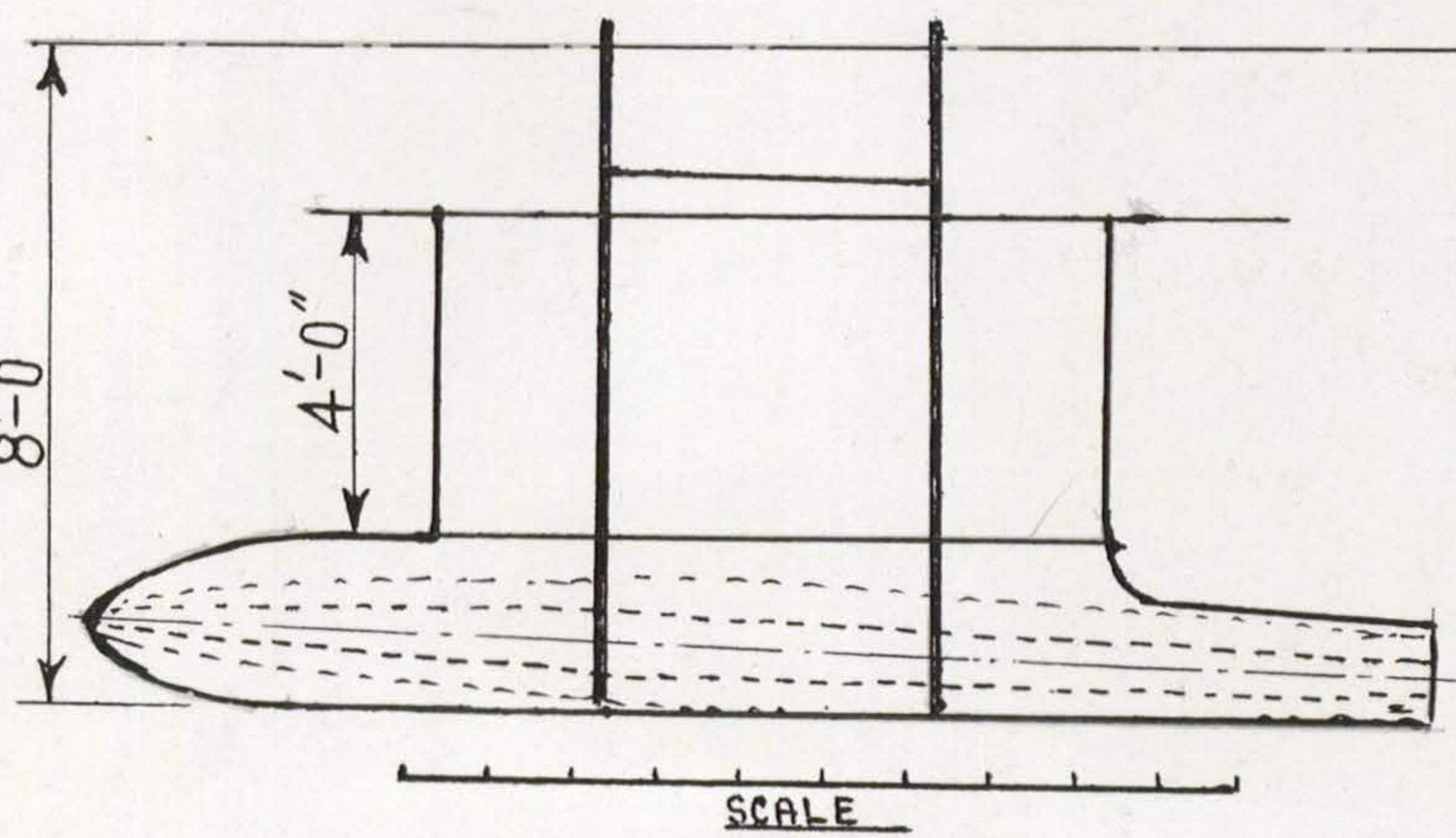
(a) Stability in heavier weather (up to force 5) was very good and on one occasion when returning to moorings in a force 7 squall under full sail we jibbed successfully (but not without some "heart in mouth" moments) (3 adults 2 children).

(b) The added convenience of movement onto decks and floats had to be experienced to be appreciated, for example, while on the first sail of the season two children (aged 7 and 5) moved about from lee float to hull with no apparent concern. The ability to transfer from dinghy to float is also a great advantage and much appreciated by all concerned.



MANUREVA





"MANUREVA" 1965

FLOAT AND DECK LAYOUT

FLOAT L.W.L. 15 FT.

L.O.A. 16 FT.

MAX. BEAM W.L. 10 INCHES.

MAX. BEAM BOTTOM 5 INCHES

DISPLACEMENT TO W.L. 300 LBS

DISPLACEMENT TO DECK 800 LBS.

(c) The design of the overhung deck lifted towards the bow on the main hull and on the floats has contributed very much to the sea kindliness of the whole layout (I nearly said contraption) and in my opinion is superior to the spray deflectors found just above W.L. on most cats as it keeps well out of the spray when sailing "light" yet is very powerful when a float is depressed whether by wind acting through the sails or by the action of the waves. I cannot recall any occasion when a float was washed fore and aft by a wave along the deck.

The unkind sailing weather we had in Scotland during the latter part of the season did not permit me to carry out other tests but now at the end of the 1965 season I have decided that I will try a new layout for *MANUREVA* by converting her from a Trimaran to a Catamaran on the lines of the Micronesian layout with the second float slightly shorter than the main hull and with the float lying to windward and leeward as one changes tack. I feel that this layout should be more suitable for the conditions prevalent where I sail and I also wish to experiment with various methods of counteracting leeway, when closehauled.

I was fortunate while on holiday in North Wales when I was able to meet two members of the A.Y.R.S. One member from Altrincham transported his wife, family and Catamaran to Criccieth where an enjoyable discussion and a good sail were experienced. The other member was at work in Port Maddock where again an interesting but unfortunately protracted discussion took place.

I hope that this resumé of the past year has been of interest and I shall be glad to hear from any A.Y.R.S. member interested in my experiments or up in this "Northerly Outpost" on holiday or on business and having an hour or so at their disposal.

THE CROSS 24

Dear John,

Enclosed is a photograph and drawings of the latest model of my Cross 24. A few changes were made, namely :

1. Chined floats replace the deep veed type.
2. Wider, flatter transom.
3. Reverse sheer.
4. Flush deck.

The improvements are noticeable when the old and the new are sailed together. The new boat does not heel as much, especially when close hauled. This results in it being faster than the old boat and the transition through the hull speed range is much smoother and the hump is less noticeable.

A Mr. Hibbard and his son built this trimaran in less than five

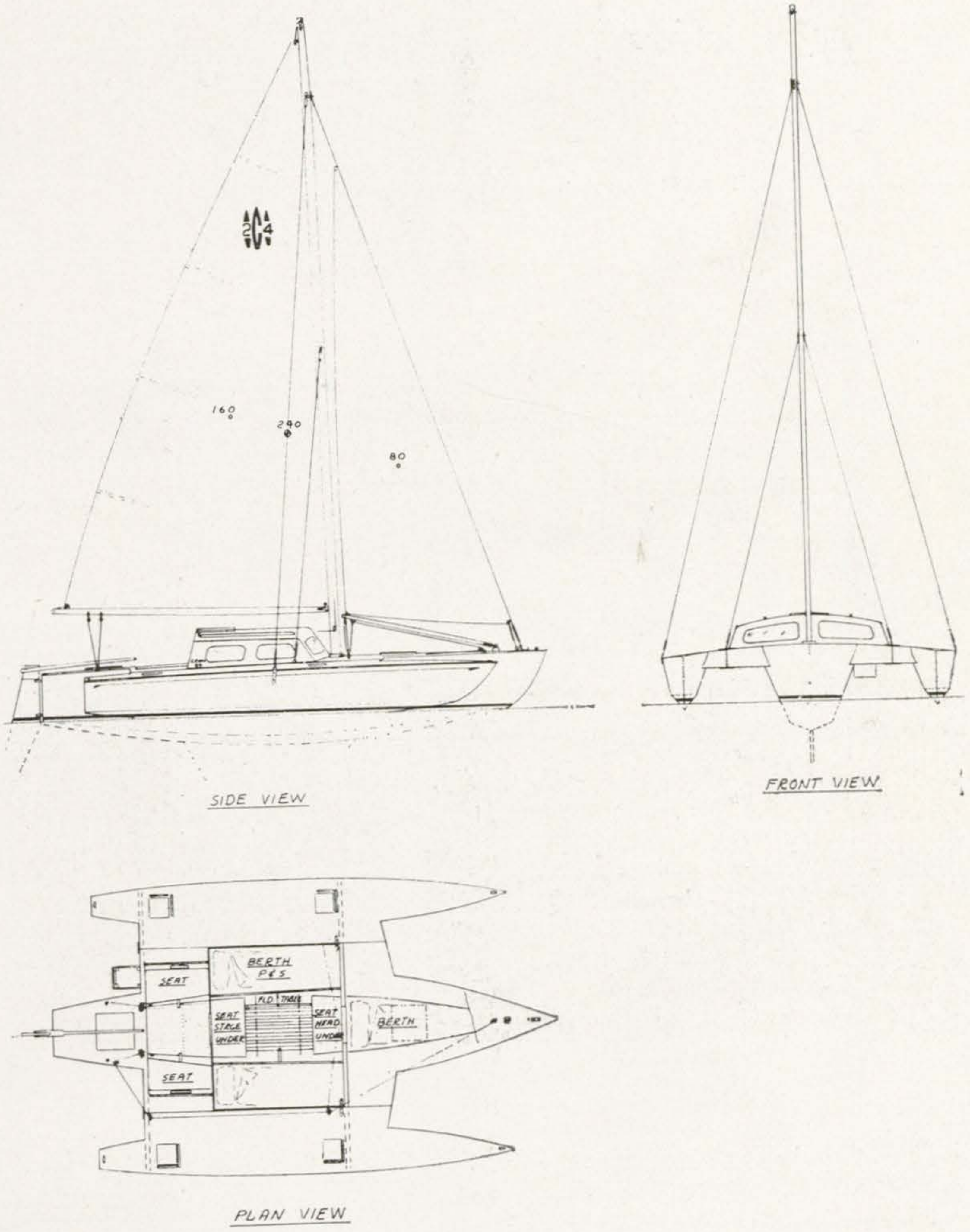
CROSS 24

months from the time he received the drawings to launching date. They worked hard, evenings and weekends. The boat sails beautifully. A slightly larger jib was added.

I also enclose drawings of my new Cross 26 and the redesigned Cross 30 which has now 6 feet of headroom and a slightly longer main cabin.

NORMAN CROSS.

4326 Ashton, San Diego 10, California.


160
240
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SIDE VIEW
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P&S
SEAT
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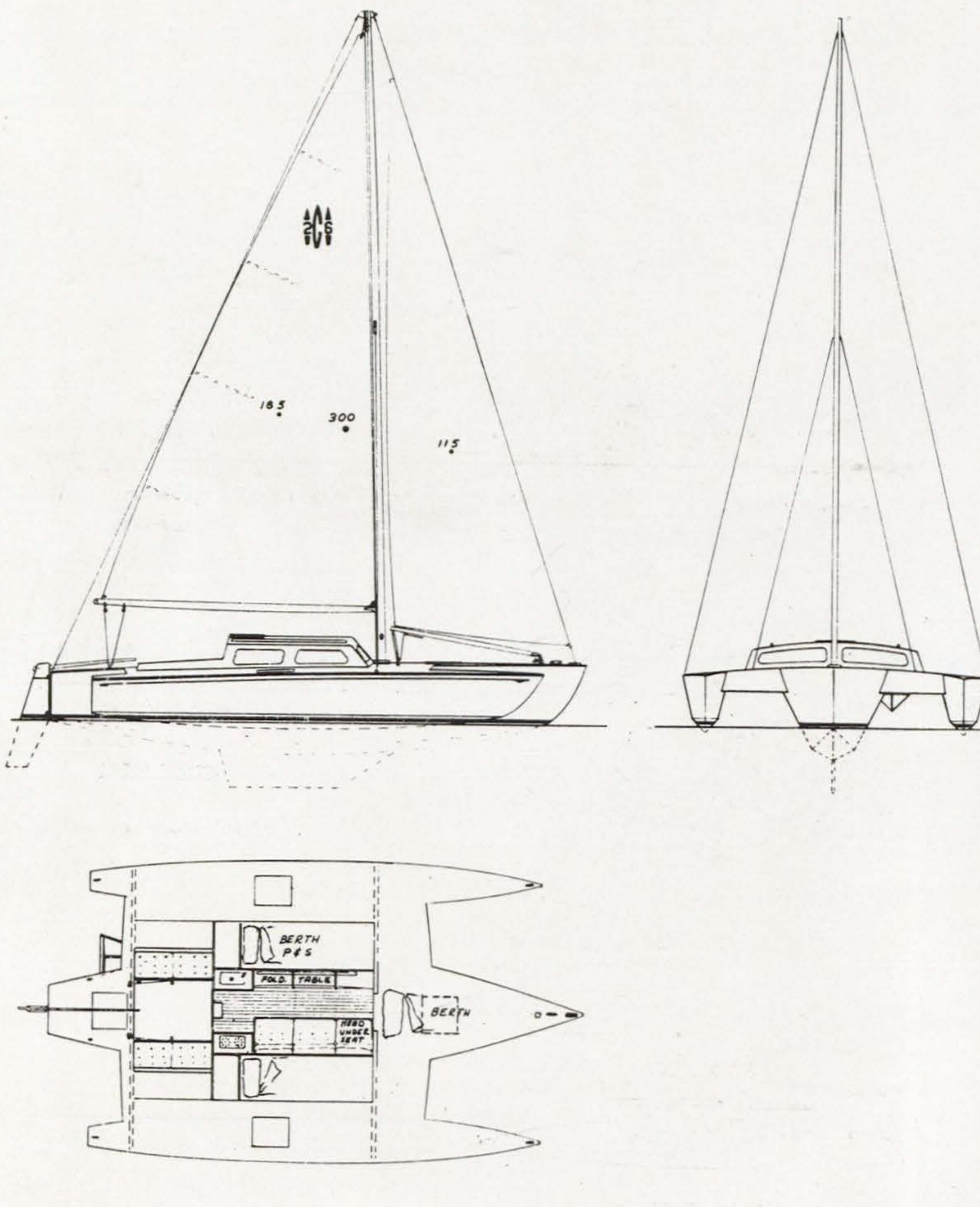
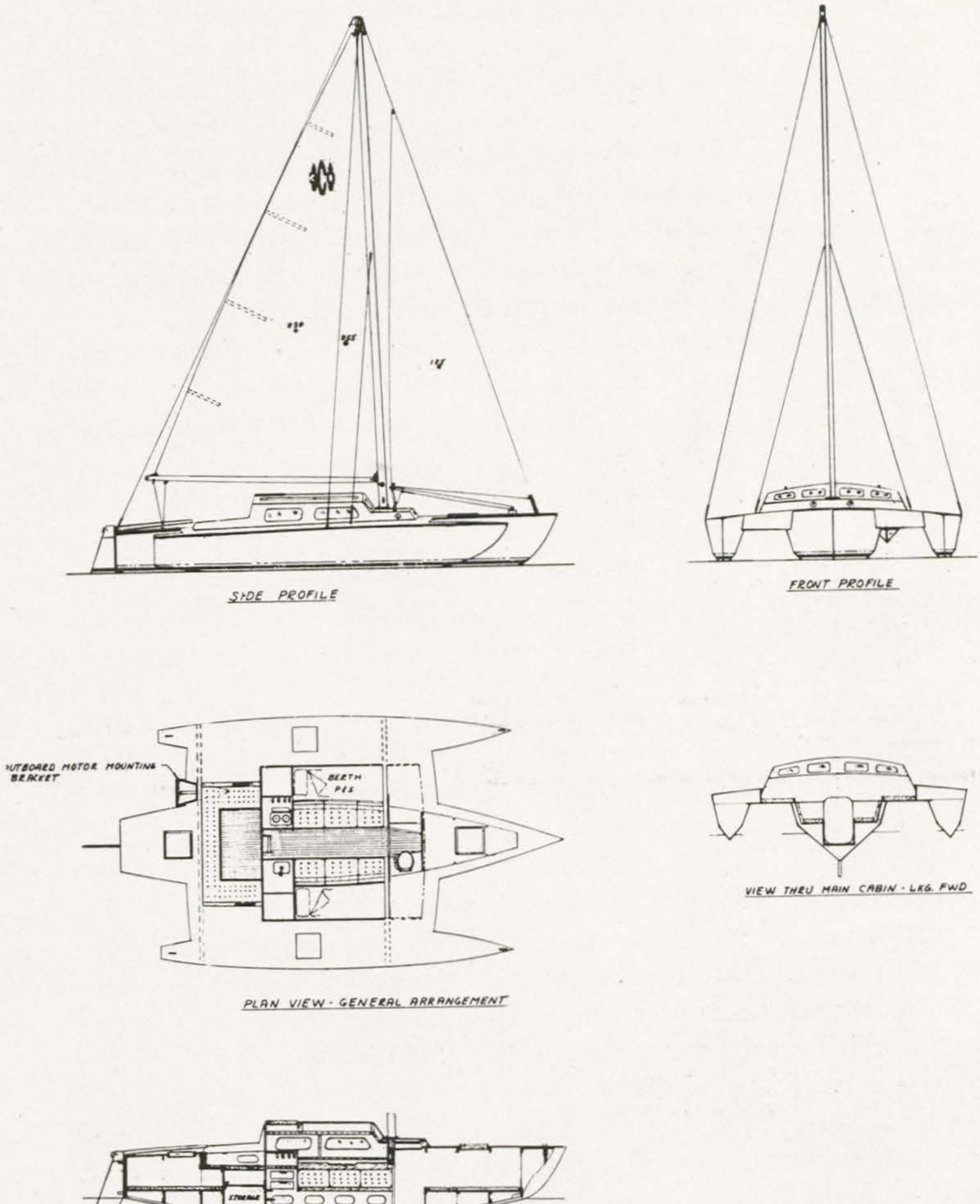
BERTH
PLAN VIEW

CROSS 24



CROSS 26



CROSS 30 *Plans*

Kul 1' x 8'

THE HIGH PERFORMANCE TRIMARAN

BY

JOSEPH C. DOBLER, N.A.

801, Eight Street, Manhattan Beach, California.

Conventional sailboats have a speed limitation, commonly called *Hull Speed*, which is somewhat dependent on length, weight and shape, and which sets an effective upper limit of speed possible under sail. This is the result of wave-making by the boat as it pushes the water aside in its forward movement. Hull speed may be increased to a certain extent by making the boat light and long and slender, but the limit, though a little higher, is still there.

Below its hull speed, the conventional or *Displacement Boat* is very easily driven. The Indian canoe is an excellent example of a fine lined displacement boat. It is famous for ease of propulsion at low speed.

Single hulled sailboats have shapes which are largely determined by their need for stability to enable them to stand up to the heeling force of their sails. The result is a relatively full bodied hull with pronounced wave-making tendencies. Such a boat of, say, 25 feet waterline length will go about 8 m.p.h. at best.

The catamaran gets its stability in another way, so each of its two hulls can be made even finer than the canoe. It must be designed for good performance in light winds as well as strong, however, and the limit due to wave-making though higher, is still there.

The trimaran combines a single fine hull, to carry the load, with a smaller hull on each side to provide the stability. The wind pushes on the sails and the trimaran resists the heeling force by transferring some of its weight to the lee float, which can then push up with a force equal to the weight applied to it. This is in acccord with the ancient law that water pushes upward on a vessel with a force equal to the weight of the water displaced by the vessel. The float is shorter than the main hull and if it is canoe shaped or V bottom design its resistance to forward movement will increase rapidly with increased load, approaching a hull speed which will be lower than that of the main hull. Obviously this is not good—we expect to go faster, not slower, when the wind blows harder. What to do ?

There is another kind of boat, with a *Planing Hull*, which gets its support not by displacing the water but from dynamic lift as it gives the water a quick downward push in passing. At low speed the planing boat will behave as a displacement boat but with high resistance it is a poor shape for low speed operation. It is ideal for high speed operation, however, as the resistance increases only slightly with increased speed and the planing hull is not caught in the hull speed trap. The lift provided increases rapidly with speed increase and is dependent on the area in contact with the water.

Planing floats—the obvious solution for our trimaran. In light winds there will be little load on the lee float, so it will plane at low speed. When the wind blows harder the faster speed will give the float more lift and we have a neat self adjusting system. As load is transferred to the float the lighter main hull has less resistance—the total may actually decrease. The result—Speed. This is the high performance trimaran.

Some people will say, "I am not greatly interested in speed, I just want to cruise. Give me safety, with speed a secondary consideration". No argument there, we all want safety, first and all the time. There are various kinds of safety. Appendicitis or an infection from a trivial appearing wound may occur on any boat. Speed in reaching treatment is important here. Safety from capsizing is the area which is principally dependent on the design of the boat. A boat will capsize only when the wind forces can push it over easier than they can push it ahead. The multihull boat cannot heel to spill the wind, its ultimate safety will depend on its ability to spill the wind by spurting ahead when the knockdown gust strikes unexpectedly. I would not be so rash as to say any boat is non-capsizable, but certainly, the one with the least resistance to forward movement when the lee float is heavily loaded will be most non-capsizable. So, the planing float trimaran gives safety as the result of speed and not at the expense of it. I am sure that anyone who understands the situation will want the fastest boat under these conditions.

THE DOBLER TRIMARANS

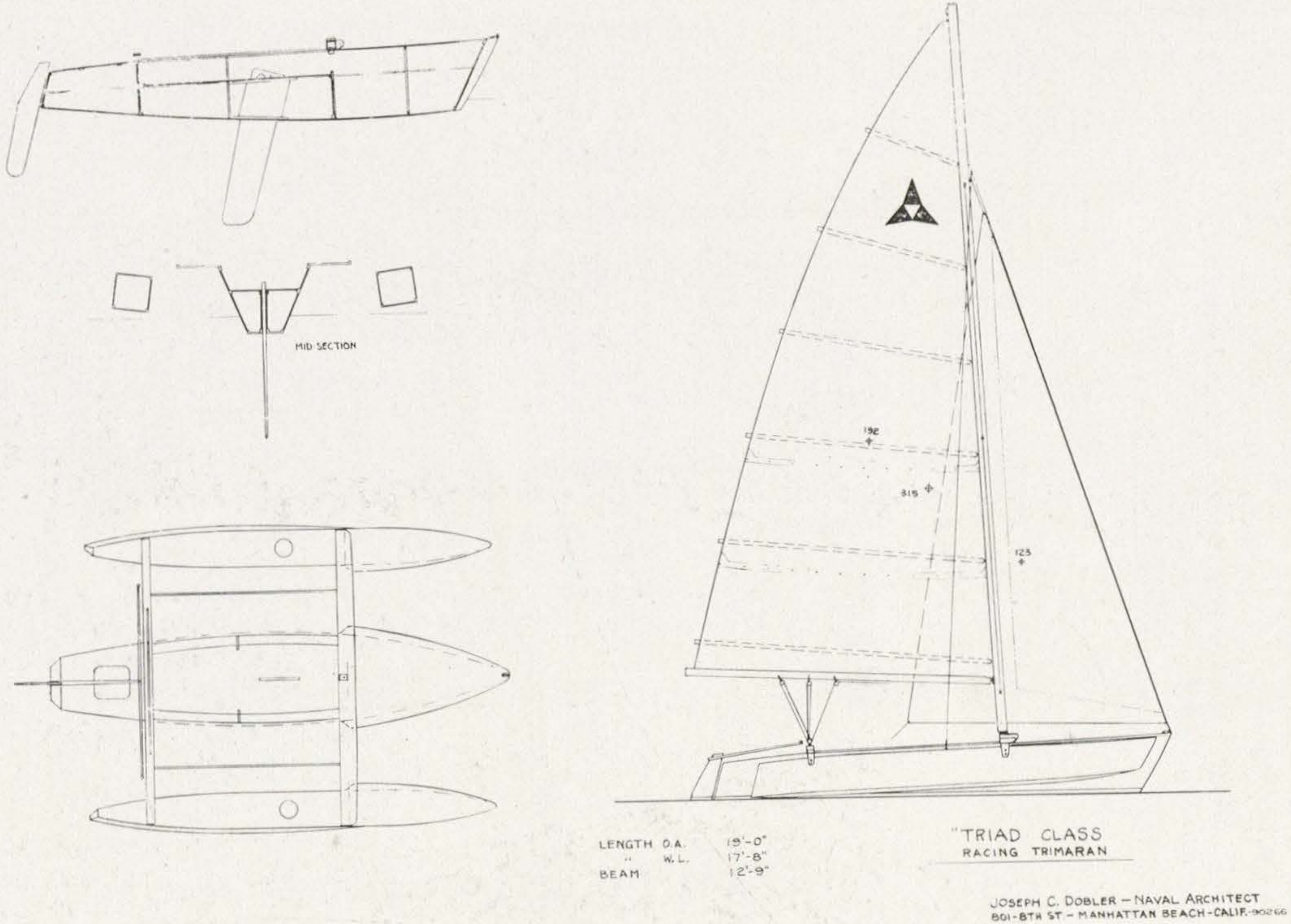
BY

JOHN MORWOOD

TRIAD CLASS. L.O.A. 19 ft. 0 ins. L.W.L. 17 ft. 8 ins. Beam 12 ft. 9 ins.

All the designs which Joseph Dobler has sent me are of flat bottomed trimarans with box-shaped floats, designed to plane. We know that this type of trimaran goes well and is the easiest to build. *TRIAD* is of this type and is reminiscent of Victor Tchetchet's designs but with more beam to the floats and central hull. The float bottoms of *TRIAD* slope up at the outer side as compared with the other trimarans of this series.

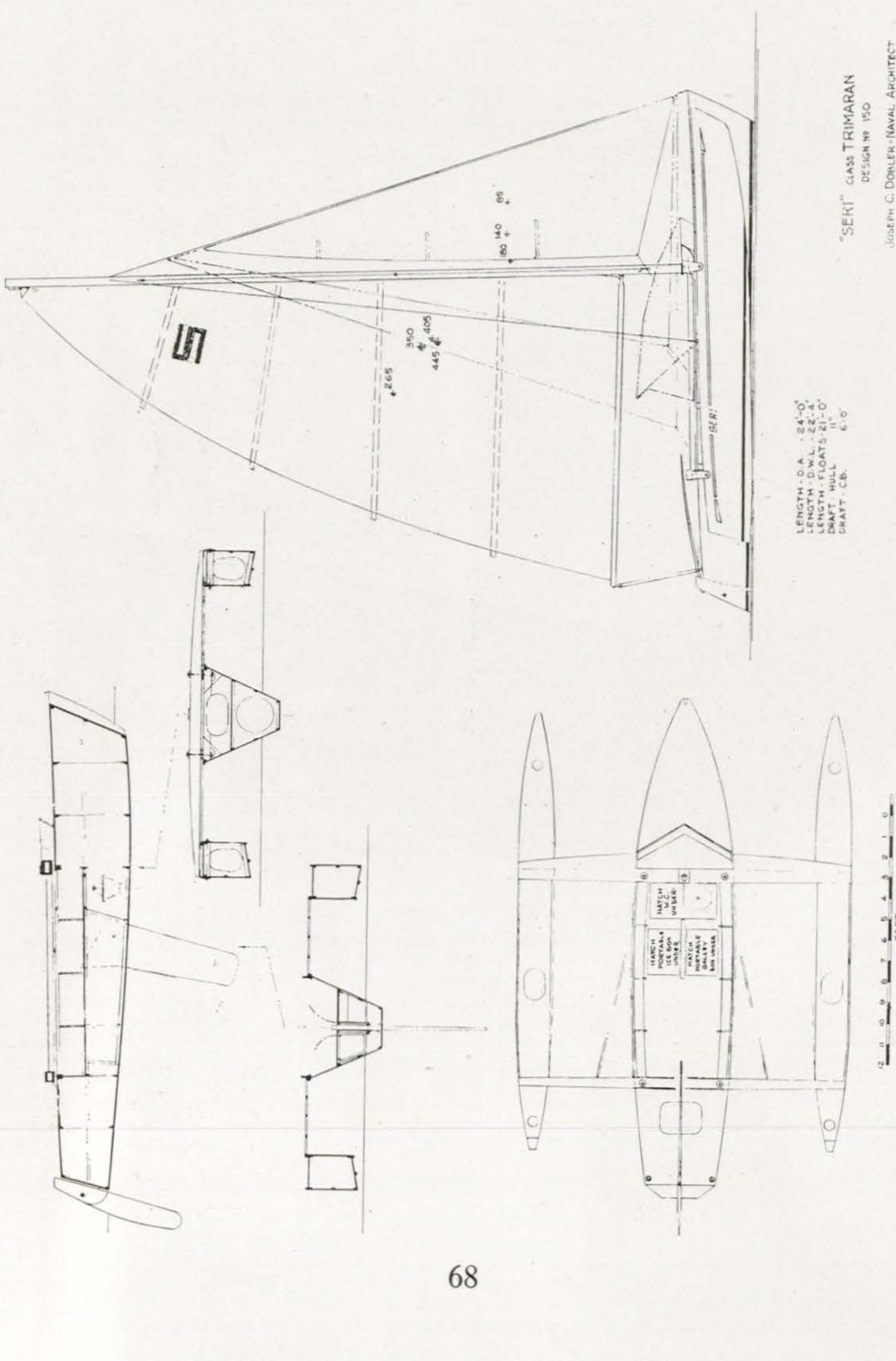
TRIAD—Joseph Dobler



TRIAD Trimaran—Joseph Dobler

SERI CLASS. L.O.A. 24 ft. 0 ins. L.W.L. 22 ft. 4 ins. Float length 21 ft. Draft 9 ins. Draft C.B. 6 ft.

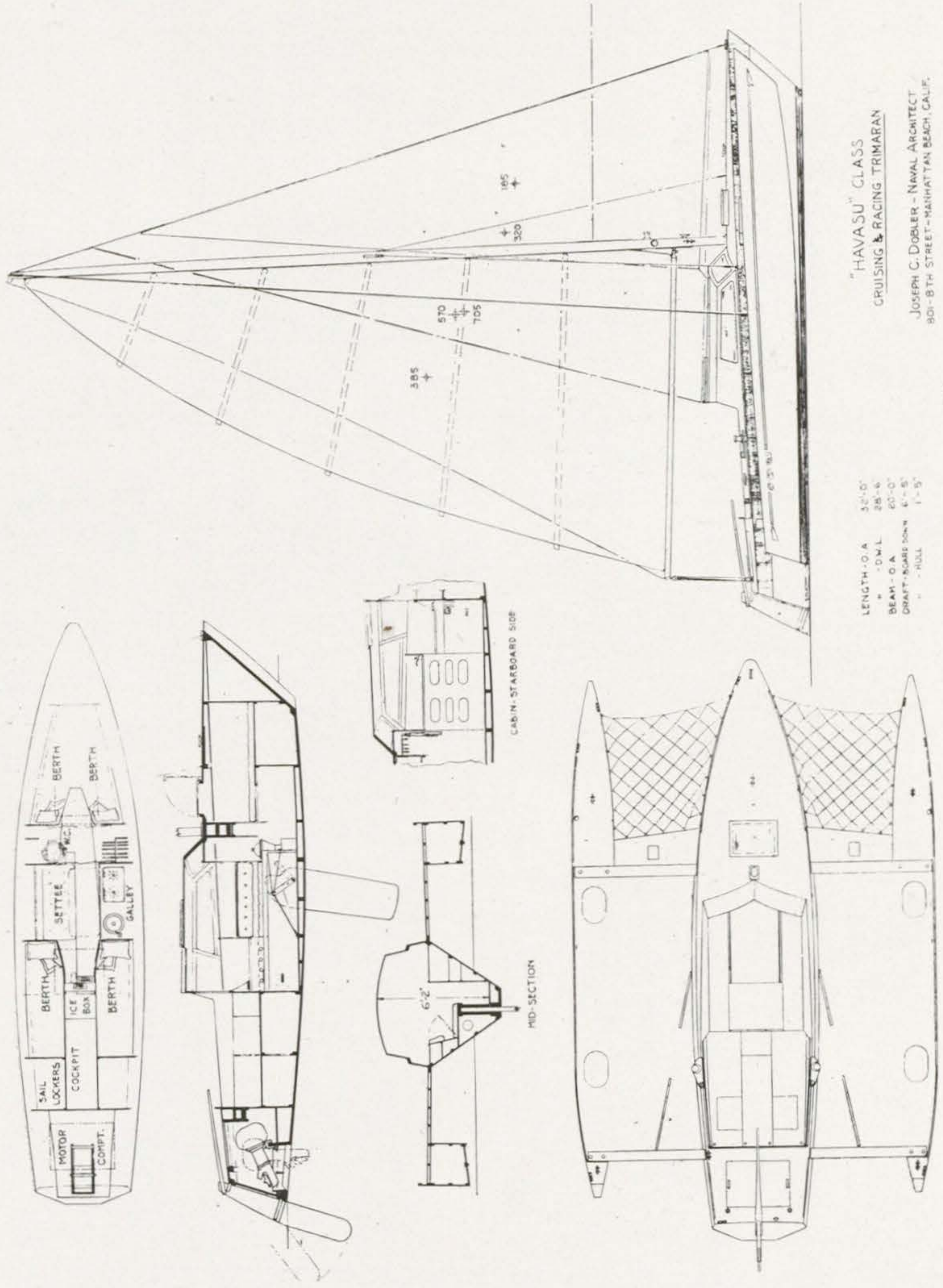
This trimaran is similar to the previously described *TRIAD*, except for the floats which slope up in the inner side, presumably to prevent pounding. However, they may often be in the bow wave of the central hull and thus conform to the wave surface. A canvas hood at the fore end of the cockpit will give shelter for day sailing and to keep stores dry when using the boat as a camping cruiser.



SERI Trimaran—Joseph Dobler

HAVASU CLASS. L.O.A. 32 ft. 0 ins. L.W.L. 28 ft. 4 ins. Beam o.a. 20 ft. 0 ins. Draft 1 ft. 5 ins. and with C.B. 6 ft. 5 ins.

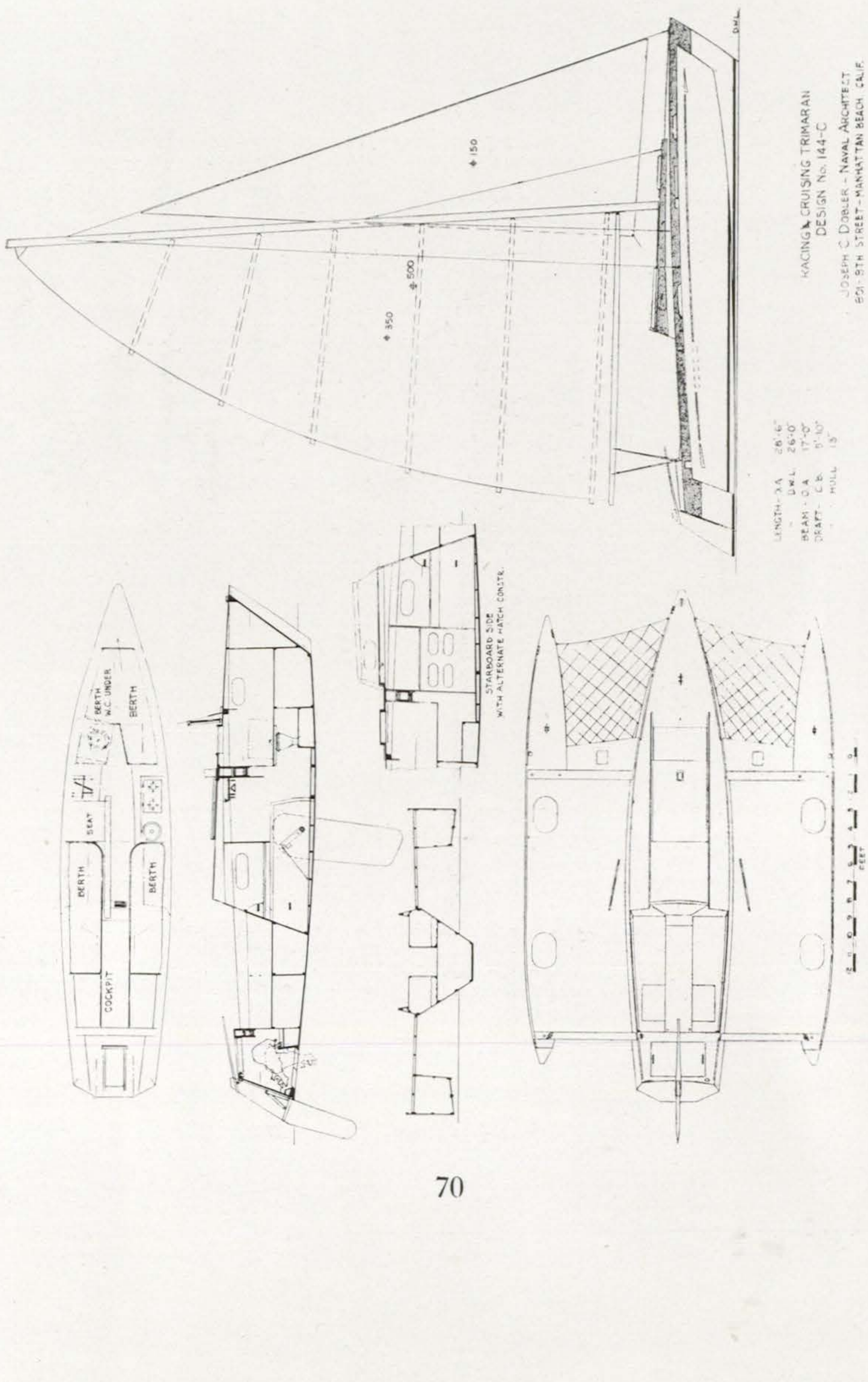
This is a five berth cruiser with all the accommodation placed in the central hull and the outboard placed in a separate cabin aft, which allows it to be brought into action by tipping it down through a well in the bottom.



HAVASU Trimaran—Joseph Dobler

RACING CRUISING TRIMARAN DESIGN No. 144 C. L.O.A. 28 ft. 6 ins. L.W.L. 26 ft. 0 ins. Beam o.a. 17 ft. 0 ins. Draft 15 ins. with C.B. 5 ft. 10 ins.

This design is merely a slightly smaller version of the *HAVASU* type. It has all the same design features and 5 berths.



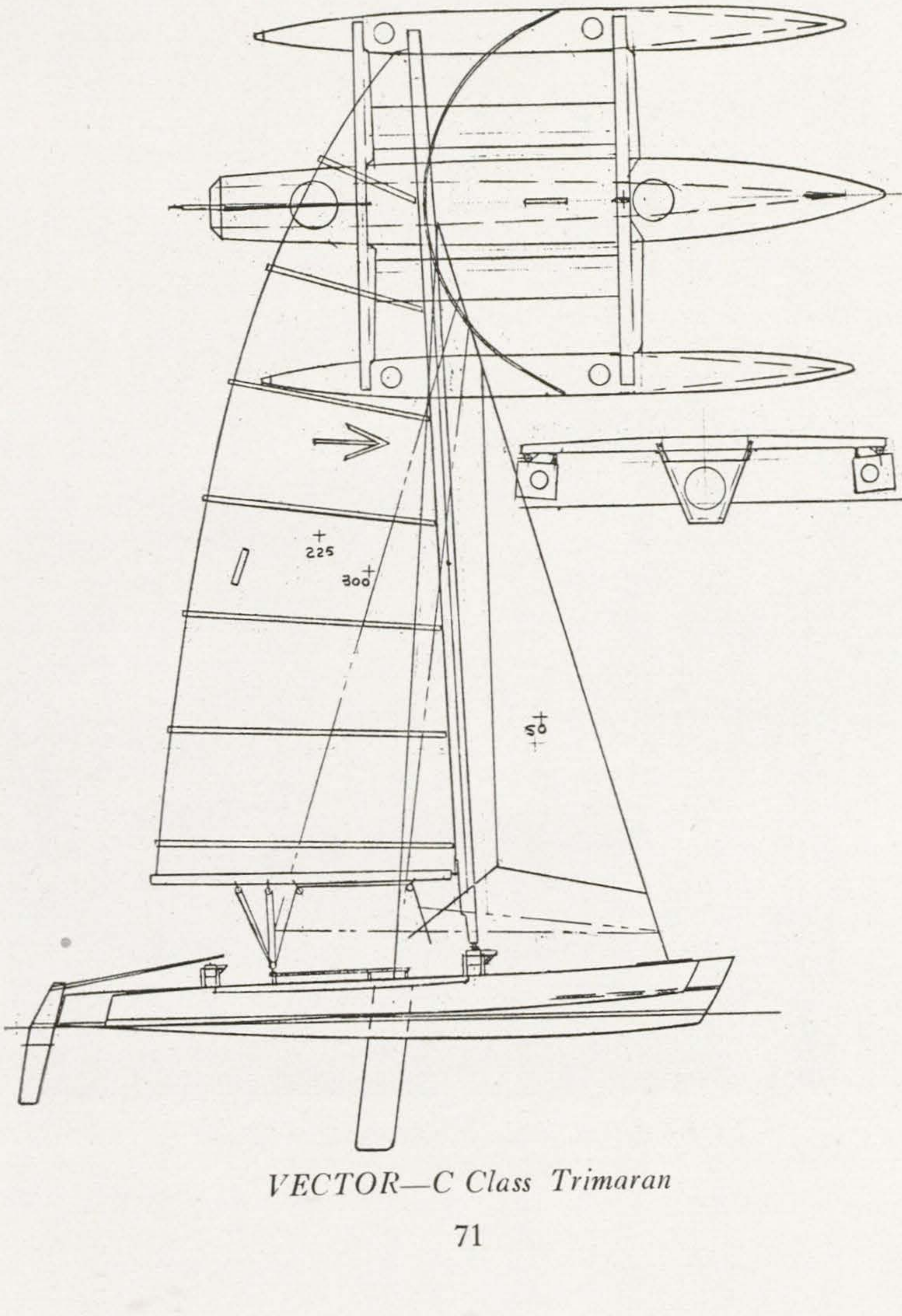
29ft. *Cruising Trimaran—Joseph Dobler*

VECTOR, A C CLASS TRIMARAN

Designer: Joseph Dobler 801, Eighth Street, Manhattan Beach, California.

The L.O.A. is 25 ft. and the beam 14 ft. with 300 sq. ft. of sail area.

The drawings show the general layout and the photograph shows *VOLARE*, which was built to this design, sailing. It will be noticed that there is a good deal of dynamic lift being created by the lee float.



VECTOR—C Class Trimaran

VOLARE—C Class "VECTOR" design

Joseph Dobler writes: "*VOLARE* frequently finishes first against the big racing cats here. In the recent Multihull—one of a kind regatta, she finished first in the first race with winds about 12 knots. The other races had winds of 5-6 knots and she did not quite do so well.

The *TRIAD* is becomong established as a class. It does well under all conditions and can outsail *VOLARE* in the light airs. Both boats are at their best in winds over 15 knots and have frequently made the trip to Catalina, which is about 30 miles of rough water."

SOUTH COAST TRIMARANS
2301 7th Avenue, Santa Cruz, California 95062.

Dear Sir,

It has been a long time since we corresponded. Early 1960 was when the Society published the story of our voyage down the Mexican Seaboard in the 24′ trimaran *JUANA*. It was then, I believe, that the "seagoing trimaran" movement got started.

Now, your letter requesting information on our line of trimarans comes at a good time. for we have withheld material from the A.Y.R.S. until we have had something substantial to submit.

Designing independently now, we have drawn four trimarans, with some twenty of these under construction by owner-builders. But our dilemma has been that, because individual builders usually work slowly, most of these designs are yet to be sailed.

However, last fall I became affiliated with a professional builder here in Santa Cruz. An experimental prototype 26′er we call *CARAVEL* was designed and built this winter, and we have been sailing her now for two months, learning much of interest to Society members.

This boat is a study in extremes, with each design concept involved being over-expressed to determine for sure if we are going in the right direction. Of particular interest is our treatment of interplay wave-making between the hulls, an inherent problem of the multi-hull types, especially on windward courses. I have observed many trimarans fighting themselves to windward due to the main hull bow-wave smashing into the leeward float somewhere around amidships with the result that the float is pushed to leeward by a wall of water, which also becomes constricted in the tunnel, generally impeding progress.

Through model work, and our experience with many existing trimarans, it has developed that several design variables effect this "interplay" wave pattern :

(a) Main-hull fineness ratio.

(b) Main-hull displacement curve, with reference to where along the waterline one locates the maximum projected frontal area.

26 *ft. CARAVEL*

(c) Main-hull "taper ratio", describing how much wider per foot of run the entry gets.

(d) Hull spacing—the room in the tunnel.

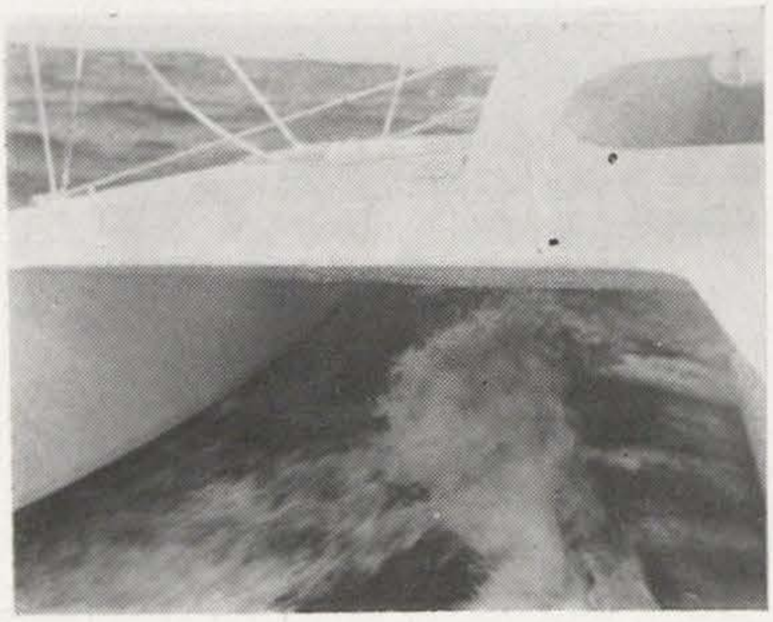
(e) Float shape, with reference to its displacement curve (at $\frac{1}{2}$ immersion) and is the float bi-lateral, or truly asymmetric.

(f) Fore-n-aft relationship between main hull and float; how far forward is the float carried, and how do the two displacement curves compare when superimposed.

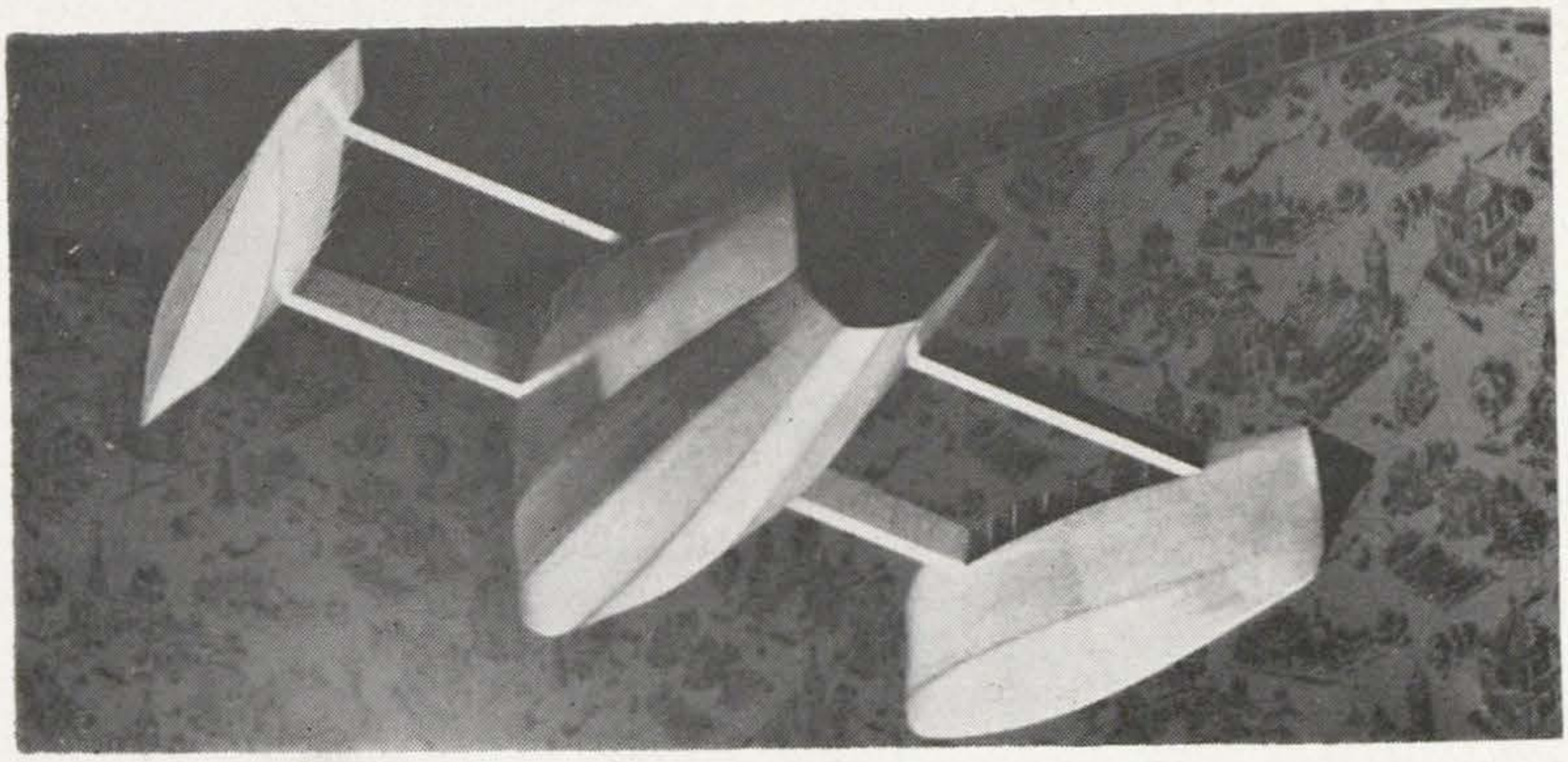
(g) Size of the boat.

Through different expression of these variables in form and inter-relationship we have seen that it is possible to markedly influence the tunnel wave pattern. In fact, definite and predictable contortions of the water surface as seen by the hulls has been achieved.

Generally speaking, we have arrived at narrower hulls, greater spacing between, and asymmetric floats. Observations in the tunnel of *CARAVEL* reveal that the wave pattern spends its interplay *away from* the sides of the hulls. Most important, there is achieved on windward courses a contortion of the surface which makes the dynamic water-line on the inboard side of the lee float actually *lower* than on the outboard side, with a resultant startling performance to windward, for the boats' own wave pattern is holding it against leeway. And leeway, of course, simply enlarges the projected frontal area as the water sees it, making even fine hull forms put up a terrible wave-making drag.



On right: wave interference in the tunnel



The Model

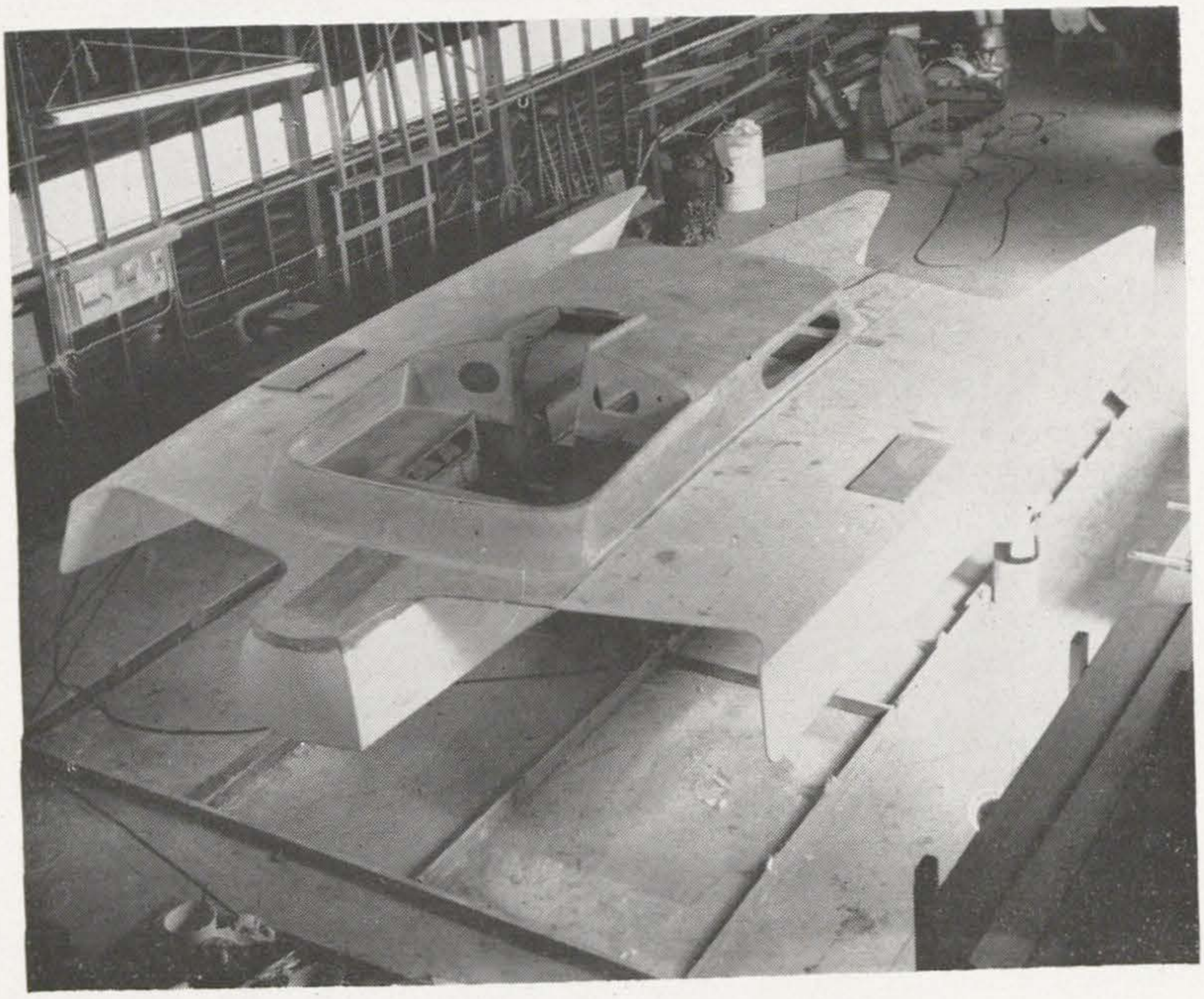
Local yachtsmen here have been very co-operative in asking us to join in their organised races to get a controlled comparison on triangular courses with keel yachts. Of the five races we have entered, including all conditions, and sailing against the fine local fleet of from

The test

20′ers to 50′ers, we have, in each case gained time on all competitors except the 8 meter, *ANGELITA.* And as was demonstrated last weekend, given enough wind, we can catch her too.

That event was a 49-mile triangle in coastal, but unprotected waters. As always, we started about last, and to leeward of the fleet to avoid disrupting the official entries, and in this case we were off the line 6 minutes behind the first class of the larger boats. In 15-20 m.p.h. winds we overhauled the entire fleet, except for the 8 meter, on the close-reaching first leg of 9 miles. On rounding the first mark the new tack was closehauled, a 22-mile beat against what developed into a 25-30 m.p.h. wind with big seas and bright sunshine—a marvelous day. *ANGELITA* was just ahead, and to my surprise, did not pull away with the new pointing course-line. We sailed in her wake for $2\frac{1}{2}$ hours, and watching her was extremely exciting for me, for she was so beautiful there, driving hard just ahead of us. But behold—we were doing just as well in a boat half the size !

Her crew was also visibly excited. For once, they had someone to sail with, and so did we. The terms of the contest were perfect, and a real point of honor lay in the outcome. I eventually discovered that as the wind increased, I could pinch higher than our course-line without losing distance to the 8 meter, but could go no faster against the mounting seaway, now all breaking combers. But by putting *ANGELITA* slightly to leeward of us we were able to bear off a little and finally drive through her lee, emerging with her on our weather quarter and just a few yards off. This moment was one of great elation, as can be imagined.



26 *ft. CARAVEL*

But the beautiful adversary was still there, chasing us as we had pursued her, and would probably overtake us if the wind and seas laid down. She was trying hard. With the sun behind her, we could see the genoa filling with water as she smashed over each crest, the water appearing luminous in the sail with back lighting. In the next minute she lay dismasted, a-try among the seas and spray mist. The feeling for us, upon seeing this, was one of shock—the hurt that comes with seeing a bird with a broken wing. We were deprived of learning the outcome of our unlikely contest, and deprived of her company. It was an unhappy letdown from the high-flying scene of moments earlier. As she needed no assistance, we sailed on to the weather mark, turned with a windshift to beat again for the finish in light airs.

Our elapsed time for the race was 56 minutes less than the first official entry to finish, a Kettenberg 40'er, and about 1½ hours less than the fastest boat our size (Lapworth 28'er) for an elapsed time difference between us of about 20%, and an unofficial course record.

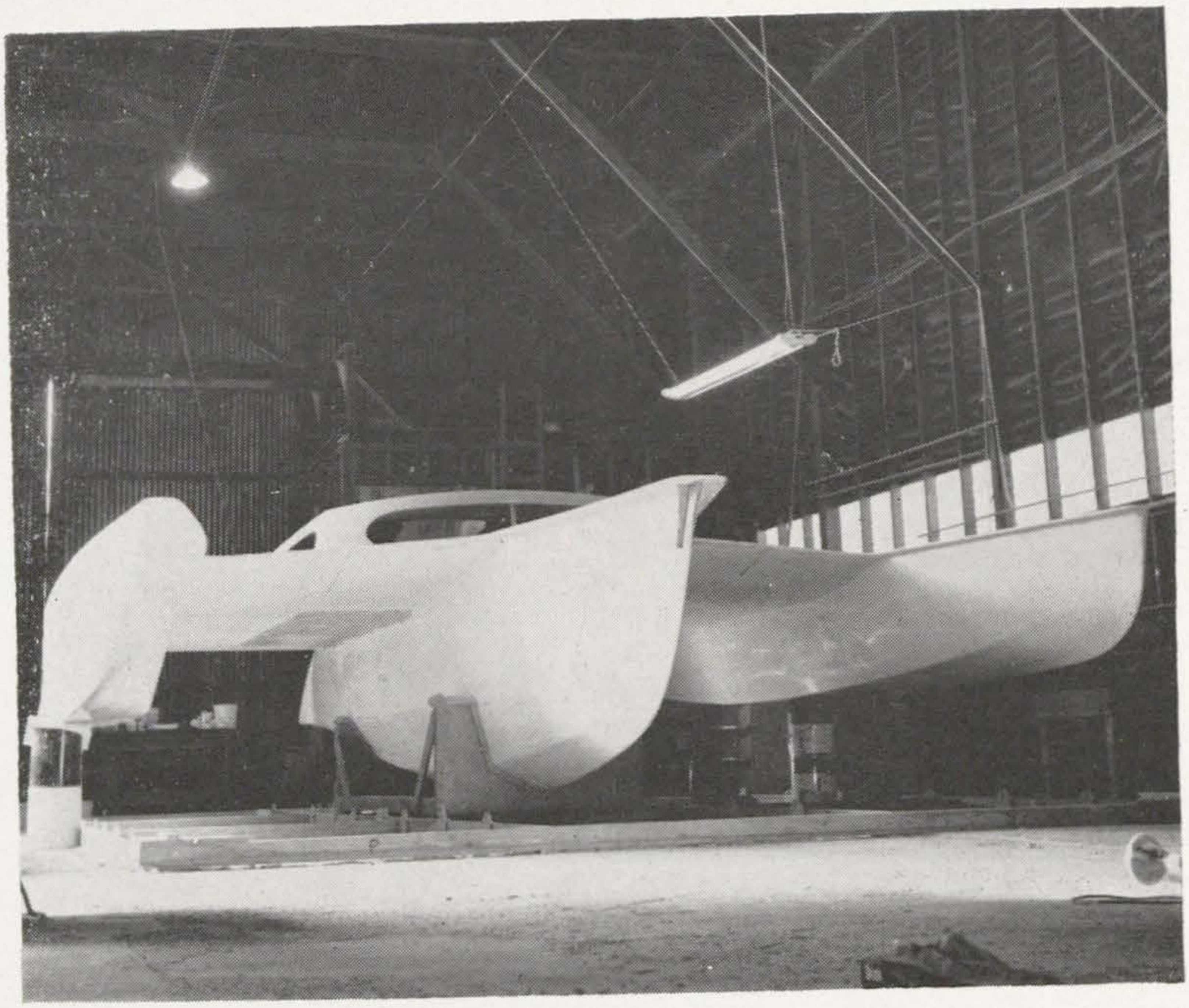
I feel that this performance substantiates a positive advance in on-the-wind sailing for multi-hulls. 20% faster in an all-upwind course is more than just a marginal gain, and *CARAVEL* enjoys all the other attributes of multi-hulls; she has tremendous stability (we were the only boat to carry the genoa all the way around that 49-mile course) and she has good performance off the wind, even when loaded (we have seen 20 m.p.h. on our speedometer with nine persons aboard —though I don't trust the instrument).

While *CARAVEL* has a dagger-board (more necessary in *lighter* winds) I feel that, when the wind really blows and the seas mount up, this board (4½' draft) is simply not enough to allow her to point and foot with a deep, racing meter-boat twice her size. When we heel enough to get the asymmetric float down there and working, *undisturbed by wave-making* from the main-hull, then we see the real windward potential of the boat.

This is not to say that the boat dies in light airs, because in ghosting conditions we can apparently sneak away from anything with a keel and about our mast height. On spinnaker runs, in a wild breeze 8-10 m.p.h., we can stay with the 30'ers, even *without* using a spinnaker. But real speed, on any point of sailing, is of course tied to wind speed.

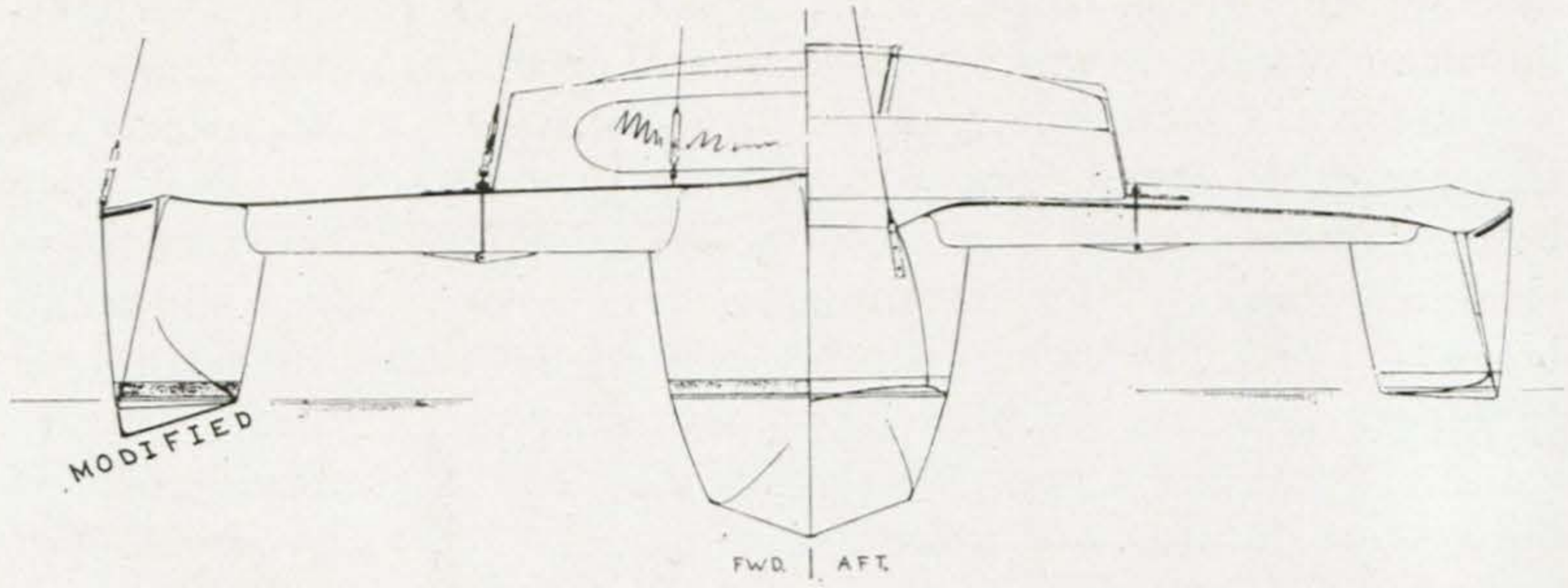
As we know, asymmetric shapes are not new to multi-hulls, but my opinion is that they do not get their best chance to work in catamarans, where they oppose each other on down wind courses at high speeds, and therefore cannot be made asymmetric *enough* to be really effective to windward when the speed drops. Our shapes have a maximum thickness difference each side of centre, of from 2-to-1 to 3-to-1, depending on size; the bigger the boat, the less "ASYM", as we say. In catamarans, this one-sided shape impairs carrying capacity, for the principle reduces displacement, and in trimarans the designer must guard against a stability problem caused by a reduction in gross float buoyancy in these shapes, especially at the bows. But asymmetric floats do not impair the trimaran's carrying capacity, for this is the job of the main hull (*CARAVEL*'s double-chine bottom gives her actually *too much* buoyancy, and we often carry ballast—a nice situation for a larger, cruising boat) and neither do the floats impair high-speed downwind sailing, for they are then little immersed.

Some old worms have been turned. I have been involved in trimaran development since its modern inception, and necessarily have become inured to the usual difficulties and the deserved scepticism from fellow sailors. But the trimaran's long record of dismastings and breakdowns was, at least this time, reversed; for it was the traditional contender who was disabled by the acid test, a long heavy beat to windward (one other boat was dismasted). Also, our attitude toward the rest of the fleet has a familiar old ring, "We like your modern yachts very much. They have some nice things about them, and are beautiful to see sailing, but the pity is that they just don't *go* to windward."



26 *ft. CARAVEL*

Some unsuccessful design features of *CARAVEL* are : (1) The broad, flat main hull transom with re-curved outrun. This is a good shape for very high speeds, when the stern wave departs to show up after the boat has passed; but at moderate speeds, it places the transom



MANTA

right on top of the stern wave, causing "dirty heels". (2) The flat bottoms on the floats, which pound as I expected. While the idea is apparently good for smaller trimarans, as evidenced by the planing floats in the excellent day-racing trimarans by Joe Dobler of Southern California, the added speed achieved when reaching through float lift is not worth the noise of spanking in light airs. They do not pound from driving, for when heeled in a breeze one float is down and the other is up. But let them come in and out, up and down, as in slatting conditions, and they drive you nuts.

But on the bright side, we have the trimming board, or stern dagger, which eases the helm when surfing, allows self-steering even on a broad reach, and also self-steering to windward under mainsail alone ! This tactic, incidentally, of striking the jib instead of reefing the main, is easier than reefing and apparently more efficient, for the boat keeps charging.

Also, a real joy is the big cockpit with all-around coaming, and the lofty masthead, spreaderless rig. The boat's aesthetic appearance and workmanship have been well received.

Many of *CARAVEL*'s design concepts are included in the other designs we offer. Plans for the 38′ *OFF SOUNDINGS* and 34′ *MANTA*, already voluminous and uniquely detailed, have been recently re-worked to include asymmetric floats. A new design, the 41′ Trimaran Auxiliary, also includes these new floats, and a number of new features. Notable are its central cockpit, large quadrant centre-board, and 40 h.p. diesel auxiliary.

Incidentally, there is a man in England now beginning to build our 38′ *OFF SOUNDINGS* design. He is Tom Tuppein, 19 Southcliff Road, Southampton, Hampshire, England.

Tom is a seaman; in fact, he is 3rd Mate of the S.S. President

Garfield, and has owned a trimaran before. His 30'er was lost in the Channel when she refused to beat off of a lee shore. I am very anxious for him to make a success of his project, and suspect that your members in his area may be interested in examining his plans, and the boat as it comes along.

Thank you for requesting information—I hope that the Society may benefit.

Sincerely,

JIM BROWN.

MANTA—A CRUISING TRIMARAN

South Coast Trimarans, 2301-7th Avenue, Santa Cruz, California 95062
Area Code 408-Dial 475-9599

Length Overall 34'
Extreme Beam 20'
Draft 30"
Genoa Jib 347 sq. ft.
Designer : Jim Brown

Sail Areas :
Mainsail 260 sq. ft.
Club Jib 182 sq. ft.

Description. *MANTA* is a cruising trimaran, but with design emphasis on performance. Her accommodations are comfortable, though modest, there being permanent berths for only four persons. Hull forms and sail plans are intended to make her very quick and powerful.

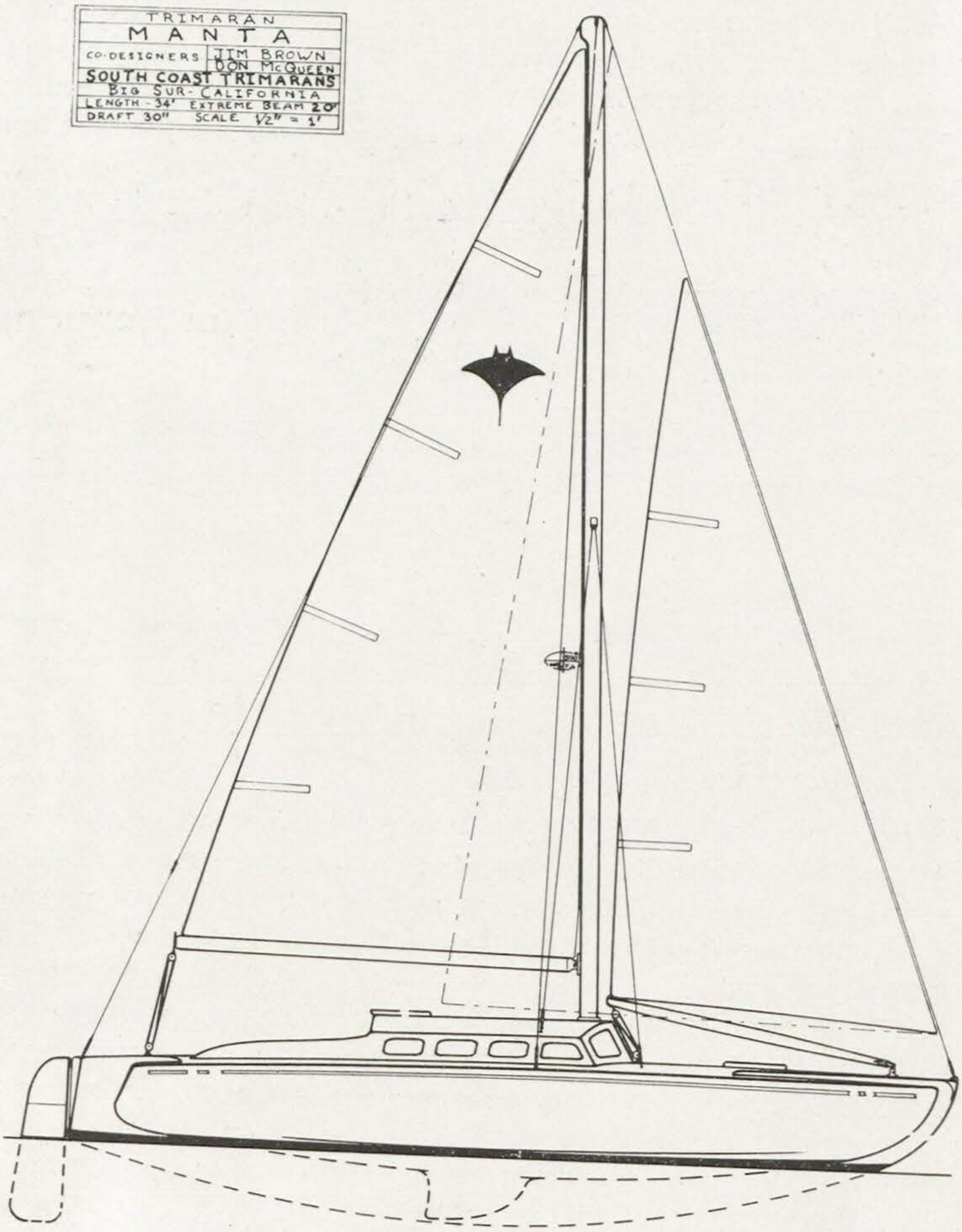
The potential for speed, however, has been coupled with generous displacement for a multi-hull the size of *MANTA*, affording the all-important carrying capacity necessary for stores and cruising gear or for day-racing with extra crew. She is large enough for serious cruising, and her club-jib, roller reefing and snug cockpit make her easily managed single-handed.

Yet with her *optional yawl rig*, she is better suited to cruising than as a sloop, for the yawl rig has a more flexible, conservative sail-plan which shortens the main mast and boom, and provides the mizzen and mizzen staysail for more sail combinations.

These features then—accommodation, sail-plans, and carrying capacity—together with emphasis on high performance make *MANTA* truly a racing-cruising combination.

Several of our design innovations are included in *MANTA* :

Floats. A float-design improvement—development of the chines —is to afford greater "stiffness" in the early moments of heeling, a more comfortable motion. Still, the desired gross-float-buoyancy



is maintained to *allow* heeling in the face of knockdown gusts; in all—the right kind of stability.

Main Hull. The main hull stern has been extended to make a "clean outrun" and adequate buoyancy aft, thereby avoiding the common multi-hull tendency to sail down by the stern in a squatting trim.

The main-hull chines run in a continuous shallow curve parallel to the dynamic water-line. This feature is to keep the chines free,


34 *ft. MANTA*

while maintaining a buffer of immediate reserve buoyancy just above the water-line where it is needed. Chine development at the bow affords a very "fine entry" with some "hollow" in the water-lines.

Hull Spacing. MANTA's overall beam of 20′, when combined with her narrow hulls, provides a very wide "tunnel" space between the hulls. This allows water to pass between the hulls with a minimum of constriction, and minimizes pounding on the under-wing.

Fins and Rudder. This trimaran employs our hydrodynamic float-fin design (instead of a centre-board in the main hull) and a large, deep tilt-up rudder. These provide a good windward performance, firm, crisp control when running in a seaway, and good protection when beaching or striking flotsam.

Rigging Plan. Our unique masthead, *spreaderless* rigging plan takes advantage of *MANTA*'s great resource of beam. The arrangement of shrouds is uncommonly simple and secure, and is inherently stronger than "diamond" or "spreader" rigs. The overlapping, masthead genoa jib may be sheeted in hard for windward sailing and be free from chafe. This rig has been thoroughly tested and proven at sea.

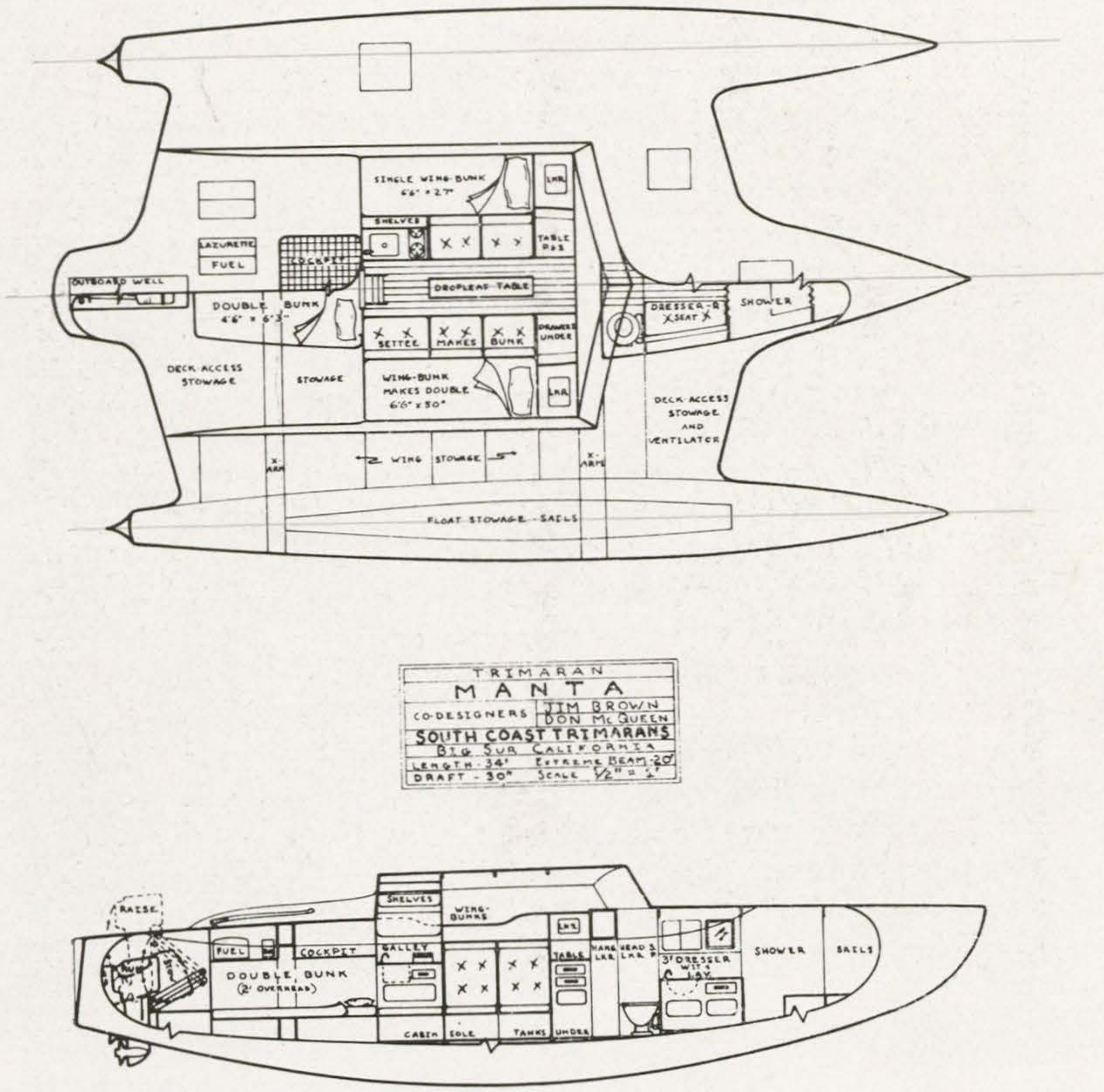
Construction. Our straightforward construction method involves the framing-up of all three hulls at once, as a unit, so that the home-builder is assured of proper alignment of components. After the sheet-plywood planking is applied, the method affords separation of the hulls for inverting and fibreglassing. When re-assembled permanently, everything must fit back together properly.

The frames themselves are simple plywood bulkheads with perimeter and interior lumber-framing attached. The interior layout,

34 ft. MANTA

as well as the exterior shape of the hulls, is established by these transverse frames through our system of "combination framing"—yielding a light, strong and simple skeleton.

Accommodation. *MANTA*'s flexible accommodation plan affords berths for from 4 to 6 persons. There is a single-bunk in each wing, and a commodious double-bunk filling the entire main-hull just aft of the cabin. The starboard wing-bunk may be extended to a double, and the settee on the starboard side may be widened to form a bunk by means of exchanging the seat for the wider upholstered seat back. When the bunks are opened to capacity, passage through the cabin is still maintained.



MANTA

The galley counter is of modest size (18″ x 30″) but additional work space is available by folding-down a vertical side-board. In the down position, this work-board (18″ x 24″) occupies one of the port-settee seats, but provides ample space to manage preparation of a large meal. In the up position, it compartments the galley from the rest of the cabin.

A generous utility area in the bow has only sit-down headroom, but seats are installed to allow use of the shower and dressing-room in comfort.

Stowage space is plentiful with bins, lockers and drawers appearing throughout this practical, comfortable accommodation.

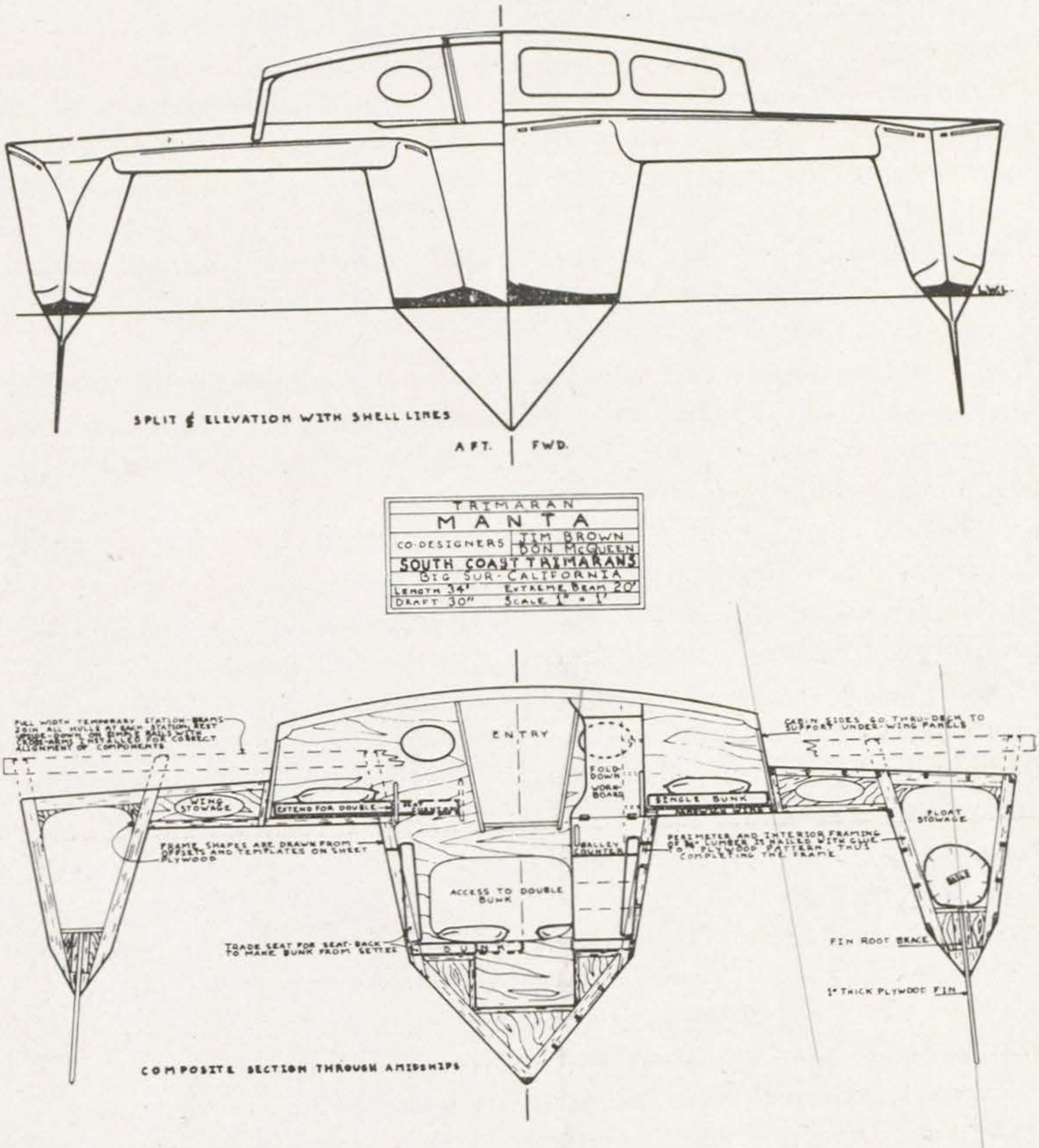
Auxiliary Power. The design of the outboard motor well-and-bracket is another of *MANTA*'s innovations. The well provides for below-decks running and stowage of the motor. In the running position the propeller is located on centre, well under the boat, and just ahead of the rudder for the all-important maneuverability feature not possible with the propeller located anywhere else. Our "scissors-type" bracket guides the motor vertically up when retracting, through the smallest-possible propeller aperture, and holds it firmly in the raised position while the aperture is closed with a form-fitting plug, thus eliminating drag under sail. Then the motor is reclined-and-lowered in its bracket to rest secure in the dry, protected stowage position. The well hatches may be locked. This well-and-bracket feature appears to be the only seamanlike approach to outboard power for trimarans.

MANTA may also be equipped with a traditional inboard engine, with thru-hull shaft and strut, and a feathering propeller.

Free from Compromise. There are many ways to justify the trimarans as a type. Most of these revolve around solving the central problem in all boat design—compromise.

The trimaran configuration with its approach to stability through outriggers, has been seen to impart great safety to seafaring without the burden of a ballast keel ! Once rid of the lead, and the accompanying burdensome hull to carry it along, the lightweight trimaran may have narrow, slicing hulls and great stability at the same time. And with this basic compromise—ballast and beamy hull for stability—now resolved, a chain of other traditional compromises is unlocked.

With the trimaran, we may enjoy exhilarating high performance at reduced cost. We experience greater comfort in accommodation and riding motion than in larger conventional craft. With ease of construction, low maintenance, and the joy that comes with using a new and different thing—a better thing—we can reduce the compromises that impart such painful limitations to many boats.



MANTA

The designers consider *MANTA* to be strictly tops in all design considerations—a wholesome example of her type.

Plans. The plans themselves are very complete, containing large-scale blue-prints and step-by-step instructions. There is a detailed drawing of virtually every structural joint in the boat, with "Builder's Choice" options clearly defined. There is a 15 page booklet on fibreglassing prepared by the designers to apply directly to trimarans. These plans are kept current—amended and enlarged as improvements are developed.

It is clear that the spirit of this boat, as a home-built project, is strongly oriented toward quality. To control this quality, a prospective builder is asked to complete an application which, if accepted, gives the designers some assurance that the boat will be completed as a credit to the design. Also the builder is required to sign a legal statement which limits the use of the plans to only one boat, requires that the plans be followed (or that "improvements" be approved by the designers), and that the plans must not be reproduced. This agreement is mainly to bring the intentions of both parties into common understanding, but is also legally binding for mutual protection. The design fee is $300.

A representative cost analysis based on the materials list and the buying power of the home-builder to include plans, first-class materials, outfitting and sails for the 34′ *MANTA* trimaran, all-up ready for sea, totals $4500 to $5500.

Finally, a new and refreshing value of trimarans of this type is *MANTA*'s pleasing appearance. The fine hull-forms express her speed and sea-kindliness; the low sheer and cambered decks give this multi-hull a look of strength and unity; the rigging and sails appear efficient and manageable. Below decks, the in-ornate but very livable cabin imparts the motion of a real thoroughbred. A man should feel that the boat he builds and owns is beautiful. With this boat he is assured.

34′ TRIMARAN *MANTA*

Approximate Cost Analysis

Plywood. Exterior grade except where noted $490.
Marine grade throughout $980

Framing Lumber at 30 cents per b.f. average $290.

Fibreglassing materials as listed $508

Fastenings, nails and glue as listed $155

Chandler's Items $650 to $1500.

Stainless steel standing rigging, all hardware and fittings, steering linkage, anchors and line, dacron and stainless running rigging; outfitting such as head, sink, stove, etc.—everything required to use the boat in coastal sailing.

Stainless Steel Fabrications $525.

Special fittings for rigging, steering and spars, including labour.

Paint $210.

Epoxy exterior, enamel interior, preservative, bottom paint, and sanding materials.

Sails.

Sloop rig (Club jib, Genoa jib, mainsail). Racing quality $825 Cruising quality $650.

Yawl rig (Storm jib, Club jib, Genoa jib, mainsail, mizzen, mizzen stays'l). Racing quality $1040. Cruising quality $870.

Genoa winches and hardware $200 to $500.

Aluminium spars with roller-reefing.

Sloop $450.

Yawl $625.

Out board auxiliary—complete installation approx. $400.

Depending on elective options and the intended use of the boat, there is considerable latitude in the selection and cost of materials. Based on the above *approximate* analysis, it appears that the home-builder, buying at the retail level, can expect to invest from $4,000 to $5,500 in *MANTA*'s materials and outfitting.

SPECIFICATIONS AND PRICES for 34′ *MANTA*

Plans. $300.

Complete detailed working drawings, step-by-step instructions, consultation and materials-buying service.

Kit I. $4,108.

Hull and floats built to designer's specifications, fibreglassed, sanded and primer painted. Cross-arms included, components aligned with reference bolts, ready for separated transport and/or final assembly. Under-wing panels provided pre-cut.

Kit II. $7,720.

Basic structure—complete with decks and cabin, outboard well, cockpit and lazarette. All fibreglassing completed, sanded, and finish-painted except primered decks. No interior finishing or furnishing.*

Kit III. Sloop—$11,775. Yawl—$12,125.

Sail-away condition including aluminium masts, stainless and dacron rigging, bronze and stainless hardware, all shackles, cleats, winches, etc. necessary for working the sails. 18 h.p. Johnson outboard auxiliary in well with plug and controls. Hatches, windows, ventilators, steering and teak trim. Basic wiring, navigation lights, all exterior finish painting, anchor, line and fenders. Dacron sails include: sloop—main, jib, genoa; yawl—

mizzen staysail, all made by peter Sutter. No interior finishing or furnishing.*

COMPLETE BOAT. Sloop—$14,750. Yawl—$15,100.
All of the above plus interior completely finished in enamels and mahogany. Vinyl-covered foam seats and mattresses for 6 berths. Galley and lavatory sinks with pumps, water and fuel tanks, marine head, basic plumbing and wiring, storage battery. Two-burner stainless stove. *MANTA* well-found.

* Regarding the "no interiors" kits, it should be pointed out that our "combination framing" method establishes all transverse components of the interiors in the framing stage, so that the buyer of these kits has the accommodation already well established.

Prices subject to change.

OFF SOUNDINGS—A CRUISING TRIMARAN

South Coast Trimarans, 2301-7th Avenue, Santa Cruz, California 95062
Area Code 408-Dial 475-9599.

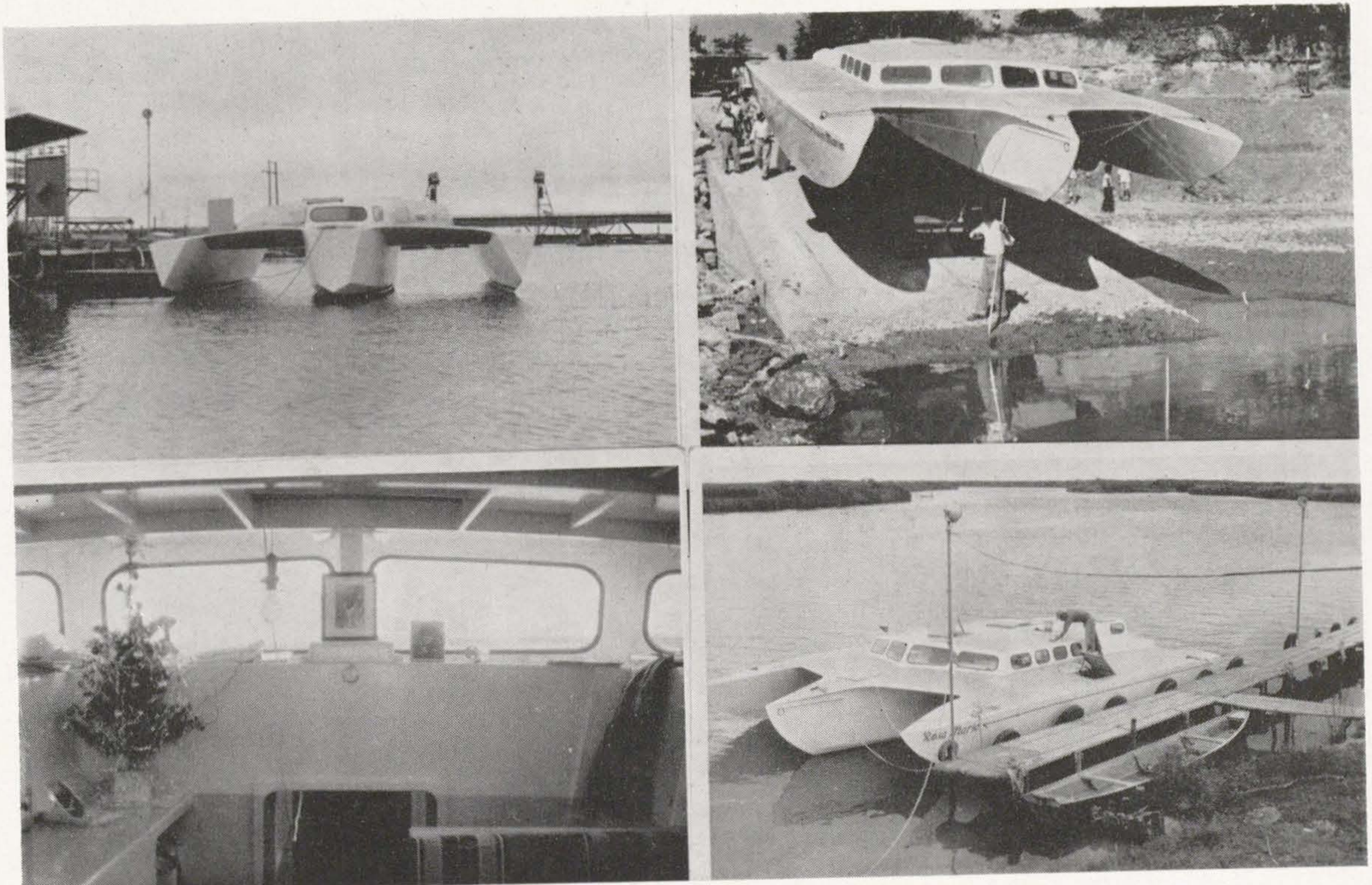
Length Overall 38′
Extreme Beam 22′
Draft 33″
Displacement 7,300 lbs.

Sail Areas :
Club Jib 146 sq. ft.
Genoa Jib 304 sq. ft.
Mainsail 216 sq. ft.
Mizzen Staysail 204 sq. ft.
Mizzensail 103 sq. ft.
Totals 973 sq. ft. all sail
623 sq. ft. with Genoa
465 sq. ft. with Club Jib

Designer : Jim Brown.

OFF SOUNDINGS is a cruising trimaran designed expressly for the owner-builder to satisfy the basic requirements of a family cruising auxiliary. As her name implies, she is meant for really going places—capable of carrying an amateur crew wherever they may wish to voyage. But she is simply constructed of economical materials, the construction being adapted entirely to standard lumber and plywood sizes. Every effort has been made to approach the design from the builder's vantage.

Hull Form. The trimaran's potential for speed has, in *OFF SOUNDINGS*, been coupled with a generous displacement for a multi-hull of her size, providing the all-important carrying capacity and resulting safety, with cruising payloads aboard.

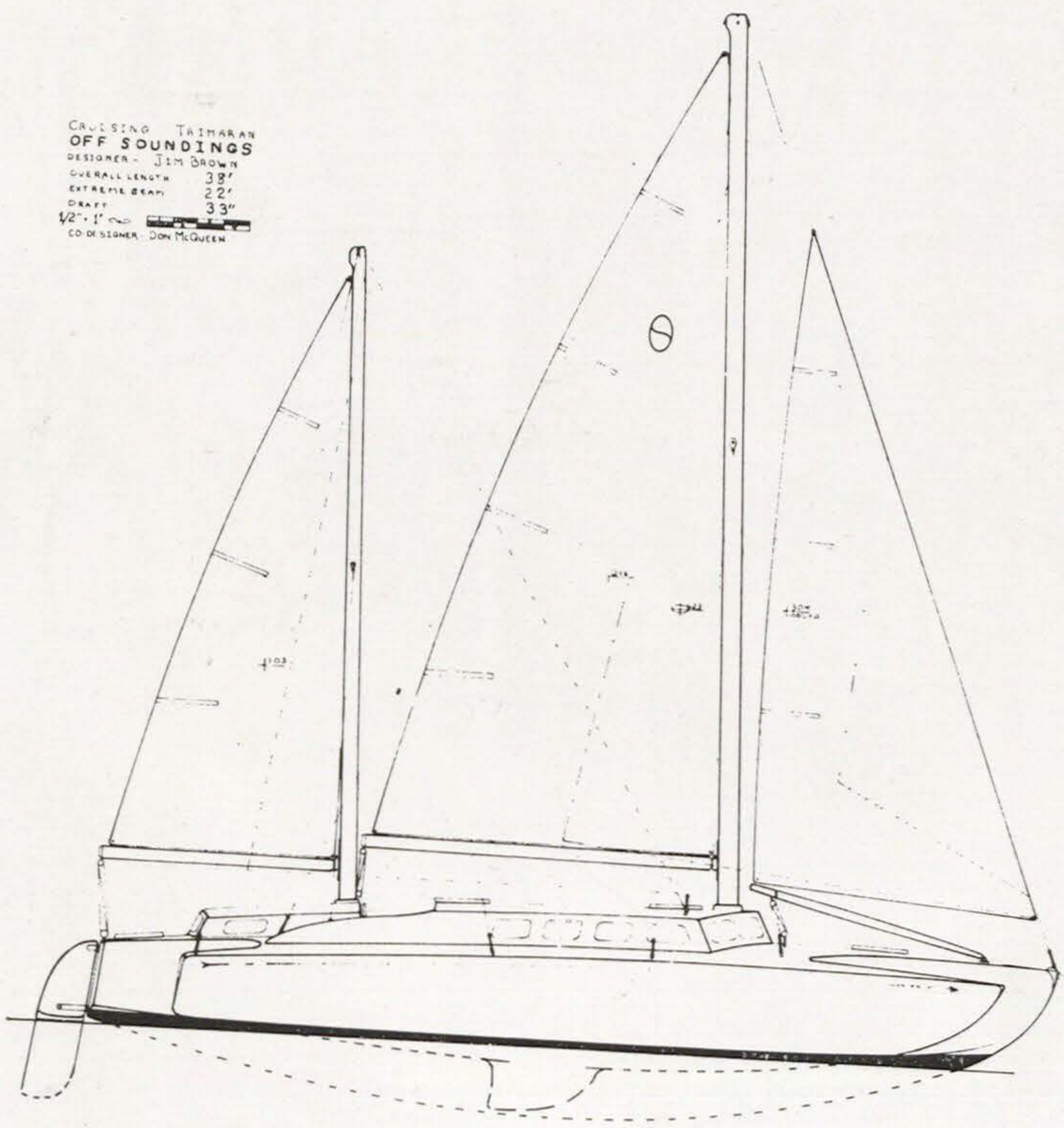


38 *ft.* OFF SOUNDINGS

Several other of our design innovations are expressed in these hulls, such as: the extended stern for "clean outrun" and adequate buoyancy aft; the very "fine bow" with up-sweeping chine for a sharp entry; the "raised chine" to provide a greater "reserve buoyancy" at the waterline where it is needed; and a wide "tunnel" or space between the hulls to allow water to pass through without constriction or pounding.

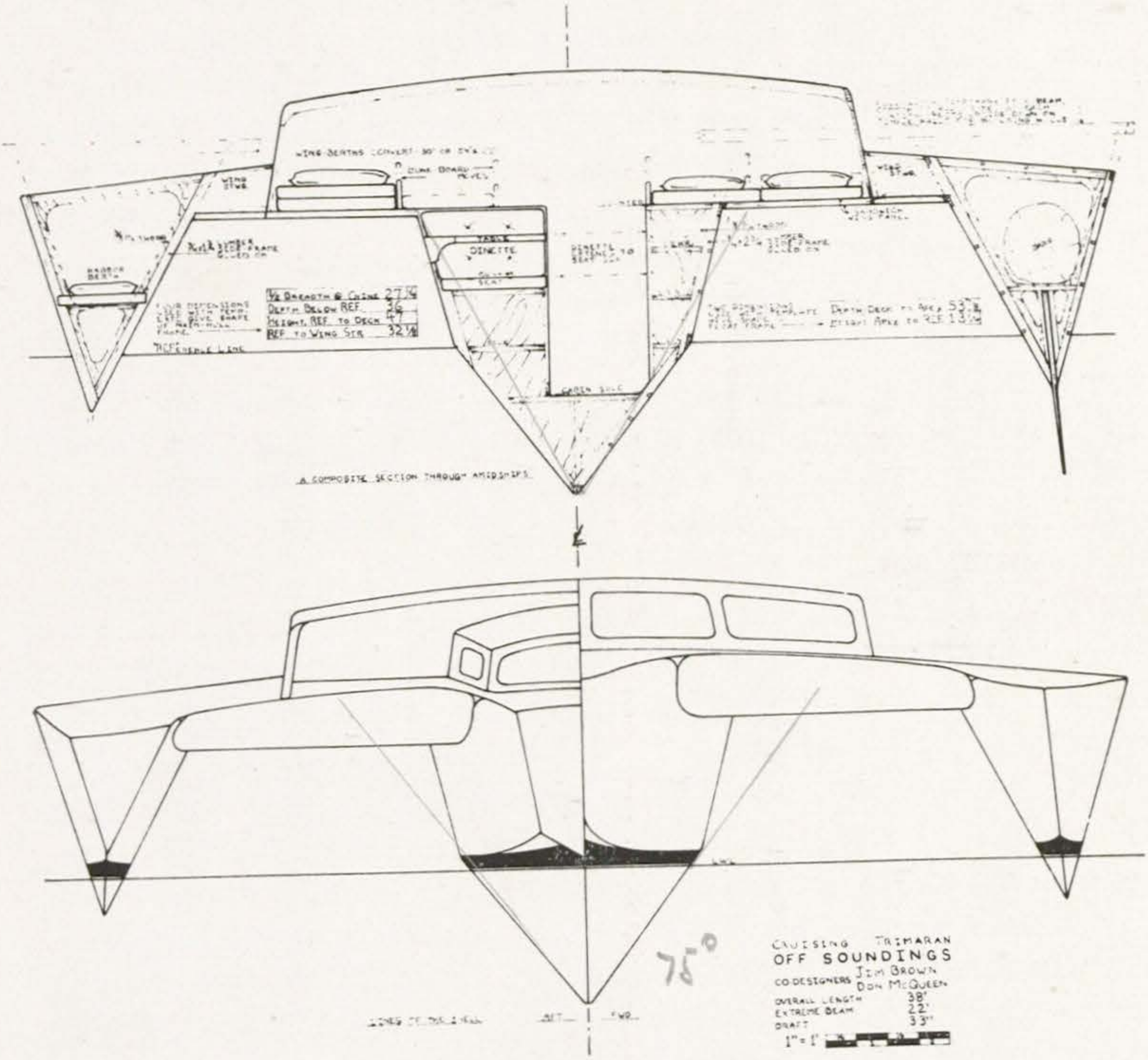
Consistent with cruising, *OFF SOUNDINGS* is equipped with float fins (instead of a drop-keel on the main hull), and a large tilt-up rudder. These provide firm, crisp control when running in a seaway, good wind-ward performance, and complete protection when beaching or striking flotsam.

Rigging and Sail Plan. A meaningful advance in multi-hull rigging is our unique masthead, spreaderless rig, featured in this



OFF SOUNDINGS

cruising trimaran. By taking advantage of her great resource of beam, the rig may be made uncommonly simple and inherently stronger than with the spreader rigs on narrow boats. The overlapping masthead genoa may be sheeted in hard for windward sailing and be free from chafe.



OFF SOUNDINGS

Being decidedly a ketch, *OFF SOUNDINGS*' mizzen mast will accommodate a sizable mizzen staysail, yet the mizzen boom does not overhang the stern, which makes roller-reefing of the mizzen possible (as with the main) and right from the cockpit.

The trimaran has been seen to require greater adjustment of sail area—a more flexible sail plan—for proper handling at sea. With the versatility of a real ketch, roller-reefing on both booms, three headsail graduations, and the mizzen staysail, we consider the masts, rigging and sail-plan to be well suited to the intended purpose of the boat.

Construction. The plans include a detailed drawing of every frame in the boat. Instructions describe how the shape of the frame is established with an amazingly simple use of templates which minimize measuring by describing angles common to many of the frames.

By using a unique system of framing the hulls all three at once, as a unit, the home-builder is assured of proper alignment of the components, yet after the sheet-plywood planking is applied, the hulls may be disassembled for inverting and fibreglassing, then reassembled permanently, with the assurance that everything will fit back together properly. The frames themselves are simple plywood hulkheads with perimeter and interior lumber-framing glued on. The interiors are also established by these frames through our system of "combination" framing, yielding a light, strong and simple skeleton.

Accommodation. The flexibility of *OFF SOUNDINGS*' accommodation provides berths for from three to seven persons. By extending the wing-bunks to form doubles, converting the dinette to a single, and by stowing the chart table in the sterncastle to make way for the double bunk, there is berthage for a large crew of seven, not including the harbour berths in the floats.

The conversions described are simple and workable, including extension of the dinette to seat six. Yet the design provides for stowing much of this furniture, which is used only occasionally, so that at other times the cabins are not filled with bunks and tables.

Looking closely through the boat, one sees that there is an abundance of stowage space; under the dinette, beneath the $6\frac{1}{2}$ foot-long counter, in built-in drawers, lockers and bins, and under the cabin sole. The floats take care of all light-weight bulky articles such as sails, extra bedding and clothing, leaving all the cabin stowage open for ready-access items. There is a practical double-galley with adjacent galley stowage and 'frig, three lockers for hanging long garments, and also, a snug easy chair with bookshelf. While most of the accommodation is fixed and not variable, there are several "builders choice" options included in the plans.

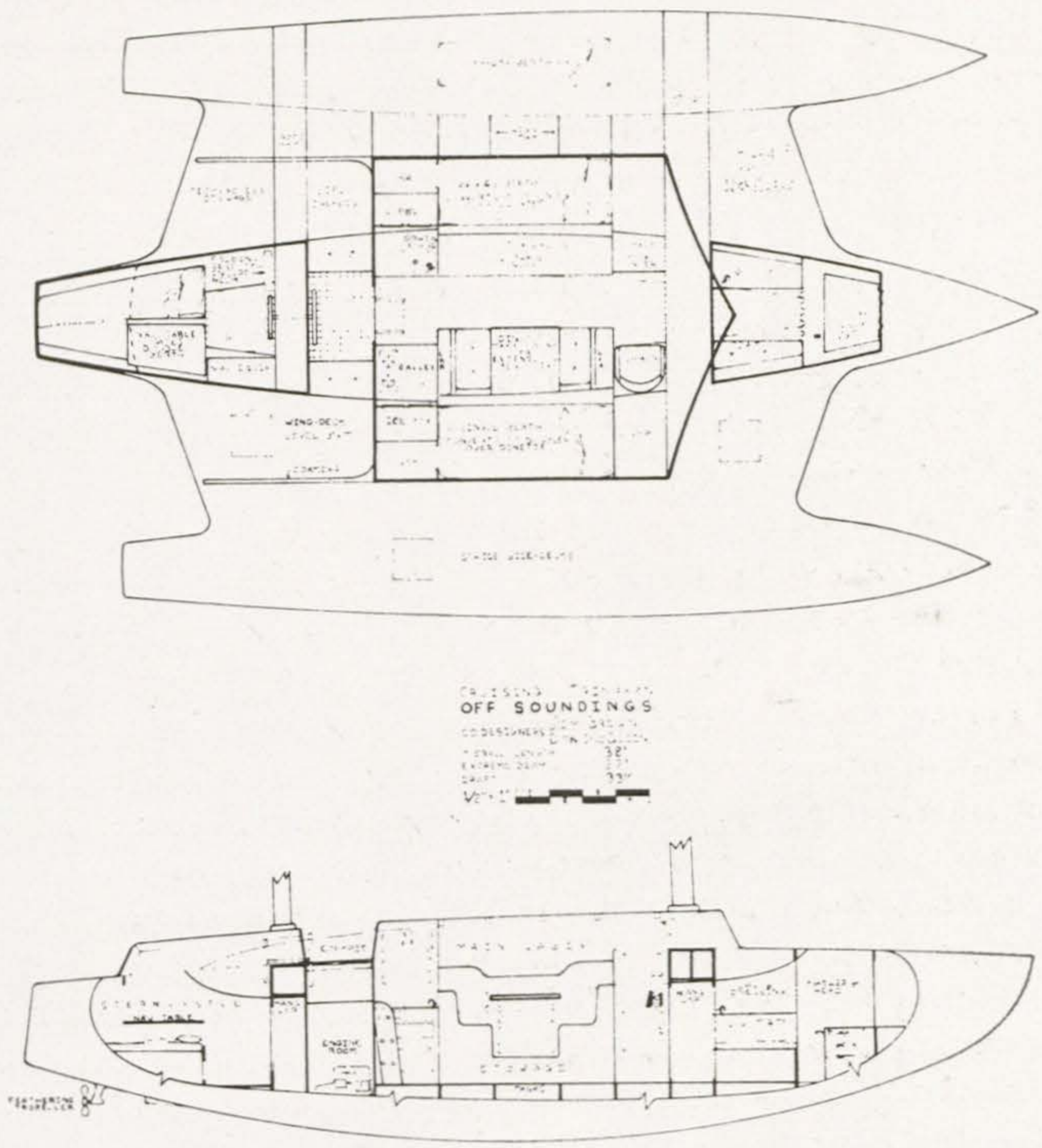
Up forward is a two-compartment head offering a lavatory-dressing room with seat, and a combination head-and-shower. A sail bin and rope locker are in the forepeak.

The sterncastle is intended for the skipper. There is a seat-bunk with large chart table which drops to form a double berth in harbour. There is space for the navigator's equipment, charts, and even an inside helm with folding seat.

Light and ventilation are carefully considered throughout. Large cabin windows afford good visibility and a feeling of spaciousness.

There are integral dorade-type ventilators in the wings to provide a large volume of fresh dry air to the cabins.

Deck Plan. The cockpit is intentionally very small, affording maximum protection and comfort for the helmsman on long watches. But adjacent to the cockpit on either hand are the wing-decks. Also sheltered by coamings, they offer ideal lounging or fishing space and are



OFF SOUNDINGS

perfect for sleeping on deck. During lively sailing the crew is stationed here, well out of the helmsman's way; yet the boat can be single-handed all from the cockpit. Deck space is more than ample to minimize confusion in skin-diving, sail handling, or sailing with large parties.

Engine. Auxiliary power is provided by the "Brennan Imp", a 35 horse-power, 4 cylinder gasoline marine engine weighing only 170 lbs. The engine can be fitted with a take-off pulley for driving a husky pump and an alternator for battery charging at engine-idle speeds. A customary thru-hull shaft and strut arrangement is prescribed, with emphasis on using a feathering propeller to reduce drag under sail.

We consider *OFF SOUNDINGS* to be strictly tops in all design considerations. To be sure, more trimaran design improvements are certainly forthcoming—because as interest grows, and the boating public becomes aware that the type is much better than anything else for this intended purpose, more talent and resources will be invested. *OFF SOUNDINGS* is a developmental craft, but most important to the prospective builder is the fact that her design represents the most advanced, yet proven, sea-going type of sailboat, and her construction has been made so *feasible* as to be a reve'ation to the self-reliant, aspiring voyager. A representative cost estimate for the entire project, including all materials, first-class equipment and sails to completely outfit the boat for serious cruising, would be 65 to 75 hundred dollars, though individual cases may vary.

The plans themselves are very complete, containing over 30 sheets of 18″ x 24″ blue-prints, and complete, written, step-by-step instructions. All longitudinal views are drawn to the large scale of ½″ to the foot. The transverse views (from which the boat is actually built), are twice as large, 1″-1′. There is a detailed drawing of virtually every structural joint in the boat, and many details of spars and rigging are full-scale. There is a 15 page booklet on fibreglassing, prepared by the designers to apply directly to trimarans.

It is clear that the spirit of this boat, as a home-built project, is strongly oriented towards quality. To control this quality, a prospective builder is asked to complete an application which, if accepted, gives the designers some assurance that the boat will be completed as a credit to the design. Also the builder is required to sign a legal statement which limits the use of the plans to only one boat, requires that the plans be followed (or that "improvements" be approved by the designers), and that the plans must not be reproduced. This agreement is mainly to bring the intentions of both parties into common understanding, but is also legally binding for mutual protection. The design fee is $400.

Finally, a new and refreshing value of trimarans of this type is *OFF SOUNDINGS* pleasing appearance. The fine hull-forms express her speed and sea-kindliness; the low sheer and cambered decks give this multi-hull a look of strength and unity; the rigging and sails appear efficient and manageable. Below decks, the in-ornate but very livable cabin imparts the motion of a real thoroughbred. A man should feel that the boat he builds and owns is beautiful. With this boat, he is assured.

NOTE : Plans have been extensively reworked as of April, 1965 to include many improvements the principle modification has been inclusion of the asymmetric float design, seen to improve windward performance and further relieve "interplay" or construction of water-flow between the hulls.

38′ TRIMARAN *OFF SOUNDINGS*
Approximate Cost Analysis

Plywood. Exterior grade except where noted $690.
Marine grade throughout $1340.
Framing Lumber at 30 cents per b.f. average $440.
Fibreglassing materials as listed $598.
Fastenings, nails and glue as listed $190.
Chandlers' Items $1100 to $1950.
Stainless steel standing rigging, all hardware and fittings, steering linkage, anchors and line, dacron and stainless running rigging; outfitting such as head, sink, stove, etc.—everything required to use the boat in coastal sailing.
Stainless Steel Fabrications $350 to $595.
Special fittings for rigging, steering and spars, including labour.
Paint $330.
Epoxy exterior, enamel interior, preservative, bottom paint, and sanding materials.
Sails. Racing quality. $1220. Cruising quality. $940.
Storm jib, club jib, genoa jib, mainsail, mizzen, mizzen stays'l.
Genoa winches and hardware $200 to $500.
Aluminium spars with roller reefing and fittings $675.
Wooden spars included in plans (without fittings) $180.
Outboard auxiliary—complete installation approx. $500.
Inboard auxiliary—complete installation approx. $1200.

Depending upon elective options and the intended use of the boat, there is considerable latitude in the selection and cost of materials. Based on the above *approximate* analysis, it appears that the home-builder, buying at the retail level, can expect to invest a minimum of $5,500, a maximum of $10,000, with an average of $7,000 in *OFF SOUNDINGS*' materials and outfitting.

41′ TRIMARAN AUXILIARY

South Coast Trimarans, 2301-7th Avenue, Santa Cruz, California 95062
Area Code 408-Dial 475-9599

Length Overall 40′ 9″
Beam Overall 24′ 0″
Designer : Jim Brown.

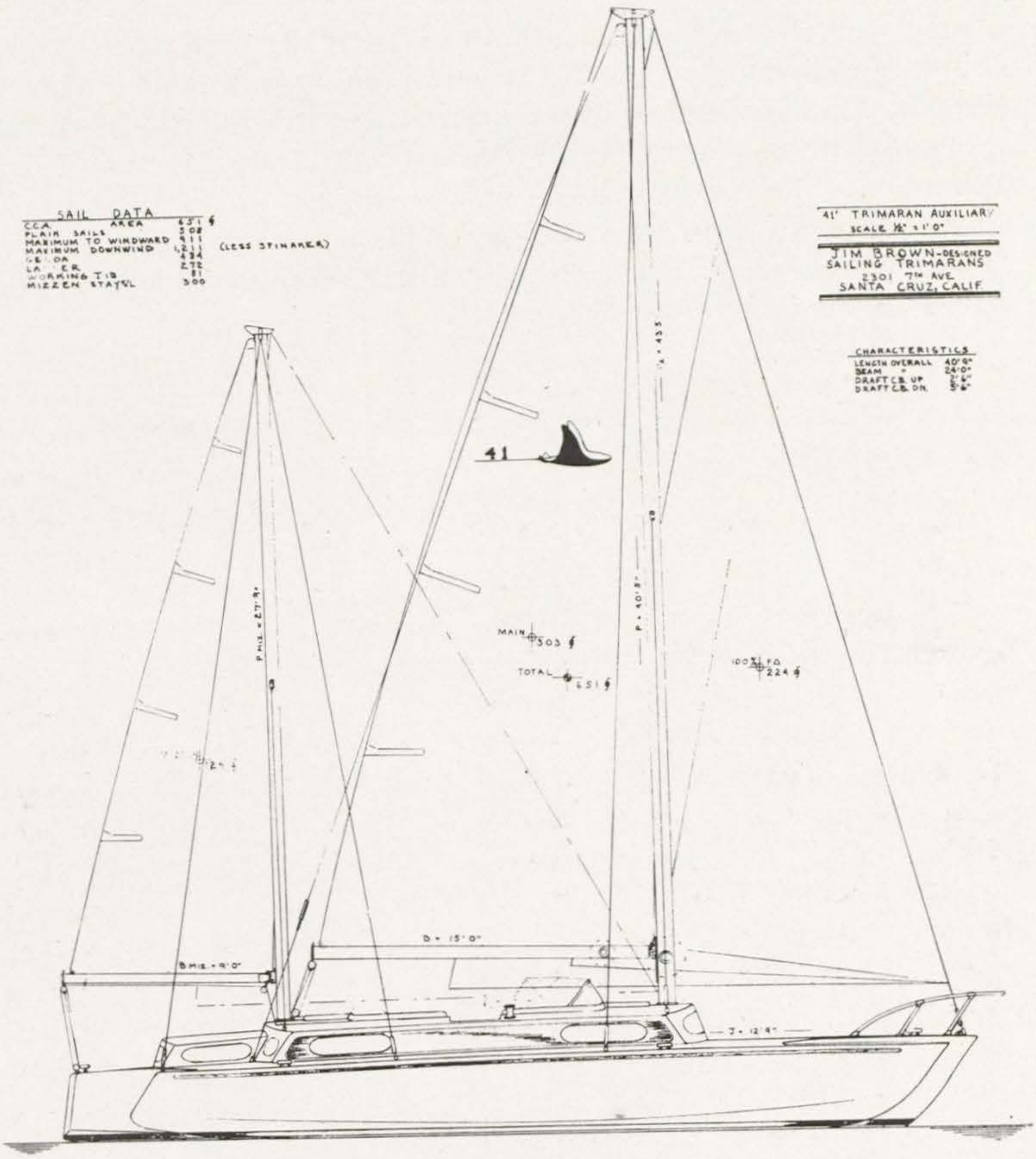
Draft C.B. up 2′ 6″
Draft C.B. down 5′ 6″

Performance is the basic requirement of this design; while the trimaran has been seen to impart great safety, comfort, and accommodation to sea-faring, the performance potential of the larger models has not been fully realized. This design is to exploit the past-proven merits of the type, and achieve (not impair) the potential for performance as well.

In trimaran design, the accommodation plan is usually quite separate and unrelated to performance features, but in this design the two are closely related. The foremost feature of this boat's arrangement is her central cockpit. A nucleus which divides the accommodation into a double-cabin layout with commodious privacy, it also forms a labyrinth around it arranging all available space to be uniquely usable. And this nucleus is to have a marked effect on performance.

Quadrant Centre-Board. By locating the cockpit in the centre of the vessel, a centre-board, often omitted in trimarans, can now be included without the trunk and accompanying structure interrupting the cabin. This trunk is under the cockpit. It strengthens the deepest part of the keel, supports the cockpit sole, and allows for removing the board for service up through the cockpit without hauling the boat. The top of the trunk is several feet above the water-line, in the self-bailing cockpit, eliminating the problem of sealing. The board itself is of the quadrant type which has great inherent strength, pivots automatically on striking obstructions, and because of its quarter-circle shape, always fills its own slot in the keel. Regardless of how far down it is adjusted, there is no partly-open aperture to cause drag. While good windward performance has been achieved in trimarans without centre-boards, using instead fixed fins in the floats, the larger, deeper centre-board included in this design is to achieve *peak* windward performance.

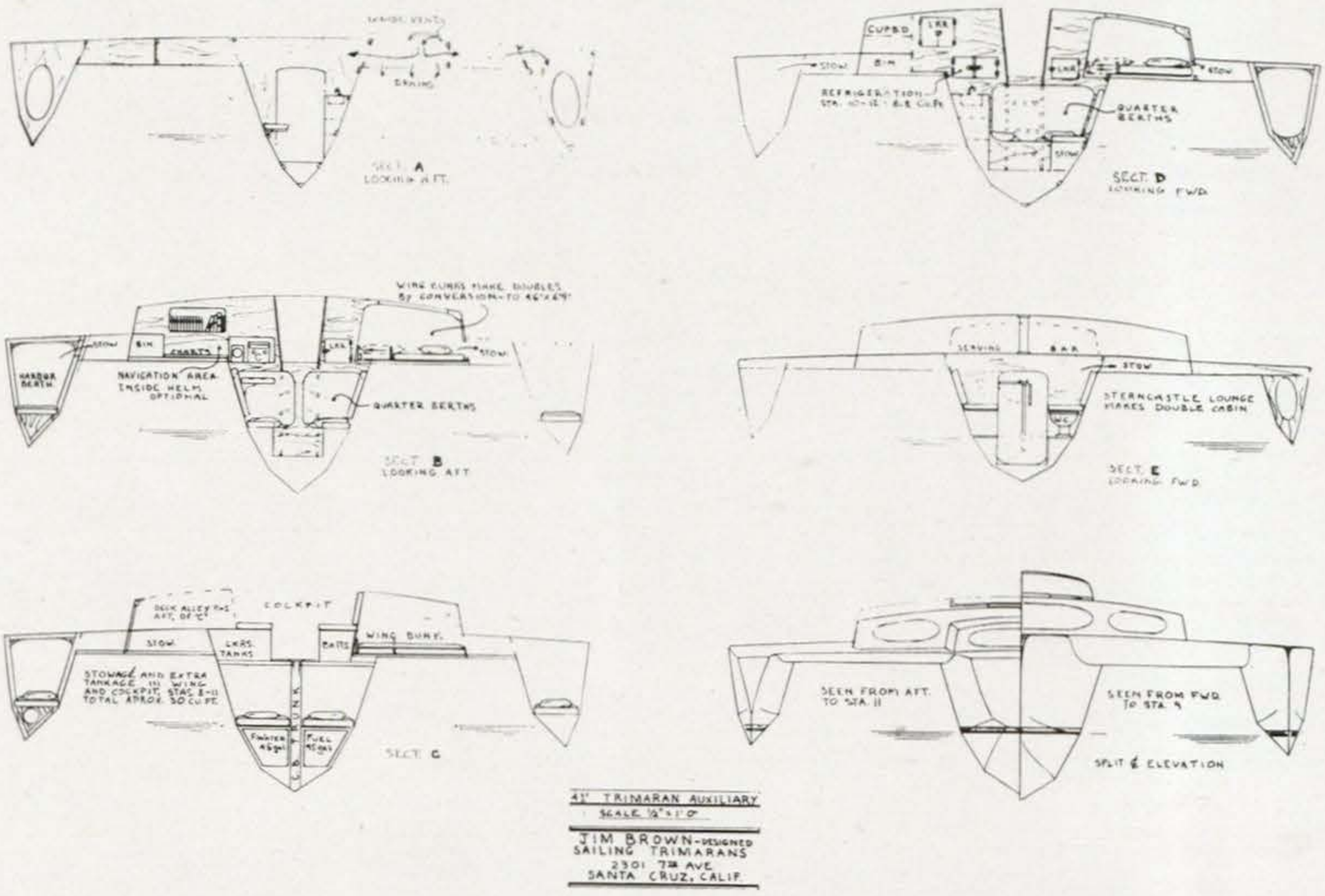
Weight Distribution. The heaviest non-structural objects in this trimaran are people, tankage, and engine, in that order. The central cockpit, now for the first time, allows for all three of these objects to be centralized. The engine is moved several feet forward of its usual position; the tanks are localized in the deepest bilges; and the weight of the crew, formerly centered well aft in a stern-cockpit, is now



41 *ft. Trimaran design*

placed amidships. Centering these weights emphasizes performance in two ways: first, the main hull can be shaped to give a clean, fine "outrun" or stern sections instead of the buxom shape formerly required to give adequate buoyancy aft for supporting these weights. Second, by centralizing these masses at the "axial centre of gyration" (the point around which the boat moves) there is achieved a better more kindly motion and improved directional control and steering qualities.

Control Centre. The cockpit is the point from which the boat is controlled. While sailing vessels have traditionally had their helms located well aft, this is an anachronism from the days when rudder and tiller were a unit. It is no longer necessary with modern control systems. Either wheel or tiller in the cockpit is linked to the rudder through cables or hydraulics. Because the helmsman sits facing athwartships, he can look aft as well as forward to see all the sails. And the various sense data coming to the helmsman from the boat "through the seat of his pants" are better received because of this central location.

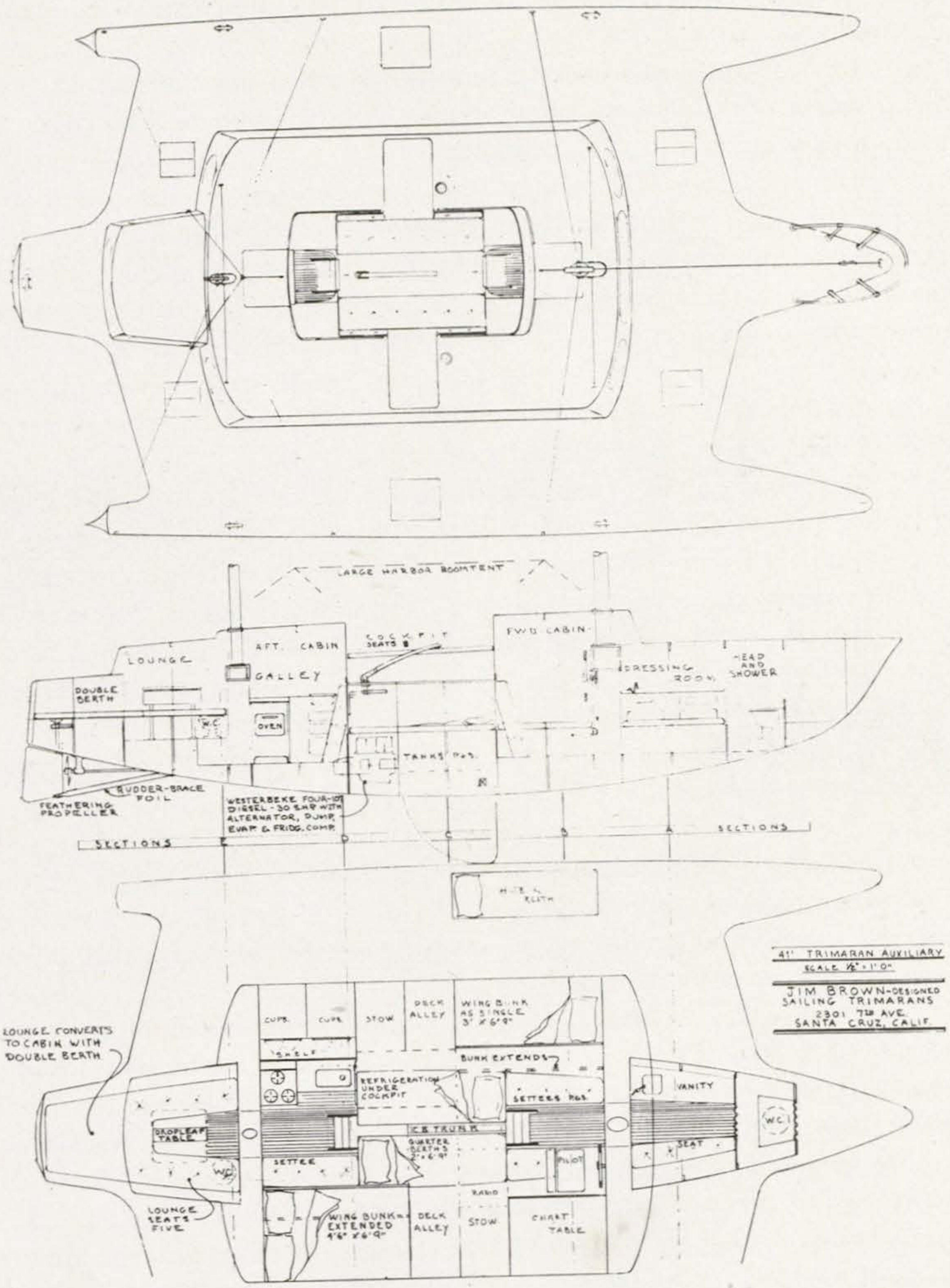


41 *ft Trimaran design*

It being an equal distance to both masts from the control centre, it is possible to lead all control lines such as sheets, halyards and topping lifts directly from the mast steps into the cockpit. It is but a short distance from the control centre to all points on deck.

Access to the deck from the cockpit is facilitated by "deck alleys" which lead outboard from the cockpit at deck level, allowing the crew to go on deck without climbing on the cabin-top by stepping over the coaming instead. These "alleys" also afford separate, sheltered stations for the crew who tend the headsail sheet winches. A sailor, by wedging himself into the alley, has good stance and leverage for cranking the winches, and is out of the helmsman's way.

Pillbox. But the prime virtue of this control centre is the shelter and protection it provides. Imagine ? A sailboat of this size whose



41 *ft Trimaran design*

pilot sits 10 feet from the water, at the exact point where motion is least and visibility best. A wrap-around windshield guards against spray, and the nucleus can be further protected by a canvas dodger while sailing. Rough seas will have a real task to penetrate the defenses of this cockpit, for it is a virtual pillbox.

Combine this with cockpit seating for eight persons (sleeping for two), add a portable dropleaf table, a gigantic boom-tent to cover the area, and you have a real cockpit.

Accommodation. Excellent new possibilities in accommodation layout are open to the designer through the trimaran configuration. In the face of the possibilities many trimarans have become housing projects, and their performance has suffered. There is a strong temptation to try and do too much with a boat of a given size. Some restraint, then, has been exercised in this design to keep her outward form and appearance, her weight and structural integrity, from suffering due to the "row of flats" accommodation.

The requirement "privacy in separate cabins", often met by covering the whole deck with superstructure to include the floats, is answered here by dividing the boat with the cockpit, forming a private cabin forward, and a second one aft. Further privacy is found in the forecastle where the dressing room and head-and-shower are located, and also in the stern-castle where the lounge area converts to a private, double cabin. This makes four private compartments altogether.

While this arrangement lacks one-cabin volume and the accompanying *apparent* spaciousness, it allows an apportionment to make space *usable.*

For instance, underneath the cockpit there are two quarter-berths. They are the bunks which, in a standard cabin layout, could be used only by converting a dinette or sleeping on settees. In this layout they are not used for seating.

Yet there are upholstered seats provided in this boat for some twenty persons. There is a seat in the dressing room, two double settees in the forward cabin, one in the after cabin, and seating for five in the lounge, eight in the cockpit. The settees in the cabins do *not* double as berths (no one will be sleeping here where you want to sit, or worse, sitting on your bunk while you're trying to sleep). The cockpit seats, however, can be used for sleeping on deck, and the lounge, as mentioned, does make into a double cabin when that capacity is required.

There are, altogether, bunks for twelve persons, including the harbour berths in the floats, though the permanent cabin bunks sleep just six. There are two wing bunks, each of which may be used as a single for comfort at sea, or opened to a double when desired.

"Seats for twenty and bunks for twelve" sounds fantastic for a 41′ yacht, and it is, though this capacity would be rarely used. It is only on crowded, festive occasions that so many guests would come aboard, and this flexible accommodation provides for such occasions.

However, the boat is designed for a sustained party of four-to-six, and she looks it. The added capacity does not show in the form of a burdensome, boxey appearance and resultant loss of performance.

In trimarans, that part of the boat which lies between the cross-arms is the most livable, and in this design a special framing module through amidships is geared to the size of a person. Any three bays are long enough to make a bunk (6′ 9″). The wing bunks are arranged outboard of, and overlapping the cockpit (also 6′ 9″ long) and the quarter-berths are directly beneath the cockpit. So, the bunks, cockpit, quarter-berths and cabin areas are arranged in a sort of three-dimensional checker-board, making good use of this valuable amidships area.

Though seating and sleeping can be emphasized, it is not at the expense of stowage space and special-use areas, for the module makes a special labyrinth. Some study of the drawings will reveal this. Note the spaces under the cockpit seats and in the wings: many of these compartments are accessible from several sides. For instance, the refrigeration space may be loaded from the cockpit by raising the seat, and unloaded in the galley. Wing areas marked "stow" are divided access from on deck, or below. Space for stowage of batteries, extra tanks and gear totals some thirty cubic feet in these voids, besides the large refrigeration space and cabinets for navigation equipment. The deck alleys, which are not covered by superstructure, still have compartments beneath them in the wing, and outboard of the cabin there are several deck-access stowage spaces for anchor, lines, and all the clutter usually kept in the forecastle. Some of these spaces double as drain boxes for large dorade ventilators (Section A).

The forward cabin combines a wing-bunk and settee to port with the large navigation area to starboard. Radio and instruments are mounted in a special cabinet shown in Section B, with a large chart table, bookshelf, and even an optional inside helm. In a racing crew, the navigator's bunk is the quarter-berth proximates to his work.

The after cabin includes the generous galley to port, whose work and stowage space extends up into the wing and outboard to the cabin trunk line. There is about 20 cubic feet of galley stowage in the wing and under the counter, a good-sized sink with cutting-board cover, and a 3 or 4 burner range with oven. Fuel is either bottled gas or alcohol, and there is a fine space in the wing adjacent to the galley for storage of gas bottles or large alcohol tank. Filling is done from on deck, with drains and vents through the bottom of the wing. The refrigeration compartment measures 6.8 cubic feet with three inches of foam insulation, and can be enlarged if desired to over 9 cubic feet.

On the starboard side in this cabin, the convertible wing bunk, lockers and the settee complete the cabin.

The interesting feature of this cabin, however, is its couple with the lounge. Because the engine is now out of the way, and the cockpit is re-located, we can pass beneath the after cross-arm into the sterncastle, just as there is passage under the forward cross-arm into the forecastle (Sections A & E). This was formerly not possible in trimarans because the cockpit and engine interrupted this area, requiring that the sterncastle be entered from on deck through a small hatch and down a high ladder. Now, by passing under the aft cross-arm (requires bending from the hips only, not the knees) one enters the lounge where sole and seats are raised to make eye level at window level. Seated around the horse-shoe booth, with dropleaf table between, five or six persons may enjoy dining or refreshments while watching the wake astern. And because the space over the cross-arm is open, the top of the beam becomes a big serving bar from the galley to the lounge. Over this bar, the two cabins are visually joined when togetherness is desired, but can also be separated by draw screen. With dropleaf table lowered, the cabin becomes a double, private stateroom with head.

Rigging and Sailplan. A meaningful advance in multi-hull rigging is our unique masthead *spreaderless* rig, featured in this trimaran. By taking advantage of her great resource of beam, the rig may be made uncommonly simple and inherently stronger than with the spreader rigs or diamond rigs. The overlapping masthead genoa may be sheeted in hard for windward sailing, and be free from chafe.

The mizzen mast is tall enough to accommodate a sizable mizzen staysail. We note the fine possibility of passage-making under headsail and mizzen staysail only, with plenty of sail area in these two sails for average winds, and no booms swinging around.

The sail area in this design is substantially greater than in other "cruising" designs, and the sailplan is more lofty to give higher aspect ratios to the sails. The greater area is to give more power and speed when sailing off the wind and to improve light-airs performance, and the higher aspect produces more drive to windward to exploit the potential of the hulls on this heading.

While the added power is available, it is also possible to turn it off. Because of the ketch rig, sail reduction can be easily made by striking sails instead of reefing, making the boat easily managed even by a small crew. Also, the ketch is more easily trimmed to ease the helm and achieve self-steering.

Hull Forms. Hull and float design in this 41'er represent the designer's latest developments. A unique feature is the double-chine main hull which reduces wetted surface, wave drag and draft, and increases carrying capacity. But most interesting is the design of the *asymmetric* out-rigger. We have seen that this concept, while not new to multi-hulls, is especially applicable to trimarans where the floats can be designed to satisfy a unilateral purpose. When close-hauled to windward, the leeward float sees fairly constant immersion and speed, and can be designed to resist leeway under those conditions. The windward outrigger is, at this time, riding clear of the water, and does not oppose the work being done by the other float. Asymmetric hulls have been highly developed in catamarans, but do not have their chance to function there at their best because both hulls are in the water at once, and they must experience the entire speed range. Multi-hull speeds increase as the point of sailing turns toward downwind. At this time, the floats in this trimaran are carried along with only little immersion, the weight of the yacht being supported by the main-hull. Thus, their asymmetric shapes do not oppose each other and do not impair the boats' ultimate downwind speed potential.

And so it is that these asymmetric floats have been designed for peak performance when they are needed most: at one speed (about 8 knots), on one point of sailing (to windward), and at one-half immersion (moderate heeling). Each float can do its one-sided job uncompromised on this point of sailing, without impairing performance on other points of sail (or without impairing carrying capacity as in asymmetric cats). Also, if properly related to the main hull with correct spacing between, the asymmetric float relieves "interplay" wave action and constriction of water between the hulls, seen to aggravate leeway and reduce speed in trimarans. Together with the quadrant centre-board, these features indicate superb windward performance for this design.

Auxiliary Power. Even with strong emphasis on performance under sail, it is provided that this trimaran be a true auxiliary. The engine prescribed is the Westerbeke Four-107, a high quality marine diesel designed expressly for sailboat auxiliaries. Forty diesel horse-power on the shaft insures plenty of lugging power. And with no reduction, a small feathering propeller can be turned fast enough to take advantage of the trimaran's easily driven shape for a projected cruising speed of 9 knots and a range of 400 miles with standard tankage.

Access to the machinery space is through the after cabin. By removing the accommodation ladder, and folding forward a portion of the quarter-berths, the engine compartment can be opened. A space

5′ wide and $2\frac{1}{2}$′ deep is revealed, with engine and all accessory equipment such as alternator, pump, evaporator etc. easily serviced. Controls and ventilation ducts are housed in a "utilities chimney" just aft of the centre-board trunk.

The inboard rudder and propeller are both protected from damage by the rudder brace, a foil-shaped skeg. Good manoeuvreability under power is insured by the propeller being located just ahead of the rudder.

Aesthetics. All of the features discussed above, particularly those of accommodation, could combine to detract from the beauty of the craft. Over-emphasizing the superstructure can make for an imposing top hamper. Happily, this has been avoided here. The low profile with gently cambered decks and reverse sheer give a pleasing unified appearance to this multi-hull. But beauty is only one part of a boat's aesthetic value, for she is never more beautiful than when she is *moving*. The sight and sound add feeling of a boat that performs well on all points and in all conditions is bound to be beautiful too. And so the advanced design concepts, carefully developed after six years of pioneering trimaran experience are to make this trimaran a wholesome example of her type.

Dear Sir,

The attached slide shows *TRI-ONE* at rest at the dock. The full sized sails have not been finished as yet but it has been tried out under power and with kayak sails which totalled 18 sq. ft.

With a 22 h.p. outboard at 3/4 throttle, the hull moves about 9 to 10 knots. There is very little bow wave but this speed pushes up a stern wave and the stern squats. When we try her with full sized sails, we will see how much of this is due to the outboard.

Surprisingly enough, the tiny sails moved the hull about three knots with a variable 15 to 20 knot wind. The windward angle was surprisingly small, perhaps due to the special boards. Originally, there was no thought of planing this narrow hull because of the round bottom. Now, I am interested in determining at what speed planing will take place.

G. F. Kroneberger.

61, Montego Key, Bell Marin Keyes, via Novato, California.

Ed. Mr. Kroneberger's trimaran was made from three aeroplane drop tanks. The centre one was 24 ft. long: the two side ones 18 ft. overall.

DIESEL ENGINES FOR TRIMARANS

Arthur Piver recommends the Finn Olympia diesel engine for his 40 footers. This engine weighs 295 lbs. and is rated at 15 h.p. With controllable sailing propeller, the 60 lbs. weight of the gearbox is eliminated. The larger Piver trimarans can handle standard diesel weights.

Lauren Williams, who have a series of designs of sailing trimarans, recommend the Olympia, Starret and Westerbake diesels as being small, lightweight and quiet.

The smallest diesel engine in the world, however, appears to be the Petter AAIM air cooled marine diesel. This weighs about 100 lbs. costs £102 15s. 0d. in the basic version and develops a continuous 3 h.p. at 3,000 rev./min. This 3 h.p. is the British Standards rating and I do not know how this compares with the rating of other countries. A 2 : 1 or 4 : 1 reduction gear is included in the price. I estimate that this diesel will give a performance equivalent to that of a 10 h.p. outboard but am woefully ignorant of these matters. Full information can be got from PETTERS LTD., Hamble, Southampotn, England.

The Fairey Hydraulic Drive. With this system, the engine drives a pump which pumps hydraulic fluid through two pipes to a unit where the fluid drives the propellor. Valves can reverse the flow for reverse while a third pipe from this unit can return the fluid to the reservoir without driving the prop to allow the drive to be instantaneously stopped. This system lets the engine be placed more or less anywhere in the boat which is the main advantage. The losses are about 33% which compares quite well with gear losses of 25%. Further details can be got from FAIREY HYDRAULICS LTD., Heston, Middlesex, England.

RETRACTABLE PROPELLOR UNITS

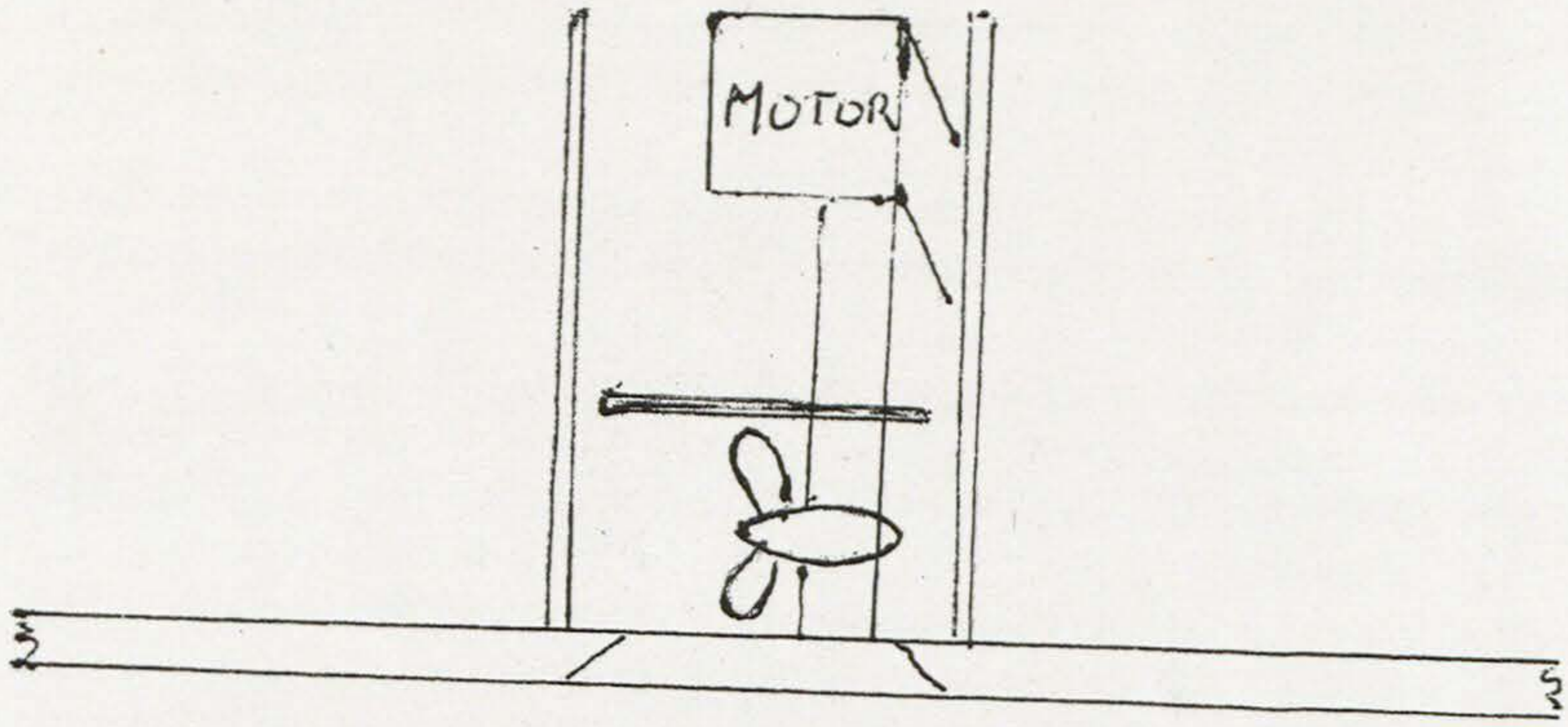
BY

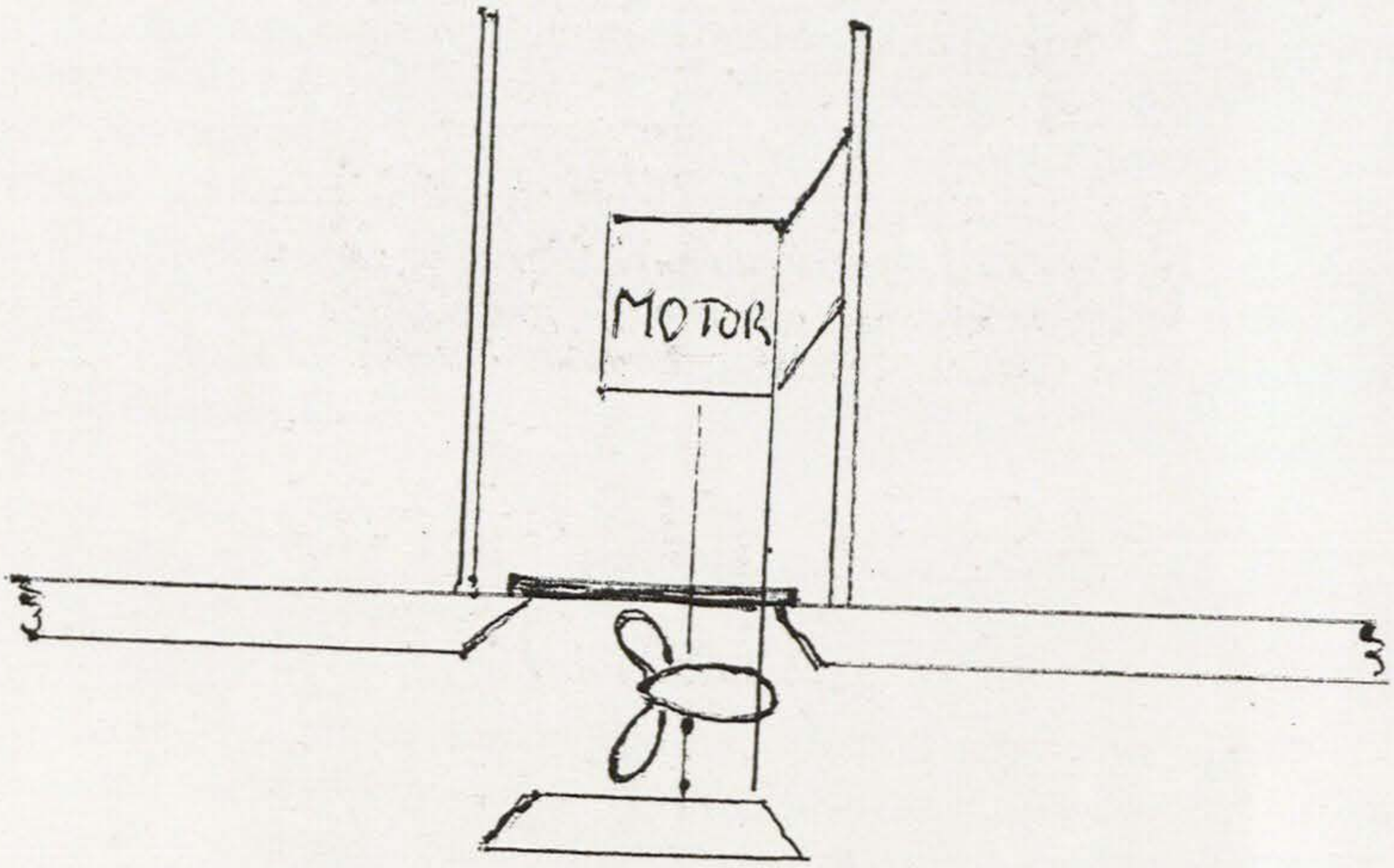
JOHN MORWOOD

The problem of retractable propellors unit is not very easy. If one has an outboard, it eventually drops to the bottom of the ocean, is not instantaneously available and needs the great juggling act to get it on in anything of a seaway.

Inboard-outboard drives are satisfactory but usually need to have the engine in the stern where its weight can be a nuisance. George Chapman's modification of an outboard as an inboard-outboard by revolving the drive through the transom to bring the prop up sideways (described in A.Y.R.S. No. 53) is clever and good but all of these leave the propellor unit exposed at the stern which is less than the best.

The outboard "Trunk", as shown in several designs in this publication, nearly fits the bill but is space consuming, when the outboard tilts. It is also unsatisfactory to drive the boat through an open hole in its bottom. Fitting the "Plug" after use can be a nuisance.





My own solution to this problem is to have the outboard fitted so that it rises and falls vertically (or by parallel sheets of plywood on hinges) and have the propellor "cowled" by a piece of the boat's bottom below it which drops with it and another sheet of plywood above it which drops down onto the inside of the boat's bottom. The drawing shows the idea which is not patented, to my knowledge. With this scheme, the motor is more or less instantly available. It is all inboard, except when in use and presents no sailing obstruction. It could be used with the FAIREY HYDRAULIC DRIVE.

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